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InterPartner 2020

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2nd Grabchenko's International Conference on Advanced Manufacturing Processes

September 8-11, 2020 | Odessa, Ukraine

Book of Abstracts

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International Association for Technological Development and Innovations

InterPartner
Grabchenko's International Conference on Advanced Manufacturing Processes 2020

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Recommended by Coordination Board of International Association for Technological Development and Innovations (Protocol No. 11, August 14, 2020)

This book covers topics at the interface between manufacturing, materials and mechanical engineering, as well as quality assurance, with a focus on advanced manufacturing processes. It focuses on the recent developments in production planning, design engineering, advanced materials, manufacturing technology, machining processes, process engineering, quality assurance. It covers a wide range of manufacturing processes, such as cutting, grinding, assembly, coatings, including ultrasonic treatment, molding, radial-isostatic compression, ionic-plasma deposition, volumetric vibration treatment, wear resistance, highlighting the advantages of augmented reality, RFID technology, reverse engineering, optimization, heat and mass transfer, energy management, quality inspection, and environmental impact. Based on the 2nd Grabchenko's International Conference on Advanced Manufacturing Processes (InterPartner-2020), held on September 8-11, 2020, in Odessa, Ukraine, this book offers a timely overview and extensive snapshot on trends and technologies in the significant areas of engineering. It is also intended to build a bridge between academic and industrial researchers.

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Dynamics of a Particle on a Movable Wavy Surface

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The relative motion of a particle on a linear wavy surface with a sinusoid cross-section is considered in the article. The rectilinear generatrices of the surface are parallel to each other and parallel to the horizontal plane. The surface oscillates in such a way that all its points describe circles in horizontal planes. Numerical methods solve the differential equations of the relative displacement of a particle. The trajectories of sliding of a particle on a surface and graphs of its reaction were obtained. The relative trajectory of the particle after movement stabilization can be closed or periodic spatial curves. When the diameter of the circle during oscillations is equal to the period of the sinusoid, the trajectory of the relative motion of the particle can be a periodic curve. In this case, the particle moves in a direction, close to the transverse, overcoming depressions and ridge surfaces. In other cases, the trajectory of sliding is a closed spatial curve whose horizontal projection is close to the circle. A partial example of a surface is a plane, and the trajectory of relative motion (the sliding of a particle) is a circle. An analytical expression of its radius was found.

Synthesis of a Passive Pressure Reducing Valve Using Modified Kinematic Graphs

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Pressure reducing valves are widely used in the industry. The growing requirements for precise pressure control in industrial hydraulic or pneumatic systems, as well as automatic pressure control with maximum energy independence and autonomy of these operations, require the introduction of new design solutions. One of the effective tools for solving the synthesis of new devices is graph theory, which is a convenient tool for modeling the structural properties of technical systems and relationships between objects of various nature. The article presents the result of the synthesis of a fundamentally new passive pressure reducing valve based on its model in the form of a modified kinematic graph. The analysis of the obtained solution is carried out, and possible options for its optimization are shown. It is established that the presence of a mechanical control system in the synthesized pressure-reducing valve makes it possible to realize the target characteristics of the reduction of various types of nonlinearity. The results obtained indicate the possibility of widespread use of the proposed device.

Particle Movement on Concave Coulter of the Centrifugal Distributor with Radially Installed Vertical Blades

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The relative motion of a particle along the inner surface of a horizontal concave coulter along a vertical blade installed in the radial direction is considered in the article. The disk rotates around a vertical axis with a given angular velocity. A system of differential equations of particle motion, which is solved by numerical methods, is complicated. Kinematic characteristics were found, the regularities of the relative motion of a particle on the spherical surface were determined. The spherical working surface of the disk allows increasing the dispersion zone of technological material. Analytical description of the particle motion makes it possible to investigate the acceleration during the motion on the disk along with the blades, as well as to find the relative and absolute velocities at the moment of the ascent particles from the disk. The obtained analytical dependencies allow determining the influence of structural and technological parameters on the particle acceleration process.

Strength Calculation Method for Steel Wire Rope Considering Broken Wires

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Relying upon a study of elastoplastic deformation, the authors define the load capacity of wire ropes subject to pure tension and allowing for the resistance of broken wires. Reaching by the most loaded wire under the tension of its ultimate balanced strain, whose value is determined based on a diagram σ-ε of tensile testing, is used as a criterion for the exhaustion of load capacity. For determining the resistance force for broken wires, two problems have been solved. The first one regards friction of a helically-formed thread (wire) against a cylinder having a straight element. The second problem (concerning double-lay ropes) focuses on the friction of wire against the surface of a cylinder having a helically-formed element. The parameters determining the resistance of broken wires are: a friction coefficient, a distance of breakage from the reference section of a rope, angles of wire twist in strands (single-lay ropes), and strand lay angles in a double-lay rope. Being illustrated by the particular rope structures, a dependence of their load capacity from a friction coefficient, number of broken wires. The divergence between theoretical values of the load capacity of ropes and the empirical data does not exceed 6 %.

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