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No. 32

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25 May 1977

USSR AND EASTERN EUROPE SCIENTIFIC ABSTRACTS

ENGINEERING AND EQUIPMENT

No. 32

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USSR

UDC 541.24:532.5

SPEED OF SOUND IN FERROLIQUIDS

Perm' UCHENYYE ZAPISKI. PERM'SKIY GOSUDARSTVENNIY PEDAGOGICHESKIY INSTITUT [Scientific Annals. Perm' State Teachers Institute] in Russian No 152, 1976 pp 164-166

PIROZHKOV, B. I., PUSHKAREV, YU. M. and YURKIN, I. V.

[From REFERATIVNYY ZHURNAL, MEKHANIKA No 1, 1977 Abstract No 1B752 by V. A. Naletova]

[Text] The authors measured the rate of propagation of longitudinal, ultrasonic oscillations in two ferromagnetic suspensions, one of which is a suspension of spherical ferroparticles Fe_3O_4 (19 g) with a diameter of approximately 10^{-6} cm in kerosene (100 ml), the stabilizer is oleinic acid (17 ml), the other is a suspension of acicular ferroparticles Fe_3O_4 (25 g) in vacuum oil (100 ml), the stabilizer is oleinic acid. The frequency of oscillations was varied from 50 kHz to 1.2 MHz. In both ferrolíquids no dispersion in speed of sound was observed. The authors investigated the influence of the size of the magnetic field and its gradient on the speed of sound, for this a magnetic field strength up to 6000 Oe was used. No influence was detected of the size of the magnetic field and its gradient on the speed of sound in both liquids. The results of the measurement on speed of sound in both liquids at various temperatures are shown on graphs.

USSR

LONG-WAVE PERTURBATIONS IN REACTING MEDIA

Novosibirsk ISSLED. PO GIDRODINAMIKE I TEPLIOBMENU in Russian 1976 pp 94-95

BORISOV, A. A.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2B600 by the author]

[Text] A study is made of the propagation of small and finite-amplitude perturbations through a chemically reacting gas. The system of equations describing this phenomenon is reduced to a single equation, from which in limiting cases $\tau/T < 1$ the Korteweg-de Vries-Burger equation is produced, while where $\tau/T \approx 1$ the equation for medium frequencies is produced and where $\tau/T > 1$ the high-frequency approximation is produced. Here τ is the time of the chemical reaction, T is the characteristic period of the initial perturbation.

It is demonstrated that if a long-wave perturbation propagates through a medium with an exothermal reaction, it increases in amplitude and decreases in duration, i.e., the signal is amplified. The picture is the reverse for an endothermic reaction. This theory can be used to calculate the unstable structure of acoustical detonation waves in reacting gases.

USSR

UDC 539.3: 534.1

NATURAL FREQUENCIES AND CONFIGURATIONS OF THE SKIRT OF AN AIR-CUSHION VEHICLE

Moscow IZVESTIYA VUZOV MASHINOSTROYENIYE in Russian No 12, 1976 pp 44-48
manuscript received 22 Apr 76

CHAKHOYAN, A. A.

[Abstract] A solution is given of the problem of the free oscillations of the flexible skirt of an air-cushion vehicle as a cylindrical, momentless, inelastic soft shell. The pressure inside the flexible skirt and in the air cushion is considered to be constant during the oscillation process. Curves are plotted for determining the natural frequencies and configurations for a partial case. The unperturbed configuration of the skirt is that of an arc formed by the conjunction of two circular cylinders of different radii. The partial case involves configurations for a particular arc aperture spacing and misalignment ($C/L = 0.4$ and $1/L = 0.06$). It is concluded that the natural frequencies are proportional to the square root of the excess pressure; natural frequencies increase with increased pressure drop coefficient, and increase almost uniformly with increased frequency number. Illustrations 3; bibliographies 5.

USSR

SUPERSONIC FLOW ON A THIN SWEPT WING

UCH. ZAP. TSENTR. AERO-GIDRODINAM. IN-TA in Russian Vol 7 No 4, 1976 pp 9-7

MINAYLOS, A. N.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2B258 from the resume]

[Text] A method described earlier by the author (see Uch. Zap. Tsent. Aero-Gidrodinam. In-ta, Vol 7, No 3 1976 pp 91-102, RZhMekh, 1977, 1B220) is used to study the conical flow about a swept wing with a sweep-back angle of the lateral edge which varies from 45° to 90° . Results are presented corresponding to $M_\infty = 5$ and angles of attack of 5° to 25° . References 5.

USSR

OPTIMIZATION OF THE BASIC PARAMETERS AND CHARACTERISTICS OF A LIGHT AIRCRAFT
FOR THE NATIONAL ECONOMY

[TR.] MOSK. AVIATS. IN-TA in Russian No 356, 1976 pp 4-12

BADYAGIN, A. A.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 12B1237
by G. S. Aronin]

[Text] A study is made of the four-dimensional problem of optimization of a light aircraft for the national economy based on the criterion of cost of transportation. Optimal values of flying weight, wing area, wing span and cruising speed are sought with fixed (variable) values of design flight range, takeoff run and two versions of mechanization of the wing as applicable to a subsonic monoplane with T-shaped empennage and one AI-25 turbofan engine, designed for a payload of 600 kg. Calculation equations are presented for determination of the takeoff weight, fuel consumption and cost of transportation. The algorithm used to search for the optimum, based on a gradient method using penalty functions, was highly effective in "valley situations." Analysis of the results of optimization showed that the optimal speed increases with a decrease in the design range, an increase in takeoff run length and transformation to more powerful wing mechanization. The optimal wing span is minimal (7.6-8.0) with a design range of 420-500 km and is almost independent of the type of mechanization. The optimal wing area and optimal takeoff weight increase with increasing design range and are somewhat less with more powerful mechanization. The optimal specific load on the wing decreases with increasing range and is higher with more powerful mechanization. It is noted that the problem was solved on an M-220m computer in 126 minutes. References 6.

USSR

DESIGN OF AXIALLY ASYMMETRICAL NOSE PORTIONS OF MINIMAL DRAG

Novosibirsk ISSLED. PO GIDRODINAMIKE I TEPLIOBMENU in Russian 1976 pp 230-235

VEDERNIKOV, YU. A.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2B1244
by the author]

[Text] The problem of constructing optimal aerodynamic shapes without axial symmetry is studied in the hypersonic approximation considering surface friction variable with length. Optimization is performed by the method

of random search for the minimum multiparameter functional describing the resistance of the surface around which flow occurs, a nose of variable elongation.

The optimal configurations of the nose portions are determined in a range of elongations of 0 to 6. It is shown that the elongation of the nose portion significantly influences the geometry of the wedges and the relative drag reduction in comparison to an equivalent cone. The number of wedges is varied from 2 to 6. The results of weight testing in a supersonic wind tunnel the T-313 of the Institute of Precision Mechanics, using a 4-wedge nose at $M = 4$ and $Re = 5 \cdot 10^7$ with an elongation of 2.5 show satisfactory agreement between calculated and experimental data. References 10.

USSR

APPLICATION OF POLYNOMIAL METHOD TO CALCULATION OF PARAMETERS OF A STABLE MANEUVER OF AN ELASTIC AIRCRAFT

UCH. ZAP. TSENTR. AERO-GIDRODINAM. IN-TA in Russian Vol 7 No 4, 1976
pp 88-94

AMIR'YANTS, G. A., and BUN'KOV, V. G.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V443 from the resume]

[Text] An algorithm is presented expanding the capabilities of the polynomial method to include the case of calculation of certain aerodynamic characteristics of an elastic aircraft and its stable maneuver parameters. The basis used consists of the characteristics used in design for flutter-rigidity, inertial and aerodynamic matrices. The deformations of the aircraft, angles of deflection and effectiveness of the control surfaces, both in lateral maneuver and in longitudinal, are expressed in universal form. References 8.

USSR

UDC 629.78.015:533.6

NUMERICAL STUDY OF THE FORMATION OF A SEPARATION ZONE NEAR THE SIDE SURFACE
OF A PLATE OF FINITE LENGTH

UCH. ZAP. TSENTR. AEROGIDRODINAM. IN-TA in Russian Vol 7 No 4, 1976
pp 125-128

MYSHENKOV, V. I.

[From Moscow REFERATIVNYY ZHURNAL 41. RAKETOSTROYENIYE No 2, 1977 Abstract
No 2.41.135 from the resume]

[Text] The Navier-Stokes equations are used to produce a numerical solution of the problem of flow around a long plate of finite thickness by a stream of gas at $0.3 \leq M \leq 0.9$ and $Re \leq 1000$. The flow is studied in the vicinity of the leading edge of the plate and restructuring of the flow is studied (formation of separation zones) around the forward angle of the brake on its lateral surface. The dependence of the critical Reynolds number of restructuring of the flow Re_0 on M number is determined. Figures 4; references 5.

USSR

UDC 629.78.015:533.6.01.5.04

INFLUENCE OF CURVATURE OF LEADING EDGE OF A DELTA WING ON ITS AERODYNAMIC
CHARACTERISTICS AT SUPERSONIC FLIGHT SPEEDS

UCH. ZAP. TSENTR. AEROGIDRODINAM. IN-TA in Russian Vol 7 No 4, 1976 pp 1-8

KELDYSH, V. V., and SHTEYNBERG, R. I.

[From Moscow REFERATIVNYY ZHURNAL 41. RAKETOSTROYENIYE No 2, 1977 Abstract
No 2.41.138 from the resume]

[Text] Results are presented from an experimental study of the influence of curvature of the leading edge of a delta wing on its aerodynamic characteristics at supersonic flight speeds. It is shown that with a subsonic leading edge, curvature within limits of $r/c \leq 0.25$ may not lead to a decrease in aerodynamic quality of the wing. At supersonic speeds an increase in sweep-back from 60° to 80° produces a noticeable increase in maximum aerodynamic quality. Figures 5; references 5.

USSR

STUDY OF THE EFFECTIVENESS OF A WING WITH FEATHERED TIPS

[TR.] MOSK. AVIATS. IN-TA in Russian No 356, 1976 pp 21-29

KISELEV, V. A.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2B1222 by A. I. Kharitonov]

[Text] An experimental study is presented of the aerodynamic effects accompanying flow around models of straight and swept wings with feathered tips similar to the wings of birds. The "feathers" are made in the form of rigid streamlined surfaces, which can be set at various angles of attack to the load-bearing surfaces of the wing; in the closed position, the feathers contact each other, forming a single flow profile at the end of the wing. The models were tested in the T-1 wind tunnel of the Moscow Aviation Institute and in a hydrodynamic tube. Coefficients c_x and c_y were measured, and the flow was visualized by means of colored jets of liquid. It is shown that the model of a wing with a feathered tip under certain flight conditions allows the aerodynamic quality $k = c_x/c_y$ to be increased by approximately 20% in comparison to a wing with a continuous tip. This is explained by the fact that the planes of the feathers damp the inductive velocity and drag due to the effect of splitting the end vortex. Based on analysis of the data produced, it is suggested that the maneuvering characteristics of an aircraft be improved by changing the angles of installation of the feathers at the ends of the wing during flight.

USSR

CALCULATION OF AVERAGED FLOW CHARACTERISTICS AT THE INTAKE OF AN AIR COLLECTOR INSTALLED BENEATH A DELTA WING

UCH. ZAP. TSENTR. AERO-GIDRODINAM. IN-TA Vol 7 No 3, 1976 pp 10-17

BAZZHIN, A. P. and FILIMONOV, I. M.

[From REFERATIVNYY ZHURNAL 41. RAKETOSTROYENIYE No 1, 1977 Abstract No 1.41.146 from the resume]

[Text] Results are presented from calculation of the values of M_{av} , compression factor K , total pressure reduction factor ψ_{av} and flow skew angles γ_{vav} and γ_{wav} averaged for the flow at the intake of an air collector installed beneath a delta wing with a sweepback angle $\chi = 80^\circ$ in the range of incident flow M numbers of 3 to 6 and angles of attack $\alpha = 0-10^\circ$. A study is made of the flow mode around the wing with detachment of the compression jump from the leading edges. The change in the characteristics

M_{av} , K and v_{av} as a function of placement of the plane of intake of the air collector is studied. Figures 5; references 3.

USSR

STRENGTH, STABILITY AND OSCILLATIONS OF THINWALL STRUCTURES

[TR.] MOSK. AVIATS. IN-TA No 362 Moscow 1976 80 pages, see also [TR.] MOSK. AVIATS. IN-TA No 362, 1976 pp 18-24, see also [TR.] MOSK. AVIATS. IN-TZ 1976 pp 40-43

OBRAZTSOV, I. F. [Editor], DUDCHENKO, A. A., AVDONIN, A. S., and KNYAZEV, A. A.

[From REFERATIVNYY ZHURNAL 41. RAKETOSTROYENIYE No 1, 1977 Abstract No 1.41.176-178K by T. A. Ye.]

[Text] A study is made of problems of the strength of modern flight vehicles which operate under the influence of high accelerations, high temperature fields and various types of vibration. Particular attention is given to structures which are combinations of various thinwall envelopes, plates, beams and rod systems, and methods of their design for strength, rigidity and stability, based on extensive utilization of computers. A number of works are dedicated to the design of flight vehicle bodies, determination of the influence of geometric parameters, rigidity characteristics and loading conditions on the stress-strain state of structures and their load-bearing capacity. The critical states of smooth cylindrical envelopes are studied under the influence of axial compression and a combination of loads (internal pressure plus pure bending). A study is made of a broad range of problems involved in the design of torroidal, spherical and circular torus envelopes. A new method is presented for clarifying the distribution of stresses near a beam of variable cross section. Problems are studied which are related to the refinement of relationships in the classical theory of elasticity. The collection is intended for specialists in the area of construction mechanics and the strength of thinwall structures and for students at aviation vuzes.

USSR

THE SELECTION OF THE METHOD OF CALCULATION OF THE EVOLVENT OF LINEAR
SURFACE ENVELOPES OF AIRCRAFT UNITS

SAMOLETOSTR. TEKHN. VOZDUSH. FLOTA. RESP. MEZHVED. TEMAT. NAUCH.-TEKHN.
Sb. No 39, 1976 pp 48-50

ZAMALIN, S. M.

[From REFERATIVNYY ZHURNAL 41. RAKETOSTROYENIYE No 1, 1977 Abstract No
1.41.181 from the resume]

[Text] A comparative evaluation is presented for methods of design of the
evolvent of envelopes (skins) of veneer surfaces of flight vehicle units
as a function of the required accuracy and speed. A rapid method of de-
termination of the coordinates of evolvents of envelopes is analyzed, sig-
nificantly reducing calculation time and decreasing the length of the
cycle of manufacture of envelopes and of their replacement in the process
of repair of product units. Table 1.

USSR

UDC 539.3

INCREASING THE CARRYING CAPACITY OF ELONGATED PANELS WITH A DISCONTINUOUS
STRINGER BY THE METHOD OF STRESS-RELIEVING CUTOUTS

UCHNYYE ZAPISKI TSENTRAL'NOGO AERO-GIDRODINAMICHESKOGO INSTITUTA [Scien-
tific Annals of the Central Aerohydrodynamic Institute] in Russian Vol 7
No 3, 1976 pp 156-159

KULIKOV, A. N., KUT'YINOV, V. F., KUSHEVERSKIY, S. K., and PANCHENKO, I. N.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1V217 by resume]

[Text] The authors give the results of experimental investigations on the
carrying capacity of elongated panels with a discontinuous stringer. They
show that the stress concentrator "discontinuous stringer" lowers the carry-
ing capacity by 40% for the panel in the presence of undercuts in the
coupling zone of the stringer with the web. On the basis of the investiga-
tions conducted by the methods of photoelasticity and small-base tensometry
the authors demonstrated that by using stress-relief cutouts as a result of
redistributing the stresses in the concentrator zone this reduction is
lowered to 15%. They give recommendations for selecting the dimensions and
position of the stress-relief cutouts for constructing the elongated panels
with a discontinuous stringer.

HEAT EXCHANGE DURING INJECTION IN THE AREA OF INTERACTION OF A JET WITH AN INCLINED BARRIER

Moscow IZVESTIYA VUZOV MASHINOSTROYENIYE in Russian No 10, 1976 pp 93-98
manuscript received 16 Jul 75

LEONT'YEV, A. I., MEZENTSEV, A. V., and PUZACH, V. G.

[Abstract] A description is given of an experimental study of the heat exchange in the area of interaction of the initial portion of a high-temperature, supersonic, expanded jet with an inclined barrier in the presence of tangential injection of cold air into the turbulent boundary layer through the usual slots. The experimental results obtained in the form of distributions of pressures and specific heat fluxes along the surface of the barrier are reduced to "standard" conditions with the aid of laws of friction and heat exchange. The distributions of pressures and specific heat fluxes were studied along the axis of the jet that expands at a flat, water-cooled barrier plate that is spaced six nozzle diameters from the nozzle face and inclined 35° relative to the nozzle axis in such a way that the axis of the expanding jet at the plate coincided with the axis of the slot. The maximum error in temperature measurement did not exceed 5%. Illustrations 2; bibliography 3.

USSR

METHOD OF PROCESSING OF EXPERIMENTAL DATA FOR DETERMINATION OF THE CHARACTERISTICS OF A TURBULENT BOUNDARY LAYER

TR. MOSK. VYSSH. TEKHN. UCH-SHCHA IM. N. E. BAUMANA in Russian No 222, 1976 pp 5-14

AFANAS'YEV, V. N., BELOV, V. M., SHISHOV, YE. V., and YUGOV, V. P.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2B233 by V. A. Barinov]

[Text] A description is presented of a method of processing of experimental data by computer. The necessary characteristics, in this case the extraction thickness, loss of momentum, etc., are to be determined using a certain smooth function approximating the system of experimental points. The following method is suggested for construction of this approximating function. The entire interval is divided into several sectors (their number may vary, in the example presented they were selected as 6 and 9), in each sector of the approximating function by means of a third power polynomial. In the first sector, adjacent to one end of the interval, it is

necessary to assign a value of approximating function and its derivative at the beginning of the sector; these quantities define two of the four unknown coefficients of the third power polynomial, the other two being defined by the method of least squares from the condition of minimum sum of squares of deviations of experimental data in the first sector from the approximating dependence. Using the polynomial thus defined, the value of the approximating function and its first derivative at the end of the first sector are calculated, and serve as the initial quantities for determination of the coefficients of the polynomial in the second sector, where also two other coefficients are determined by the method of least squares using experimental points located in the second sector, etc. A test is presented of one of the programs for processing the mean and pulsation characteristics of the boundary layer for a Minsk-22 computer using AKI-400 language.

Abstractor's note. The method presented for processing of experimental data by construction of approximating functions with a small number of junction points is similar to a method described in a work by the abstractor (Uch. Zap. Tsentr. Aerogidrodinam. In-ta, 1975, Vol 6, No 5, 128-132, RZhMekh, 1967 4B1033) in which the approximating function used is a spline, i.e., a system of third power polynomials, but with values of the function, first and second derivatives equal at the junction of the sectors.

USSR

UDC 629.78.015:533.1

STUDY OF PULSATIONS OF BOTTOM PRESSURE WHEN A SUPERSONIC GAS JET INTERACTS WITH A BARRIER IN A SUPERSONIC WAKE

UCH. ZAP. TSENTR. AEROGIDRODINAM. IN-TA in Russian Vol 7 No 4, 1976
pp 140-143

ANTOKHIN, P. S., and STOLYAROV, YE. P.

[From Moscow REFERATIVNYY ZHURNAL 41. RAKETOSTROYENIYE No 2, 1977 Abstract No 2.41.151]

[Text] Results are presented from an experimental study of the pulsations of pressure on the floor of a model with a hemispherical barrier located at various distances from the plane of the cross section of nozzles within limits of $x = 1.2 d_a$ to $x = 3.3 d_a$. The aftersection of the model consisted of 8 nozzles located in a circle around the peripheral portion of the bottom area. The conical nozzles were designed for the geometric number $M_a = 4.95$. The variations from design $\bar{p}_a = 10-40$. The velocity of the wake was $M_{\infty} = 6$. It was established that within the range of variations and distances to the barrier studied, the bottom pressure pulsation spectra are continuous wideband spectra. The levels of pulsations increase with increasing variation and eventually approach a certain limiting value. In the range of distances to the barrier studied, the total levels of pressure pulsations decrease monotonically with an increase in this distance. Figures 5; references 7.

USSR

UDC 532.526

DETERMINATION OF A SELF-INDUCED PRESSURE GRADIENT ON A FLAT SURFACE IN A
REGIME OF WEAK INTERACTION

GIDROAEROMEKHANIKA I TEORIYA UPRUGOSTI. MEZHVUZOVY NAUCHNYY SBORNIK
[Hydroaeromechanics and the Theory of Elasticity. Intervuz Scientific
Collection] in Russian No 20, 1976 pp 3-14

SAVEL'YEV, YU. P.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B162 by the
Author]

[Text] The author gives the computational data on the influence of injection $-0.5 \leq f_w \leq 0.5$, the indicators of isoentropy of the outer flow $1.1 \leq \chi \leq 1.6$, cooling of the wall $0.2 \leq q_w \leq 0.87$, the Mach number of the outer flow $5.8 \leq M_{\infty} \leq 100$ and the Prandtl number $0.72 \leq Pr \leq 1$ on the size of the self-induced pressure gradient in the regime of weak interaction on a flat surface.

USSR

UDC 532.526

ON NONDETACHED FLOWS DURING INJECTION

Moscow ZADACHI MEKHANIKI I MATEMATICHESKOY FIZIKI [Problems of Mechanics
and Mathematical Physics, Collection of Works] in Russian Izd-vo Nauka 1976
pp 265-278

SUSLOV, A. I.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B163 by the
Author]

[Text] The author establishes the sufficient conditions for the existence of nondetached flows with injection for a plane-parallel stationary boundary layer of an incompressible liquid. For the nondetached flows with injection the author investigates the asymptotic behavior of the longitudinal velocity component of the liquid $u(x,y)$. He proves the convergence $u(x,y)$ when $x \rightarrow \infty$ to self-modeling profiles corresponding to different injection velocities. References 9.

USSR

INVESTIGATION OF HEAT EXCHANGE IN AN ANNULAR SLOT LOCATED IN THE VICINITY OF THE REAR CRITICAL POINT

Moscow TRUDY MOSKOVSKOGO AVIATIONNOGO INSTITUTA [Works of Moscow Aviation Institute] in Russian No 351, 1976 pp 4-9

SOLNTSEV, V. P., KRYUKOV, V. N., and LIMONOV, V. G.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B461 by I. S. Riman]

[Text] The authors investigate the local heat exchange in a narrow annular slot located in the vicinity of the critical point of a blunt body. The experiment was conducted in a subsonic wind tunnel with an open working part. The flow rate varied from 29 to 165 m/sec, the temperature was equal to 260°. The model was a disk 500 mm in diameter with intensification for setting up the block flush with the annular slot. With change in the disk the authors varied the eccentricity of the annular slot 0, 40 and 80 mm relative to the critical point--the center of the disk. The investigations were conducted with Reynolds numbers $Re = 2 \times 10^6$, computed from the radius of the disk. On a significant part of the surface of the disk the flow velocities varied as a linear dependence on radius. The test results are presented in the form of the ratio of local coefficients of heat yield in the slot to the coefficient of heat yield of a smooth disk. The obtained data indicate a strong dependence of heat yield on the size of the eccentricity of the annular slot and disk, flow rate and slot depth. Increase in the Re and eccentricity leads to intensification of heat yield. In the depth of the slot the heat yield is less than at the surface.

USSR

UDC 533.697

COMPUTATION OF THE AVERAGED CHARACTERISTICS OF A STREAM AT THE INPUT OF THE AIR INTAKE, INSTALLED UNDER A TRIANGULAR WING

UCHENYYE ZAPISKI TSENTRAL'NOGO AERO-GIDRODINAMICHESKOGO INSTITUTA [Scientific Annals of the Central Aerohydrodynamic Institute] in Russian Vol 7 No 3, 1976 pp 10-17

VAZZHIN, A. P., and FILIMONOV, I. M.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B1065 by resume]

[Text] The authors give the results of computations of the values of the number M_{av} , the compression ratio K , the coefficient of recovery of the total pressure ζ_{av} and angles of slope of the stream $\chi_{V_{av}}$ and $\chi_{W_{av}}$, average for the stream at the input of the air intake installed under a triangular wing with an angle of sweepback $\chi = 80^\circ$, in the range of M numbers of the approaching stream from 3 to 6 and angles of attack $\alpha = 0^\circ - 10^\circ$. The authors examine the regime of streamlining of the wing with a discontinuity in sealing isolated from the trailing edges. They investigated the change in characteristics of M_{av} , K and ζ_{av} as a function of the location of the plane of input of the air intake.

USSR

UDC 621.43.011:533;621.5:533

EXPERIMENTAL INVESTIGATION OF THREE-DIMENSIONAL UNDEREXPANDED JETS

GIDROAEROMEKHANIKA I TEORIYA UPRUGOSTI. MUZHVUZOVY NAUCHNYY SBORNIK [Hydroaeromechanics and Theory of Elasticity. Intervuz Scientific Collection] in Russian No 20, 1976 pp 41-47

SOKOLOV, YE. I. and USKOV, V. N.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B1093]

[Text] The authors discuss the results of an experimental investigation of three-dimensional underexpanded air jets flowing to a flooded space from slit nozzles with parameters: $M_a = 1.0$, $1/h = 6, 15$; $M_a = 1.67$, $\theta_a = 10^\circ$; $1/h = 15$. On the basis of the obtained streak-photographs in projection on two planes of flow symmetry, the change in wave structure is analyzed ($1.5 < n < 50$). The authors give the results of measuring the characteristic geometric dimensions of the jets and make a comparison with the corresponding data for two-dimensional and axisymmetrical jets. References 6.

USSR

UDC 629.7.054.07

THE GRADIENT METHOD OF NAVIGATION

Leningrad IZVESTIYA VUZOV PRIBOROSTROYENIYE in Russian No 1, 1977 pp 83-89

IVANOV, V. I., Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov

[Abstract] It is theoretically possible to resolve problems of navigation and control in physical fields of unknown structure in terms of the results of measurement of derivative fields. Moving objects are always immersed in various physical fields: vectorial, scalar, natural or artificial. Data pertaining to the physical fields are usually incomplete: we usually do not know the structure of the fields. The method employed is the correlation-extremal method (Beloglazov and Tarasenko). To analyze angular and linear coordinates of an object of finite dimensions immersed in non-uniform stationary physical fields of unknown nature (but of known structure), there exist solutions for all points where $\bar{V}$ and $\bar{W}$ are linear and $D \neq 0$.

USSR

UDC 532.516

ON SECONDARY SPACE-PERIODIC MOVEMENTS IN AN UNBOUNDED SPACE

Perm' UCHENYYE ZAPISKI. PERM'SKIY GOSUDARSTVENNIY PEDAGOGICHESKIY INSTITUT [Scientific Annals. Perm' State Teachers Institute] in Russian No 152, 1976 pp 77-86

NEPOMNYASHCHIY, A. A.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B79 by Ye. M. Zhukhovitskiy]

[Text] The linear theory of stability of stationary plane-parallel flow with a periodic velocity profile in unbounded space developed earlier (MESHALKIN, L. D., and SINAY, YA. B., PRIKLADNAYA MATEMATIKA I MEKHANIKA [Applied Mathematics and Mechanics] Vol 25, No 6, 1961, pp 1140-1143 [REFERATIVNYY ZHURNAL, MEKHANIKA No 10 1962 Abstract No 10B504] YUDOVICH, V. I., CHISLITEL'NYYE METODY RESHENIYA ZADACH MATEMATICHESKOY FIZIKI [Numerical Methods of Solving Problems in Mathematical Physics, Collection of Works] Moscow, Izd-vo Nauka, 1966, pp 242-249 [REFERATIVNYY ZHURNAL, MEKHANIKA No 6 1967 Abstract No 6B525]) shows that this flow with increase in Reynolds number becomes unstable relative to the long wave perturbations. In this paper the author investigates the secondary motions arising as a result of the development of instability of plane-parallel flow with an arbitrary periodic velocity profile $u(y)$ (the x axis is directed

along the velocity of the basic flow, the y axis--perpendicular). By the method of the small parameter, as which the author uses the width of the interval of wave numbers of the growing perturbations, he finds a nonlinear equation for the transverse velocity component of the secondary motion $V(x)$. It is shown that in the presence of wave dispersion the profile shape $V(x)$ is near sinusoidal. If there are no such dispersions (for example, with an odd velocity profile of the basic motion), then the profile $V(x)$ differs substantially from the sinusoidal, other than the region near the neutral curve. In the case of a symmetrical velocity profile of the basic motion the profile $V(x)$ is expressed through elliptical functions. For the nonsymmetrical profile $U(y)$ the functions $V(x)$ are constructed by the Runge-Kutta method for several values of the wave number and parameter of assymetry of the velocity profile of the basic motion.

USSR

UDC 533.6.011.8

RELAXATION IN A SINGLE-ATOM SPATIALLY UNIFORM GAS

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA [Bulletin of Leningrad University] in Russian No 13, 1976 pp 90-97

MASLOVA, N. B., and CHUBENKO, R. P.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B262 by the Authors]

[Text] The authors set $f(u, t)$ as the solution to the Cauchy problem for the Boltzmann equation

$$\partial f / \partial t = J(f), \quad t > 0, \quad f \Big|_{t=0} = f_0 \gg 0, \quad f_0 \in C(R^3)$$

For the power intermolecular potentials of the form $U = Kr^{-s}$, $s > 4$ (with angle formation) they prove the following theorem:

Theorem. If $f_0 \neq 0$, $\sup f_0 (1+u^2)^{\chi/2} < \infty$, $\chi > \chi(s)$, then when $t \rightarrow \infty$, $f(u, t)$ tends to $m(u)$ uniformly in R^3 . (Here $M(u)$ is the Maxwell distribution, $\chi(s)$ is a positive constant). References 5.

ASYMPTOTIC EVALUATION OF THE SECOND MOMENT OF THE NUMBER OF INTERSECTIONS OF THE STRAIGHT LINE $kt+a$ BY THE GAUSSIAN STATIONARY PROCESS AND ITS UTILIZATION IN THE THEORY OF A RAREFIED GAS

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA [Bulletin of Leningrad University] in Russian No 13, 1976 pp 101-108

MIROSHIN, R. N.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B263 by the Author]

[Text] The asymptotic evaluation given in the title was obtained at $k^{-1} \sqrt{-p''(0)} \rightarrow 0$ in the case when the correlation function of the process ξ_t has for $t \downarrow 0$ the form $p(t) = 1 - t^2/2 + h(t)(1 + o(1))$. Here the author assumes existence of the limits

$$e = \lim_{t \downarrow 0} \frac{th'}{h}, \quad c_1 = \lim_{t \downarrow 0} \frac{t^2 h''}{h}, \quad \lim_{t \downarrow 0} \left(\frac{th'}{h} - 2 \right) \left(\frac{h}{t^2} \right)^{-\delta_1}$$

where $0 \leq \delta_1 < 1$. The result is used for generalizing the author's theorem which evaluates the probability density of the single reflection of atoms of the rarefied gas during collision with a mildly rough surface (see VESTNIK LENINGRADSKOGO UNIVERSITETA [Bulletin of Leningrad University] No 13, 1968, pp 96-101 [REFERATIVNYY ZHURNAL, MEKHANIKA No 5 1969 Abstract No 5B207]). In conclusion it is proven that the function, equal to

$$1 - \frac{2+\beta}{2} |t|^\beta \quad \text{when } 0 \leq |t| < 1,$$

$$\frac{\beta}{2} (2 - |t|)^\beta \quad \text{when } 1 \leq |t| < 2$$

and equal to zero when $|t| \geq 2$ in the case $0 < \beta \leq 1$, is a correlation function. References 10.

USSR

UDC 527

THE EQUATIONS OF INERTIAL NAVIGATION CONSIDERING RELATIVISTIC EFFECTS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 231 No 6, 1976 pp 1311-1314
manuscript received 8 October 76

SEDOV, L. I., Moscow State University

[Abstract] A study is made of the general problem of navigation, determination of world line C of the center of mass of a small particle moving arbitrarily in a Riemann four-dimensional space, as well as the problem of rotation and deformation of the small volume of a particle relative to the inertial Fermi-Walker reference points at points on world line C . The characteristics of the phenomena (independent of the nonessential states of the observer) produced using the natural coordinate system in Fermi-Walker bases have direct and simple physical significance. References 16.

USSR

PECULIARITIES OF HEAT EXCHANGE WITH AN INITIAL ADIABATIC SECTOR AND VARIABLE FLOW PREHISTORY

Novosibirsk ISSLED. PO GIDRODINAMIKE I TEPLIOBMENU in Russian 1976 pp 109-118
VASECHKIN, V. N., and YARYGINA, N. I.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2B218 by the authors]

[Text] Results are presented from an experimental study of heat exchange in supersonic and subsonic turbulent boundary layers with a preconnected adiabatic sector. Particular attention is given to the case of supersonic flow where $M = 3$. An attempt is made to clarify the mechanism of development of the thermal boundary layer under these conditions. The velocity profile is artificially deformed in the incompressible boundary layer for this purpose.

It is found that the heat transfer coefficients follow the standard law of heat exchange for a plate if the Reynolds number is calculated by means of the distance from the beginning of the zone of heat exchange. This result contradicts the theoretical predictions. The peculiarities of the distribution of the mean temperature (where $M = 3$, the mean stagnation temperature) and mean velocity transverse to the boundary layer reveals certain causes for this divergence and the behavior of the heat transfer coefficients. References 10.

USSR

UDC 539.125.5.07

THE COMPLEX OF APPARATUS FOR TESTING NEUTRON FLUX IN THE CONTROL AND PROTECTION SYSTEM OF WATER-MODERATED, WATER-COOLED POWER REACTORS

Moscow POSTROYENIYE SISTEM APPARATURY YADER. PRIBOROSTR. in Russian 1976 pp 13-24

BURENKO, I. YE., BOROVIK, G. F., ZHERNOV, V. S., KRASHENINNIKOV, I. S., and LYUBETSKIY, K. I.

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA No 1, 1977 Abstract No 1.32.1432 by P. N. A.]

[Text] The concept of development and basic systems engineering decisions of a new hardware complex for neutron flux measurement for nuclear power plants in their control and protection systems is presented. The following problems are analyzed: the concept of development and structure of the hardware complex; basic versions of electronic circuits; testing of workability; assurance of interference stability; standardization, design solutions; experimental checking and testing; technical parameters. The complex of hardware for testing of the neutron flux provides for testing and measurement of the flux density of thermal neutrons in water-cooled, water-moderated nuclear power plant reactors in all operating modes, including fuel transfer, in the reactor power range of 10⁻¹⁰-120%. The basic technical parameters of the device for testing of neutron flux for the control and protection system are regulated by the International Electrical Engineering Commission. Figure 1; tables 2; references 12.

USSR

UDC 624.074.4.012.4.04

SOLUTION OF THE NONLINEAR PROBLEM OF DESIGNING LARGE-SCALE REINFORCED-CONCRETE VAULTED PANELS AND SHELLS

Moscow STROITEL'NAYA MEKHANIKA I RASCHET SOORUZHENIY in Russian No 6, Dec 76 pp 20-25

MATSELINSKIY, R. N., Scientific Research Institute of Concrete and Reinforced Concrete

[Abstract] A method is proposed for computing short, sloping cylindrical shells on the basis of a deformation pattern that accounts for physical nonlinearity. An equation is derived for the nonlinear connection between displacements and loads that also accounts for the process of crack formation in the diaphragms up to creep initiation in the reinforcement. Experiments were conducted with 57 specimens of vaulted prestressed panels of different concretes in various sizes (from 1.5 x 6 to 3 x 24 m) with various reinforcements. The bending curve plotted for the 3 x 24-m panel is characteristic of all the tested panels and shows that the loss of bearing stability by the system results from creep in the active reinforcement of the diaphragm. Theoretical bending at creep initiation exceeds the experimental by 9-10%, providing a sufficient reserve of reliability for the proposed method. Illustrations 6; tables 2.

USSR

UDC 536.485: 666.97 (626.8)

INFLUENCE OF CONTRACTION ON THE FROST-RESISTANCE OF CONCRETE

Moscow GIDROTEKHNIKA I MELIORATSIYA in Russian No 10, 1976 pp 30-33

SHLAYEN, A. G.

[Abstract] The mechanism is explained whereby contraction occurs during the hardening of concrete. It is shown that contraction does not create a particular type of porosity, but simply leads to the formation of an additional volume of gaseous constituent as a result of the internal liberation of gas during the reduction, by contraction, of the gas pressure above the surface of the water inside large pores and capillaries as a result of hydration adsorption. Contraction can increase the frost-resistance of the concrete as well as the air that is entrained into it along with additives. Depending on the conditions under which the concrete hardens, contraction can also have a negative affect on the frost-resistance. Frost resistance will not be improved in concrete that is wet down or immersed in water to cure unless it is first cured in air to the point where its compressive strength is at least 0.04 to 0.05 MPa. Bibliography 7.

USSR

UDC 627.8.034.96

GROUTING AND DRAINING THE BASE OF THE DAM AT THE ZEYA HYDROELECTRIC POWER STATION

Moscow GIDROTEKHNICHESKOYE STROITEL'STVO in Russian No 11, 1976 pp 10-12

NOVOZHILOV, M. S., and PLOSK, A. YE.

[Abstract] The massive counterforce dam at Zeya is 112 meters high, 714 m long at the crest, and contains about 2,200,000 m³ of concrete. The filling of the reservoir began in Aug 75, and the first generator set was put on load in Nov 75. The base of dam is a lower paleozoic intrusion of diorites with veins of lamprophyres and mezozoic porphyrites. The grouting and drainage project called for 36,000 lin m of grouting and 11,000 lin m of drainage wells, which were sunk 5-6 m below the grouting zone. Where the rock base joined the concrete dam the grout curtain was reinforced by two additional series of wells 10-20 m deep and filled with grout. An important element of the underground contour of the dam is a frontal drainage curtain extending about half the depth of the grout curtain (30-35 m). In order to reduce the filtration load on the crack filling material in the grout curtain zone the 105-mm diameter drainage wells were inclined 15° to the water level. Illustrations 3; bibliographies 4.

USSR

UDC 627.82.034.93

CONSOLIDATION GROUTING OF THE CHIRKEY DAM BASE

Moscow GIDROTEKHNICHESKOYE STROITEL'STVO in Russian No 11, 1976 pp 13-15

KOTUL'SKIY, V. V., SKOKOV, V. G., and SUROVEGIN, V. V.

[Abstract] The arch dam at the Chirkey hydroelectric power station was completed in 1976. It has an overall height of 231 m (discharge height 48 m, arch portion 183 m) and is 345 m long at the crest. Two basic types of tectonic cracks are found: folded (smooth, narrow--10-20mm--almost vertical, extending 70° - 90° at right angles to the river) and diagonal (extending in different directions, 5° - 70°, from the lower water level on the right bank 500-800 m, and to the upper water level on the left bank). Deformation moduli vary considerably. For these reasons consolidation grouting was necessary to a depth of 20 m in the central and lower sections of the dam and 15 m in the upper section. A complete description is given of the grouting configuration and operation. Illustrations 2.

USSR

UDC 666.972.167

IMPERMEABILITY AND FROST RESISTANCE OF CONCRETE WITH AMMONIA SOLUTION AS A FROST-RESISTANT ADDITIVE

Moscow GIDROTEKHNIЧЕСКОYE STROITEL'STVO in Russian No 11, 1976 pp 17-19

KUZ'MIN, YE. D., VIRSKAYA, V. V., and KRUGLOV, V. A.

[Abstract] Although it is known that concrete with ammonia added can be placed at temperatures down to -100° , that the ammonia does not corrode the reinforcement and is the cheapest of all concrete additives (27 rubels per ton), the lack of information on the frost resistance and permeability of ammonia concrete induced the authors to investigate these factors, as well as the physical-mechanical properties in relation to the amounts of cement used, cement-to-water ratio, ammonia concentrations, percentage of icing, and temperatures. It was found that the concrete hydrated with ammonia and cured at negative temperatures has a high water impermeability than ordinary concrete without the additive. The presence of up to 60% ice in the concrete cured at below freezing temperature does not reduce the main physical-mechanical properties below those of ordinary concrete. Partial icing (25-30% of the liquid phase) considerably increases the strength and frost resistance of the concrete. Tables 3; bibliographies 8.

USSR

CALCULATION OF THE LIMITING VALUES OF SHRINKAGE DEFORMATION OF HEAVY HIGH-STRENGTH CONCRETES

Kiev RASCHET I ISPYTANIYA STROIT. KONSTRUKTSIY in Russian 1976 Vyshcha Shkola Press pp 79-91

LUBENETS, I. I., RAZZAKOV, S. R., and SAYDASHEV, L. M.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V655 by O. M. Popkova]

[Text] A review and analysis are presented of existing methods of calculation determination of the limiting values of deformation shrinkage of heavy high-strength concretes. It is noted that most existing methods use the following formula to estimate the shrinkage deformation of the concrete:

$$\varepsilon_y = \varepsilon_y^H \prod_{i=1}^n \xi_i,$$

where ϵ_y^H is the mean limiting value of shrinkage deformation from the moment of completion of moist storage of the concrete, ξ_1 is a dimensionless coefficient considering one of the factors influencing the shrinkage (dimensions of cross section of specimen, moisture content of air). A comparison is presented of the results of 70 series of tests performed by various investigators for the results of calculation determination of shrinkage deformation of heavy concretes using various methods. It is noted that the best agreement with the experimental results is obtained by a method suggested by the authors considering the influence of the water/cement ratio and the content of cement in the concrete mixture on the shrinkage deformation of the concrete. References 13.

USSR

UDC 624.046

THE LOAD-BEARING CAPACITY OF NONCENTRALLY STRETCHED REINFORCED CONCRETE ELEMENTS OF ORDINARY AND HIGH-STRENGTH CONCRETE UNDER THE INFLUENCE OF TRANSVERSE FORCES

Moscow BETON I ZHELEZOBETON in Russian No 11, Nov 76 pp 34-37

ZORICH, A. S., Khar'kov Commercial Construction Scientific Research and Planning Institute

[Abstract] Experiments have shown that the actual load-bearing capacity of noncentrally stretched reinforced concrete elements, particularly when there is force eccentricity and transverse forces are applied, is in many cases significantly higher than that calculated by the standard formulas of the construction norms and rules. More accurate formulas are presented for calculation of this strength factor. When one set of formulas here presented is used, the experimental values of transverse force average 46% greater than the calculated values. The experimental beams used in the study measured 180 x 300 x 3000 mm and were reinforced with longitudinal reinforcement consisting of three rods 25 mm in diameter of type A-III steel, placed in the span, in cantilevers and above the beam supports, and three rods 12, 14 or 16 mm in diameter of A-III steel, placed in the span in the upper zone of the beam. The tests showed that the sequence of application of the transverse load and longitudinal tensile force had no significant influence on the direction, width and projection of slanted cracks produced by the load or on the maximum load upon rupture of the beams.

USSR

UDC 69.024.4:691.328

THE ECONOMIC EFFECTIVENESS OF LARGE REINFORCED CONCRETE VAULTED PANELS

Moscow BETON I ZHELEZOBETON in Russian No 11, Nov 76 pp 7-9

MATSELINSKIY, R. N., MIRONOV, A. A., and SPANNUT, L. S., Scientific Research Institute for Reinforced Concrete

[Abstract] Large reinforced concrete vaulted panels are used to make the roofing of industrial buildings with spans of 12, 18 and 24 m. The advantage of this structure over traditional flat structures in the form of segmented beams and flat slabs is the three-dimensional work of the vaulted panels, allowing simplified design of buildings, providing for minimum material consumption, and assuring simplicity of manufacture and installation. Prestressed reinforcement is located in the diaphragm ribs and is generally made of a single rod or cable element, while unstressed reinforcement in the form of a grid is placed in the floor of the panel and in the ribs. The introduction of large reinforced concrete vaulted panels meets the major requirements of technical progress in the area of construction--significant reduction in labor consumption for the manufacture and installation of the panels, a decrease in the consumption of metal and cement and a reduction in the mass of the products. Roofing made of these new panels has great rigidity and crack resistance, significantly increasing reliability and durability. References 5.

USSR

UDC 624.102:539.4

EXPERIMENTAL INVESTIGATIONS OF ECCENTRICALLY COMPRESSED REINFORCED CONCRETE SUPPORTS BUILT ON THE VOLCANIC SLAGS OF KAMCHATKA

Petropavlovsk-Kamchatskiy BETONY NA YESYESTVENNYKH PORISTYKH ZAPOLNITEL-YAKH KAMCHATKI [Concretes on the Natural Porous Fillers of Kamchatka Collection of Works] in Russian 1976 pp 105-111

BEL'CHUK, I. L.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1V1108 by M. Kh. Leybur]

[Text] The author discusses the method and cites the results of testing eccentrically compressed supports with a flexibility of 6.34, 8, 12, 16, 17.6. Samples with a cross section of 15 x 25 cm were reinforced by longitudinal rods with a diameter of 12 A-111 and a ring with a diameter of 8 A-1. During the tests the author measured the deformations of the reinforcement and concrete with the aid of tensoresistors, and the deflections were measured with Aistov deflectometers. The columns were tested to fracture. The theoretical carrying capacity of the samples was computed

from Construction Norms and Regulations 11-13.1-62* and the "Handbook on Planning Constructions and Light Concretes." The experimental values of the fracturing loads are compared with the corresponding computed values. References 5.

USSR

UDC 532.529

SUPERSONIC FLOW OF A GAS CONTAINING PARTICLES AROUND A THIN WEDGE AND CONE WITH HEAT EXCHANGE AND DEFLECTION OF THE PARTICLES TAKEN INTO ACCOUNT

Tashkent IZVESTIYA AN UZBEKSKOY SSR, SERIYA TEKHNICHESKIKH NAUK No 3, 1976 pp 67-68 manuscript received 2 Oct 75

DZHALILOVA, T. A., Institute of Mechanics and Earthquake Resistant Structures, Academy of Sciences Uzbek SSR

[Abstract] The problem, in linear formulation, involves the flow of the two-phase medium around a thin profile, with the deflection of the particles and heat exchange taken into account. It is assumed that the deflection of the particles from the surface of the body does not influence the flow of the gas containing the particles, and that friction between the particles is absent before and after their deflection. A generalized Newton formula is used to determine the pressure of the particles against the surface. Bibliographies 6.

USSR

UDC 624.046: 519.2

APPLICATION OF RELIABILITY THEORY TO THE STANDARDIZATION OF DESIGN LOADS

Moscow STROITEL'NAYA MEKHANIKA I RASCHET SOORUZHENIY in Russian No 6, Dec 76 pp 15-19

SUKHOV, YU. D., and BULYCHEV, A. P., Central Scientific Research Institute of Structural Parts

[Abstract] On the assumption that a method of standardization of design loads is needed, the authors suggest that a minimum expenditure requirement for the erection and use a structure be used. They propose, for example, that the design snow loads that are used in the traditional "semi-probability" method of calculation be standardized by means of a probability-optimization method in order to guarantee the reliability of structures within the required economic constraints. The method may consider several real factors in addition to the theoretical. Changes in standards should be compared with traditional norms and the change justified by experience

from practice. For example, before new snow-load curves are used for a structural design a series of existing designs should be studied to select those closest to optimum, and the loads for which they were designed should be compared with the snow-load curves of the standardized design. This will allow for the introduction of correction factors based on practical experience. Illustrations 5; bibliographies 5.

USSR

STRUCTURAL HYSTERESIS AND SEISMIC STABILITY OF METAL FRAMES WITH JOINTS
MADE WITH HIGH-STRENGTH BOLTS

Tashkent SOVERSH. METODOV RASCHETA I KONSTRUIR. ZDANIY I SOORUZH.,
VOZVODIMYKH V SEYSMICH. R-NAKH in Russian Fan Press 1976 pp 149-151

SIGAL, F. R.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V276
by Yu. A. Belyayev]

[Text] A study is made of the influence of dry friction on the reaction of structures to seismic effects. Experiments are performed with a model of a metal frame unit. A study is made of a single-mass system, linearized by the method of statistical linearization. The acceleration of the base is taken as a stationary process with rational fraction spectral density. Expressions are produced for the dispersion. Graphs are constructed. Numerical integration is used to study a multimass system. The relationships between dry friction forces by levels are taken on the basis of various rules.

USSR

THE INFLUENCE OF ICE COVER ON THE SURFACE OF A RESERVOIR ON OSCILLATIONS OF THE STRUCTURE OF WATER ENGINEERING STRUCTURES IN THE WATER MEDIUM DURING EARTHQUAKES

Leningrad SOVERSH. METODOV RASCHETA I PROYEKTIR. GIDROTEKHN. SOORUZH., VOZVODIM. V SEYSMICH. R-NAKH in Russian Energiya Press 1976 pp 162-165

SHEYNIN, I. S., MUKHUTDINOVA, R. KH., and SHAMES, M. P.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKI No 2, 1977 Abstract No 2V493 by the authors]

[Text] A study is made of the problem of hydroelasticity of two bodies. A structure with a vertical supporting face performs oscillations in a body of water, the surface of which is covered with ice. The model of an ideal incompressible fluid is selected. In solving the integrodifferential equation for forced oscillations of the ice, the presumption of smoothness of bending of the ice surface is used, due to which the problem is reduced to solution of a system of linear algebraic equations, performed on an M-222 computer. The program written allows, for fixed values of physical parameters of the system, determination of the first m values of the resonant frequencies, bending function W and the coefficients of "attached masses" for the wall and the ice.

USSR

STUDY OF THE STRENGTH OF FOUNDATIONS AND SUBSTRUCTURES BY THE METHOD OF PHOTOMECHANICS

TR. NII PROM. STR-VA in Russian No 17, 1976 pp 41-66

FAZULLIN, I. SH., BORODIN, O. A., SYCHEV, YU. G., and KUDIMOV, YE. V.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKI No 2, 1977 Abstract No 2V839 by the authors]

[Text] This article is dedicated to a review and analysis of the results of experimental studies performed by the polarization-optical method (photomechanics) by the strength laboratory of the Scientific Research Institute for Industrial Construction over the last 10-13 years. The authors demonstrate the need for and effectiveness of application of photomechanics for investigation of stress state of the foundations beneath substructures. The methodological aspect of the problem is presented. The use of mathematical modeling on an EGDA-9/60 electrical integrator for the production of needed information in the method of photomechanics for the determination of normal

stresses is described. Particular attention is given to the study of stresses around piles and pile foundations of various designs as they interact with single-layer and multiple-layer foundations. A significant number of experiments was performed to reveal the regularities needed for refinement of calculation which, as a rule, are approximated by functional dependences. Some of these dependences are used in theoretical solutions. A number of statements are tested under natural conditions. Along with the solution of specific problems concerning foundations, the optico-mechanical properties of foundation model materials are studied, and the method of experimental studies is debugged and improved. References 44.

USSR

STUDY OF THE OPERATION OF SHORT POURED PILES WITH RADIAL EXPANSIONS UNDER STATIC AND DYNAMIC LOADS

Kishinev SOVERSH. METODOV RASCHETA I KONSTRUIR. ZDANIY I SOORUZH., VOZVODIMYKH V SEYSMICH. R-NAKH in Russian 1976 pp 93-97

SHAYEVICH, V. M., and YARUTIN, V. K.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V878 by B. I. Didukh]

[Text] Studies of poured piles under the influence of vertical and horizontal static and horizontal dynamic loads applied to the head of the pile are studied at two construction sites consisting of macroporous loess-like loam. The length of the piles is 3 m, mean diameter 50-65 cm, spread at lower end 120 cm in diameter.

Some of the piles were driven an additional 40 cm into the ground by means of a VP-1 vertical vibrator after they were poured, compacting the soil beneath the foot of the pile. Static testing of the load-bearing capacity for vertical loads shows a significant increase for these piles (approximately by a factor of 3) in comparison to ordinary poured piles; however, a reduction in load-bearing capacity for horizontal loads was observed in the vibrated piles.

Horizontal dynamic loads cause additional settling of the piles, which appeared only when a certain threshold value of parameter of oscillation was exceeded. Tables of the main results of the experiments performed are presented.

USSR

STUDY OF THE SEISMIC STABILITY OF A MASSIVE COUNTERFORCE DAM ON A LARGE-SCALE FIELD MODEL

Leningrad SOVERSH. METODOV RASCHETA I PROYEKTIR. GIDROTEKHN. SOORUZH. VOZVODIM. V SEYSMICH. R-NAKH in Russian 1976 Energiya Press pp 96-100

GORDIYENKO, P. I., ZATVORNITSKIY, O. G., and SHABLINSKIY, G. E.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V1234 by the authors]

[Text] The method and results are presented from studies of seismic stability of a massive counterforce dam 119 m in height. The studies were performed on a 1:15 scale model constructed in a special field on a rock foundation. In the experiments, the dynamic characteristics of the dam, displacements, accelerations and stress state of the dam resulting from seismic effects were studied. Modeling of seismic effects was performed by means of special short-delay explosives. The results of the studies on the large-scale model were compared with the data of laboratory studies of the same dam in 1:200 scale. Important peculiarities of the work of such dams during an earthquake found only in the large-scale model are noted.

USSR

FIELD STUDIES OF THREE-DIMENSIONAL GRID STRUCTURES UNDER STATIC AND DYNAMIC LOADS

Tashkent SOVERSH. METODOV RASCHETA I KONSTRUIR. ZDANIY I SOORUZH., VOZVODIMYKH V SEYSMICH. R-NAKH in Russian 1976 Fan Press pp 60-69

ABDURASHIDOV, K. S., KHASHAKBAYEV, A. I., URUMBAYEV, A. KH., and ASHMARIN, P. I.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V1293 by Ya. M. Ayzenberg]

[Text] Results are presented from experimental studies of three-dimensional metallic grid structures for roofing. The purpose of the experiment was to refine the calculation models of structures and check the theoretical concepts concerning their operation under static and dynamic loads. The studies were performed on a natural three-dimensional structure of "Kislovodsk" type pipe measuring 30 x 30, type number SP-30-400S, with a design load on the roof of 400 kg/m² for buildings with seismic activity ratings of 8 and 9 units, as developed by Giprospletslegkonstruktsiya Institute. Recommendations are given for adjustment of the structures.

USSR

THE INFLUENCE OF THE PROPERTIES AND STRESS STATE OF A "FOUNDATION-STRUCTURE" SYSTEM ON THEIR REACTION TO SEISMIC EFFECTS

Kishinev SOVERSH. METODOV RASCHETA I KONSTRUIR. ZDANIY I SOORUZH. VOZVODI-MYKH V SEYSMICH. R-NAKH. in Russian 1976 pp 43-49

ALIYEV, G. A.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V1303 by L. Sh. Kilimnik]

[Text] A brief analysis is presented of studies dedicated to the problem of interaction in a building-substructure-foundation system under seismic effects. Primary attention is given to increasing the energy dissipation characteristics upon transition of the load-bearing structures and foundation of the structure to the elastic-plastic and plastic stage of deformation. Results are presented from experimental studies of building-foundation system models by methods of centrifugal modeling using an installation developed under the leadership of the author. It is noted that analysis of the test results allows explanation of certain peculiarities of the reaction of the building to earthquakes and eliminates the contradiction observed between the calculated and actual seismic stability of structures.

USSR

UDC 624:539.4

EXPERIMENTAL INVESTIGATION OF THE DYNAMIC CHARACTERISTICS OF FOUNDATIONS AND THE SYSTEM TURBOUNIT-FOUNDATION-BASE

TRUDY KOORDINATSIONNOGO SOVESHCHANIYA PO GIDROTEKHNIKA [Works of the Coordination Conference on Hydraulic Engineering] in Russian No 109, 1976 pp 35-41

VARENTSOVA, N. A., GOL'DICH, V. A., KIRILLINA, V. N., KOSTAREV, V. V., ORLOV, I. I., ROGOZINA, N. V., and TOMASHEVSKIY, A. V.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1V1014 by the Authors]

[Text] The authors discuss the results of experimental investigations of the dynamic characteristics of unloaded foundations of turbounits K-500-240-2 from the Khar'kov Turbogenerator Plant imeni S. M. Kirov at the Troitskaya State Regional Electric Power Plant and the K-500-65/3000 from the Khar'kov Turbogenerator Plant at the Leningrad Atomic Energy Power Plant. They determined the influence of installing the turbounits on the dynamic characteristics of the system turbounit-foundation-base. The

authors cite data on the sizes of the oscillation energy scattering coefficients in these systems. They give recommendations on building up systems from resonances.

USSR

UDC 69.059.22: 624.131.29: 624.141.414.3

ON DEFORMATIONS OF STRUCTURES ON THE HEAVING SOILS OF KAZAKHSTAN

Moscow OSNOVANIYA, FUNDAMENTY I MEKHANIKA GRUNTOV in Russian No 6, 1976
pp 7-10

ULICHKIN, G. M., GUR'YEVSKIY, YE. A., and KOCHIN, V. F.

[Abstract] The city of ARKALYK in central Kazakhstan was first built up with prefab barracks-like structures in 1956; three- and four-story brick, panel and block structures were first built in 1959, and 5-story buildings in 1962; in 1972 construction was begun on reinforced-concrete and steel-frame industrial buildings. The air temperature varies over the year from -52°C to $+40^{\circ}\text{C}$; the frostline extends down to a maximum of three meters (two meters average). The Arkalyk territory is made up of an antropogenic system of formations consisting of clays and loams in low-plasticity, semi-solid and solid states. Freezing causes the soils of the base to swell to a depth of 10 meters, causing a maximum heaving of 20%, generating pressures of 0.4 to 0.6 MPa. Many structures in Arkalyk become deformed to the point of becoming dangerous to use; some develop vertical cracks extending from the foundation to the roof. Frequent construction measures against the heaving have had little affect because the characteristics of the heaving of the base have been studied under summer conditions or in the laboratory without the freezing process taken into account. The affect of swelling during freezing must be determined under real conditions. Illustrations 4; table 1; bibliographies 8.

USSR

STUDY OF THE STABILITY OF THE STRUCTURE OF NONCOHESIVE SOILS UNDER MONAXIAL DYNAMIC DEFORMATION CONDITIONS

IZV. VNII GIDROTEKHN. in Russian Vol 111, 1976 pp 51-55, 139

SMIL'TNEK, A. I.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V794 by the author]

[Text] A brief description is presented of a new method for investigation of the dynamic stability of noncohesive soils in a monaxial compression tester, based on determination of the dynamic compressive stresses causing deformation of the soil. The concept of critical dynamic stress is introduced. Results are presented from studies of specimens of sand soils of varying granulometric composition.

The results of testing of the sands can be used for preliminary estimation of the dynamic stability of the structure of noncohesive soils, comparable as to geological engineering data with the soils studied.

USSR

USE OF SETTLING AS A FUNCTION OF LOAD TO CALCULATE THE RELATIVE SETTLING PROPERTIES OF SOILS

Moscow INZH.-STROIT. IZYSKANIYA No 3(43) Stroyizdat Press 1976 pp 23-27

EKMAN, V. YE.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V796 by the author]

[Text] A short method is suggested for determining the relative settling properties of soils. During laboratory studies, one need but determine the relative settling at a pressure of 0.3 MPa. The value of relative settling up to 0.2 MPa can be calculated with accuracy sufficient for practice using conversion factors. References 6.

USSR

THE INFLUENCE OF THE MICROSTRUCTURE OF ARTIFICIALLY REINFORCED SOILS ON THEIR PHYSICAL AND MECHANICAL PROPERTIES

Moscow NOVYYE SPOSOBY STR-VA I GIDRAVLIKA GIDROTEKHN. SOORUZH in Russian No 3, 1976 pp 30-36

BOCHKO, E. A.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V799 by the author]

[Text] Silicate-soil and polymer-soil specimens are studied. It is established that the binders in polymer-soil systems are in three states: films, three-dimensional grid structures and independent elements. These states of the binders in the soil correspond to contact, film and pore states. Another important peculiarity of the microstructure is the variation in thickness of cement films resulting from the method of stabilization. It is also established that for all stabilized sands the air-dry storage mode has a clear tendency toward increasing rate of propagation of P waves with a simultaneous decrease in specific gravity, increase in porosity and static modulus of elasticity. These data can be used in planning measures for stabilization of unstable rock. References 6.

USSR

UDC 550.35:551.341.5

THE IMPULSE NATURE OF ANOMALIES OF THE HELIUM AND RADON CONTENT IN CERTAIN SPRINGS ASSOCIATED WITH FAULTS IN THE NORTHERN TYAN-SHAN SEISMIC ZONE DURING THE PERIOD PRECEDING THE KOCHKORSKIY EARTHQUAKE OF 1974

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 231 No 6, 1976 pp 1331-1334 manuscript received 25 Jul 76

CHALOV, P. I., TUZOVA, T. V., and ALEKHINA, V. M., Institute of Physics and Mathematics, Academy of Sciences KirgSSR, Frunze

[Abstract] The authors had the rare opportunity to monitor continually the helium and radon content of artesian well water, observing short-term (day-week) variations in the radioisotope parameters of waters associated with the faults of the northern Tyan-shan seismic zone in June and July of 1974. The studies were performed in the summer of 1973 (July) and 1974 (June-July) on hot water springs in Tyan-shan. It was found that the content of helium changed significantly, increasing and fluctuating quite widely, during the period immediately preceding the earthquake of 1974. Although the content of radon did not increase as sharply as that of He before the earthquake, there was an increase in comparison with the level in 1973, and fluctuations

were considerably broader. Thus, temporary changes in the content of He and Rn of great frequency and amplitude, with a background of generally increasing levels of these parameters, in some springs of water from deep faults in tectonically active zones may signal activation of tectonic processes which may result (or may not result) in the formation of earthquake foci within the limits of the seismic zone or large faults. References 5.

USSR

UDC 624.131.434: 131.212

SWELLING OF A SAND BASE AS A RESULT OF THE GENERATION IN IT OF CRYSTAL
HYDRATE SECONDARY FORMATIONS

Moscow OSNOVANIYA, FUNDAMENTY I MEKHANIKA GRUNTOV in Russian No 6, 1976
pp 5-7

SOKOLOVICH, V. YE., and TROTSKIY, G. M.

[Abstract] A description is given of the strong deformation of the foundation under two inside columns at the Krasnopresnensk Sugar Refinery built in 1965; the deformations were caused by the chemical swelling of the sandy base as a result of the formation of crystal hydrate compounds from technological sewage that systematically invaded the base from piping leaks that were not checked. The two columns had lifted 20 and 5 cm, respectively, when tested in Aug 1972. The first column lifted an additional 39 mm before stabilizing in mid-1973. The process of formation of the hydrates in the system $\text{NaCl-NaOH-H}_2\text{O}$ was analyzed, and measures were taken to correct the dangerous situation. The sewer piping system was replaced, and the two threatened columns were vertically reinforced at the ground level by struts connected to horizontal reinforcing beams at the floor and ceiling levels. By early 1976 the foundation under the two columns had settled back to the original level. Illustrations 4.

USSR

HEAT TRANSFER UPON BOILING OF AQUEOUS SOLUTIONS OF INORGANIC SUBSTANCES IN LARGE VOLUMES

Baku 2-YE VSES. NAUCH.-TEKHN. SOVESHCH. TEKHN. SOVESHCH. PO TEME "ISPOL'Z. MOR. I SOLONOVAT. VOD NA TES I ZADACHI NAUCH. ISSLED." 1976 TEZISY DOKL. in Russian 1976 pp 97-98

GUROVICH, B. M., TAKTAYEVA, L. N., and GORELOV, A. YA.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2B522 by S. G. Povsten']

[Text] Results are presented from a study of heat exchange in boiling water and boiling solutions of NaCl , NaNO_3 , Na_2SO_4 , KNO_3 , NH_4NO_3 , NH_4Cl , $(\text{NH}_4)_2\text{SO}_4$, K_2CO_3 in a large volume at atmospheric pressure over a broad range of concentrations and thermal loads up to 300 kw/m^2 . The working element was a pipe of stainless steel 7.5 mm in diameter, heated by direct transmission of electric current through it. The heat transfer coefficient is determined as a function of the thermal load for each of the solutions studied and a generalizing equation is produced for all solutions, the results of calculation by which vary from experimental data by $\pm 13\%$.

USSR

UDC 534.222.2

HIGH-VELOCITY TWO-LAYER DETONATION IN AN "EXPLOSIVE-GAS" SYSTEM

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 231 No 6, 1976 pp 1315-1318 manuscript received 4 Aug 76

BAKIROV, I. T., and MITROFANOV, V. V., Institute of Hydrodynamics, Siberian Division, Academy of Sciences USSR, Novosibirsk

[Abstract] It has been demonstrated that a heterogeneous system consisting of alternating layers of a condensed explosive and a gas can generate self-sustaining detonation velocities several times greater than the detonation velocity of a homogeneous charge of the same explosive. The effect is related to the initiation of explosive conversion of the shock wave propagating through the gas layer, maintained due to transverse expansion of the detonation products. This experimental study of the effect utilized a highly sensitive primary explosive--lead azide--in combination with a light gas--helium. The detonation velocity of lead azide outside the channel was 4.5-4.7 km/s; in combination with helium, the maximum detonation velocity achieved was over three times as high as that of ordinary detonation of lead azide. References 7.

USSR

UDC 536.24

METHOD OF DETERMINING HEAT TRANSFER COEFFICIENTS IN REGENERATIVE SURFACES

Alma-Ata PROBL. TEPLOENERG. I PRIKL. TEPLOFIZ. in Russian Nauka Press No 11, 1976 pp 168-172

FISAK, V. I., and TOLIKIN, L. A.

[From REFERATIVNYY ZHURNAL TEPLOENERGETIKA No 1, 1977 Abstract No 1G76 by I. G. Zal'tsman]

[Text] A method is presented for determination of the heat transfer coefficient in regenerative fittings (F), based on direct comparison of experimental and theoretical temperature dependences by computer. The theoretical analysis is based on solution of a system of equations describing unstable cooling of F in a gas stream. It was assumed that the thermal resistance of the F in the direction transverse to the flow was equal to 0 and was infinitely great in the direction of the flow. The gas temperature at the beginning of the F was considered an arbitrary function of time. The initial conditions are 0 conditions. An experimental study is performed of packets consisting of 8 steel sheets measuring $190 \times 150 \times 2 \text{ mm}^3$ with a slot width of 2 mm. The gas temperature was measured at the input and output of the packet by thermocouples with a hot junction diameter of 0.4-0.5 mm. Before the beginning of the experiment, each packet was heated to about 440 C, then cold air was blown over it. The time dependence of temperature at the output was produced and used to construct the solution. The procedure for iterational determination of heat transfer coefficient (to the point of agreement of theoretical and experimental gas temperature at the output) is presented. Figures 3; references 9.

USSR

UDC 697.34"313"

PROSPECTS FOR CONCENTRATION OF HEAT CONSUMPTION IN THE SPHERE OF RESIDENTIAL AND COMMUNAL ECONOMY IN CITIES

NAUCH. TR. AKAD. KOMMUN. KH-VA in Russian No 127, 1976 pp 3-5

BORODKIN, YU. D. and LEDENTSOVA, N. A.

[From REFERATIVNYY ZHURNAL TEPLOENERGETIKA No 1, 1977 Abstract No 1C210]

[Text] The characteristics of available housing in various groups of cities allow an estimate to be given of the specific heat losses of residential buildings. Within the limits of each design period, the specific value of heat losses has a tendency to increase for groups of cities with small populations. Rather intensive growth of the specific share of heat capacities of cities with load concentrations of 1200-1300 and 3000-5000 Gcal/hr is suggested (in %: 1970-12.8 and 1.0; first calculation period--18.8 and 1.6; second calculation period--18.9 and 6.5; third calculation period--19.8 and 12.2 respectively). However, the highest specific share and the greatest

frequency across the country is and will continue to be at the level of concentration of thermal loads of less than 400 Gcal/hr (in %: 1970--58.3; first calculation period--48; second calculation period--45.3; third calculation period--41).

USSR

UDC [697.644.1+621.65:621.694].001.4

STUDY OF THE OPERATION OF A HIGH-TEMPERATURE WATER ELEVATOR

NAUCH. TR. AKAD. KOMMUN. KH-VA in Russian No 127, 1976 pp 15-20

YAKIMOV, V. L.

[From REFERATIVNYY ZHURNAL TEPLOENERGETIKA No 1, 1977 Abstract No 1S233]

[Text] It is established that an elevator of ordinary design can operate on high-temperature water with a pressure in the injection stream significantly less than the boiling pressure of the working medium. The elevator stops operating when the flow rate of the injected water drops, when the temperature of the mixed water increases to the saturation temperature for the pressure at the input to the mixing chamber. The operation of the elevator is accompanied by noise. In order to attach consumers to high-temperature heating networks, it is suggested that an elevator unit be combined with a preswitched heat exchanger, in which the temperature of the water in the network is reduced before it enters the elevator by heat exchange with water delivered by the elevator into the heating system. The service of the heat exchanger, designed to reduce the temperature of the water in the network before the elevator nozzle from 200 to 150 C, is not over 2 m² per Gcal/hr of design heating load, which will increase the cost of the elevator unit very little. Figures 2.

USSR

UDC 662.6:662.612.5

PRIMARY HEAT ENGINEERING CHARACTERISTICS OF THE GAS FROM THERMAL DECOMPOSITION OF COAL

TR. VNII EKON., ORGANIZ. PROIZ-VA I TEKHN.-EKON. INFORM. V FAZ. PROM-STI in Russian No 1/2, 1974 pp 194-200

AKHMEDOV, R. B., AKBAROV, G. A., and ISKANDEROV, S. G.

[From REFERATIVNYY ZHURNAL TEPLOENERGETIKA No 1, 1977 Abstract No 1T59]

[Text] Characteristics are presented for the gas produced by thermal decomposition of coal, including the composition of the gas, heat of combustion, air consumption for combustion of 1 m³ of gas, volume and composition of combustion products and their heat capacity, maximum heat content of combustion products, maximum and calorimetric combustion temperature, ratio of dry and moist combustion products, ratio of volumes of water vapor and carbon dioxide in the combustion products. A I-t diagram is presented for the process of combustion of the gas for air flow factors (α) of 1-2, air preheating temperatures of 0-1200 C.

USSR

UDC 536.25

FREE HEAT CONVECTION IN A BLIND THERMOSIPHON DURING ROTATION

Perm' UCHENYYE ZAPISKI. PERM'SKIY GOSUDARSTVENNIY PEDAGOGICHESKIY INSTITUT [Scientific Annals. Perm' State Teachers Institute] in Russian No 152, 1976 pp 137-149

TKACHENKO, G. M.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B452 by L. M. Zysina-Molozhen]

[Text] The author describes the results of an experimental investigation of the mechanism of motion and heat exchange in a closed thermosiphon (natural-circulation cooling system) during rotation. The author discusses the results of a work published previously (see ZYSINA-MOLOZHEN, L. M. and TKACHENKO, G. M., INZHENERNO-FIZICHESKIY ZHURNAL [Engineering-Physics Journal] Vol 20, No 1, 1971, pp 157-160 [REFERATIVNYY ZHURNAL MEKHANIKA No 7 1971 Abstract No 7B754]). The second part of the work contains the results of computations of values of the Nusselt numbers Nu (in the variation range of the quantities $Gr \cdot Pr = 10^{10}$ - 10^{13}) using known formulas. One can see that with one and the same value of $Gd \cdot Pr$ the values of Nu, computed by the different formulas, may differ by 10 times. Consequently, such a comparison is not fully correct. In the above-cited work it was shown that

in a rotating thermosiphon for different values of the relative expansion and rate of rotation one can distinguish two possible regimes of flow which are distinguished mainly by the exchange mechanism which determines completely different levels of intensity of heat yield (and Nusselt number Nu). Thus, comparison of the computational formulas is feasible only in the limits of such a flow regime for which they are obtained. References 18.

USSR

UDC 536.24:532.54

EXPERIMENTAL INVESTIGATION OF HEAT EXCHANGE FOR A DENSITY OF THE THERMAL FLUX THAT IS VARIABLE ALONG THE LENGTH OF THE PIPE

Moscow TRUDY MOSKOVSKOGO AVIATIONNOGO INSTITUTA [Works of Moscow Aviation Institute] in Russian No 351, 1976 pp 64-68

DREYSTER, G. A.

[From REFERATIVNYY ZHURNAL MEKHANIKI No 1, 1977 Abstract No 1B489 by I. S. Riman]

[Text] A pipe of Kh1810 steel installed vertically with an inner diameter $d = 6.05$ mm at a length $l = 1081$ mm was heated by an electric current passed along it. The thickness of the tube wall varied top to bottom from 1.6 to 0.54 mm. The tests were run within the following ranges: air flow rate $G = 0.67-17.9$ g/sec, pressure $p = 1.2-28$ technical atmospheres, temperature at input $10-17^\circ$, at output $360-412^\circ$, and wall temperature $70-559^\circ$. With flow from top to bottom the local Reynolds numbers Re , determined from the local temperature, varied from 23×10^3 to 173×10^3 , ratio of wall temperature and air current varied from 1.06 to 1.48. With a flow from bottom to top the limits of the local Re were 22.4×10^3 to 166×10^3 , and the temperature ratios varied from 1.2 to 2.2. Change in thermal flux q_w is characterized by the dimensionless quantity $|(d/q_w)(dq_w/dx)| = 0.005-0.13$. Under these conditions the average heat yield with growth in thermal flux is more than 5%, and with decrease in the thermal flux it is 8% lower in comparison with the case of $q_w = \text{const}$. References 5.

USSR

UDC 536.24:532.54

EXPERIMENTAL INVESTIGATION OF NONSTATIONARY HEAT EXCHANGE IN A PIPE BY
VARYING THE FLOW RATE OF THE HEATED GAS

Moscow TRUDY MOSKOVSKOGO AVIATIONNOGO INSTITUTA [Works of Moscow Aviation
Institute] in Russian No 351, 1976 pp 68-76

DREYSTER, G. A., MARKOVSKIY, P. M., and CHETYRIN, V. F.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B500 by I. S.
Riman]

[Text] An experimental investigation was conducted on the influence on heat exchange of nonstationarity by flow rate. Heating of the air, flowing from top to bottom along a vertical pipe of 1Kh18N10 steel, was done at a time-constant wall temperature. The pipe had an inner diameter $d = 12.14$ mm and a 1209 mm length segment heated by an alternating current. The tests were conducted in the range of Reynolds numbers $Re = 7600-82,000$, gas pressure $p = 1-5.15$ bar, wall temperature $T = 723-773^\circ K$, ratio of wall temperature to average mass temperature of the stream 1.03-1.85, weighted flow rate $G = 2.33-33.3$ g/sec. Increase and decrease in flow rate were done for a time $\tau = 1.3$ and 5 sec for $|dG/d\tau| = 0-15$ g/sec². The authors give the dependence on time of the quantities G , $K = Nu/Nu_0$ and $K_{Gg} = (dG/d\tau)(d/G)\sqrt{\mu/G}$, where Nu and Nu_0 are the nonstationary and quasistationary values of the Nusselt numbers, μ is the coefficient of dynamic viscosity. They obtain an approximate empirical dependence between the quantity K and the criterion of hydrodynamic nonstationarity K_{Gg} . $K = 1+670 K_{Gg}$ for the interval of values of K_{Gg} from -0.3×10^{-4} to $+6 \times 10^{-4}$.

USSR

UDC 536.24:536.42:669-154

INVESTIGATION OF LOCAL HYDRAULIC RESISTANCES IN THE ROD REGIME OF FILM
BOILING

Moscow TRUDY MOSKOVSKOGO AVIATIONNOGO INSTITUTA [Works of Moscow Aviation
Institute] in Russian No 351, 1976 pp 76-82

KALININ, E. K., KOCHELAYEV, YU. S., and SDOBNOV, G. N.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B507 by I. S.
Riman]

[Text] An experimental investigation was made of the hydraulic resistance of diaphragms during the flow of liquid nitrogen under conditions of rod film boiling. The liquid in this regime is separated from the pipe wall by a steam layer. The experiments were conducted on a pipe with an inner diameter of 9.735 mm of 1Kh8N9T steel with sealed-in copper diaphragms having

ratios of the areas of the transfer cross sections to the area of the pipe of 0.195, 0.285, 0.405 (type A) and 0.216 (type B). The tests were conducted in a nonstationary regime. The initial temperature of the working segments was 1000°K. The obtained dependences for the coefficients of hydraulic resistance of the diaphragms showed that in the regime of rod film boiling they differ little from the values corresponding to the stream of single-phase liquid. The test results are presented by graphs and empirical formulas.

USSR

UDC 532.529

INVESTIGATION OF HEAT EXCHANGE BETWEEN A HORIZONTAL STAGGERED BUNDLE OF PIPES AND A FLUIDIZED BED

Minsk TEPLOMASSOOBMEN-V. MATERIALY V VSESOYUZHNOY KONFERENTSII PO TEPLOMASSOOBMENU [Heat and Mass Exchange - V. Materials from the Fifth All-Union Conference on Heat and Mass Exchange. Collection of Works] in Russian Vol 6, 1976 pp 117-122

TAMARIN, A. I., ZABRODSKIY, S. S., and YEPANOV, YU. G.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B711 by A. P. Baskakov]

[Text] The authors investigated heat yield from a horizontal calorimeter with a diameter of 30 mm in a bundle of the same pipes arranged at the corners of a triangle, and also in a free bed of millet (particle size 2 mm, density 1 g/cm³) and fire clay crumbs (3 mm and 2.3 g/cm³). The horizontal span of the pipes was from 2 to 3.3 of their diameters. The calorimeter was always placed in one place of the bundle (approximately in its center). The dimensions of the apparatus were 45 x 25 cm, height of covering of particles 35-45 cm, rate of fluidization 0.8-3.1 m/sec, the gas distributor is a bed of tissue held between two perforated sheets with a useful cross section of 49%. The coefficient of heat yield from a pipe in the bundle (with a horizontal span equal to 3.3 and diameter at 5%) is slightly lower than in the free bed. Since in a bed of such large particles the determinant is the convective heat yield to the gas, the test data are processed in the form of the dependence of the Nusselt and Archimedes numbers: $Nu = 0.146 Ar^{1/3} \times (\arctan S)^{1/3}$, where S is the side of the equilateral triangle, to the apexes of which are projected the axes of the pipes.

AERODYNAMICS OF THE INTERACTION OF TWO PARALLEL TWISTED JETS IN AN OPEN SPACE

Moscow TEPLOENERGETIKA in Russian No 12, 1976 pp 27-30

AKHMEDOV, R. B., AKHMEDOV, D. M., BALAGULA, T. B., and KHAKIMBAYEV, SH. A.

[Abstract] As an extension of an earlier work (Inzhenernofizicheskiy zhurnal, Vol 21, No 5, 1971) the authors investigate the more general nature of the interaction and the exclusion of possible effects of secondary flows on the flow mechanism. An isothermal aerodynamic test stand was used to study a system consisting of two parallel twisted jets with equal and opposite twist. Two zones of flow are established. The first zone extends from the face of the vortexer to the cross section $x/d = 1.5-2.0$ (x = distance from nozzle). In this zone the jets retain their individual characteristics and are practically independent. The second zone extends from $x/d = 2.0$ to approximately $x/d = 3.0$. Here the jets mix and propagate as a unified mixed flow. Beyond this zone ($x/d > 3.0$) the resulting flow has the characteristics of a free jet. The results can be used in revamping the theory of the interaction of twisted jets, as well as in the practical designing of burners for steam generators. Bibliographies 3.

USSR

UNSTABLE INTERNAL WAVES CREATED BY PERIODICALLY APPLIED PRESSURES

Sevastopol' MOR. GIDROFIZ. ISSLED. in Russian No 2 (73), 1976 pp 48-60

DOTSENKO, S. F.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2B47 by A. K. Nikitin]

[Text] A study is made of the process of development of waves in an exponentially stratified ideal incompressible fluid of constant depth H , excited by periodically operating pressures applied to a certain area on the free surface of the liquid at rest. The Coriolis force is not considered. The problems are solved in their linear statement. A study is made of a layer $-\infty < x, y < +\infty$, $-H \leq z \leq 0$, unlimited in the horizontal direction. The density of the fluid in the unperturbed state varies according to the rule $\rho_0 = \rho_1 \exp(-kz)$, where ρ_1 and k are positive constants, the z axis of directed vertically downward. A study is made of the process of development of waves caused by pressure $P_0 = f(x, y) \exp(-i\omega_0 t)$, periodic in time, applied at moment in time $t = 0$ in a certain area of the free surface of the quiescent fluid. The problem is solved using a Fourier transform with respect to x and y and a Laplace transform with respect to time t . The unstable wave field is then analyzed for the following cases: 1) $f(x, y) = f_1(x)$ -- flat wave; 2) $f(x, y) = f_1(R)$, $R = \sqrt{x^2 + y^2}$ -- cylindrical wave; 3) $f(x, y) = f_1(x) \exp(in_0 y)$ -- waves from pressures traveling in a strip. In all cases, function f_1 differs from zero only in the final interval of the x axis. The presentation in each case is quite brief, frequently with an indication only of the method and final results. References 14.

USSR

UDC 626.8 (471.4)

FIELD IRRIGATION PROBLEMS ALONG THE VOLGA

Moscow GIDROTEKHNIKA I MELIORATSIYA in Russian No 10, 1976 pp 37-42

KOVAL', T. A.

[Abstract] Future hydraulic engineering construction for irrigation along the Volga River must involve extensive mechanization, and automation, and the introduction of the new "Fregat" irrigation technique; it must also be carried out as a single, large-scale, general project. Combination irrigation systems must be built. Sprinkler and pump systems must be made uniform for the entire area, and more intensive unified training of personnel must be given, particularly in techniques of rapid repair and overhaul. Scientific research institutes along the Volga must have the responsibility for determining which crops shall be planted in the newly irrigated fields.

The great increase in irrigation in the area will require a consolidated industrial base and assignment of a sufficient work force to handle the increased irrigation construction work. Tables 2.

USSR

UDC 621.226

ON THE STABILITY OF THE MOVEMENT OF A HIGH PRESSURE HYDRAULIC DRIVE

Moscow IZVESTIYA VUZOV MASHINOSTROYENIYE in Russian No 12, 1976 pp 77-83
manuscript received 15 Dec 75

PROKOF'YEV, V. N., ZAKHAROV, YU. YE., and MUSATOV, YE. A.

[Abstract] A nonlinear model is considered for a hydraulic drive in which the active drag and leakage vary according to exponential law, in the first case with positive exponents and in the second case with negative exponents depending on the influence of pressure on viscosity of the working fluid. The possibility of loss of stability becomes real when a pressure increase caused by static loading increases the viscosity beyond a certain point. Reducing temperature reduces viscous pressure considerably, but increases the danger of self-sustained vibrations at high rates of motion. The reduction of temperature, however, also reduces the modulus of elasticity of the working medium, thereby increasing the stability reserve according to a dimensionless criterion of the dynamic properties. Thus the choice of working fluid for high-pressure hydraulic drives is important, and an experimental determination of the values of viscosity and modulus of elasticity in relation to pressure and temperature for such working fluids is absolutely necessary. Illustrations 3; tables 2; bibliographies 3.

USSR

INFLUENCE OF EVACUATION OF LIQUID ON PARAMETERS OF SUPERCAVITATION FLOW IN THE PERMEABLE WORKING SECTOR OF A HYDRODYNAMIC TUBE

Novosibirsk ISSLED. PO GIDRODINAMIKE I TEPLOOBMENU in Russian 1976 pp 186-191

YEGOROV, YE. YE., and KULAK, A. P.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2B782 by the authors]

[Text] Based on the Bernoulli equation with flow rate variable over the length of the stream in an ellipsoidal cavity located on the axis of a permeable pipe, an integrodifferential equation is produced allowing calculation of the necessary quantity of evacuated fluid with various cavitation numbers and coefficients of friction on the walls of the permeable channel. Solution of this equation is performed by an iterational method on an M-222 computer. It is shown that the type of perforations have a significant influence on the intensity of evacuation through the walls. Based on the calculations, it is concluded that it is possible in a real structure to increase the load of the stream of the cavity from 1% (1/10 diameter) in a solid cylindrical tube to 5-6% (1/5 diameter) in a perforated working section. References 6.

USSR

UDC 532.517.4.001.24

THE QUESTION OF THE UNIVERSALITY OF THE "WALL LAW"

GIDRAVLIKA I GIDROTEKHN. RESP. MEZHVED. NAUCH.-TEKHN. SB. in Russian No 23, 1976 pp 27-33

MARCHENKO, A. G.

[From REFERATIVNYY ZHURNAL TEPLOENERGETIKA No 1, 1977 Abstract No 1G39]

[Text] The results of analysis of experimental data on the distribution of velocities in the boundary layer area of nonseparated turbulent streams of an incompressible fluid are used to draw the conclusion that the constants in the "wall law" of Prandtl are generally not universal. An experimental foundation is provided for the existence of a universal similarity of velocity profiles in the boundary layer of a flow over smooth and rough surfaces with and without arbitrary longitudinal pressure gradients. Figures 3; table 1; references 16.

THREE-DIMENSIONAL WAVES ON THE SURFACE OF A VISCOUS LIQUID OF INFINITE DEPTH INCIDENT ON A VERTICAL WALL

Novocherkask TRUDY NOVOCHERKASKOGO INZHENERNO-MELIORIATSIONNOGO INSTITUTA
[Works of the Novocherkask Engineering and Land Reclamation Institute] in
Russian Vol 17 No 5, 1975 pp 238-241

NIKITIN, A. K., and TALDYKIN, YE. I.

[From REFERATIVNYY ZHURNAL MEKHANIKI No 1, 1977 Abstract No 1B36 by I. P. Oborotov]

[Text] In linear formulation the authors examine the problem of 3-dimensional gravitation waves on the surface of a viscous incompressible liquid of infinite depth bounded by a vertical wall. The liquid occupies the region $-\infty \leq x \leq \infty$, $-\infty \leq y \leq \infty$, $-\infty \leq z \leq 0$, the wall is taken for the yz plane. The nondamping progressive waves approaching the wall from the left are given by the velocity components v_{x1} , v_{y1} , v_{z1} and the pressure p_1 .

The reflected curves are sought on the following assumptions: (1) they have the same frequency as the approaching waves; (2) the wave numbers along the y axis of the approaching and reflected waves are the same; (3) at the wall the amplitudes of these and other waves coincide; (4) in proportion to the distance from the wall the reflected waves damp by exponential law. These assumptions made it possible to give the velocity components, v_{x2} , v_{y2} , v_{z2} and the pressure p_2 , produced by the reflected waves in the form of the known (with the exception of certain coefficients) functions, x , y and t . To find the dependences of these parameters on z the authors used the Navier-Stokes equations which were solved under the corresponding boundary conditions (absence of tangential stresses on the free surface, damping of waves with depth and adhesion of the liquid to the walls). Since on the strength of the linearity of the problem, relationships of the form $v_x = v_{x1} + v_{x2}$ exist, then the problem is reduced to a system of ordinary differential equations relative to the variable z . Application to these equations and boundary conditions of the integral Fourier transforms with an infinite upper limit reduces the system to algebraic form. Then an inverse approach to the original was used in the found solution using the converse theorem. As a result the equation of the free surface was obtained in finite form. No computations were made by the authors of the velocity and pressure components but they demonstrate that the computation can be reduced to tabular integrals if certain of the parameters are expanded into power series.

USSR

UDC 532.542

EXPERIMENTAL INVESTIGATION OF THE HYDRAULIC RESISTANCE OF A DIAPHRAGM
INSTALLED IN A VIBRATING CONDUIT

Tomsk DINAMIKA MEKHANIKA I GIDRAVLICHESKIKH SISTEM [Dynamics of Mechanics
and Hydraulic Systems. Collection of Works] in Russian No 3, 1975 pp 74-79

SLABOZHANIN, G. D., and MEL'KOV, V. I.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B926 by
M. O. Shteynberg]

[Text] The investigation was made on the test segment of a metal pipe, 21 mm in diameter, with a diaphragm having a degree of contraction equal to 0.15. The working liquid is an AMG-10 oil mixture. The frequency of oscillations f of the conduit varied in a range from 0 to 100 Hz with a constant amplitude equal to 0.5 mm. The authors studied the influence of various directions of oscillations: transverse (angle α between direction of oscillations and axis of pipe equal to 90°), longitudinal ($\alpha = 0^\circ$) and at an angle of 45° . The Reynolds number of the stream varied from 100 to 1000. The results of the experiment are presented in the form of graphs. The dependence of the ratio φ of the coefficients of hydraulic resistance of the diaphragm during vibration and without it on the Reynolds number shows that with $Re < 400$ and with a frequency of $f = 40$ Hz the reduction in Re causes an increase in φ , the greatest growth in φ causing longitudinal oscillations; with $Re > 400$ the coefficient φ differs little from unity. With $Re = 260$ the maximum increase in the coefficient φ for various directions of the vibration takes place only on predetermined frequencies of the investigated range.

USSR

UDC 621.43.011:533;621.5:533

ON A METHOD FOR EXPERIMENTAL INVESTIGATION OF FLOWS OF LIQUID IN ELEMENTS
OF AUTOMATIC JET HYDROEQUIPMENT

Tomsk DINAMIKA MEKHANIKA I GIDRAVLICHESKIKH SISTEM [Dynamics of Mechanics
and of Hydraulic Systems. Collection of Works] in Russian No 3, 1975 pp
138-146

MIKHAYEVICH, YE. P. and FRANK, E. G.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B1111 by A. S. Malyutin]

[Text] The authors describe a method of determining the structure and characteristics of isolated and interacting freely submerged jets of liquid AMG-10 with respect to the jet proportional amplifier. The investigations were made because of deficiencies in the experimental data in the pressure range of 10-150 kg/cm². The investigations were made using a specially

constructed miniature total-pressure receiver in the form of a cone head installed on microordinates. The local speed was calculated from the Bernoulli equation on the assumption to equating the static pressure to zero. The authors obtained the pressure distribution in free and deflected jets. The obtained results agree qualitatively with the known relationships, but quantitatively they differ slightly from the available data and need to be refined.

USSR

CALCULATION OF GAS STATIC SLOT BEARING OPERATING UNDER HIGH PRESSURE CONDITIONS

Kazan' GAZOVYYE OPORY TURBOMASHIN in Russian 1975 pp 29-33

ROMANOVA, O. G., SNOPOV, A. I., and YUDINA, L. M.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2B136 by I. Ye. Sipunov]

[Text] The static characteristics of a radial gas bearing with a continuous slot restrictor located in the middle cross section are calculated for 2 cases: $\xi \ll 1$ and $\xi = 1$ (ξ is the relative eccentricity). In the first case, the distribution of pressure in the lubrication layer and in the slot is found with an accuracy equivalent to a quantity on the order of $O(\xi^4)$. In the second case, the pressure in the lubricating layer is expressed through hypergeometric functions, represented in trigonometric form; an infinite system of linear algebraic equations, used to determine the coefficients of the desired solution of the Reynolds equation, is cut down to 40 equations. Graphs of the load-bearing capacity of the bearing and gas flow rate as functions of relative eccentricity, elongation and ratio of slot width to mean radial gap are presented.

USSR

STATEMENT AND NUMERICAL SOLUTION OF THE PROBLEM OF ACCELERATION OF A PISTON
BY AN ELECTRICALLY CONDUCTING GAS

TR. NII PRIKL. MAT. I MEKH. PRI TOMSK. UN-TE in Russian No 7, 1976 pp 91-96

SINYAYEV, S. V., and SHALAGINA, L. A.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2B323
by M. Ya. Ivanov]

[Text] A detailed description is presented of the mathematical statement of the problem of electrodynamic acceleration of a piston in a coaxial channel upon electric discharge of a battery of condensers in a gas. The ponderomotive forces, parameters of the external electric circuit and heating of the gas by the electric current are all considered. The system of one-dimensional unstable equations describing the magnetohydrodynamic flow in such a channel is written in Lagrange variables. Boundary conditions are formulated for the equations of the electromagnetic field of the discharge. The working gas used in the calculations is hydrogen, for which empirical equations of state are utilized, correct up to values of pressure on the order of 10^4 bar and temperature on the order of $6 \cdot 10^3$ K.

The system of equations is approximated by means of a fully conservative difference system of second order accuracy as to time and coordinates. The solution of the difference equations is performed by the run-through method. Results are presented from calculation of three versions which differ in their initial values of pressure of unperturbed gas with identical initial specific volume. References 8.

USSR

ELEMENTS OF THE DESIGN OF CONTAINERS WITH SEGMENTED SLEEVES FOR PRESSURES OVER 20 kbar

TR. VSES. N.-I. I PROYEKT.-KONSTRUKT. IN-TA METALLURG. MASHINOSTR. in Russian No 44, 1976 pp 95-101

ROZANOVA, N. B.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V1186 by I. N. Preobrazhenskiy]

[Text] An analysis is presented of structural versions of high-pressure units capable of withstanding an internal pressure of over 20 kbar. Several methods are studied for the manufacture of such structures. Based on the formula of Lamé, two types of structures with segmented liners are analyzed, differing in the condition of opening and closure of joints between segments. A comparison is drawn with a monolithic liner. Using numerical examples for materials such as VK-6 and VK-10, the advantages are shown, under equivalent operating conditions, of segmented structures with opening walls. It is concluded that structures in which the joints between segments do not open should not be manufactured. References 7.

USSR

UDC 621.512.004.69

IMPROVING THE DISCHARGE VALVES OF LOW-TEMPERATURE HERMETIC COMPRESSORS

Moscow KHOLODIL'NAYA TEKHNIKA in Russian No 11, 1976 pp 17-21

BYKOV, V. A., and YAKOBSON, V. B.

[Abstract] The authors studied the influence of the diameter of the openings in the seat of the discharge valve on the volumetric and energy characteristics of a low-temperature hermetic compressor at 6,000 rpm with freon-502 as working medium. On the basis of their study, they give recommendations regarding the selection of optimum diameters of the openings in the valve seat for different refrigerants and operational conditions. For low-temperature hermetic compressors that use a wide range of boiling and condensation temperatures (t_o -40°C to -25°C and t_k 25-55°C) the optimum diameter would be 6 mm for freon-502, and somewhat smaller for freon-22. Illustrations 7; tables 2; bibliographies 5.

USSR

UDC 666.65: 546 . 81

INTERACTION OF ALLOYING OXIDES MUTUALLY AND WITH SnO_2 DURING THE FIRING OF STANNIC OXIDE CERAMICS

Moscow STEKLO I KERAMIKA in Russian No 11, 1976 pp 25-26

GEDAKYAN, D. A., KOSTANYAN, K. A., and UNANYAN, L. G.

[Abstract] Devigraphic methods are used together with x-ray analysis for studying the interaction of the oxides of copper, manganese, zinc, and antimony among themselves and with SnO_2 at temperatures up to $1,100^\circ\text{C}$. The obtained results indicate that the mutual interaction of the alloying oxides and their reactions with the SnO_2 during monocomponent activation are accompanied by transformations into simple two-component systems. At the same time interactions of more than two components are also possible, resulting in the production of complex mixed oxides in solid solutions. Illustrations 3; bibliography 1.

USSR

UDC 621.73.043: 621.789: 669.15-194

HIGH TEMPERATURE THERMOMECHANICAL TREATMENT DURING EXTRUSION

Moscow IZVESTIYA VUZOV MASHINOSTROYENIYE in Russian No 11, 1976 pp 137-140 manuscript received 29 Oct 75

ATROSHENKO, A. P., BERLET, YU. N., BOGAYAVLENSKIY, K. N., SERGEYEV, YU. G., and FEDEROV, V. I., Leningrad Polytechnic Institute

[Abstract] Results are given of a study of the process of high-temperature thermomechanical treatment during the extrusion of stainless austenitic steel Kh18N10T. A statistical planning method was used in setting up the experiments. The derived regression equation adequately describes the experimental results within the established area of determination of the basic factors influencing hardening (heating temperature $1,000-1,200^\circ\text{C}$, deformation temperature $1,000-1,100^\circ\text{C}$, deformation 25-75%). It is shown that with a selected optimum extruding mode during the high-temperature heat treatment the fatigue strength is increased by 12% and the nominal creep limit 100% by comparison with ordinary heat treatment. The plasticity properties are somewhat reduced in the process, however, but still remain at a satisfactorily high level. Illustrations 2; table 1; bibliographies 3.

USSR

UDC 629.113.001.4

WEAR RESISTANCE OF A CYLINDER-PISTON ASSEMBLY

Moscow IZVESTIYA VUZOV MASHINOSTROYENIYE in Russian No 10, 1976 pp 62-65
manuscript received 1 Oct 75

IVANENKO, V. S., and BORISOV, V. N.

[Abstract] The Krasnoyar Polytechnic Institute conducted investigations on improving the vibration machining of the cylinder sleeves of ZIL-130 engines for the purpose of determining the dependence of the wear resistance of the sleeve-ring-piston assembly on the depth of the grooving produced by the vibration machining process. On the basis of the results the authors recommend a new sleeve machining procedure that will provide a considerable improvement in the wear resistance of the cylinder-piston assembly. Illustrations 3; table 1; bibliographies 2.

USSR

UDC 620.17

LOW-MODULUS MATERIAL FOR PREPARING SMALL-SCALE MODELS

TRUDY KOORDINATSIONNOY SOVESHCHANII PO GIDROTEKHNIKE [Works of the Coordination Conference on Hydraulic Engineering] in Russian No 109, 1976 pp 79-83

KOMAROV, A. I., SAMSONOVA, T. I., and SAFONOV, G. V.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1V1359 by the Authors]

[Text] The authors present the technological conditions for obtaining model materials and the dependence of the properties of the materials on the composition and amount of components and on the conditions of the test. The original elements were liquid rubber, epoxide resins, an amine hardener, a mineral filler and cork crumb. The hardening conditions were selected on the basis of studying the interaction kinetics of the epoxide groups with the amine hardeners by the method of isothermal calorimetry. The authors study the frequency and temperature dependence of the properties of the model materials. From the material with modulus of elasticity of 300 ± 50 kg/cm² and with values of the Poisson coefficient of 0.20 ± 0.02 and the logarithmic decrement of vibrations of 0.30 ± 0.02 , models of the base-foundation-turbounit were cast in scales of 1:70 to 1:50. References 8.

USSR

UDC 539.4:536.543

LAWS OF CREEP AND LONG-TERM STRENGTH OF IRRADIATED STEEL WITH ALLOWANCE FOR NONSTATIONARITY OF THE LOAD AND FORM OF THE STRESSED STATE

Kiev RADIATIONNYE EFFEKTY IZMENENIYA MEKHANICHESKIKH SVOYSTV KONSTRUKTSIONNYKH MATERIALOV I METODY IKH ISSLEDOVANIYA [Radiation Effects of Change in the Mechanical Properties of Structural Materials and Methods of Investigating Them. Collection of Works] in Russian Izd-vo Naukova Dumka, 1976 pp 25-51

KISELEVSKIY, V. N., KOSOV, B. D., LUKASHEV, V. K., POLEVOY, D. V., KHRISTOV, G. P., and YUDIN, O. N.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1V1258 by G. P. Mel'nikov]

[Text] The authors investigated the laws of creep and long-term strength of irradiated steel with allowance for nonstationarity of the load and form of the stressed state. They established the interrelationship between the characteristics of heat resistance of the irradiated steel in the form $v_{irr}^\beta \gamma_{irr} = \text{const}$, where β is a parameter which depends on the value of the indicator of creep and long-term strength, v_{irr} is the rate of the steady

creep, t_{irr} is the time to fracture. The authors clarify the linear character of the dependence between the coefficient of radiation reduction in longevity and the integral flow. They propose an equation of state which describes the development of creep deformation during bombardment, corresponding to the equation of the hypothesis of strengthening. For the case of gradual loading during tests of samples of Kh16N15M3B steel at a temperature of 650°, it was established that the sum of the defects, determined from the principle of linear summation, varies in the range of 0.5-1.6. Under conditions of a complex stressed state the authors demonstrate the impossibility of utilizing the Pisarenko-Lebedev criterion which is the optimum criterion for comparing the criteria of long-term strength of non-irradiated materials. They suggest the criterion of long-term strength which takes into account the conditions of bombardment.

USSR

UDC 539.4:536.543

EXPERIMENTAL INVESTIGATION OF CREEP AND LONG-TERM STRENGTH OF STAINLESS STEEL UNDER CONDITIONS OF REACTOR IRRADIATION

Kiev RADISTSIONNYYE EFFEKTY IZMENENIYA MEKHANICHESKIKH SVOYSTV KONSTRUKTSIONNYKH MATERIALOV I METODY IKH ISSLEDOVANIYA [Radiation Effects On Change in the Mechanical Properties of Structural Materials and Methods of Investigating Them. Collection of Works] in Russian Izd-vo Naukova Dumka, 1976 pp 14-24

PISARENKO, G. S., KISELEVSKIY, V. N., LUKASHEV, V. K., POLEVOY, D. V., YUDIN, O. N., KHRISTOV, G. P., TSYKANKOV, V. A., SAMSONOV, B. V., and LOSEV, N. P.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1V1257 by G. P. Mel'nikov]

[Text] The authors investigated the creep and long-term strength of flat and tubular samples of the material OKh16N15M3B under conditions of neutron bombardment. The tests were conducted in a helium medium at a temperature of 650-675° and intensity of the neutron bombardment of about 3.5×10^{14} n/cm²sec. The range of loads was defined as stresses from 18 to 30 kg/mm² on a base of 500-hour duration. They established that the processes of deformation and fracture in the bombarded materials take place much more intensely; the third segment of the creep curve is clearly expressed, the amount of which in common time is 30-40%. The authors mention especially the abrupt reduction in longevity upon reduction of the level σ_0 , here ϵ_{min} grows by more than an order of magnitude. They note the influence of the form of the stressed state on the change in characteristics of creep and long-term strength.

USSR

UDC 539.4

CHARACTERISTICS OF FATIGUE STRENGTH AND FEATURES OF FRACTURE OF A SHEET
COMPOSITE MATERIAL UNDER TRANSVERSE BENDING

Moscow VOLOKNISTNIYE I DISPERSNOUPROCHENNIYE KOMPOZITSIONNIYE MATERIALY
[Filamentary and Disperse-Resistant Composite Materials. Collection of
Works] in Russian Izd-vo Nauka, 1976 pp 84-87

SUKHANOV, YU. V., ANISHCHENKOV, V. M., GAYDUK, V. V., and MOROZOV, L. V.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1V1194 by Yu.
P. Zezin]

[Text] On a vibration electrodynamic test bench the authors investigated the fatigue strength of two composite materials--sheets of the EI-435 alloy reinforced by various methods with a VT7 tungsten wire, 1 and 0.5 mm in diameter. The tests were conducted until the eigenfrequency of the sample, strictly controlled in the process of the test, dropped by 2 Hz. They demonstrated that the reinforcement, which increases the static strength of the material, substantially reduces the fatigue strength. They discuss the mechanism of defect accumulation in the investigated composite materials.

USSR

UDC 539.4

EXPERIMENTAL PROOF OF THE HYPOTHESIS OF EXISTENCE OF A THERMOMECHANICAL
SURFACE FOR A TITANIUM ALLOY

Novosibirsk DINAMIKA SPLOSHNOY SREDY [Dynamics of a Solid Medium] in
Russian No 25, 1976 pp 92-101

NIKITENKO, A. F., and TORSHE NOV, N. G.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1V1132 by the
Authors]

[Text] The authors present experimental data which confirm the existence of a thermomechanical surface for a titanium alloy in the temperature range from -50 to +50°. They demonstrated that the thermomechanical surface for the investigated alloy does not depend on the form of the stressed state. They established that the projection of the thermomechanical surface onto the plane β, ϵ (β, ϵ are dimensionless coordinates) represents a "unique" curve of instantaneous deformation, that is invariant with respect to the temperature in the investigated range.

USSR

UDC 669.35:539.23:539.2.083.6

METHODS OF STUDYING PATTERNS OF STRUCTURAL FORMATION AND CHANGE IN PROPERTIES OF FILMS OF MULTICOMPONENTIAL METAL ALLOYS IN VACUUM CONDENSATION

Moscow ZAVODSKAYA LABORATORIYA in Russian No 12, 1976 pp 1475-1478

VIGDOROVICH, V. N., and POPOV, V. I., Moscow Institute of Electronic Equipment

[Abstract] Differential methods were used to study structure and electrical properties of films condensed at various stages of evaporation of a weighed portion of multicomponential alloys in a vacuum. Copper-manganese-palladium and copper-manganese-cobalt alloy systems showed that this method permits observation of structural changes in the surface of stage-atomized films and their electrical properties; these changes result from the redistribution of alloying elements through the depth of the layer being formed. Data obtained from differential analysis lets us predict integral properties of films condensed in a vacuum with evaporation of these multicomponential alloys. St 50-1 devitrified glass was used as the support in the experiments. Its temperature during atomization was 573°K. These methods can be used to test new materials for microelectronics and to develop technological processes for producing film components using multicomponential alloys. References 7; illustrations 4.

USSR

UDC 621.74.04

INCREASING CORROSION PROPERTIES OF CAST AUSTENITE STEELS BY REFINING AND ADDING TRACE RARE-EARTH METALS TO ALLOYS

Kiev TEKHNLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 11, 1976 pp 38-39

BRAUN, M. P., ALEKSANDROVA, N. P., TSAP, YU. P., TURCHANENKO, YU. T., and YASTREB, YE. F., Institute of Casting Problems, Cherkassk Chemical Fiber Plant

[Abstract] A study was done on increasing reliability of austenite steels (stainless) types Kh18N9TL and OKh23N28M3D3TL at the Institute of Casting Problems. These steels are often subjected to exposure to corrosive media. Open induction and plasma-arc smelting were studied. For rare-earth trace alloying the following were used: ferrocerium, mishmetal, and rare-earth metal fluorides. Heat treatment was done to reduce the metal's tendency toward intercrystalline corrosion. Plasma-arc smelting had some positive effect on the physical and mechanical properties of the metal. Rare-earth metals somewhat improved strength and relative elongation properties of the metal, but had a greater impact on purity, structure and anticorrosion properties. It is felt that the combination of plasma-arc smelting and addition of rare-earth trace metals will greatly improve anticorrosion properties of metal exposed to corrosive agents.

USSR

UDC 621.165:621.221-253-5:658.588

REPAIR OF STEAM TURBINE VANES AFTER EROSION WEAR

Kiev TEKHNLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 11, 1976
pp 55-57

POGREBNOY, N. A., ZOZULYA, V. F., BUGAYEV, A. M., IVANOVA, L. P., and
TELESHOVA, L. M., Kharkov Polytechnical Institute, Kharkov Turbine Plant

[Abstract] In spite of active and passive methods used to protect steam turbine vanes against erosion, they have only a 30-40% operational factor. Surfacing was studied as a possible means of repairing eroded turbine vanes. This method is suitable only when certain conditions are satisfied: good weldability of primary and surfacing metals; minimum deformation of unit; lack of metallurgical defects; uniform structure throughout the depth of the surfaced connection, and high erosion resistance. The surfacing alloy chosen was 13% chromium steel (types 30Kh13, 15Kh11MF, and 10Kh13). Pre-surfacing was done manually in an argon atmosphere with 60-90 amperes and reversed polarity. The vane is preheated to 350-400°C, the copper support plate is heated to 400-450°C. The results were quite good. The most flexible surfacing alloy was 10Kh13. Only surfacing with 30Kh13 steel causes significant increase in brittleness and decrease in impact viscosity of the surfaced connections. When alloyed with 10Kh13 steel, the vane has 70% operating efficiency prior to its failure. Fatigue strength is reduced if the steels are not preheated. The alloy steels are 2-3 times more erosion-resistant than the primary vane metal. Illustrations 3; references 2.

USSR

UDC 669.295.5:620.193

INFLUENCE OF ALUMINUM ON THE TENDENCY OF TITANIUM TO SALT CORROSION

Kiev FIZIKO-KHIMICHESKAYA MEKHANIKA MATERIALOV in Russian Vol 12 No 6,
Nov/Dec 76 pp 60-64 manuscript received 15 Dec 74

KOLACHEV, B. A., and TRAVKIN, V. V., Stupinsk Branch of the Moscow Aviation Technology Institute

[Abstract] The authors are concerned with the tendency of titanium-aluminum alloys to salt corrosion. They find that technically pure titanium has no tendency to salt corrosion. When titanium is doped with aluminum it leads to salt corrosion which is especially strong when more than 4% of aluminum is used. That titanium alloys have a greater tendency to salt corrosion upon increase in aluminum concentration can be explained by the following factors. When the aluminum content is increased the hydrogenation of the metal is raised in the zone of slow crack growth. At the temperatures of salt corrosion aluminum lowers the solubility of hydrogen in titanium and raises its tendency to hydrogen brittleness. Aluminum is concentrated over

the grain boundaries and with a concentration above 2%, the alpha-2 phase discriminations appear which makes plastic deformation difficult and facilitates development of the chemical reactions taking place with hydrogen discrimination. Figures 3; table 1; references 6: 3 Russian, 3 Western.

USSR

UDC 629.7.036.3

THE POSSIBILITY OF NEUTRALIZATION OF TOXIC COMPONENTS ON A HEATED WALL

Kuybyshev VOPR. PROYEKTIR. I DOVODKI MALORAZMERN. GTD I IKH ELEMENTOV in Russian 1975 pp 114-117

IVLIYEV, A. V., and LUKACHEV, V. P.

[Moscow REFERATIVNYY ZHURNAL 34. AVIATSIONNYYE I RAKETNYYE DVIGATELI No 1, 1977 Abstract No 1.34.9 from the resume]

[Text] A study is made of the possibility of neutralization of the toxic components in the exhaust gas of a gas turbine engine on a heated wall. The content of CO and NO_x is determined. It is shown that when a grid of flat plates of predetermined dimensions made of Kh18N10T steel heated to 600-900 C is placed in the flow, a significant reduction in the concentration of CO and some reduction in the content of NO_x can be achieved. Figures 2; references 4.

USSR

THE INFLUENCE OF TUNGSTEN FILMS ON THE MECHANICAL PROPERTIES OF MOLYBDENUM

Moscow METALLICH. MONOKRISTALLY in Russian 1976 Nauka Press pp 104-107

YAROSHEVICH, P. YU., BELOMYTTSEV, YU. S., BULGAK, L. V., and MUKHIN, I. P.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V1572 by the authors]

[Text] A study is made of the influence of tungsten films 0.15 mm thick on the mechanical properties of single crystals of molybdenum under short and long-term loading. The tests were performed on specimens 3 mm in diameter with orientation along the [110] axis. It is shown that tungsten films reduce ductility, significantly increase strength characteristics and reduce the rate of stable creep of molybdenum. When a tungsten film is applied, the strength of molybdenum at 1600 C increases from 1.8 to 3.5 kg/mm², relative elongation decreases from 78 to 51%, the stable creep rate under a stress of 0.9 kg/mm² decreases from 3 to 0.06%·hr⁻¹. References 6.

USSR

LOW TEMPERATURE PLASTICITY OF VANADIUM AND THE INFLUENCE OF THE SUPERCONDUCTING TRANSITION ON TWINNING

Moscow METALLICH. MONOKRISTALLY in Russian 1976 Nauka Press pp 228-234

ABRAIMOV, V. V., YEFIMOV, YU. V., SAVITSKIY, YE. M., and STARTSEV, V. I.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2V1418 by the authors]

[Text] A study is made of plastic deformation of single crystals of vanadium with a resistance ratio of about 100 at 4.2, 77 and 293 K. At room temperature during extension slipping is observed with a low hardening factor; rupture occurs with deformation by 15-16%. At 77 K, the tensile curve shows a clear flow wave; the specimen ruptures in a clear "knife edge" pattern with deformation of 9%. At liquid helium temperature, in addition to slipping the process of twinning is also observed. The transition to the superconducting state facilitates the formation of twins. The total relative deformation reaches 25%. References 19.

USSR

UDC 621.564.25: 536.22

THERMAL CONDUCTIVITY OF BINARY MIXTURES OF LIQUID FREONS

Moscow KHOLODIL'NAYA TEKHNIKA in Russian No 12, 1976 pp 17-19

TSETKOV, O. B., CHILIPENNOK, YU. S., and DANILOVA, G. N., Leningrad Technological Institute of the Refrigeration Industry

[Abstract] An experimental installation is described for continuous heating and measuring the thermal conductivity of mixtures of liquid freons at low temperatures. Experimental data are tabulated for mixtures of freons 22 and 15, and 22 and 13V1 in the temperature range of -120°C to 40°C and pressures to 100 bar for various component ratios, and of pure freons 22, 115, 13V1, and 12 in the temperature range from the melting point to +40°C along the saturation curve. Relationships are given for computing the thermal conductivity of these refrigerants. Illustrations 2; table 1; bibliographies 3.

USSR

UDC 621.923: 621.921.34.669.018.25

PECULIARITIES OF DIAMOND POLISHING OF HARD ALLOYS CONTAINING NO TUNGSTEN

Moscow VESTNIK MASHINOSTROIYENIYA in Russian No 12, 1976 pp 53-55

MALEVSKIY, N. P., POPOV, S. A., TARAKHNOV, N. S., and TPESHCHENKO, L. M.

[Abstract] Since hard alloys containing no appreciable amount of tungsten are much more difficult to polish than tungsten base hard alloys the authors investigated the possibility of using electropolishing along with polishing with diamond wheels that have metallic binders. Sheets of KNT-16 alloy were polished with AChK wheels 150 x 10 x 3 x 32 mm, with grain sizes ASV 100/80-100% and ASV 125/100-100% and various binders. The electrolyte contained 3.5% NaNO_3 ; 3% Na_2CO_3 ; 0.15% Na_2SO_4 ; 0.07% borax; rest soda. The electropolishing reduces the cutting force area as a consequence of the adaptation, i.e., reduction, of contact of the cutting surface relief of the diamond wheel. This increases the machining properties of the wheel, and decreases the energy requirement for abrasive polishing. Although the process enhances the polishing of these alloys, the results obtained were relatively slight, suggesting that further improvement must be in the direction of developing better diamond wheels and optimum conditions for their use. Illustrations 2; tables 3; bibliographies 1.

USSR

UDC 620.173.25: 666.1

MECHANICAL PROPERTIES OF TECHNICAL GLASS AND SITALLS UNDER LINEAR STRESS

Moscow STEKLO I KERAMIKA in Russian No 12, 1976 pp 9-11

RODICHEV, YU. M., OKHRIMENKO, G. M., KOBAYAKO, I. P., PUCHKO, YU. S., and KOVSHAR, N. N.

[Abstract] Results are given of research on the behavior of three types of technical glass and five types of sitalls under conditions of linear stress. It was found that the materials studied (glasses 13v, plate glass and glass S49-2; sitalls STM-1, 23, A-3, V, and S) have high compressive strengths and moduli of elasticity, and remain completely elastic up to the point of failure. It is further demonstrated that technical glass and sitalls used in industry can be used in place of more expensive metallic support structures operating under high compressive loads. The most promising are sitalls STM-1 and 23, plate glass, and 13v glass. Illustrations 2; tables 2; bibliographies 9.

USSR

UDC 621.311.21: 620.193.23

CORROSION BEHAVIOR OF STEEL UNDER THE CONDITIONS AT THE KRASNOYARSK HYDRO-ELECTRIC POWER PLANT

Moscow GIDROTEKHNICHESKOYE STROITEL'STVO in Russian No 12, 1976 pp 25-27

TRIFEL', M. S., AKHMEDOV, G. M., BRYZGALOV, V. I., and GORCHAKOV, V. I.

[Abstract] According to short-time tests the rate of corrosion of steel in the water at the Krasnoyarsk plant, as in all rivers of the central northern hemisphere, varies greatly with the seasons, being as low as 10-20% of the corrosion rate in sea water in the winter, and as much as 300% of the rate in sea water during the summer. In the Yenisey River water the corrosion rate of the steel in the zone that is periodically wet by immersion is close to the rate in air, whereas in sea water the comparable rate is much higher. Where the steel is continuously under the water the corrosion rate in Yenisey water is 4-5 times the rate for periodic immersion. On the basis of long-term tests the Krasnoyarsk steel mechanical equipment and metal structures must be coated both for corrosion protection and for preservation of form. A 50-micron aluminum coating is recommended. Cathodic protection is required for the underwater zone, and may have to be used even more extensively than the tests indicated. Illustrations 3; bibliographies 6.

USSR

UDC 666.32: 620.181

STRUCTURE FORMATION AND PROPERTIES OF CLAYS WITH SODIUM FLUORIDE ADDITIVE

Moscow STEKLO I KERAMIKA in Russian No 12, 1976 pp 18-20

CHERNYAK, L. P., and LOBASOVA, T. M.

[Abstract] The addition of 1% NaF to the natural clays of various chemical-mineralogical content has an appreciable affect on the intensification of the structure-formation process during heat treatment, leads to an improvement of the crystallization structure, and greatly increases the physico-mechanical indices of the ceramic. The mass compositions developed on the basis of this study and the 120 x 65 x 7-mm ceramic tiles produced under semi-industrial conditions satisfy the requirements of GOST-13-996-68. One important property of the developed masses is the comparatively small shrinkage during drying and firing. Illustrations 3; tables 4; bibliographies 4.

USSR

UDC 621.78.061

REDUCING THE GAS SEPARATION OF CORROSION RESISTANT STEELS

Moscow IZVESTIYA VUZOV MASHINOSTROYENIYE in Russian No 11, 1976 pp 120-125
manuscript received 17 Nov 75

MAKAROVA, V. I., AKIBINA, G. V., and SAFONOV, A. N.

[Abstract] Experiments have shown that the rate of gas separation at 20°C under high ($5 \cdot 10^{-5}$ to $2 \cdot 10^{-7}$ torr) vacuum for hydrogen, water, and total gas separation in 10-mm austenitic steel 12Kh18N10T sheet (used in high-vacuum engineering) that has been descaled by etching during hot rolling can be reduced to 1/10 its usual value by a corrosion-inhibiting thin layer of HNO_3 . A further corresponding reduction in the gas separation rate of the thus coated steel can be achieved by a brief heating in air in the 100-150°C range. Illustrations 3; bibliographies 3.

USSR

UDC 621.7

HOT ROLLING OF LOW DUCTILITY ALLOYS WITH A LUBRICANT

Moscow IZVESTIYA VUZOV MASHINOSTROYENIYE in Russian No 12, 1976 pp 147-149
manuscript received 22 Dec 75

NIKITIN, G. S., ROSTOV, G. N., ZHUCHIN, V. N., SHVARTSBART, YA. S., VLASOV, T. F., and GRIBACH, YU. F.

[Abstract] The Moscow Higher Technical School and the Zhdanov Metallurgical Institute conducted experiments on the use of technological lubricants in the hot rolling of alloys EI-435 and EI-702 at rolling speeds of 4.5, 9.5, and 15.7 m/sec. The EI-435 was rolled at 1,323 K and EI-702 at 1,273 K, close to the minimum for technological conditions. Two types of lubricant were used: 1) solid (briquetted) 2M lubricant with 70-80% graphite, 15-25% refractory clay and up to 5% surface-active substance; and 2) type MS-1 liquid mixture of water, sodium soap, about 8% synthetic aliphatic acid, and 3% refractory clay. The reduction of friction resulting from the use of the lubricant had no appreciable relationship to the rolling rate. The lubricant allows a reduction of rolling pressure; the solid lubricant is more effective than the liquid. However, the relative reduction of the mean rolling pressure varies for different rolling rates because of the hydrodynamic effect. Illustrations 3.

CZECHOSLOVAKIA

VERIFICATION OF ACCURACY OF DETERMINATION OF WAVE LENGTHS BY ABSORPTION SPECTROPHOTOMETERS IN THE VISIBLE SPECTRAL REGION

Prague JEMNA MECHANIKA A OPTIKA in Czech Vol 21 No 7, 1976 pp 213-215
manuscript received 9 Jan 76

HORKY, M., Czechoslovak Academy of Sciences, Brno

[Abstract] Problems of calibration of medium accuracy absorption spectrophotometers in the region of visible light are discussed. The problem is met in evaluation of laser mirrors. Best chemicals for this purpose are lanthanides and compounds of neodymium with wave lengths of 623, 629, and 637 nm. Most suitable compound is neodymium chloride with a slight excess of hydrochloric acid, which maintains the stability of the solution. The author obtained very good results with a 22 percent solution of NdCl_3 with about one percent free HCl . The accuracy obtained was about ± 2 nm at 633 nm. Distilled water is used as the comparative solution. For calibrations with very high accuracies emission spectra of cadmium and mercury discharge tubes may be used. This is rarely needed for medium accuracy photospectrometer. Verification of the calibration should be made twice per year. Most frequent impurities found in the used solutions are iron compounds. Figures 4; tables 2; references 4 (Western).

USSR

UDC 681.121.89.082.4.088: 532.517.6

PROCEDURAL ERRORS IN THE MEASUREMENT OF PULSATING FLOW RATES WITH ULTRASONIC PHASE FLOWMETERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 8, 1976 pp 46-47

IVANOV, A. A., and RESHETNIKOV, V. A.

[Abstract] The authors provide a theoretical study of the non-linear phase modulation of the ultrasonic vibrations in a flow that occurs during a measurement of variable flow rates by means of ultrasonic phase flowmeters; this phase modulation leads to a change in the continuous and variable components of the pulsating flow rate and the appearance of frequencies not otherwise contained in the flow rate spectrum. The conversion factor of an ultrasonic flowmeter for variable components of the flow rate differs from that for the continuous component. This causes an error in the measurement of the variable component by a flowmeter calibrated for a continuous flow rate. Bibliographies 3.

USSR

UDC 532.527.001.5

STUDY OF THE HYDRODYNAMIC PARAMETERS OF TWISTED FLOWS IN THE INTAKE SECTIONS OF FLOWMETERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 8, 1976 pp 49-50

PUSTOVOYT, YU. A.

[Abstract] In order to determine the degree of velocity profile deformation and distribution of static pressure in the intake section of flowmeters experimental measurements were made of the flow rate of the working medium, its temperature, total and static pressure fields, and the angles of taper of the velocity vector in the cross sections that are removed from the origin of the twisted flow by 3, 6, 8, 15, 22, 33, 87, and 115 internal diameters of the channel. The kinematic structure of the twisted flows was studied by means of a special single-channel hydrometer attachment. It was found that the deformation of the velocity profile depends on the angle of twist of the flow in the cylindrical inlet, that the tangential component of the velocity vector changes continuously with distance from the diaphragm, and that the twist and Re of the flow influence wall friction. It is concluded that an additional error can be eliminated by positioning the flowmeter approximately 100 internal diameters from the origin of the twisted flow. Bibliographies 2.

USSR

UDC 536.532.089.68.089.6: 536.5.081.4

STANDARD THERMOCOUPLE CALIBRATION ERRORS CONNECTED WITH THE CONVERSION TO
MPTSh-68

Moscow METROLOGIYA in Russian No 12, 1976 pp 20-29

ESTRIN, B. S., and FINKEL'SHTEYN, V. YE.

[Abstract] Examples are given to show that the introduction of MPTSh-68 (International Practical Temperature Scale 1968) in principle requires a change of the equations that connect emf with temperature. Otherwise there are errors in the calibration of $\delta - \Delta$ in the 300 - 1,300°C interval for standard thermocouples, i.e., not only relative errors but errors greater than the discrepancy between the temperatures measured according to MPTSh-68 and MPTSh-48. In other words in all cases when the thermocouple is being recalibrated from MPTSh-48 to MPTSh-68 it will be necessary to analyze the previously used calibration method and, if necessary, make changes, i.e., change the equations. Otherwise the recalibration can lead to an increase, rather than to a decrease, of the instrument errors. Tables 5; bibliographies 7.

USSR

UDC 620.179:539.21

MEASUREMENT OF THE MÖSSBAUER EFFECT IN BACKSCATTERING GEOMETRY

TR. TYUMEN. INDUSTR. IN-T in Russian No 45, 1976(1976) pp 89-96

TYUTEVA, N. D., NAKORNEYEVA, T. D., DOLODARENKO, A. G., NASSONOV, V. V.,
DOLODARENKO, G. G., and MAKAROV, A. I.

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA
No 1, 1977 Abstract No 1.32.220]

[Text] Some possibilities of application of a nuclear gamma resonance (NGR) spectrometer to backscattering geometry are presented, representing a new and promising method for nondestructive testing of iron-containing specimens. The theoretical principles of the method are studied, as well as its application for the study of the structure of the alloys: determination of the quantity of residual austenite in steels, investigation of the structure of coatings, determination of the influence of compressive and tensile stresses on the characteristics of the Mössbauer spectra.

THE PROBLEM OF CALCULATING THE BEAM SYSTEM OF A QUANTUM FREQUENCY METER

Moscow METRL. OBESPECHENIYE IZMERENIYE OPTIKO-FIZ. PARAMETROV IZLUCH. OKG
in Russian 1976 pp 148-150

IL'CHENKO, A. M., KLEYMAN, A. S., and TEMLYAKOVA, T. B.

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA
No 1, 1977 Abstract No 1.32.584 by V. G.]

[Text] A method is described for computer calculation of the parameters of six-pole magnets used for spatial separation of the beam of hydrogen atoms in a laser. The calculations produce the ratios N_f/N_0 and N_d/N_0 , where N_0 is the number of particles radiated by the source per unit time, N_f and N_d are the numbers of focused and defocused atoms passing through the channel of the magnet without colliding with the walls. The ratios depend on the parameters of the beam system: the radii of the source and field of the magnet R_s and R_m , the lengths of the channel L_m , the field intensity at the pole of the magnet H , the distance between the source and input to the channel L_s , the ratio of length to diameter of the source channels L_c/D_c . Graphs are presented of the dependences of N_f/N_0 and $(N_f - N_d)/N_0$ on the parameters. It is established that where $R_s/R_m = \text{const}$, $N_f \approx R_m^2$, $N_f - N_d \approx R_m^2$, the product $R_m^2 H$ can serve as an estimate of the quality of the magnet and its optimal design. L_c/D_c should be not over 40, 30 and 20 where $H = 5, 10$ and 20 koe respectively. Figures 2; references 2.

ANALYSIS OF METROLOGICAL CHARACTERISTICS OF A DIGITAL METER FOR MEASUREMENT OF HIGH RESISTANCES AND A METHOD OF ITS CALIBRATION

Moscow NAUCH. PRIBORY in Russian No 10, 1976 pp 19-26

ILYUKOVICH, A. M., and KULIKOV, V. A., All-Union Scientific Research Institute of Physicotechnical and Radiotechnical Measurements

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA
No 1, 1977 Abstract No 1.32.1163]

[Text] The results are presented from theoretical and experimental studies of the capabilities of the latest, most precise model of meter for measurement of very high resistances (10^7 - 10^{15} ohm), developed at the All-Union Scientific Research Institute of Physicotechnical and Radiotechnical Measurements. Functional and equivalent circuits of the resistance meter are

analyzed. The results of the studies show that the digital high resistance meter has low nonlinearity, little dependence of indications on temperature and low random error. Full realization of the precision capabilities of the instrument requires the corresponding method of calibration, which can minimize systematic errors. A method of calibration of the digital meter developed by the authors is presented, including self-testing, in which calibration begins at the lower limits of measurement and each subsequent measurement limit is calibrated on the basis of the previous limit. The errors of the instrument, including calibration errors of 0.01% at the lower limit of measurement to 1.5% at the upper limit, are presented. In order to prevent the error from exceeding these indicated limits, it need be calibrated but once each 4-6 months. Figures 2; table 1; references 6.

USSR

UDC 532.57+532.137+536.51+532.14.08+531.787

ON THE QUESTION OF MEASURING THE TEMPERATURE OF A HIGHLY HEATED TWO-PHASE FLOW

Kiev TEPLOMASSOOBMEN-V. MATERIALY V VSESOYUZNOY KONFERENTSII PO TEPLU- I MASSOOBMENU, Minsk 1976 [Heat and Mass Exchange - V. Materials from the Fifth All-Union Conference on Heat and Mass Exchange, Minsk 1976. Collection of Works] in Russian, Izd-vo Naukova Dumka, 1976 pp 19-23

ALEMASOV, V. YE., MAKSIMOV, V. K., SAGADAYEV, V. I., SERGEYENKO, E. S., and TAYMAROV, M. A.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B1204 by B. I. Bakum]

[Text] The authors present the results of an investigation of the influence of scattering effects as a function of concentration and dimensions of aluminum oxide particles on the accuracy of measuring the temperature of a two-phase flow by the method of absolute intensity of the spectral line (the sodium line was used with $\lambda = 0.5890-0.5896$ micron). The investigations were conducted on a device containing a high-temperature gas generator (plasmotron, operating on a mixture of compressed gas with 3-5% argon, a test segment, a system of feeding the solid particles into the gas flow and a system of dyeing this latter with a salt of alkali metal. The tests encompassed a range of 0-16% particle concentration; the dimensions of the particles varied in the different tests in the range of 0-50, 50-63, 63-100 and 0-160 micrometers. They showed that the influence of the scattering effects begins to be expressed with a concentration above 6%, the influence of the particle dimensions being insignificant. References 8.

USSR

UDC 535.612.1.089.6 (47 + 57: 430.2): 535.653.8

COMPARISON OF THE SPECTRAL COEFFICIENTS OF REFLECTION OF WHITE SURFACE
SPECIMENS OF MS-20 GLASS ACCORDING TO MEASUREMENTS IN THE GDR AND USSR

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 8, 1976 pp 21-23

KOENIG, H. (GDR), NIKONOVA, YE. I., POKROVSKAYA, G. V., and YUSTOVA, YE. N.

[Abstract] A comparison of the results of measurements at the USSR All-Union Scientific Research Institute of Metrology (VNIIM) and at the GDR Office of Standardization, Measurement, and Commodity Testing (ASMW) showed that in the 480-740-m wavelength range they coincide within an error range of 0.001 - 0.005. In the 400-800-m spectral region they differ by 0.01; this discrepancy is apparently due to the individual peculiarities of the measuring devices. VNIIM used the SF-10 two-beam recording spectrophotometer, K-30 lamp, F-3 photocell, 180-mm dia sphere, 25-mm dia light spot on the specimen, 22° angle of incidence of light on the specimen, measurement error in the 400-750-m range ± 0.002 to ± 0.005 . ASMW used a single-beam spectrophotometer based on the Zeiss SPM-1 monochromator, Wi 17/G lamp, FS-35 photomultiplier, V-5 digital voltmeter, 200-mm dia sphere, 40-mm dia inlet aperture, 0° angle of incidence, and measurement error the same as for the VNIIM equipment (± 0.002 to ± 0.005). Illustrations 1; tables 2; bibliographies 12.

Optical

USSR

METHODS OF DESIGNING CONVERGING LENSES AND FOCUSSED LENSES

Tashkent GELIOTEKHNIKA in Russian No 6, 1976 pp 23-28 manuscript received 25 Mar 76

BARANOV, V. K., Leningrad

[Abstract] The article, a summary of three previous works by the author, describes rapid and satisfactorily accurate methods of constructing the profiles of the parabolotoric converging lenses and parabolocylindrical focussing lenses of solar concentrators. The radius-vector values required for plotting the parabolic profile are tabulated. The calculation of the profile of a converging lens and a focussing lens with a 20° parametric angle is given as an example. Illustrations 3; table 1; bibliographies 3 (by the author).

USSR

UDC 662.997: 537.22

ON COMPUTING THE OPTICAL CHARACTERISTICS OF LUMINOUS ENERGY SENSORS FOR HIGH TEMPERATURE RESEARCH

Tashkent GELIOTEKHNIKA in Russian No 6, 1976 pp 38-42 manuscript received 30 Sep 75

ZAKHIDOV, R. A., and IL'YINSKIY, A. I., Central Design-Construction and Technology Office of Scientific Instrument Building, Academy of Sciences Uzbek SSR

[Abstract] A theoretical study is made of the influence of the non-equilibrium of a radiator-sensor system on the integral optical characteristics of the sensor. Values are derived for the integral absorption coefficient and of the integral radiative power of tungsten and molybdenum within a wide range of temperature measurements at the sensor and radiator. The dependence of the integral radiative power on temperature is plotted for tungsten (1,250-6,000 K) and molybdenum (2,000 - 6,000 K). It is shown that Kirchhoff's integral law does not apply for non-equilibrium selective systems. The results obtained here can be used for designing tungsten and molybdenum sensors for radiometers. Illustrations 4; bibliographies 11.

SECTIONAL CONCENTRATORS WITH SPHERICAL RADIATION SOURCES

Tashkent GELIOTEKHNICA in Russian No 6, 1976 pp 43-51 manuscript received 25 Jul 75

FADERIN, L. YA., Central Aerohydrodynamics Institute

[Abstract] In an earlier work (Geliotekhnika No 2, 1976) the author presented a method of computing the density distribution of the radiant fluxes from mirror concentrator systems over irradiated surfaces of arbitrary configuration. Here sectional concentrators with spherical radiation sources are considered; these concentrators represent an assembly of conical or spherical rings of equal width which at their original and final cross sections intersect the generatrices, the ellipsoids of rotation. The radiation source, lying in the primary focus of the ellipsoid, is a spherical solid radiator with volumetric intensity constant. The sectional concentrators are shown to be close to ideal ellipsoidal concentrators with respect to density and light flux distribution. For ellipse eccentricity $e > 0.8$ the concentrators should be composed of conical rings, and for $e < 0.8$ of spherical. When the width of the rings reaches several diameters of the source a very high level of illumination in the focal plane can be achieved. Thus such sectional concentrators can be used effectively in radiation heating systems. Illustrations 6; bibliography 1.

STUDY OF THE INFLUENCE OF THE ANGULAR APERTURE OF THE READ-OUT SYSTEMS ON THE ACCURACY CHARACTERISTICS OF PHOTOELECTRIC TRANSDUCERS WITH RASTER SCALE

Leningrad OPTIKOMEKHANICHESKAYA PROMYSHLENNOST' in Russian No 11, 1976 pp 11-14 manuscript received 15 Jan 76

FROLOV, G. I., CHISTOV, V. N., and SHATALOV, YU. A.

[Abstract] In photoelectric raster-type displacement-to-code transducers, raster scales with 30-100-micron graduations are used in the precision read-out, and phase interpolators are used to improve the resolution. Since the literature does not consider the influences of the aperture angle of the read-out system and spacing between the raster scales in recommendations on the choice of raster convergence parameters for obtaining a minimum phase error in the interpolator, the authors attempt here to fill that information gap. For the read-out systems a method is proposed for determining the influence of the angular aperture on the transfer function of obturated and moiré raster convergences. The phase error values of a quadrature-phase raster interpolator relative to the parameters of the rasters, the spacing between them and the aperture angle of the read-out system were determined

by electronic computer. The results may be used for designing high-precision photoelectric displacement-to-code transducers. In the designing of phase interpolators the choice of the type of convergence depends on the required accuracy of the interpolator. If the permissible phase error of raster convergence is approximately 0.1% of the gap between the rasters, obturated convergence is recommended. If higher accuracy is demanded, then moiré convergence is preferable. Illustrations 3; tables 2; bibliographies 6.

USSR

UDC 531.787.91.087.92:088.6:621.317.715-525

A PNEUMOGALVANOMETRIC COMPARATOR

Moscow STRUYN. TEKHNKA. VI MEZHDUNAR. KONF. TEZISY DOKL. in Russian Nauka Press 1976 pp 283-287

MAKAROV, V. A.

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNKA No 1, 1977 Abstract No 1.32.220 by P. N. A.]

[Text] The sensitivity of pneumatic-optical transducers to applied pressure can be significantly increased by compensation of the mechanical moment due to the action of the stream of gas on the valve of the converter by magnetoelectric moment. By analogy with photogalvanometric mechanical moment compensators, these devices are called pneumogalvanometric comparators. They consist of a magnetoelectric galvanometer, the moving portion of which is rigidly connected to a mirror and valve. The stream of gas leaving the nozzle deflects the valve and mirror. The displacement of the beam of light reflected from the mirror causes redistribution of the light fluxes on the surfaces of the two halves of the photoresistor. The imbalance of the differential electric circuit leads to the appearance of a current in the negative feedback circuit, consisting of a resistor, milliammeter and galvanometer frame. The magnetoelectric moment thus formed compensates the mechanical moment due to the action of the jet on the surface of the valve. Results are presented from analysis of the dynamic characteristics of the comparator and the results of determination of its experimental characteristics. Figures 2; references 3.

USSR

UDC 539.3

ON THE CALCULATION OF A CYLINDRICAL SHELL WITH A FRAMED CUT-OUT

Moscow IZVESTIYA VUZOV MASHINOSTROYENIYE in Russian No 10, 1976 pp 5-9
manuscript received 3 Oct 75

SKOPINSKIY, V. N.

[Abstract] The author considers the stress-strain condition of a fuselage-like cylindrical shell with a reinforced square hole. The shell consists of two parts, one open, the other closed. It is reinforced by two elastic rings, one at the end of the closed part, the other at the border between the open and closed parts, and is firmly secured at the open end. The longitudinal edge of the open part of the shell can be either free or reinforced by a longitudinal element. The shell is assumed to be momentless; the rings are circumferentially inelastic and attached to the cylindrical shell without eccentricity; the load is applied only against the reinforcing elements, which undergo two-dimensional strain. The action of a concentrated normal force applied to the reinforcing element is given as an example. The two-part shell is treated as three sections, each a circular rod plus cylindrical panel; this takes into account certain bending moments in the stressed ring in section III which influence the stress condition in the panels and which might be neglected if other calculation methods were used. Illustrations 3; bibliographies 9.

USSR

UDC 621.226

STABILITY OF THE FORCED OSCILLATIONS OF THE ACTUATING ELEMENT OF A HYDRAULIC SERVO

Moscow IZVESTIYA VUZOV MASHINOSTROYENIYE in Russian No 10, 1976 pp 83-86
manuscript received 9 Mar 76

BARANOV, V. N., DOBROVOL'SKIY, B. V., and ZAKHAROV, YU. YE.

[Abstract] A study was made of the stability of the motion of the actuating element of a hydraulic servovalve mechanism for flow control. After deriving the equations of motion in dimensionless form and formulas for the perturbation effect, based on generalized Lyapunov theorems, the authors obtain the conditions of asymptotic stability of the forced oscillations of the actuating element over a finite interval of time. Bibliographies 5.

STABILITY OF ELASTIC INCOMPRESSIBLE BODIES UNDER OMNIDIRECTIONAL COMPRESSION

Kiev PRIKLADNAYA MEKhanIKA in Russian No 11, 1976 pp 3-11 manuscript received 11 Feb 76

GUZ', A. N., Institute of Mechanics, Academy of Sciences Ukrainian SSR, Kiev

[Abstract] A study is made of the stability of the state of equilibrium of a singly-connected isotropic incompressible solid with arbitrary elastic potential during omnidirectional uniform deformation. The main relationships are derived in general form for the theory of finite subcritical deformations, and different variations of the theory of small subcritical deformations are formulated. In the latter case new rigorous expressions for computing the perturbations of a surface live ("follow-up") load are obtained from the corresponding expressions for the theory of finite subcritical deformations. It is demonstrated that sufficient conditions of applicability of the static method of investigation are realized for the cases when identical boundary conditions exist on the entire boundary surface and when different boundary conditions exist on different portions of the boundary surface. In the general case for the theory of finite and small deformations it is shown that the equilibrium condition of the elastic body during omnidirectional uniform deformation is stable if a "follow-up" (live) load is applied over the entire boundary surface. The traditional problem of a hinge-supported plate during uniform omnidirectional deformation is considered as an example of the problem of different boundary conditions on different portions of the boundary surface. It is shown that in the problem considered here the equilibrium condition is stable if a live ("follow-up") load is applied at the lateral surfaces, and unstable if a "dead" load is applied at the lateral surfaces. The results are analogous to earlier obtained results for a compressible body. (Prikladnaya mekhanika, No 6, 1976 pp 3-27). Bibliographies 2.

NONLINEAR OSCILLATIONS OF A WALL IN A LIQUID

Kiev PRIKLADNAYA MEKhanIKA in Russian No 11, 1976 pp 110-116 manuscript received 28 Jan 75

FILIPPENOK, V. Z., Leningrad Higher Military Engineering School

[Abstract] The author considers the problem of the nonlinear oscillations of an elastic wall within a channel of constant width and depth and semi-infinite length. The motion of the liquid is assumed to be potential, and the liquid itself is inviscous and incompressible. Undulations of the surface are taken into account. Analogous problems for the linear formulation were treated by Grodtko (Inzhenernyy zhurnal, No 4, 1961, pp 6-10) and Chen Chung-Chen (Prikladnaya matematika i mekhanika, No 1, 1961, pp 150-154),

the latter for the linear problem of the dynamic water pressure against a dam during an earthquake. Accounting for the nonlinearity refines the earlier solutions for the wall in question. Systems of equations are derived for the first two approximations, the system for the first approximation giving the well-known result for the solution of the linear problem; from the system of equations for the second approximation an additional component is derived that accounts for the nonlinear oscillations of the wall. Estimated relationships are obtained for the wave motions and hydrodynamic pressures at the wall. The influence of the nonlinearity will be greater, the higher the amplitudes of the wall oscillations. Taking the nonlinearity of the wall oscillations into account reveals higher hydrodynamic pressure values at the wall and necessitates changes in the linear solution for the wave actions of the liquid. Illustrations 2; bibliographies 4.

USSR

UDC 539.3: 534.1

STABILITY OF CYLINDRICAL SHELLS UNDER DYNAMIC OMNIDIRECTIONAL COMPRESSION

Kiev PRIKLADNAYA MEKHANIKA in Russian No 11, 1976 pp 117-119 manuscript received 29 Oct 75

VOYTSEKHOVSKIY, A. I., and SHUMIK, M. A., Kaliningrad

[Abstract] Tabulated results are given of an experimental study conducted with a hydraulic ram which allowed the impact pressure exerted on the rod to be exerted as omnidirectional hydraulic pressure against the shell. The increase of pressure with time was close to linear, and could be regulated. Pressures were recorded with the TDM-60 tensometer. Deformations were measured with wire strain gauges soldered to the inside wall of the shell. The tested specimens were 13 AMG-6T alloy shells 325 mm long and 93.75 mm in radius, and reinforced at the ends. Three shells were tested under static loading, and 10 under dynamic. The typical statically tested specimen lost stability at a pressure of $7.5 \cdot 10^5$ n/m² and was configured with four equally spaced dents. In the dynamic loading the rate of loading had a direct influence on the critical load and shell configuration at failure. With loading rates varied from 3.5 to 10.0 the critical pressure doubled in value and the number of dents increased from five to seven. Illustrations 3; table 1; bibliographies 6.

USSR

UDC 539.374.3 + 629.7.023

STUDY OF THE BENDING OF SANDWICH PLATES WITH LARGE HOLES

Kiev PRIKLADNAYA MEKHANIKA in Russian No 11, 1976 pp 126-130 manuscript received 10 Apr 75

TAMUROV, N. G., and VOLKOVA, T. D.

[Abstract] The authors apply the finite-difference method on the basis of the bending equations of the technical theory of symmetrical sandwich shells with rigid filler to study the stress-strain pattern of a square shell with a large square hole under the affect of a uniformly distributed load. The edges of the plate and of the hole are freely supported. Maximum bending values are obtained for a wide range of variation of the proportions of mechanical and geometric parameters of the shell, and some estimates of their values are given. The normal loads at the points with maximum bending are computed. The variation of the geometric proportions of the layers has a considerable influence on the numerical results. Illustrations 3; tables 4; bibliographies 4.

USSR

UDC 539.412.001.5 (045)

CALCULATION OF A CYLINDRICAL SHELL WITH FILLER

Moscow IZVESTIYA VUZOV MASHINOSTROYENIYE in Russian No 12, 1976 pp 5-9 manuscript received 19 May 76

SVERDLOV, A. I., and SPITSYNA, I. N., article introduced by Professor I. F. OBRAZTSOV, Moscow Aviation Institute

[Abstract] A method is given for calculating the strength of a long ($L/R > 4$) smooth, thin cylindrical shell with continuous elastic filler and loaded by a system of concentrated longitudinal forces applied at the end of the shell symmetrical to the vertical axis of its cross section. Applying the semi-momentless theory and following Papkovich, the authors present the solution in the form of a primary and a corrective stress condition. The primary, statically possible condition is that which involves a thin-walled shell with nondeformed cross sectional contour. The corrective stress condition is that which represents a system of functional "superfluous" unknowns that is determined on the basis of the minimum value of the potential energy required to deform the system. The dependence of normal stresses on the number of applied concentrated forces and relative rigidity of the continuous filler is established. Illustrations 2.

USSR

UDC 534.1: 007

PLANNING OF OSCILLATIONS IN THE IDENTIFICATION OF MECHANICAL SYSTEMS

Moscow MASHINOVEDENIYE in Russian No 6, 1976 pp 15-20 manuscript received 6 Apr 76

GLUKHAREV, K. K.

[Abstract] Author considers the problem of planning the motion of a dynamic system in carrying out experiments for the purpose of identifying the system. In this case the results of the experiments are represented in the form of a table containing information for the reconstruction of the right sides of the equations of motion of the system. For the sake of accuracy in the reconstruction of the original functions, the table must contain values of these functions at points that are distributed with sufficient density over the entire range of motions under consideration. From this arises the problem of organizing the motion of the system along a trajectory which passes through a certain number of points that make up an E-set of finite elements with fixed minimum spacing. It is shown that such a trajectory may be obtained in the case of a perturbation of nearly periodic oscillations in the system. The problem of the formation of the structure of an external force generating nearly periodic oscillations is solved, and it is shown that a guaranteed result may be obtained only along one of the generalized coordinates. In certain cases the setting up of the experiment is difficult, for example in the study of the dynamics of machine tools, reduction gearing and other similar types of machines and mechanisms. Bibliographies 7.

USSR

UDC 539.3

ON THE CONCENTRATION OF THERMAL STRESSES AROUND A SEMI-ELLIPTICAL RECESS

Moscow MASHINOVEDENIYE in Russian No 6, 1976 pp 54-59 manuscript received 15 Dec 75, revised 9 Mar 76

KABELEVSKIY, M. G.

[Abstract] A shallow semi-elliptical recess is considered in which a non-uniform field of stresses is generated as a result of nonuniform heating. It is shown that if the change in the elastic constants of the material around the recess and the influence of this change on the temperature distribution are neglected the solution of the problem can be obtained as a superimposing of the stresses in the body without the recess and as the well-known solution of N. I. Muskhelishvili (Nekotoriye osnovnyye zadachi matematicheskoy teorii uprugosti--Some Basic Problems of the Mathematical Theory of Elasticity--Moscow 1954). Simple formulas are obtained for determining the maximum stress. Data given in the literature are compared

with the results. It is found that in a computation of the concentration of thermal stresses in actual objects by means of the formula given here for $\delta_{\max}$, the commonly used correction factor for a reduction of the "active cross section" must be introduced. Illustrations 3; table 1; bibliographies 7.

USSR

UDC 539.4

TOWARD THE ESTABLISHMENT OF AN ENERGY VARIANT OF CREEP THEORY. REPORT 1.
MAIN HYPOTHESES AND THEIR EXPERIMENTAL VERIFICATION

Kiev PROBLEMY PROCHNOSTI in Russian No 11, 1976 pp 3-8 manuscript received
18 Aug 75

SOSNIN, O. V., GOREV, B. V., and NIKITENKO, A. F., Institute of Hydro-
dynamics, Siberian Department, Academy of Sciences USSR

[Abstract] The main hypotheses are formulated as a basis for stating the energy variant of creep theory, and experimental results that verify these hypotheses are given. The hypotheses involve: the concomitance and mutual influence of creep and failure; a specific force of dispersion W as a measure of creep intensity, and a specific energy of dispersion $A = \int_0^t W dt$

as a measure of the damageability of the material; an equation of state $W = \phi(\sigma_3, T, A)$, where σ_3 is the equivalent stress and a function of the invariants of the stress tensor and, possibly, of the anisotropy tensor of the creep properties of the material; a flow hypothesis of the similitude of the deviators of creep and strain rates up to the point of failure; and the retention of plastic incompressibility up to failure. Experiments involving pure tension, pure compression and pure buckling were conducted on steel 45 and D16T duraluminum because they are isotropic materials with identical, or nearly identical, creep behavior in tension and compression. For nearly all forms of stress condition the value of the dissipated specific energy at the moment of failure was practically constant. Overload tests showed that creep and failure are concomitant wherever the "equivalent stress condition" prevails. The energy variant of creep theory is shown to be valid and is recommended for practical use. Illustrations 6; tables 3; bibliographies 2.

USSR

UDC 539.376

TOWARD THE ESTABLISHMENT OF AN ENERGY VARIANT OF CREEP THEORY. REPORT 2.
DESIGN OF STRUCTURAL ELEMENTS AND EXPERIMENTAL VERIFICATION OF THE RESULTS

Kiev PROBLEMY PROCHNOSTI in Russian No 11, 1976 pp 9-13 manuscript received
18 Aug 75

SOSNIN, O. V., GOREN, B. V., and RUBANOV, V. V.

[Abstract] This second report deals with the applicability of the energy equations to the solution of the problems of the pure bending of a beam, the buckling of a solid shaft and buckling of a hollow shaft with an applied axial tensile force. The computed results were experimentally validated by tests on D16T duraluminum at 250°C under conditions described in Report 1 (Kiev, Problemy Prochnosti, No 11, 1976, pp 3-8). The experimental results were in very good agreement with the theoretical, thus verifying the consistency of the equations of state in the energy form and providing circumstantial evidence of the authenticity of the integral process of creep and the accumulation of strains in structural elements all the way up to the point of failure. Illustrations 6; table 1; bibliographies 9.

USSR

UDC 539.379

STANDING SHEAR WAVES IN HARDENING RIGID PLASTIC BODIES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 231 No 6, 1976 pp 1308-1310 manuscript received 19 Feb 76

DRUYANOV, B. A.

[Abstract] A study is made of two-dimensional stable flow of a hardening rigidly plastic material. Due to its incompressibility, only tangential velocity discontinuities are possible in such a material. The discontinuity surface is looked upon as a limit approached by the layer of material when the thickness of the layer approaches zero and the maximum shear velocity increases without limit. Consequently, the velocity discontinuity surfaces, if they exist, should coincide with the surfaces of maximum shear. A formula is presented which defines the rate of propagation of shear perturbations. It shows that in ideally plastic bodies, dynamic propagation of perturbations is impossible. However, with quasistatic flow in ideally plastic bodies, this rate is indefinite and, consequently, velocity discontinuity surfaces may appear. On the other hand, with quasistatic flow in hardening bodies, the shear propagation rate is infinite.

USSR

ANALYSIS OF THE INFLUENCE OF GEOMETRIC PARAMETERS ON THE STRESS-STRAIN STATE OF STRUCTURES SUCH AS THE BODY OF A FLIGHT VEHICLE WITH A NOTCH

[TR.] MOSK. AVIATS. IN-TA No 362, 1976 pp 75-78

BOMSHTEYN, K. G., and PAPKO, V. V.

[From REFERATIVNYY ZHURNAL 41. RAKETOSTROYENIYE No 1, 1977 Abstract No 1.41.180 by T. A. Ye.]

[Text] In planning flight vehicle bodies, one must be interested in the nature of change of the stress-strain state of the structure in the area of a notch with variable relative dimensions of the notch. For various types of loading, the distribution of normal stresses with the maximum modulus in various cross sections of a conical envelope weakened by a notch was found. The study performed allows the most highly stressed cross section to be found for various types of loading of structures with notches, and also determination of the external critical loads for various types of loading of structures with notches. The study was performed by computer using a program based on a refined method of design of open envelopes such as aviation structures. Figures 3; references 2.

USSR

LOAD-BEARING CAPACITY OF THINWALL SPHERICAL SHELLS UNDER AXISYMMETRICAL LOADING

[TR.] MOSK. AVIATS. IN-TA No 362, 1976 pp 31-33

MATYUSHEV, YU. S., and MOVCHAN, A. A.

[From REFERATIVNYY ZHURNAL 41. RAKETOSTROYENIYE No 1, 1977 Abstract No 1.41.182 from the resume]

[Text] A study is made of a thinwall spherical envelope filled with a liquid of a defined specific gravity and articulated by its equator so that the evenly distributed reactive load produces no bending moment relative to the middle surface of the envelope. This calculation plan can be used for a suspended tank with closely located supporting brackets. The load consists of the even internal excess pressure and hydrostatic pressure. The maximum compressive force which will occur in the lower hemisphere (near the equator), maximum axial acceleration, as well as maximum excess pressure are determined. Figures 2; references 2.

USSR

INFLUENCE OF ELASTICITY OF RIBS ON STRESS STATE OF A REINFORCED CYLINDRICAL ENVELOPE LOADED WITH LONGITUDINAL FORCES

[TR.] MOSK. AVIATS. IN-TA No 362, 1976 pp 10-17

TARASOV, A. T.

[From REFERATIVNYY ZHURNAL 41. RAKETOSTROYENIYE No 1, 1977 Abstract No 1.41.183 by T. A. Ye.]

[Text] A study is made of a cylindrical envelope with a skin supported by 8 stringers and in the transverse direction by a large number of ribs. The skin is considered to work only in shear, the stringers only in extension-compression. The relative error of the solution is determined for the case when the hypothesis of invariability of the cross-sectional contour is used in comparison with the solution in which the elasticity of the rib is considered. When the envelope is loaded with 4 balanced forces (instead of 8), the influence of rib elasticity is increased. This is explained by the fact that the potential energy of extension-compression and bending of a rib under the influence of the balanced fluxes of tangential forces in effect in this case is about 50 times greater than for the case of 8 balanced forces. When the diameter of the envelope is increased, the influence of elasticity of ribs on the stress state of the envelope acted upon by longitudinal forces also increases, since the moment of inertia of the ribs does not increase usually in proportion to the fourth power of the increase in linear size, which would be required to retain all dimensionless parameters of the envelope and, consequently, the influence of rib elasticity. Analysis of the influence of rib rigidity on the stress state of the envelope, loaded with longitudinal forces, shows that the use of the hypothesis of invariability of cross-sectional contour with this type of loading and with conservation of accuracy of calculation to 3-5% is possible only with quite rigid ribs. Figures 12.

USSR

THE PROBLEM OF USING THE RUPTURE OF THINWALL CYLINDRICAL SHELLS IN CYCLICAL LOADING

[TR.] MOSK. AVIATS. IN-TA No 362, 1976 pp 67-74

ZHEKOV, K. A., ANTONOV, M. S., and LYSYAKOV, V. G.

[From REFERATIVNYY ZHURNAL 41. RAKETOSTROYENIYE No 1, 1977 Abstract No 1. 41.184 by T. A. Ye.]

[Text] Results are presented from studies of the rupture of thinwall cylindrical specimens when there are "large" defects under the influence of cyclical loading of high intensity and constant amplitude. Experimental-theoretical studies were performed for: determination of the true physical picture of rupture of specimens with time; studies of the influence of parameters of specimens and loading on rupture time; determination of statistical distribution of the time of rupture as a function of defining parameters. A description is presented of an installation and an experimental method is presented. Figures 8; table 1; references 4.

USSR

UDC 539.3

ANTIPLANE DEFORMATION OF AN ANISOTROPIC BODY WITH A RIGID LAMINAR INCLUSION

Kiev FIZIKO-KHIMICHESKAYA MEKHANIKA MATERIALOV in Russian Vol 12 No 6, Nov/Dec 76 pp 80-85 manuscript received 30 May 75

BEREZHNIYSKIY, L. T., SADISVSKIY, V. M., and LEN', M. P., Physico-Mechanical Institute, Academy of Sciences Ukrainian SSR, L'vov

[Abstract] Use of the methods of fracture mechanics to determine the brittle strength of composition materials requires knowledge of the distribution of stresses and dislocations in the vicinity of various types of defects and inclusions. In addition to the results of two-dimensional problems, the authors investigate the stress-strain state of an anisotropic body with laminar rigid inclusions perpendicular to the plane of elastic symmetry when such a body is found under conditions of antiplane deformation. Figures 3; references 7: 6 Russian, 1 Western.

USSR

UDC 620.178.311.4

ACCELERATED EVALUATION OF FATIGUE RESISTANCE CHARACTERISTICS BASED ON TEST RESULTS WITH INCREMENTAL STRESS AMPLITUDE

Moscow ZAVODSKAYA LABORATORIYA in Russian No 10, 1976 pp 1238-1241

STEPNOV, M. N., YEVSTRATOVA, S. P., Moscow Aviation Technological Institute

[Abstract] The question of methods to accelerate evaluation of arbitrary variables of fatigue curve equations in terms of the instant of macroscopic fracture formation and ultimate destruction and fracture of structure elements of light alloys is examined. Loading conditions impact on fatigue strength such as initial stress level, stress increment, rate of load increment; and structural factors such as cross section dimension, stress concentration are considered as they affect the maximum sum of accumulated damage. The maximum sum of damage is independent of the rate of stress amplitude increment. Time may be cut short in testing by a factor of more than 10. Based on 107 test cycles error does not exceed that of standard fatigue strength tests. Illustrations 4; table 1; references 4.

USSR

UDC 620.172.2-462

NEW METHOD FOR TESTING TUBULAR SPECIMENS FOR TENSILE STRENGTH

Moscow ZAVODSKAYA LOABORATORIYA in Russian No 11, 1976 pp 1399-1400

MARKOVETS, M. P. and KOSTOV, YE. S., Moscow Power Engineering Institute

[Abstract] The effect of plastic deformation on mechanical properties is usually studied in tensile testing within the limits of uniform deformation, i.e., until necking down. New method eliminates necking down right up until the point of fatigue fracture, without reducing maximum ductility. For tubular specimens this is done by using rods inserted into the pipe to restrict deformation. The deformation process consists of two stages: 1. free deformations where ductile flow of metal is not restricted radially and the tube necks down; and 2. restricted deformation where the tube contacts the inserted rod and deforms axially. The inside of the tube is lubricated before testing to facilitate removal of the rod-insert after completion of the test. Illustrations 2.

USSR

UDC 539.3

DYNAMIC TORSION OF AN INFINITE CYLINDER INCLUDED IN AN ELASTIC SEMI-INFINITE RING

GIDROAEROMEKHANIKA I TEORIYA UPRUGOSTI. MEZHVUZOVY NAUCHNYY SBORNIK [Hydroaeromechanics and Theory of Elasticity. Intervuz Scientific Collection] in Russian No 20, 1976 pp 82-86

BERNSHTEYN, P. YA.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1V114 by the Author]

[Text] The examined problem is a partial case of the dynamic axisymmetrical mixed problem of the theory of elasticity for an infinite cylinder, on part of the lateral surface of which $z = R$ and $z > 0$ is applied a uniformly distributed tangential load, and the other part $z < 0$ is included in the elastic ring. The solutions was obtained for the case when the tangential load is an arbitrary function of time, the only limitation being that it grows slower than a certain exponential function of time. References 9.

USSR

UDC 539.4:536.543

INFLUENCE OF THE RELAXATION PROCESSES ON THE KINETICS OF BRITTLE FRACTURE

Kuybyshev TEZISY DOKLADOV 8-Y VSESOYUZHNOY KONFERENTSII PO FIZIKE PROCHNOSTI I PLASTICHNOSTI METALLOV I SPLAVOV [Texts of Reports of the Eighth All-Union Conference on the Physics of Strength and Plasticity of Metals and Alloys. Collection of Works] in Russian 1976 pp 257-259

STEPANOV, V. A., SHPEYZMAN, V. V., and ZHOGA, L. V.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1V1255 by Ye. Z. Korol']

[Text] In the formula for longevity

$$\gamma = \gamma_0 \exp \frac{u_0 - \delta \sigma}{kT}$$

instead of the quantity $\delta \sigma$, to allow for the concentration of stresses in the microstructure during relaxation and creep, the authors suggest introducing $V[n\gamma - \ln(t/t_0 + 1)]$, where V is the activation volume, t is the time, α and t_0 are the relaxation parameters, n is the coefficient of stress concentration when $t = 0$, u_0 and $\gamma_0 = \text{const}$, k is the Boltzmann constant and T

is the longevity. The authors confirm that the fracture time, computed from the formula

$$\frac{t_p}{t_0} = 1 + \frac{\chi_{(no)}}{t_0} \left(1 - \frac{Y\alpha}{kT} \right)^{1-V\alpha}$$

agrees with the experimental results.

USSR

UDC 539.375

RUPTURE OF ALUMINUM ALLOYS

RAZRUSHENIYE. Vol 6 in Russian, Moscow, Metallurgiya Press 1976 pp 296-369

ZINKHEM, R. I., and DEDRIK, J. Kh.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 12, 1976 Abstract No 12V560 by V. I. Kuzginov]

[Text] The constantly increasing demands for operational characteristics of metal products made of aluminum alloys are resulting in increased strength of these alloys. When high strength aluminum alloys are used, one must consider the probability of low ductility and brittle rupture.

Various methods of testing used in estimating the ductility of rupture of aluminum alloys are described and compared. It is shown that the parameters of the linear mechanics of rupture, such as critical stress intensity factor with planar deformation K_{IC} and the planar stress state K_C are the primary characteristics of aluminum alloys. A slight difference is found in the ductility of rupture of aluminum alloys at cryogenic and room temperatures. The study of corrosion under stress in series 7000 alloys has shown that the propagation of a crack occurs primarily in specimens cut across the sheet in the direction of the thickness. The expediency of studying the micromechanism of rupture using electron microscopy is discussed and a brief description is presented of the role of metallurgical aspects in the rupture of high strength aluminum alloys and increases in their rupture ductility. It is shown using series 7000 alloys that the viscosity of rupture can be improved by decreasing the content of insoluble impurities, and also by more precise testing of other elements. References 53.

USSR

UDC 621.313.322-82.044.004.69

STEPS TO PREVENT LOOSENING OF THE STEEL ARMATURE PLATES IN HYDRAULIC GENERATORS

Moscow ELEKTRICHESKIYE STANTSII in Russian No 9, Sep 76 pp 71-73

TER-GAZARYAN, G. N., doctor of technical sciences, KHERKHEULIDZE, I. A., engineer, and BLETKIN, N. P., engineer, Georgian Scientific Research Institute of Power Engineering and Hydraulic Engineering Structures

[Abstract] The article gives the results of a protracted in situ study of the compression of armature plates in the stators of large hydroelectric generators. Measurements were made with special magnetoelastic sensors of mechanical stress developed by B. B. Timofeyev at the Georgian Scientific Research Institute of Power Engineering and Hydraulic Engineering Structures. These sensors were modified and adapted for measuring stresses in the clamping pins and compression bolts of the armature stacks. A special portable meter was also developed for the research. Stresses were monitored during assembly at the plant, and over a period of one year of generator operation. It was found that one of the main causes of loosening of the armature stacks is nonuniformity of original stresses when the plates are assembled at the plant and considerable relaxation not only in the first hours after initial tensioning (as expected) but for 1-1.5 years during operation of the generators. As a result, zones in the active steel may show up where the stress in the clamping pins is as low as 20-30% of the rated value. The results of this study show that the proposed equipment and technique are effective for monitoring stresses in the stators of hydroelectric generators. Figures 6; reference 1 (Russian).

USSR

UDC 621.438.001.5

EXPERIMENTAL STUDY OF THE INFLUENCE OF FREQUENCY SCATTER AT THE RESONANCE LEVEL OF ROTOR BLADES

Leningrad ENERGIOMASHINOSTROYENIYE in Russian No 10, 1976 pp 14-16

NABATOVA, N. A., and SHIPOV, R. A.

[Abstract] Data are given on measurements of the amplitude of the resonance oscillations of three variations of an axial compressor rotor which differ in the frequency structure of the blading. It is found that the total frequency scatter has only a slight influence on the spread and level of the maximum amplitudes of the blade oscillations. An influence by an abrupt drop in frequency on the amplitude level is noticed. A plot of the mutual correlation functions of the resonance frequencies and maximum amplitudes has a single sharp peak, indicating that the maximum absolute values of these functions can reach 0.6. Illustrations 5; tables 4; bibliographies 9.

DYNAMICS OF THE OPERATING PART OF A CONICAL CRUSHER

Moscow MASHINOVEDENIYE in Russian No 6, 1976 pp 6-14 manuscript received
9 Mar 76

AFANAS'YEV, M. M., ZAROGATSKIY, L. P., and NAGAYEV, R. F.

[Abstract] The dynamic loads of a recently built (Byulleten' izobr. No 10, 1974) inertial-type conical crusher are studied to learn their nature and pattern of formation. The reasons for their generation are explained primarily as the nonregularities of the physicommechanical properties of the crushed material and the nonuniformity of the distribution of the material in the crushing space, and the deviation of the geometric dimensions of this space from the designed value. Analytical expressions are confirmed experimentally by measurements of torque at the engine drive shaft. It is shown that the main vibrational energy of the perturbations is transmitted at frequencies f , $2f$, and $3f$, where f is the rate of rotation of the de-balance (here 8 Hz), since each of these perturbations is "stable." The analysis applies also to eccentric-type conical crushers. The results can be used in the designing of such machines. Illustrations 3; bibliographies 2.

USSR

UDC 621.438

ON THE INFLUENCE OF THE REYNOLDS AND MACH NUMBERS ON THE CHARACTERISTICS OF THE VANELESS RUNNERS OF AXIAL TURBINES

Moscow IZVESTIYA VUZOV MASHINOSTROYENIYE in Russian No 12, 1976 pp 96-100
manuscript received 18 Feb 76

KHANIN, S. N., SHERSTYUK, A. N., and MAMEDOV, Z. M., Central Scientific Research Institute of Motor Vehicles and Motor Vehicle Engines

[Abstract] Experimental data are given on the very complex influence of the Reynolds and Mach numbers on the magnitude of the loss factor in the vaneless runner of an axial turbine. Results of an approximation method described for assessing the separate influences of Re and M are in satisfactory agreement with the experimental findings. At $Re > 10^5$ the flow in the vaneless runner is primarily turbulent even when the flow in the intake is laminar. The Mach number here, unlike the case of the bladed runner, has considerable influence on runner characteristics even in the subsonic mode. When the Re is increased from 10^6 to $6 \cdot 10^6$ at $M = 0.7$ the loss factor is reduced from 15% to 12.5%. At $Re = 2 \cdot 10^6$ an increase of M from 0.5 to 0.8 reduces the loss factor from 17% to 14%. The influence of the Mach number (up to $M \geq 1$) decreases as the ratio of the curved-channel ratio decreases. Illustrations 3.

USSR

UDC 621.438.001.2

REDUCING FUEL CONSUMPTION OF A TWO-STAGE GAS TURBINE ENGINE ON IDLE

Leningrad ENERGO MASHINOSTROYENIYE in Russian No 10, 1976 pp 23-25

BARSKIY, I. A.

[Abstract] Gas turbine engines with heat exchangers use 35-45% less fuel while idling than those without heat exchangers. A gas turbine engine without heat regeneration uses less fuel during idling than one with heat regeneration. Reducing the compressor rpm greatly reduces the fuel consumption during idling up to the point where gas temperature begins to increase. Although the danger of loss of stability may be risked, the compressor rpm of gas turbine engines with axial compressor can be reduced 50-55% of rated rpm on idle, and in those with centrifugal compressor the idle rpm can be reduced to 45-50% of rated rpm. Increasing the efficiency of the compressor and turbine and the mechanical efficiency of the unit on idle by only 1% will reduce the fuel consumption 2-2.5%. Fuel consumption during idling can be further reduced by powering auxiliary units from the turbine and reducing the bypass of air from the compressor. Opening the bypass of gas between the turbines, or increasing the output angle of emergence from the control nozzle of the turbine during idling to 45-50% will reduce the fuel consumption on idle by 15-20%. Illustrations 3; bibliographies 3.

USSR

UDC 621.165 - 5.001.5

SOME ASPECTS OF THE PROBLEM OF REGULATING KALUGA TURBINES WITH A NEW SERIES GENERATOR

Leningrad ENERGOMASHINOSTROYENIYE in Russian No 11, 1976 pp 8-10

BLAGOVESHCHENSKIY, V. V., and LUKASHEVICH, V. E.

[Abstract] The new T-series generators combined with the 2.5-, 4-, 6-, and 12-Mw Kaluga steam turbines incorporate many improvements over the earlier used T2-series with respect to insulation, stator design, air-cooling, and cost, but have only about 50% of the flywheel moment of the older series. This reduces the full run-up time of the turbine and reduces the automatic rpm control system of the turbine to within dangerous limits. This has necessitated a reduction in the volume of steam, a shortening of the response time of the automatic control system, and increasing the capacities of the turbine regulator pumps for some turbine types. Measures required to modify the configuration of the servomotor control system are described. Illustrations 3; table 1; bibliographies 3.

USSR

STUDY OF THE FLOW OF AIR IN THE BLADELESS NOZZLE APPARATUS OF A CENTRIPETAL MICROTURBINE

Kuybyshev VOPR. PROYEKTIR. I DOVODKI MALORAZMERN. GTD I IKH ELEMENTOV in Russian 1975 pp 167-170

KLENINA, A. D., and KELNIN, YU. P.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2B1329 by the authors]

[Text] Static blow testing of a bladeless nozzle apparatus establishes that at small aperture angles of the lateral walls on the order of $\omega = 24^\circ$, the distribution of flow parameters and energy losses are practically independent of the presence of curved cross sections. At high angles on the order of 75° , the presence of curvature significantly reduces the loss factor (from 24 to 18%).

USSR

UDC 621.45.00.11.24:629.755

INFLUENCE OF CHANGE IN AIR TEMPERATURE AT INLET TO ENGINE ON GEOMETRIC CHARACTERISTICS OF FLOW-CARRYING PORTION OF A GAS TURBINE ENGINE

Kuybyshev VOPR. PROYEKTIR. I DOVODKI MALORAZMERN. GTD I IKH ELEMENTOV in Russian 1975 pp 53-56

BODROV, P. A., BOCHKAREV, S. K., and KULAGIN, V. V.

[From REFERATIVNYY ZHURNAL 34. AVIATIONNYYE I RAKETNYYE DVIGATELI No 1, 1977 Abstract No 1.34.22 from the resume]

[Text] An analysis is presented of various factors influencing the change in radial clearance in a turbine and the cross-sectional area of nozzle apparatus with a change in air temperature t^* at the inlet to an engine in similar gas turbine modes. An equation is produced relating the change in relative radial gap in the turbine at various temperatures t_a^* to the ratio of temperatures of elements of the turbine (body, blades, wheels) as well as the coefficient of linear expansion of the materials of these elements. Figure 1; table 1.

USSR

UDC 621.541.181.4

INFLUENCE OF REYNOLDS NUMBER ON EFFICIENCY OF AXIAL-FLOW MICROTURBINES

Kuybyshev VOPR. PROYEKTIR. I DOVODKI MALORAZMERN. GTD I IKH ELEMENTOV in Russian 1975 pp 170-173

KEBEKE, S. V., and NATALEVICH, A. S.

[From REFERATIVNYY ZHURNAL 34. AVIATIONNYYE I RAKETNYYE DVIGATELI No 1, 1977 Abstract No 1.34.29 from the resume]

[Text] A study is made of an axial flow microturbine ($D_{av} = 47$ mm) with full intake on an installation with a magnetic-air brake. Two VN-6 vacuum pumps are used to provide continuous influx of air into the turbine from the atmosphere. The Re number was varied within limits of $2 \cdot 10^5$ to 10^3 by means of changing the air pressure at the intake and output of the turbine while maintaining a constant expansion factor $\gamma_1 = 0.25$. Reduction of Re from $2 \cdot 10^5$ to 10^3 leads to a significant reduction in the efficiency, reaching 22%. Figure 1; reference 1.

USSR

UDC 621.541.181.4

COMPARISON OF THE CHARACTERISTICS OF BLADELESS NOZZLE APPARATUS WITH
RECTANGULAR AND TRAPEZOIDAL HELICAL HOUSING SHAPE

Kuybyshev VOPR. PROYEKTIR. I DOVODKI MALORAZMERN. GTD I IKH ELEMENTOV in
Russian 1975 pp 170-173

KELNINA, A. D.

[From REFERATIVNYY ZHURNAL 34. AVIATIONNYYE I RAKETNYYE DVIGATELI No 1,
1977 Abstract No 1.34.30 from the resume]

[Text] It is established that the parameters of the flow at the output of
a bladeless nozzle apparatus of rectangular meridional cross section show
an increase in losses and unevenness in comparison with a trapezoidal ap-
paratus. This is caused by the sudden change in the shape of the flow-
carrying sections and "blocking" of the terminal section of the arc. It is
shown that the stage of a microturbine with bladeless nozzle apparatus of
rectangular shape has a relative drop in efficiency of 6-16% and changes of
 u_1/c_{43} of 0.5-0.1 respectively. Figures 4.

USSR

UDC 621.438

DYNAMICS OF FORMATION OF DEPOSITS ON GAS TURBINE BLADES OPERATING WITH HIGH
SULFUR FUELS

Kalinin VOPR. POVYSH. EFYEKTIVN. I NADEZHNOСТИ TEPLOENERG. USTANOVOK in
Russian 1976 pp 35-39

OLESEVICH, K. V., and DEGTYAR', I. I.

[From REFERATIVNYY ZHURNAL 49. TURBOSTROYENIYE No 1, 1977 Abstract No
1.49.46]

[Text] A study was made of a circular segment of cooled nozzle blades in
the first stage of a gas turbine, made of ZhS6-K alloy. The fuel used was
type M40 fuel oil produced by the Odessa Oil Refinery. The tests were per-
formed with the following parameters: air flow rate 0.45-0.5 kg/s; fuel
flow rate 0.01-0.012 kg/s; gas temperature at segment inlet 900C, gas ve-
locity at segment inlet 120-140 m/s; mean blade temperature 800 C. The
time of continuous operation was 2-5 hr. Data are presented on the change
in weight of blades as a function of operating time and change in profile
losses as a function of operation time. During the initial period of opera-
tion, the blades are covered with an oxide film. Deposits begin to form in
zones where the gas velocity is minimal (in zones of thickening of the
boundary layer at the ends of the channel). Friable deposits in the output
edge zone may be caused by flow separation from the profile. Periodic stop-
ping of the experimental installation caused self-cleaning of the blades

(flaking of a portion of the deposits), which increased the roughness and caused a deterioration in the aerodynamic characteristics of the blade profiles. Figures 3.

USSR

INFLUENCE OF ANGLE OF ATTACK AND RADIUS OF CURVATURE OF LEADING EDGE ON LOSSES IN PROFILE CASCADES

Leingrad ENERGOMASHINOSTROYENIYE No 12, 1976 pp 30-32

GRISHIN, YU. A., and KRUGLOV, M. G.

[Abstract] A study is made of the actual picture of flow around a flat cascade of aerodynamic profiles by a subsonic gas flow at a high angle of attack. The profile losses are calculated as functions of the angle of entry to the turbine blade cascade with various ratios of the radius of curvature of the leading edge and spacing. The calculation method was also tested for active cascades; for comparison, data on 3 cascades are used. The results of the calculations agree well with experimental data over a broad range of change of flow entry angles.

USSR

UDC 532.516

ON THE QUESTION OF USING BEARINGS WITH A GAS LUBRICANT FOR CENTRIFUGAL BLOWERS

Kazan' GAZOVYYE OPORY TURBOMASHIN [Gas Bearings for Turbomachinery. Collection of Works] in Russian 1975 pp 79-81

IVANOVA, V. V., IL'YIN, P. A., KUZNETSOV, A. S., and PROSKURYAKOV, N. G.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B119 by I. Ye. Sipenkov]

[Text] The authors describe the static and dynamic tests of a small-scale two-bearing rotor with a mass of 0.42 kg in gas-dynamic bearings (each bearing consists of a smooth bushing and step bearing with spiral slots); the frequency of rotation of the rotor is up to 70,000 rpm. Under static tests an asynchronous (half-speed) precession of the rotor was gradually developed in proportion to the increase in frequency of rotation, beginning with 23,500 rpm. Under dynamic tests on the vibration test bench the asynchronous precession was developed instantaneously at any frequency of rotation, if only this latter was found to be equal to double the frequency of vibrations of the base; in the opposite case no precession was observed.

EQUIPMENT
Acoustical & Ultrasonic

USSR

UDC 621.317.351

A SPECTRUM ANALYZER OPERATING WITH ULTRASONIC SURFACE WAVES

USSR Author's Certificate No 542956, 31 Dec 74

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 2, 1977

ZHUKOV, V. A., ZABUZOV, S. A., LITVINENKO, A. A., and UL'YANOV, G. K.,
Leningrad Institute of Aviation Instruments

[Text] A spectrum analyzer containing an acoustic duct made of piezoactive material and transducers of ultrasonic surface waves, one at the inlet and several at the outlet, also a sound-absorbent cover, with the distinguishing feature that, for the purpose of increasing the resolution and simplifying the assembly, a rectangular decelerating wedge and a focusing lens are placed one behind the other between the inlet transducer and the outlet transducers so as to remain within the field-of-vision of the inlet transducer, while the electrodes of the latter run parallel to one side of the wedge and the plane of the lens is tilted relative to these electrodes through the angle

$$\alpha = \tan^{-1} \left[\tan \beta \left(\frac{v_{\text{surf}}}{N} - 1 \right) \right]$$

toward the outlet transducers in the focal plane of the lens.

USSR

AN ULTRASONIC TWO-CHANNEL DETECTOSCOPE

USSR Author's Certificate No 542135

Moscow OTKRYTIYA IZOBRETENIYA PROMYSHLENNYYE OBRAZTSY TOVARNYYE ZNAKI No 1
1977 p 180

PRANITSKIY, A. A., DEMCHENKO, A. S., and VEREMEYENKO, S. V., All-Union
Scientific Research Institute for Development of Nondestructive Methods and
Equipment for Quality Testing of Materials

[Text] 1. An ultrasonic two-channel detectoscope containing an oscillator connected to a volumetric wave sensor in the first channel and a Rayleigh wave sensor in the second channel, each of which contains an amplifier and amplitude-time selector and actuating device, is distinguished by the fact that to increase the accuracy of testing, it is equipped with logic AND and NOT circuits and a delay unit, the outputs of the selectors of both channels are connected to the logic AND element, the output of the selector of the

first channel is connected through a delay unit to the input of the logic NOT element, the blocking input of which is connected to the output of the AND element, while the outputs of the NOT and AND elements are connected to the actuating devices.

2. A defectoscope as in claim 1 is distinguished by the fact that to increase the accuracy of testing, the output of the selector of the second channel is connected through a delay unit to the input of the second NOT logic element, the blocking input of which is connected to the output of the AND element, while the output of the second NOT element is connected to the actuating device.

USSR

SYSTEM FOR DECREASING THE MANEUVERING LOADS ON A HEAVY TRANSPORT AIRCRAFT

[TR.] MOSK. AVIATS. IN-TA in Russian No 356, 1976 pp 43-49

KUZNETSOV, YU. V., VOROB'YEVA, O. A., and KUZNETSOVA, T. A.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKI No 2, 1977 Abstract No 2B1226 by G. S. Aronin]

[Text] A study is made of a heavy subsonic aircraft (such as a Tu-154) with three different systems for decreasing maneuvering loads acting on the wings: root, terminal and combined control surfaces, consisting of flaps with limiting angles of deflection of $\pm 50^\circ$ with small velocity heads and $\pm 30^\circ$ with large velocity heads. These systems displace the center of pressure of a swept wing toward the fuselage and thereby decrease the bending and torque moments. Numerical analysis has shown that the maximum unloading of the wing occurs with a relative spread of the control surfaces of about 0.6. The effectiveness of the system of the third type is practically double that of the first and second types. An increase in wing span improves unloading, narrowing of the wing influences unloading little. For all types of system, the central and end sections of the wing are unloaded approximately twice as much as the root sections. The third type of system allows, with unchanged wing weight, an increase in span by 10-15%, thus reducing inductive drag.

USSR

UDC 531.77:621.314.57(088.8)

A FUNCTIONAL ROTATION VELOCITY TRANSDUCER

USSR Author's Certificate No 502326 Filed 30/10/73 Application No 1965976
Published 13/07/76

ZARIPOV, M. F., VAKHITOVA, KH. Z., BOGDANOVA, N. A., and URAKSEYEV, M. A.,
Ufa Aviation Institute, Bashkir Affiliate, Academy of Sciences USSR

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA
No 1, 1977 Abstract No 1.32.531P]

[Text] A transducer is suggested containing two ferromagnetic cylinders located coaxially, a rotating magnet and a measuring coil. In order to produce an emf proportional to the square of the velocity, permanent circular magnets are installed on the internal rotating cylinder, equipped with oppositely wound three-corner poles. The two cylinders are encompassed by a common measuring winding, the external nonmoving cylinder is encompassed by a shorted screen on the external and internal generatrices. Figure 1.

HUNGARY

A HIGH-PRESSURE, HIGH-TEMPERATURE REACTOR LOOP, TO BE BUILT AT THE TRAINING REACTOR OF THE BUDAPEST TECHNICAL UNIVERSITY

Budapest ENERGIA ES ATOMTECHNIKA N° 9, 1976 pp 412-415

CSOM, GYULA, Training Reactor of the Budapest Technical University; KOCSIS, ELEMER, FARKAS, DANIEL, ANGYAL, ISTVAN, SZABO, MIHALY, Chair of Chemical Engineering Equipment of the Budapest Technical University

[Abstract] Preliminary design details of the proposed research loops to be installed in the reactor of the Technical University are presented. The loop is designed for a maximum pressure of 100 atm. and a maximum temperature of 300°C. In order to avoid an excessive activation of the structural materials, the loop may be removed from the reactor and placed in a pool of water. During the dynamic experiments the liquid can be circulated into the core region to be irradiated for a period from 180 to 2200 seconds. Provisions have been made for heating and sampling the solution in the loop. The projects, to be carried out in cooperation with the Chair for Nuclear Power Plants of the Moscow Institute of Energetics, include the study of complexing compounds, such as ethylene diamine tetra acetate (Trylon B, etc) during thermoradiolytic decomposition; the "conditioning" (corrosion protection) of metal surfaces in the primary coolant circuit of power reactors and examination of the corrosive effects of radiolytic products of stainless steels. Illustrations 3.

Gyroscopic

USSR

THE PROBLEM OF STABILITY OF A SINGLE-ROTOR ADJUSTABLE GYROCOMPASS

SB. NAUCH. TR. PERM. POLITEKHN. IN-TA in Russian 1975(1976) No 176, pp 112-116

NIKOLAYEV, S. G.

[From Moscow REFERATIVNYY ZHURNAL MEKHANIKA No 2, 1977 Abstract No 2A74 by V. V. Krementulo]

[Text] A study is made of the linear equations of motion of a single-rotor adjustable gyrocompass installed on an aircraft considering the dynamics of the horizon indicator. Through the use of Lyapunov function, a quadratic form with variable coefficients, a sufficient condition of asymptotic stability of the position of equilibrium of the single-rotor gyrocompass is produced in the form of an inequality. A numerical example is presented.

USSR

UDC 629.1.054

CALCULATION OF VERTICAL GYRO PARAMETERS

Leningrad IZVESTIYA VUZOV PRIBOROSTROYENIYE in Russian No 1, 1977 pp 76-83

SERGEYEV, M. A., Leningrad Institute of Precision Mechanics and Optics

[Abstract] Methods are given for computation using digital computer of the mean quadratic error of a vertical gyro as a function of the device's constants under the influence of known perturbations from forces of inertia and dry friction in the sensor's suspension. Using digital computer results, a method is proposed for selecting device constants (synthesis of its components) to provide given precision in steady-state motion of an object. This results pertain to choice of gyroscopic motor having least kinetic momentum, correction device, and suspension-system bearings. Illustrations 3; references 5.

Hydraulic

CZECHOSLOVAKIA

NEW VALVES FOR PRESSURE CONTROL UP TO 32 MPa

Prague STROJIRENSKA VYROBA in Czech Vol 24 No 7, 16 Jul 76 pp 517-524

STEINC, LUDVIK, TOS Rakovnik, National Enterprise, Plant Hydraulika Vrchlabi

[Abstract] Design, operation, and characteristics of pressure relief valves VP 3 and VR 3 developed at the TOS plant at Vrchlabi are described. The new valves are superior, and replace the valves VP 2 and VR 2 offered by the firm in the past. The VP 3 valves are designed for indirect operation and have a conical body with a seat. It incorporates two valves, one controlling the pressure in the controlled circuit, the other providing the reference pressure level. The pressure is not affected by the rate of flow through the valve. The valves may be used for maintaining desired pressure levels, or provide a given pressure reduction. Full flow pressure reduction through the valve is about three percent of the operating pressure. The VP 3-10 valve has a 10 mm diameter, the VP 3-20 a 20 mm diameter, with respective flow rates of 100 and 200 cubic decimeters per minute. The VR 3-10 and VR 3-20 are pressure reducing valves with the same diameters and capacities as stated for the VP valves. Maximum inlet pressure is 34 MPa and minimum outlet pressure 1 MPa. Figures 17.

USSR

A DEVICE FOR DAMPING OF HYDRAULIC SHOCK

USSR Authors' Certificate No 542059

Moscow OTKRYTIYA IZOBRETENIYA PROMYSHLENNYYE OBRAZTSY TOVARNYYE ZNAKI No 1, 1977 p 160

GLAZKOV, M. M., KURINKOV, V. N., and LANETSKIY, V. G., Kiev Order of the Red Banner Institute of Civil Aviation Engineers

[Text] A device for damping of hydraulic shock, the body of which contains a damping chamber filled with a working fluid in the process of braking, is distinguished by the fact that to increase the reliability, the body contains a cavitation fitting, the internal transmission channel of which is made in the form of two truncated cones with their tips connected through a cylindrical bore, connected by a channel to the damping chamber, which is divided into parts by discs with valving apertures, the diameters of which gradually decrease in the direction of the flow.

Industrial

CZECHOSLOVAKIA

A SPECIAL SEMIAUTOMATIC MACHINE FOR CUTTING OF PIPES AND THIN WALLED BEAMS

Prague STROJIRENSKA VYROBA in Czech Vol 24 No 7, 16 Jul 76 pp 527-528

STEFANAK, PETER, HUDAK, MILAN, Research Institute for Metallurgical Industries, Presov

[Abstract] The Presov Research Institute developed a semi-automatic cutting machine which is provided with a storage arrangement for the material to be cut. The machine is designed for cutting walls up to three mm thick. The drive is provided by a three KW electric motor, through a geared transfer assembly. Start and stop operations are controlled by an electromagnetic clutch and brake. Accuracy of cutting length is within ± 0.2 mm. Forward movement of the material is controlled by a photorelay. Maximum diameter of cut pipes is 100 mm, minimum 60 mm. Maximum number of cuts 30 per minute. Overall dimensions of the machine 1900 x 1560 x 2400 mm. Figures 3.

USSR

UDC 621.3.036.669

A GRAPHITIC HEATER ELEMENT FOR CRYSTAL PULLING APPARATUS

USSR Patent Disclosure No 543207 10 Mar 75

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 2, 1977

MARTYNKO, V. D., and PUKHOV, YU. G., "Quinquagenary of the USSR" Pure-Metal
Works

[Text] A graphitic heater element made in the form of two coaxial cylinders and two rings, one of the latter joining the cylinders at one end and the other ring touching the inner cylinder at the opposite end, with the distinguishing feature that, for the purpose of increasing the heater efficiency by optimization of the temperature gradients, the dimensions of the heater element have been selected in the following ratios:

$$\frac{D_2}{D_1} = 1.05-1.20$$

$$\frac{b_2}{b_1} = 1.2-1.5$$

$$\frac{h}{D_1} = 0.25-0.35$$

$$\frac{b_1}{a} = 1.0-1.1$$

where D_1 is the diameter of the inner cylinder
 D_2 is the diameter of the outer cylinder
 b_1 is the wall thickness of the inner cylinder
 b_2 is the wall thickness of the outer cylinder
 a is the thickness of the rings
 h is the height of the cylinders

USSR

UDC 621.187.121:628.161.066.002.56

NEW SYSTEM FOR SELF-REGULATION OF CONTINUOUS BLOWING OF CLARIFIERS

Minsk NAUCH. I PRIKL. PROBL. ENERG. in Russian No 3, Vysheysh. Shkola Press 1976 pp 234-238

KURILIN, L. A.

[From REFERATIVNYY ZHURNAL TEPLOENERGETIKA No 1, 1977 Abstract No 1R118]

[Text] A three-pulse plan for self-regulation of continuous blowing of clarifiers is presented, which was introduced in 1974 on five clarifiers of the Polotskaya Heat and Electric Power Plant No 2, as well as three clarifiers used at Heat and Electric Power Plant No 3 in Minsk, allowing maintenance of blowing within limits of 0.005-0.03 times the nominal productivity of the apparatus instead of the usual 0.08-0.02. The design of a two-blower optical slime density sensor and plan for reconstruction of the measurement unit are presented; a method for rapid adjustment of the regulator is briefly presented, based on imitation of the operating modes of the clarifier without changing its load. Figures 3; references 3.

USSR

A STAMP FOR ULTRASONIC STAMPING

USSR Authors' Certificate No 541560

Moscow OTKRYTIYA IZOBRETENIYA PROMYSHLENNYYE OBRAZTSY TOVARNYYE ZNAKI No 1, 1977 p 32

DOVNAR, S. A., GRIGOR'YEV, A. M., and YANOVICH, I. P., Institute of Engineering Physics, Academy of Sciences Belorussian SSR

[Text] 1. A stamp for ultrasonic stamping, containing a lower plate with a magnetostriction transducer mounted on it and a die attached to it, as well as an upper plate with a punch, is distinguished by the fact that to increase the quality of products of complex shape, it is equipped with an electromagnetic alternating current coil mounted in the upper plate and surrounding the punch, and the punch is made in the form of a concentrically installed resonant rod and hollow cylinders of materials with opposite magnetostriction effects alternating.

2. A stamp as in claim 1 is distinguished by the fact that the thickness of the walls of the hollow cylinders forming the punch is equal to the length of a half wave of radial oscillations, while the frequency and phase of the alternating electromagnetic field coincide with the frequency and phase of the ultrasonic field.

USSR

UDC 621.12-8.621.065.1

A SPEED REDUCER FOR COAXIAL SCREW PROPELLERS ON SHIPS

USSR Authors' Certificate No 542677, 19 Sep 72

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 2, 1977

RYZHKOV, N. S., NIKOLAYEV, V. P., KRYLOV, V. A., IOFFE, V. YA., KROTOV,
V. V., and DERZHAVETS, YU. A.

[Text] 1. A speed reducer for coaxial screw propellers on ships which consists of a) two central gears arranged in parallel and keyed to the inner axle and to the outer axle, respectively, both axles being coaxial, b) at least one differential whose driver member is keyed to the actuating mechanism and driven members (including a sun with an auxiliary axle), and 3) an epicyclic gear with one driver pinion keyed to it and one driver pinion mounted on the auxiliary sun axle, all kinematically linked to the respective central gears with the distinguishing feature that, for the purpose of overall weight and size reduction, each driven member of the differential is linked to the corresponding central gear through two torsion shafts, each of the latter carrying two pinions rigidly mounted at the end so that one always meshes with the corresponding central gear and one always meshes with the driver pinion for one of the driven members of the differential. 2. A speed reducer according to 1. with the difference that, for the purpose of synchronizing the speeds of screw propellers, on the auxiliary sun axle is mounted a synchronizing pinion which engages the central gear mounted on the inner axle.

USSR

UDC 532.516

INFLUENCE OF INERTIAL FORCES ON THE ENERGY PARAMETERS OF ROTATING SLIT GAPS

Nikolayev TRUDY NIKOLAYEVSKOGO KORABLESTROITEL'NOGO INSTITUTA [Works of the Nikolayev Shipbuilding Institute] in Russian No 112, 1976 pp 36-45

SHCHEDROLOSEV, V. V., VELICHENKO, G. P., and IVACHEV, V. F.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1B70 by the Authors]

[Text] The authors give the results of an experimental investigation of the influence of inertial forces on the energy parameters of an annular slit during rotation of either the internal or external elements in the variation range of the axial number Re_{ax} from 0 to 600. They demonstrate that the inertial forces exert different influences on the development of turbulence. They established the active influence of the axial flow on development turbulence upon rotation of the external part of the annular slit.

They trace the boundaries of stability of the flow regimes. They give the advantages of the effectiveness of the annular slit with a rotating external part in the transition and turbulent regions. References 9.

USSR

UDC 621.317.335: 3.532

METHOD AND APPARATUS FOR MEASURING THE HIGH DIELECTRIC CONSTANTS OF LIQUIDS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 12, 1976 pp 65-67

PODGORNIY, YU. V., TERLETSKAYA, L. A., and SHAKHMATOV, A. A.

[Abstract] A description is given of the design of the YaZh-4 variable-capacitance cell and the Tangens-2M apparatus in which the cell is used for measuring dielectric constants ϵ . The method of measurement is described, and the basic factors that influence the measurement error are discussed. Experimental results are given of measurements of ϵ and $\tan \delta$ of standard dichloroethane, nitrobenzene, acetone, n-butyl alcohol, and the measurements are compared with data from the literature. Illustrations 1; table 1; bibliographies 5.

USSR

UDC 531.768.089.6

IUKO-1 DEVICE FOR MEASURING REFLECTION COEFFICIENTS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 12, 1976 pp 61-63

KOLMAKOV, YU. P., RASIN, A. M., and GOLDOBINA, L. S.

[Abstract] A description is given of the IUKO-1 measuring device that operates on the dynamic compensation principle and uses a symmetrical ribbon test loop. Disruptions of the symmetry of the test ribbon generate TEM waves and suppress the interference of higher types of waves. The device can measure the reflection coefficient of radiopaque materials in the 136-400-MHz range at a level of 40 dB with an error of $\pm 20\%$. The measurement error estimate was obtained by load measurement with known dielectric constant $\epsilon = 2.64$ and thicknesses of 4.4, 8.8 and 13.2 mm. The random component of the error was determined for a probability $P_s = 0.99$. Illustrations 2; bibliographies 5.

EXPERIMENTAL DEVICE FOR MEASURING THE SPATIAL AND ENERGY CHARACTERISTICS OF SOLAR CONCENTRATORS

Tashkent GELIOTEKHNICA in Russian No 6, 1976 pp 29-34 manuscript received 6 Aug 75

BAZAROV, B. A., and KAPELYUSHNIKOV, V. M., Physicotechnical Institute, Academy of Sciences Turkmen SSR

[Abstract] Authors describe an experimental device (based on a VFG-type photoelectric transducer) and method for measuring luminous flux density with a resolution of 1 line/mm at any given point in a luminous field generated by a solar concentrator. The device can provide quantitative measurements of luminous flux density by the frequency-response-ratio method with the aid of an electronic digital frequency meter and actinometer. If one input of the digital frequency meter is fed a measured signal from the radiation-receiver transducer positioned in the area of interest of the concentrator, and if a second input is fed a calibrated signal, the display will read out the value of the ratio of the measured and incident luminous fluxes

$$K = \frac{f_1}{f_2} = \frac{I_1}{I_2},$$

where f_1 and I_1 , respectively, are the analog frequency and density of the measured luminous flux; f_2 and I_2 are the analog frequency and density of the incident flux; K is the ratio of the respective values. Thus at the moment the measured area of the luminous field of the concentrator passes through the radiation receiver, not only an integral curve of distribution, but also local values of luminous flux density for any given point on this curve are available. An example curve shows the energy density distribution in the focal spot of a 460-mm dia concentrator for an incident solar radiation of 536 w/m². Illustrations 5; bibliographies 5.

USSR

UDC 531.781

A METHOD OF MEASURING THE AXIAL THRUST AND THE TORQUE OF A SCREW PROPELLER

USSR Author's Certificate No 542921, 19 Feb 74

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 2, 1977

BEZZUBIK, O. N.

[Text] A method of measuring the axial thrust and the torque of a screw propeller with strain gages attachable to the propeller shaft, distinguishing feature being that, for the purpose of improving the accuracy of measurements, the strain gages are mounted on an elastic plate and the latter is loaded by known constant forces and torques so that the nominal sizes of compensating elements can thus selected, whereupon this elastic plate is attached to the propeller shaft.

USSR

A PROTON MAGNETOMETER

USSR Author's Certificate No 542154

Moscow OTKRYTIYA IZOBRETENIYA PROMYSHLENNYYE OBRAZTSY TOVARNYYE ZNAKI No 1,
1977 p 184

SALUN, M. F.

[Text] A proton magnetometer containing a free precession sensor, switching device, control unit, variable frequency amplifier, automatic frequency control system and an electronic frequency meter is distinguished by the fact that to increase reliability and accuracy of measurement, the amplifier contains discrete and linear matched electronic switching elements, for example active filters with controlled parameters, the automatic phase frequency control system is equipped with an additional oscillator tuning input, and furthermore the magnetometer also contains an automatic precession frequency search circuit, consisting of a series connected amplitude discriminator, coincidence element, pulse counter and digital-analog converter, the output of which is connected to the input of the linear amplifier tuner and an additional input of the automatic frequency phase control system, one of the digits of the counter is connected to the discrete tuning system of the amplifier, the input of the amplitude discriminator is connected to the output of the amplifier, the second input of the coincidence circuit is connected to the cycle output of the frequency meter, the strobing input of the counter is connected to the starting circuit of the control unit.

USSR

AN ENTROPY METER

USSR Authors' Certificate No 542195

Moscow OTKRYITIYA IZOBRETENIYA PROMYSHLENNYYE OBRAZTSY TOVARNYYE ZNAKI No 1, 1977 p 193

LAZARETIN, V. I., SADOMOV, YU. B., KHOKHLOV, L. M., SHEVYAKOV, A. P., and SHUVALOV, V. A., State Union Design and Technological Bureau for Planning of Computing Machines and Experimental Plant

[Text] An entropy meter, containing an adder, first adding counter, control unit, the outputs of which are connected to the corresponding inputs of a reading selector, the input of which is the input of the device, 3 AND elements, a counter for the number of readings, and a memory unit, the input of which is connected through a fourth AND element to the puts of the reading counter and the first adding counter, while the output is connected to the inputs of the adder, is distinguished by the fact that to expand the functional capabilities, the device contains a decoder, an operative memory unit and second and third adding counters, the outputs of which are connected through the first and second AND elements to the address input of the memory unit, the output of the second adding counter is connected through the decoder and the third AND element to one of the inputs of the third adding counter, the other input of the third and the input of the second adding counters are connected to one of the outputs of the control unit, the first adding counter is connected between the input and output of the memory unit, while the output of the counting selector unit is connected to the input of the control unit.

USSR

UDC 531.787.082.2

A TENSOMETRIC DEVICE FOR MEASUREMENT OF HYDROSTATIC PRESSURES

TR. METROL. IN-TOV SSR. VNIIMETROL in Russian No 194(254), 1976 pp 79-81

KISELEV, YU. A., NUDEL'MAN, YE. SH., and IL'IN, V. M., All-Union Sci-Res Inst. of Metrology

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA No 1, 1977 Abstract No 1.32.709]

[Text] A tensometric device developed at the All-Union Scientific Research Institute of Metrology for measurement of hydrostatic pressures is described, consisting of a primary measuring pressure sensor, direct current amplifier, voltage stabilizer and microammeter, the scale of which is calibrated in

units of the measured quantity. The specifics of the measurement problem consist in the requirement for complete nonmagnetism of the primary converter, which serves as a basis for development of a modified version of the type LKh-419 tensoresistive converter. The technical characteristics of the tensometric instrument are presented. Internal calibration is provided for remote testing of the operation of the instrument. The instrument is used as a depth meter with a maximum measurement depth of 25 m. Figures 2; references 2.

USSR

UDC 281.121:289

METROLOGIC FLOW METER INSTALLATION WITH BROAD FLOW RATE MEASUREMENT RANGE

Moscow SOVREM. METODY I PRIBORY AVTOMATICH. KONTROLYA I REGULIR. TEKHNOL. PROTSESSOV in Russian 1976 pp 47-51

GARTMAN, A. K., LUGANSKIY, B. N., and ZARETSKIY, L. I.

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA No 1, 1977 Abstract No 1.32.734]

[Text] Based on installations used at the Scientific Research Institute for Hydraulic Coal Mining, a two-loop installation is planned with a single hydraulic system designed for flow rates of up to 2000 m³/hr with an error in reproduction of flow rate of $\pm 0.15\%$ within limits of 0-400 m³/hr (volume-time loop) and $\pm 0.3\%$ within limits of 400-2000 m³/hr (loop with standard flow rate meters). A schematic diagram of the installation is presented. Figure 1; references 5.

USSR

UDC 532.137:620.178.2

DEVELOPMENT OF A GENERAL INDUSTRIAL VIBRATION VISCOSIMETER AND EXPERIENCE
GAINED BY ITS INTRODUCTION

Novosibirsk VIBRATS. VISKOZIMETRIYA in Russian 1976 pp 78-87

DZYUBA, A. P., ZORIN, N. P., KRUTIN, V. N., PUKHTEYEV, A. I., and USHAKOV,
L. A.

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA
No 1, 1977 Abstract No 1.32.1130 by V. L. M.-B.]

[Text] A block diagram is presented of a compensation autooscillating industrial general purpose viscosimeter, the VVN-3 (Russian abbreviation for viscosimeter, vibration type, LF-3). Calibration curves are presented, produced using the same viscosity sensor with ordinary and compensation circuits. The primary error is $\pm 4\%$ of full measurement range. The limits of measurement may vary within the range of $1 \cdot 10^{-3}$ to 30 P and higher. Figures 5; references 9.

USSR

UDC 532.137:620.178.2

AUTOMATIC THERMAL COMPENSATION UPON MEASUREMENT OF VISCOSITY OF POLYMER
PRODUCTS BY VIBRATION VISCOSIMETERS

Novosibirsk VIBRATS. VISKOZIMETRIYA in Russian 1976 pp 107-119

KOGAN, I. N.

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA
No 1, 1977 Abstract No 1.32.1132 by V. L. M.-B.]

[Text] A diagram is presented of a thermal compensator with a semiconductor thermoresistor developed at the Scientific Research Institute for Plastics, intended for continuous testing of the viscosity during production of polymer and other liquid products. The testing system consists of a continuous acting viscosity analyzer, automatic thermal compensator, temperature meter, flow-through test unit with vacuum sampler, semiconductor feedback transducer, resistance thermometer, adjustment bridge and viscosity sensor. The viscosity analyzer is a type VND-60 automatic vibration viscosimeter. Analysis of 200 samples of tar shows that the variation in results of measurement of viscosity is not over 5%. Figures 5; references 12.

USSR

UDC 532.137.08

STUDY OF THE VISCOSITY OF SALT MELTS USING A VIBRATION-AMPLITUDE AUTORESONANT VISCOSIMETER

Novosibirsk VIBRATS. VISKOZIMETRIYA in Russian 1976 pp 160-165

TRUNG, A. S., KOSMYNIN, A. S., GASANALIYEV, A. M., SHTER, G. YE., and GARKUSHIN, I. K.

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA No 1, 1977 Abstract No 1.32.1136 by V. L. M.-B.]

[Text] A block diagram and description are presented of the design of a newly developed low frequency autoresonant vibration viscosimeter, designed for measurement of the viscosity of salt melts in the range of 0.5 to 30 cP at temperatures up to 1100 C. The standard fluid used to construct the calibration curve consisted of data on the variation of viscosity of water with temperature. The viscosimeter is calibrated for salt melts with known values of viscosity and density. The probe for high temperature studies of viscosity is made of a platinum cylinder; all of the studies are performed in a platinum crucible using a platinum-platinum-rhodium thermocouple. Figures 2; table 1; references 7.

USSR

UDC 621.438-253.5:536.5

SOME PRINCIPLES OF THE PRODUCTION OF A PHOTOELECTRIC PYROMETER FOR MEASUREMENT OF THE TEMPERATURE OF BLADES AS A PART OF THE DIAGNOSTIC SYSTEM OF A MARINE GAS TURBINE ENGINE

TR. TSNII MOR. FLOTA in Russian No 214, 1976 pp 62-69

GOLUB, YE. S., IL'IN, V. V., and ANDREYEV, A. A.

[From Moscow REFERATIVNYY ZHURNAL 49. TURBOSTROYENIYE No 1, 1977 Abstract No 1.49.135]

[Text] A model of photoelectric pyrometer utilizing partial radiation operating in the near IR area of the radiation spectrum was tested for measurement of the temperature of operating blades in the diagnostic system used on marine gas turbine engines in the gas turbine engine laboratory of the Central Scientific Research Institute for the Merchant Marine. Two plans for the optical system of the sensor were developed for the pyrometer: with a light pipe and with a light pipe and focusing lens. The sensors of the photoelectric pyrometer utilized a light pipe of leukosapphire four mm in diameter and 200 mm long. A functional plan of the pyrometer is analyzed. The transducer of the pyrometer as suggested is made with extensive utilization of integrated microcircuits. One version of protection of the lens from carbon deposits is presented. Figures 3.

USSR

UDC 681.128.089.68

STANDARD INSTALLATIONS FOR TESTING LEVEL METERS THAT OPERATE AT ELEVATED TEMPERATURES AND PRESSURES

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 8, 1976 pp 51-52

FEDOROV, V. A., ANTONOV, N. N., IVASHENKO, V. V., PODKOPAYEV, K. P., and BAKULEV, V. I.

[Abstract] The Scientific Research Institute of Heat-Engineering Instrument Building (NIITeplopribor) and the Kazan' branch of the All-Union Scientific Research Institute of Physicotechnical and Radio Engineering Measurements (VNIIFTRI) jointly studied several level metering installations with measurement ranges up to 5 m for various media (water, distillates, sea water, fuels, lubricants, liquid metal) at temperatures up to 573 K and pressures up to 28 MPa and operated by the overflow principle. A description is given of the devised 3-vessel closed hydraulic loop used as the tester. It was found that the measurement error of level by a readout device under normal conditions for several media amounts to ± 0.7 mm, exclusive of the 1.25-mm systematic error which is entered as a correction factor. For level measurements by the overflow method the error is ± 0.5 mm and ± 1.0 mm at temperatures up to 573 K and pressures up to 28 MPa. Illustration 1.

USSR

UDC 620.193.52

AN APPARATUS FOR HIGH-TEMPERATURE CORROSION TESTS

USSR Authors' Certificate No 542942, 7 Feb 75

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI in Russian No 2, 1977

GOL'TSEV, V. P., FEDYUSHIN, YE. YE., KAMENEV, A. YA., and REMIZOVSKIY, E. I., Institute of Nuclear Energy, Academy of Sciences Belorussian SSR

[Text] An apparatus for high-temperature corrosion tests which consists of a test chamber divided into two interconnected compartments, each equipped with fixtures for mounting a specimen, a chamber heater, a supply tank containing the aggressive medium, and a sump with pipes connecting it to the test chamber as well as to the supply tank, the distinctive feature here being that, for the purpose of simultaneously testing with various aggregate states of the aggressive medium at the same temperature, the two compartments are placed one on top of another and separated by a partition in the form of a horizontal plate with a hole through which a connecting pipe passes into the upper compartment to a height below the top of the latter.

USSR

UDC 531.787.087.92

USE OF THE PSPP-80 QUARTZ CONVERTER FOR MEASUREMENT OF VARIABLE PRESSURE IN THE INFRASONIC FREQUENCY RANGE

TR. METROL. IN-TOV SSSR. VNII METROL. in Russian No 194(254), 1976 pp 74-79

MAL'KOV, I. YA., KISELEV, YU. A., and SELETSKIY, D. A.

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA No 1, 1977 Abstract No 1.32.730]

[Text] Studies are performed in a quasistatic chamber filled with water at frequencies of 0.01 to 100 Hz with the use of standard domestic instruments (U1-6, Shch1412, S1-19, GZ-16, MP-2.5, etc.). The variable pressure in the chamber was created by a piezoceramic radiator type PSPP-160. It is shown that the sensitivity of the receiving track, consisting of the PSPP-80 quartz transducer and U1-6 electrometric amplifier within the limits of error of measurement (2%) is constant in the 0.02-100 Hz frequency range. The absolute sensitivity (100 $\mu\text{V}/\text{Pa}$) is defined with an error of 3%. The quartz transducers of the PSPP-80, in combination with the U1-6 amplifier and the installation as a whole, are recommended for calibration of piezo-electric transducers by the method of comparison in the 0.01-100 Hz frequency range. Figure 1; tables 4; references 5.

USSR

UDC 581.121.082.7

SOME PROBLEMS IN THE DEVELOPMENT OF INDUCTION FLUID VELOCITY AND FLOW RATE METERS

Moscow SOVREM. METODY I PRIBORY AVTOMATICH. KONTROLYA I REGULIR. TEKHNOL. PROTSESSOV in Russian 1976 pp 19-26

VEL'T, I. D., NIKITIN, B. I., and PETRUSHAYTIS, V. I., Scientific Research Institute of Heat-Power Engineering Equipment

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA No 1, 1977 Abstract No 1.32.811]

[Text] "Induktsiya" brand induction flow rate meters with heterogeneous magnetic field, developed at the Scientific Research Institute for Heat and Power Engineering Equipment, have standard diameters of 100 to 1000 mm and are designed for flow rate measurement limits of 0-32 to 0-25000 m^3/hr . The primary permissible error is $\pm 1.5\%$, temperature of the medium measured from 30 to 15 C. The excess pressure for induction flow rate meters with standard diameters of 100 to 300 mm is 25 kg/cm^2 , for 400 to 1000 mm--10 kg/cm^2 . Induction flow rate meters provide a current signal of 0-5 mA at the output, and also record and add the flow rates.

USSR

UDC 551.579:621.039.83.082

THE NIV-2 NEUTRON MOISTURE METER

Moscow IZOTOPY V SSSR Atomizdat Press No 35, 1976 pp 37-38

Unsigned

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA No 1, 1977 Abstract No 1.32.1111 by V. L. M.-B]

[Text] A general view, description of design and technical characteristics are presented for the NIV-2 neutron moisture meter, designed to measure the volumetric moisture content of soils (except peat). The principle of measurement of moisture is based on the effect of scattering and moderation of fast neutrons by hydrogen moderator nuclei included in the composition of the water using a neutron source and reflection detector. The NIV-2 consists of a detection unit, testing and transport unit and counter. The source of radiation used is Pu-Be. The range of measurement of volumetric moisture content is 2.5 to 40%; the measurement error is $\pm 2\%$ and the power supply (set of 12) consists of type 373 batteries; power consumption is 0.55 VA; ambient temperature range -15 to $+50$ C. Figure 1.

USSR

UDC 533.275

AN IONIZATION AIR HUMIDITY TRANSDUCER

Smolensk ELEKTROFIZ. SVOYSTVA DIELEKTRIKOV in Russian 1975 pp 21-34

CHERNYSHEV, V. A., SELISHCHEV, G. V., and ALEKSENKO, V. M.

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA No 1, 1977 Abstract No 1.32.1117 by V. L. M.-B]

[Text] A diagram is presented of an experimental ionization chamber consisting of three independent volumes: 1. The ionization volume, the length of which is selected such that under normal conditions the path of the alpha particles falls fully within it; 2. A diffusion volume, the length of which may vary; 3. A measurement volume. The ionization current is calculated as a function of humidity of the air. The sensitivity of the alpha ionization humidity transducer is on the order of 0.5% with a measurement error of $\pm 1.5\%$ in the range of measured humidities of 20 to 80%. Figures 5; references 7.

USSR

UDC 539.3/.5:678

INSTRUMENT FOR DETERMINING THE DYNAMIC CHARACTERISTICS OF VISCOELASTIC MEDIA

Novosibirsk VIBRATSIONNAYA VISKOZIMETRIYA [Vibration viscosimetry. Collection of Works] in Russian 1976 pp 91-106

ISAYEV, A. I., KULAPOV, A. K., and VINOGRADOV, G. C.

[From REFERATIVNYY ZHURNAL MEKHANIKA No 1, 1977 Abstract No 1V1287 by Yu. P. Zezin]

[Text] The authors describe an instrument for investigating the dynamic characteristics of polymer materials in the frequency range from 10^{-3} to 100 Hz. The basic elements of the instrument are a working unit in the form of two coaxial cylinders, a mechanical system for assigning the induced harmonic vibrations with an electric drive, a torsion head and inductive systems for vibration registration. The authors describe the methods for making the tests and processing the experimental data. They cite the experimental dependences of the absolute value of the overall viscosity and effective viscosity on the deformation rate for polyisobutylene and the moduli of elasticity and losses on frequency for polybutadiene, obtained with the aid of the suggested instrument. References 13.

USSR

UDC 536.532:53.089.6

A DEVICE FOR CALIBRATION OF A NATURAL THERMOCOUPLE

REZANIYE I INSTRUMENT. RESP. MEZHVED. TEMAT. NAUCH.-TEKHN. SB. in Russian No 16, 1976 pp 64-66

LUKA, V. P., and GRECHANNIK, E. N.

[From Moscow REFERATIVNYY ZHURNAL 32. METROLOGIYA I IZMERITEL'NAYA TEKHNIKA No 1, 1977 Abstract No 1.32.906]

[Text] A basically new device is developed for calibration of natural thermocouples, the electrodes of which may be one-piece, soldered or may consist of individual columns, allowing calibration of natural thermocouples of practically any material beginning at the ambient temperature and extending to 1100 C. The device achieves good measurement accuracy due to the elimination of oxidation of the electrodes. Figures 2; references 3.

USSR

UDC 621.438:546.2

EFFECTIVENESS OF THE USE OF WATER AND STEAM INJECTION IN THE GT-100-750-2 LMZ INSTALLATION

Kalinin VOPR. POVYSH. EFFEKTIVN. I NADEZHNOСТИ TEPLOENERG. USTANOVOK in Russian 1976 pp 56-64

ARSEN'YEV, L. V., and BERKOVICH, A. L.

[From Moscow REFERATIVNYY ZHURNAL 49. TURBOSTROYENIYE No 1, 1977 Abstract No 1.49.18]

[Text] In order to increase the power output of the GT-100-750-2 LMZ apparatus by injection of water into the air tract, the most efficient method for injection is just beyond the compressor. Here, based on the conditions of saturation of the air with water vapor, the quantity of water vapor may reach 5% of the total air flow. In this case at the nominal operating mode the power output increases by 20-22%, the efficiency remains practically constant. Injection of water beyond the compressor is desirable not only to increase the power, but also to increase efficiency at low loads by decreasing the flow of air through the antistall valve. The maximum power increase of the GT-100-750-2 occurs with simultaneous injection of water beyond the compressor and turbine. Thus, with 5% water injection following the compressor and 5% following the turbine, power increase is up to 40%, with an efficiency drop of only 4.7% (relative). When steam is injected, generated by utilizing the heat of the exhaust gases, not only power, but also efficiency of the installation is increased. However, the significant complication and comparatively small quantity of steam produced make its use for improvement of the power of the GT-100-750-2 ineffective. Technical and economic analysis shows high effectiveness of the use of water in the GT-100-750-2. A significant reduction in cost occurs up to 2000-2500 hours of operation with water injection per year. Figures 2.

USSR

UDC 621.438:621.43:536.2

BALANCE OF ENERGY, HEAT AND EXERGY IN A DIESEL-TURBINE INSTALLATION

DVIGATELI VNUTR. SGORANIYA. RESP. MEZHVED. TEMAT. NAUCH.-TEKHN. SB. in Russian No 24, 1976 pp 7-15

SHOKOTOV, N. K.

[From REFERATIVNYY ZHURNAL 49. TURBOSTROYENIYE No 1, 1977 Abstract No 1.49.20 by L. P. A.]

[Text] A study is made of the principles of application of the exergetic method to analysis of processes in a diesel-turbine installation with a variable quantity of working fluid in the piston engine cylinder. An exergetic graph of the diesel-turbine installation is presented. The structure of enthalpy of gases is determined, as well as the fuel heat losses with the exhaust gases following the turbine through the exergetic losses in the course of the cycle in the diesel-turbine installation. An example of analysis of processes in the diesel turbine is analyzed, with simultaneous consideration of the quantity and quality of thermal energy. As an example, a study is made of the cycle of the DTU 4 N24/27 diesel-turbine with an independent turbocharger. Losses in percent during the course of the cycle are as follows: 44.6 in supplying heat the working fluid (combustion of fuel), 9 in flow of gases from the cylinder to the exhaust manifold, 5 in the injector and 2.69 in the turbine. Tables 5; references 15.

USSR

UDC 621.313.322 - 843.8: 621.43.056

TUBULAR-SECTIONAL COMBUSTOR OF A 10,000-KW GAS TURBINE GENERATOR

Moscow ENERGOMASHINOSTROYENIYE in Russian No 11, 1976 pp 32-35

KUKHTO, N. K., and SOKOLOV, YE. G.

[Abstract] To provide electric power in the far northern area of the USSR, where technological difficulties and remoteness preclude the building of stationary power plants, floating power plants have been built and operated. One such "Northern Lights" power station carries two 12,000-kw GTD-1 gas turbine engines that turn up 3,000 rpm to produce a total output of 20,000 to 24,000 kw. The GTD-1 gas turbine engine consists of high- and low-pressure compressors, combustor, high- and low-pressure turbines connected to the respective compressors and a free three-stage power turbine. The GTD-1 is 8.5 m long and weighs 20 tons. In Nov 1974 two gas turbine generators on a pilot-plant floating power station successfully completed the rated 20,000 hours of operation. The combustor of the GTD-1 is a direct-flow type with 10 circular flame tubes connected to one another by surge pipes in the common walls. The flame tubes are 916 mm long and 260 mm ϕ .

A complete description of the combustor is given. Laboratory tests have shown that the GTR-1 can be operated with natural gas as well as with the diesel fuel it now uses. Illustrations 5; bibliographies 4.

USSR

UDC 621.181.7: 621.311.11.

GAS-MAZOUT BOILER INSTALLATION FOR 800-MW POWER SET

Leningrad ENERGOMASHINOSTROYENIYE in Russian No 10, 1976 pp 1-5

PARSHIN, A. A., SHCHUKIN, YE. M., REZNIK, V. I., KHRISTICH, L. M., REZNIK, N. I., GOL'DENFARB, I. N., SIVTSOV, A. I., and SKRYL', V. M.

[Abstract] A description is given of the special design of the new pressure-feed, gas-mazout burning, 2,650-t/hr TGMP-204 boiler installation. Basic design concepts are given and certain design problems are discussed. Various data are given. Primary and secondary steam temperature is 545°C. Type 100 high-sulfur mazout and natural gas are burned. The boiler is 55.3m high at the crown shielding, and 20.66 m wide and 29.02 m deep along the axis of the shielding tubes. Pressure feed into the firebox is at 600 kg/m². Measures are taken to reduce the level of heat flows in the combustion zone below $400-450 \cdot 10^3$ kcal/m²hr and to prevent corrosion damage to the shielding. The main parts are of 12Kh1MF, Kh18N12T, and Kh18N10T steels. The gas-tight assembly consists of 2,688 parts. The shielding is made up of transportable sections, the largest weighing 8.06 tons and 22.7 x 2.9 x 1.2 m in size. The economic effect of the TGMP-204 is approximately 4 rubels per kw, which is better than that of the TGMP-324 installation by a factor of 1.5. Illustrations 4; bibliographies 6.

USSR

UDC 662.997.643.3

COLLAPSIBLE BEVELED SOLAR CONCENTRATOR

Tashkent GELIOTEKHNICA in Russian No 6, 1976 pp 54-55 manuscript received 13 Jul 75

UMAROV, G. YA., ALIMOV, A. K., ALAVUTDINOV, D. N., ABDUAZIZOV, A., and OVECHKIN, N. F., Physicotechnical Institute, Academy of Sciences Uzbek SSR

[Abstract] The authors recommend for wide use a new portable collapsible solar stove with seven paraboloid disks of electro-polished aluminum to replace the earlier 7-disk KS-7F cooker. The new cooker facets are each 0.83 m dia, have a focal length of 1.2 m and at a radiation of 784 m/m^2 under normal (Uzbek) climatic conditions will produce 12 liters of boiling water per hour. A 19-facet version of the new cooker with disks of the same (0.83-m) size and a 1.7-m focal length has a light output of 5.5 kw and will produce 32.6 liters of boiling water per hour. Such paraboloid electropolished aluminum facets can thus be combined in various sizes and numbers to form portable solar cookers for boiling water, preparing liquid and semi-liquid foods and coffee, or for obtaining distilled water. Illustration 1; bibliographies 3.

USSR

UDC 621.658.2(088.8)

SOLAR WATER LIFTING INSTALLATION WITH DIAPHRAGM PUMP

Tashkent GELIOTEKHNICA in Russian No 6, 1976 pp 82-83 manuscript received 2 Nov 75

UMAROV, G. YA., ALIMOV, A. K., OVECHKIN, N. F., and ABIDOV, T. Z., Physico-technical Institute, Academy of Sciences Uzbek SSR

[Abstract] The proposed solar water-lifting device operates on the "hot-cell" principle with a low-boiling fluid, such as freon-113, as working medium. The diaphragm pump is operated by the steam generated in the hot cell and the vacuum produced by the condensation cooling of the spent steam by the pumped water. A special 3-way valve (Author's certificate No 472206, Byulleten' izobretenyy, No 20, 1975), operated by the movements of the pump diaphragm, provides reliable automatic operation of the pump. Test operations were conducted at steam pressures of 2 atm. Total lift was 20 m. Pumping was done from a depth of 7.5 m to a discharge height of 12.5 m. The capacity achieved was 600 liters/hr. Illustration 1; bibliography 1.

HUNGARY

THE NEW GANZ-MAGAV PUMPS DEVELOPED FOR THE PAKS NUCLEAR POWER PLANT

Budapest ENERGIA ES ATOMTECHNIKA in Hungarian No 9, 1976 pp 385-394

JOZSA, ISTVAN, Metropolitan Water Works

[Abstract] The first, 880-MW, stage of the Paks power plant requires 53 m³/sec of cooling water; after completion of the planned enlargements the amount to be needed will reach 220 m³/sec - or twentifold the requirements of the city of Budapest with its two million inhabitants. The four newly developed pumps, operating from a common basin, are able to satisfy the water requirements even in the absence of a built-in reserve unit. The technical specifications of the Type MJO 2200 units are as follows: nominal water supply $Q_n = 13.0$ m³/sec; nominal head $H_n = 16.2$ m; controlled head for Q_n , $H = 13.5-20.5$ m; lowest and highest water supply $Q_{min} = 10.0$ m³; $Q_{max} = 18.0$ m³, revolutions $n = 296$ rpm; nominal shaft output power $P_{eff} = 2360$ kW; highest shaft output power $P_{max} = 3160$ kW; nominal efficiency = 87.5%; output power of the motor $P_{mot} = 3500$ kW; revolution of the motor $n_{mot} = 296$ rpm; weight of the pump $G = 78$ Mp; diameter of the pressure head $NA = 2200$ mm.

The water supply of the reactor safety system is taken care of by six type BQS 600-II pumps with the following specifications: Nominal water supply $Q_n = 460$ liters/sec; nominal head $H_n = 62.5$ m; revolutions $n = 985$ rpm; nominal shaft output power $P_{eff} = 336$ kW; nominal efficiency 84%; output power of the motor $P_{mot} = 500$ kW; revolution of the motor $n_{mot} = 985$ rpm; weight of the pump $G = 11$ Mp; diameter of the pressure head $NA = 600$ mm. These two high-performance pumping and water supply systems illustrate the need for the close cooperation between the systems designer and mechanical engineer. Illustrations 9; table 1; bibliographies 6.

CZECHOSLOVAKIA

SYNCHRONOUS COMPENSATOR 100 MVAR SKODA

Prague ELEKTROTECHNICKY OBZOR in Czech Vol 65 No 6, June 76 pp 321-329

HLAVAC, JOSEF, VORISEK, RENE, ZIEGLER, MIROSLAV, and SKODA, PLZEN

[Abstract] Production of synchronous compensators at SKODA started after World War II. The original unit had a capacity of 2.2 MVar, and the sizes manufactured increased steadily up to the size of 100 MVar. Manufacture and tests of this largest unit which is hydrogen cooled were completed at SKODA in 1975. The unit will be erected at the power distribution center of Krasikov, located about 10 km north of Moravska Trava. Output at

overexcitation 100 MVar, at underexcitation min 50 MVar, voltage 11 kV $\pm$ 10 percent, cycles 50 Hz, 1000 rpm, hydrogen pressure 300 kPa, synchronous unsaturated reactance 175 percent, transition unsaturated reactance 37 percent, impulse unsaturated reactance 21.8 percent, losses at nominal load 878 KW, inertia moment 35.75 tm^2 , overall length 12.4 m, height 5.5 m, total weight without accessories and start-up motor 233.5 t, total weight with accessories 266.7 t, maximum weight of single piece transported 108.5 tons. Hydrogen cooling medium is not cooled by water, but by atmospheric air, and therefore design hydrogen temperature is 50°C; because of this, typical output had to be increased by 10 percent. The compensator is started by an asynchronous motor with a circular armature with nominal characteristics of: permanent output 1125 KW, voltage 11 kV, 990 rpm, power factor 0.83, efficiency 93.5 percent, start-up period five minutes. The internal cooling system contains circulating hydrogen at a pressure of about 300 kPa (that is three kp/cm^2). Hydrogen is circulated by two axial flow blowers, located at both sides of the rotor journals. Indirect hydrogen cooling in a tubular heat exchanger is provided by atmospheric air at -30°C up to + 35°C. During cold weather spells hydrogen blowers are automatically shut off to maintain suitable temperatures. When atmospheric temperatures exceed 30°C introduced air is cooled by water sprays. The phase outlets are located on the upper part of the stator, the zero outlets under the machine, and are provided with measurement transformers. The frame of the compensator is designed as a pressure vessel, and is tested according to the standards at 886 kPa pressure (that is at an internal pressure of eight kp/cm^2). The sealing of the ring space and purging of the hydrogen is made by means of a rubber wall, which when the machine is not running seals the ring space with the shaft after pressurization. The seal is filled with nitrogen at a pressure of 700 kPa (seven kp/cm^2). The ring space contains the lighting fixture, and the front head is provided with sight glasses. The results of the tests showed good efficiency of the ventilation system, controlled temperature increases, and low vibrations. Good operational characteristics of the machine appear to be certain. Figures 16; table 1; references 3: 2 Russian, 1 Western.