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V.V. Gorbunov, A.M. Karpeev, A.A. Ignatiev

QUALITY CONTROL OF PHYSICAL AND MECHANICAL PROPERTIES OF BEARING RACEWAY SURFACES IN GAS TURBINE AIRCRAFT ENGINES BY EDDY CURRENT METHOD

Abstract. *Stable level of output characteristics of gas turbine engines during long-term operation depends on reliability and durability of the bearings. The article shows a possibility for evaluating the surface layer condition using the eddy current method not only at the production stage, but also at the test stage, as well as on completion of the operation using the proposed technological tools.*

Keywords: *reliability of bearings, defects of raceways, eddy current control, facilities for eddy current control*

P.K. Plotnikov

ON THE PRESENCE OF IRREGULAR PRECESSION MOTIONS IN A SYMMETRIC EULER GYROSCOPE

Abstract. *It is demonstrated that regular precession in the symmetric Euler gyroscope (SEG) is not the only type of motion, but corresponds only to commonly known mutually consistent initial Euler angles. Under any other initial angles, the emerging motions differ from the regular precession. In addition to solutions in the Euler angles, solutions in the Euler – Krylov angles are obtained, which in certain cases provide a more comprehensible geometrical interpretation of the motion. The analytical results are supported by mathematical modeling.*

Keywords: *symmetric Euler gyroscope, precession, Euler angles, Poisson equations, nutation, Euler – Krylov angles*

V.V. Simonov, A.A. Ignatiev

DESIGNING A MICROPROCESSOR-BASED DEVICE FOR IN-PROCESS CONTROL OF GRINDING THE BEARING RINGS

Abstract. *The article presents an analysis of devices for active control of the grinding process, considers their characteristics, and identifies the key trends in their improvement. The functional schemes for grinding the bearing rings by means of active control devices have been developed.*

Keywords: *grinding, bearing rings, active control, microprocessor*

V.I. Filippov

SPACE DECOMPOSITION ALGORITHMS $L_p(0,1)$, $0 < p < 1$, FOR INTEGER PROGRAMMING USING THE MATLAB SOFTWARE PACKAGE

Abstract. *The provided results present the theorems and specific space decomposition algorithms* $L_p(0,1)$, $0 < p < 1$, *by the systems of functions obtained as a result of contractions and shifts of a function. Approximation of space elements* $L_p(0,1)$, $0 < p < 1$, *according to the proposed methods, has the property of image compression, i.e. there are many coefficients with the given decomposition equal to zero. These algorithms may be required by specialists engaged n transmission and processing of digital information, and other researchers interested in decomposition of non-summable functions into functional series with integer coefficients. An example of decomposition of a particular signal in the form of a non-summable function using the Matlab software package is given.*

Keywords: *algorithms for integer decomposition, Fourier type series with integer coefficients, systems of functions from contractions and shifts of one function, approximation in the spaces* $L_p(0,1)$, $0 < p < 1$, *the Matlab software package*

V.V. Gorbunov, E.V. Volynskaya

IMPROVEMENT OF TECHNOLOGY AND EQUIPMENT FOR ROLLER PERFORATION OF LAMELLAR TAPE ELECTRODES IN ALKALINE ACCUMULATORS

Abstract. *The article considers the manufacturing technology of perforated lamellar tape for electrodes in alkaline accumulators, which utilizes the fabricated structure of rollers and dies in combination with grinding and electric erosion processing technologies.*

Keywords: *alkaline accumulators, perforated lamellar tape, manufacturing technology, assembly of rollers and dies*

O.P. Reshetnikova

COMMERCIAL TECHNOLOGY FOR ABRASIVE DEVELOPMENTS TO CENTERLESS GRINDING OF PRECISION-MACHINED SPHERICAL COMPONENTS

Abstract. *The article deals with the issues related to development of commercial technology to centerless abrasive machining of spherical components. The principles of the ball-screw gear assembly are considered. It is shown that the diameter of the balls directly affects the size of the gaps in various screw-ball-nut contacting groups.*

Keywords: *reliability, hollow balls, bearings, ball-screw gears, contact voltage, load capacity*

V.A. Koshuro, E.O. Osipova, M.A. Fomina, A.A. Fomin

STRUCTURE AND MICROHARDNESS OF REINFORCED LAYERS FORMED ON TITANIUM SURFACES UNDER LASER TREATMENT IN THE GRAPHITE MEDIUM

Abstract. *This work investigates the structure, depth, and microhardness of the layers formed on titanium surfaces during laser treatment in the graphite medium. The energy and duration of the laser pulse ranged from 0,76 to 10,17 J and from 0,5 to 3 ms, respectively. The treatment resulted in forming the layers with a dendritic structure to the depth of 800 μm. The hardened layers were characterized by high microhardness values up to 28,01 GPa. Based on obtained results, the authors designed the regression models which describe effects of laser treatment conditions on the given characteristics. It was found that pulse energy has the greatest effect on the depth and microhardness of the hardened titanium.*

Keywords: *titanium, powdered graphite, laser treatment, diffusion layers*

A.I. Shumilin, A. Aman, S. Palis

SUPERCAPACITORS MADE FROM CARBON NANOTUBES

Abstract. *A supercapacitor with carbon paper electrodes and a specific weight of 20 g/m^2 was investigated. The developed technologies include laser cutting of electrodes, assembly of an electrolytic cell in the coin cell CR2025, and potentiodynamic cycling with the speed ranging within 1-100 mV/s, and the potential of ± 500 mV, used to determine specific electrical capacity*

of the electrode material. Particular issues are associated with the use of carbon paper from single-walled nanotubes with a high purification efficiency of 99,9 % [1].

Keywords: *supercapacitor, single-wall carbon nanotubes, specific electrical capacitance, carbon electrodes*