INTRODUCTION

Thesis actuality:

Magnetic levitation is a result of two repelling magnetic fields. An object is called levitating when power which is produced by electromagnetic repelling counterbalancing its weight.

Nowadays magnetic levitation technology in Ukraine developed not good. Such kind of technology is quite hard to realize because the system is non-linear and not stable in case of using static fields (using ferromagnetic materials) and also in dynamics because magnetic fields are conservative forces therefore without outer influence they are not stable.

MLS technology nowadays is spread in maglev trains, in targeting systems with high precision such called frictionless systems and therefore these systems have no friction and lower losses, for example magnetic bearings. Also magnetic bearings implemented in high rpm mechanisms (about 100000 rpm). In this systems absence of friction and thus mechanical losses are very important.

The main controllable parameter is current which is applied to electromagnet coils because the current determine the force with which magnet will attract or repel a body.

The relation between science programs, themes and plans:

Master thesis performed on Automation of electromechanical systems and the electrical drive department National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute».

Goals and tasks:

The goals of thesis are to develop a mathematical model of magnetic suspension system using one magnet, develop a position control algorithm and implement it using the digital controlling system.

To achieve formulated goals following should be solved:

1. Define the control problem and justify the necessity of its solution by analyzing existing possibilities for position control in magnetic levitation systems.

2. Develop of the specified mathematical model according to object mass and magnet parameters

3. Design optimal position controller which will provide work position off.

4. Develop control systems and implement it in experimental installation

Performance verification designed control using experimental setup and determining stability limits

Research object:

Object positioning in electromagnetic suspension system.

Research subject:

Electromagnetic suspension system with digital control system.

Scientific novelty of the obtained results:

The air gap controller design according to the derived linearized mathematical model of direct current electromagnet was presented in the first time.

The practical significance of the obtained results obtained:

The designed control system can be implemented in the study purposes to study magnetic levitation phenomenon and to study system stability.

Approbation of thesis results:

The main results of the work were reported and discussed at the following conferences: XIII International scientific and technical conference of young scientists, graduate students and students "Modern problems of electrical engineering and automation", Kyiv, December 2019.

Publications:

The main results of the dissertation work are published in 1 scientific article.

Thesis content and structure:

Thesis is consists from introduction, five sections, conclusion, sources and three appendixes. Total amount of thesis pages is 101 pages, 62 figures, 31 tables. The main content is presented on the 99 pages