INFORMATION SIMULARS OF ELECTROMECHANICAL SYSTEMS

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Annotation

This article describes the steps of the electromechanical actuator simulation of spacecraft antennas. Nowadays, there is almost no information in the scientific literature on the description of the stages of modeling. It confirms the need demand for the emergence of new research in this area. Considerable attention is paid to the synthesis of the optimal ratio of dimensions and parameters for a given output characteristics of electromechanical systems. In addition, this article attention is paid to the history of the development of high-precision systems. Materials of the article will be interesting to specialists in the area of electrical engineering, computer and information technology. [1] In conclusion, the article summarizes some of the results of the study of electromechanical drive of spacecraft antennas. The findings expand the knowledge of the possible potential of computer software systems modeling the objects.

Main body

Modern development of precision systems and devices have begun in the 1970's along with creation of the "Luch" spacecraft on which simultaneous and independent guidance of four antennas, two of which were large-size, was required. Here the principles of digital control have been realized. For calculation and analysing precision systems we use modern technologies.[2]

Special program complexes for calculation of parameters of electromagnetic fields become more and more popular. One of the most powerful tools for solutions of this task is the Maxwell program by the ANSYS company. ANSYS Maxwell is the leading software for modeling of two-dimensional and three-dimensional electromagnetic fields used for a research and designing of two-dimensional and three-dimensional models, sensors, transformers, engines and other electromechanical and electric devices of various application. It is based on a finite-element method and precisely calculates harmonious, and also static electric and electromagnetic fields and transition processes in field tasks.

The main task of work is the electromagnetic analysis of the engine which can be successfully executed with use of opportunities of addition of RMXprt. It allows to accelerate process of optimization of model and gives opportunity of more exact description various features of geometry.

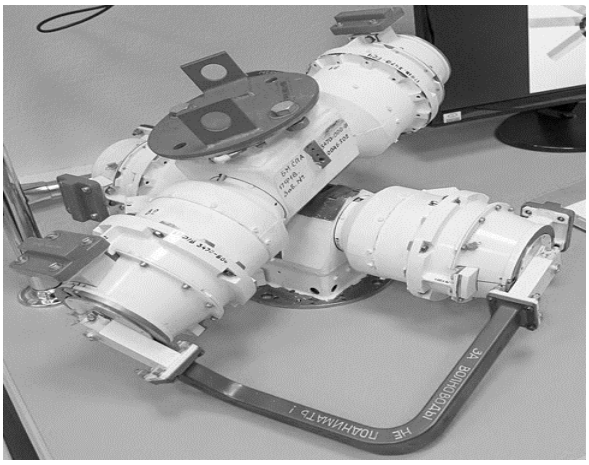

Fig.1 Model of the synchronous motor

Often research of magnetic fields of various devices is complicated by a task of the exact description of geometrical properties of magnetic system. For the description of geometry of magnetic system there is a possibility of use of CAD - applications, the model can be executed in any computer-aided engineering Then for calculation of parameters of the engine properties were appointed. By a practical way it is established that incorrect matching of materials considerably distorts a picture of the electromagnetic field. After the analysis of influence of geometrical characteristics of the electric motor on its external static characteristics, options of the most effective fulfillment of a tooth zone from a line item of decrease in pulsations of the electromagnetic moment were determined. [3]

Important task is synthesis of optimum ratios of the sizes and parameters according to the set output characteristics of electromechanical systems. On the one hand - it is dictated by high cost and deficiency of the used materials that stimulates accomplishment of electromechanical converters of energy with the minimum costs of these materials on condition of achievement enough high specific and energy rates. On the other hand – essentially new designs which are subject to a detailed research are continuously developed. For example, when designing magnetic systems with concentration of a magnetic flux the habitual scheme of engineering designing is violated, as a rule. [4]

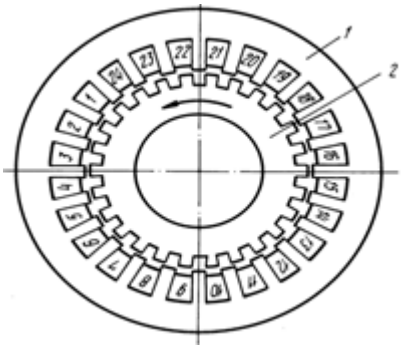

Fig.2Model of motor

The project of electromechanical system with permanent magnets single-digit and completely is defined by set of a large number of data: constructive sizes and winding data; the active, isolation and constructional characteristics of materials; and also tension, currents, rotating speed, etc.

The review of application of retrieval methods for optimization shows that most of them is anyway already approved. However comparative estimates are complicated because of their use in development of different types of electromechanical transformers for different functions of the purpose and restrictions. And still it is possible to mark that if the optimality criterion is set not in an explicit form.[5]

Conclusion

For the majority of applications of permanent magnets as a part of electromechanical devices, from the point of view of an energy efficiency the question of their placement and fixture in mobile and motionless elements of magnetic system is actual. At the same time, we try to obtain the maximum values of energy characteristics minimization of magnetic resistance. It is known that the best magnetic flux in an air gap can provide radially located prismatic permanent magnet.

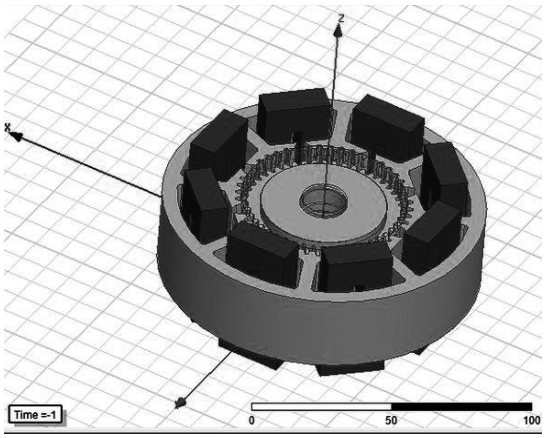

Fig.3 Simulation of the motor in Ansys Maxwell

However, fixture of a permanent magnet of this form isn't reliable, without use of the feedwell, a framework or bolt connections. Comparison of flows of dispersion of several prismatic magnets with different execution of a side surface for the purposes of the most reliable fixture was executed. If to accept the main magnetic flux of a magnet for 100%, then flow size in other cases will be 98, 96 and 95% respectively provided that width of a magnet is much more than its thickness. It is offered to keep the size of a magnetic flux with ensuring reliable fixture of a magnet by use of a groove in a side surface.

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