Abstracts

Electrical Mashines and Apparatus

Baida E.I., Gaponenko G.N., Kobozev A.S. **5**

Modeling of short-circuit current interruption by circuit breakers.

In the article, problems of modeling of short-circuit current interruption in a three-phase electric circuit by a current-limiting automatic circuit breaker are considered by means of a mathematical model developed on the basis of theoretical and experimental research. It allows modelling electric circuit opening, calculate values of Joule integral adjusted for voltaic arc quenching time, determining breaker opening time and significantly decreasing volume of full-scale experiments.

Key words – **short-circuit current interruption, three-phase electric circuit, modeling.**

Golenkov G.M., Veremeenko A.V. **9**

Optimization with help of finite element method parameters of the linear asynchronous motor with current layer on the runner.

The design of the switch device which is driven by the coaxial-linear asynchronous electric motor with the combined winding on the armature is considered by the finite element method and parameters of the motor is optimized.

Key words – **switch device, coaxial-linear asynchronous motor, finite element method.**

Gurevich V.I. **12**

A Problem of Power Supply of Microprocessor-Based Protective Relays at Emergency Mode.

The paper discusses a problem of power supply for microprocessor-based protective relays in a substation with AC and DC auxiliary voltage in an emergency mode. The paper recommends application of power capacitors and supercapacitors instead of UPS as energy storage elements for short-time duration feeding of protective relays in emergency modes.

Key words – **protective relaying, relays, microprocessors, power capacitor, supercapacitor.**

Klimenko B.V. **16**

International Electrical Vocabulary – Ukrainian prospects.

Publication of selected translation from section 441 - Switchgear, controlgear and fuses – of International Electrical Dictionary (IED) into Ukrainian continues. The Ukrainian for section 441-17 – Characteristic quantities of switchgear, controlgear and fuses is introduced.

Key words – **International Electrical Dictionary, section 441-17 – Characteristic quantities of switchgear, controlgear and fuses, terms and definitions, translation into Ukrainian.**

Makogon S.A. **21**

The three-level control system of the vibratory driver with the linear vibration exciter.

Use of the linear vibration exciter for the vibratory driver is offered, control process of vibratory pile sinking is examined and a three-level system of its automation is offered. The performance of each level is given depending on presence of the information on a system, the field of use is described. The practical realization of the lower level of automation is given.

Key words – **vibratory driver, linear motor, control system, automation.**

Panacenko M.V., Panacenko N.M., Khvorost V.Yu. **24**

Energy-saving high-current high-voltage keys and phase modules on their basis.

A hybrid structure of a high-current high-voltage two-quadrant alternating-current key is considered in terms of realization of positive properties of asymmetric dual-operational thyristers and bipolar insulated-gate transistors so as to reduce power loss in the keys. A scheme of a phase module with uniform switching nodes based on the hybrid keys with reduced dynamic power loss is given.

Key words – **high-current high-voltage key, phase module, power loss reduction.**

Pavlenko T.P. **30**

Amorphous alloys and feasibility of their application in semiconductor release blocks of automated switches.

In the work, the basic properties of amorphous alloys and feasibility of their application in different fields of engineering are considered. Taking into account features of new soft magnetic materials, there is a necessity of their application in magnetic cores of low-voltage apparatus elements, namely, in semiconductor release blocks of VA circuit breakers.

Key words – **amorphous alloys, soft magnetic material application, semiconductor release block, circuit breakers.**

Electrical Engineering: Theory

Bondar O.I. **34**

Electromagnetic processes in a nonlinear electrochemical circuit with three reactive elements under pulse input voltage influence.

In the article, a refined mathematical model of a metal plating electrolyzer which takes into account cathode and anode capacitance and electrolyte inductance is introduced. Time dependences of electrical quantities that are figures of quantitative growth and quality of metal coating are obtained. Results of experimental validation of the developed model adequacy are given.

Key words – **pulse electrolysis, mathematical modeling, numeric solution, cathode processes.**

The paper considers some methods of joint noncontact testing of magnetic conductivity and specific resistance of ferromagnetic products via eddy-current transformers. The basic mathematical relations for the testing sensitivity and error calculation are obtained. A comparative analysis of eddy-current transformers operation through metrological performance is conducted to result in determining rational operating modes of the eddy-current transformer, recommendations as for the transformer utilization in specified requirements for industrial quality control are given.

Key words – **eddy-current transformer, magnetic conductivity, specific resistance, sensitivity, error.**

A survey and comparative analysis of the main formulations for transient 3D electromagnetic field calculations with a finite element method are presented. The considered formulations are based on utilization of magnetic vector potential and other potentials of electromagnetic field. Advantages and disadvantages of various formulations are analyzed. Criteria for choice of formulations for FEM analysis of transient 3D electromagnetic fields in various electrical and power equipment are introduced. The authors' opinion on correct choice of formulations for developing effective software applications on their basis is given.

Key words – **transient 3D electromagnetic fields, magnetic vector potential, finite element method, formulation.**

High Electrical and Magnetic Field Engineering

Brief information from the history of invention of electricity sources and accumulators are presented, some results of domestic and foreign retrospective, current and perspective investigations on creation and utilization, for scientific and technological purposes, of high-voltage electrophysical installations with high-power electric and magnetic energy accumulators given.

Key words – **history, investigation, high-voltage electrophysical installations, high-power electric and magnetic energy accumulators.**

Results of electric capacity and dielectric dissipation measurements for unfilled and hydrophobic-jelly-filled telephone cables with polyethylene insulation are analyzed. It is revealed that filling of the core results in 10 % increase in mutual capacitance of pairs. Hydrophobic filling is non-uniformly distributed in the transverse structure of a cable, which is proved by greater spread of dielectric dissipation in the filled cables.

Key words – **direct measurements, mutual capacitance, partial capacities, dielectric dissipation, hydrophobic filling.**

A pulse magnetic field and electrodynamics forces that act on a thin cylindrical shell placed in a coil are analyzed with similarity criterions. A first-approximation mathematical model and a new similarity criterion are utilized, the criterion values specified for efficient magnetic pulse compression and expansion of the shell.

Key words – **thin cylindrical shell, pulse magnetic field, magnetic pulse compression and expansion, mathematical model, similarity criterions.**

Known empirical formulas are corrected for more precise determination of maximal electric field intensity on a conductor electrode of a high-voltage gas-filled bushing.

Key words – **gas-filled bushing, electric field calculation, empirical formula correction.**