

Inter-Inductive Primary Converters

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Abstract— The work is devoted to questions of development of multi-sectional inter-inductive primary converters of a various design of the mechanical parameters of mobile parts of objects of management intended for control.

Keywords— sensor inter-inductive primary converter; induction EMF; microprocessor; galvanic untied contours; linearization

I. INTRODUCTION

Information support of control systems – a cornerstone when developing not only theoretical bases for creation of mathematical models, but also identification of technological processes. It is known that the solid data promotes to reveal, and then to define ways and methods of the subsequent making mathematical models which in turn allow to simplify, and in some cases, to increase reliability of functioning of object of management as a whole. For creation of adequate mathematical model surely it is necessary to consider all conditions shown by technical and/or production requirements which should be satisfied. All this, finally, leads to creation of a control system focused not only on the correct and trouble-free functioning, but as on an optimality, and, in case of need, and on adaptability at change of external and internal conditions.

It is obvious that the main link in any control system is primary converters (sensors) – the main not only sources, but also suppliers of the current information on which functioning reliability of information, speed and survivability of system as a whole depends.

Now, hard search works on creation new or to improvement of the developed (known) means lost a sharpness and expediency. All for some reason consider that development and achievements of electronic (microprocessor) equipment can replace completely not only search, but also expediency of creation of new primary sources of information. Yes, it is valid, any signal received from a sensor can be transformed and linearized on sites of various length, and after it is possible even to receive an identical tilt angle on each of sites. Thus, by means of microprocessor programming, compulsorily linearized target characteristic even if primary signal not only accruing can be received, but also has ruptures of the first sort. And how to be, if by a physical principle of action of a sensor its target characteristic has a hysteresis loop? It is possible to consult with this task also, but only in our opinion, by means of huge and unjustified efforts that can lead to reduction of reliability of receiving reliable information as a whole.

It is obvious that in each case, surely it is necessary to consider specifications of characteristics of sensors which can be suitable are applied to the solution of an objective, and then

to put a problem of realization, linearization and even if it is necessary, expansions of a range of control or measurement.

In our opinion, from variety of known "high accurate" electromagnetic primary converters the urgency and prospects of use and even development of new inter-inductive primary converters (VPP) without the magnetic core didn't lose. It is promoted generally by that to VPP in essence a linear element because doesn't contain the ferromagnetic core which brings notorious nonlinearity and a loop of a hysteresis which limit a linear range of transformation [1-2].

It is known that the physical nature and dimension of inductance and mutual inductance one and the same, however features of influence different. The parameter «mutual inductance» exists in only case when (the primary coil with an alternating current) induces a foreign source of a variation field in other (secondary) closed EMF coil proportional to flux linkage change between contours of the interconnected coils of inductance. In turn, raised in the EMF secondary coil counteracts change of flux linkage external the field which influences the primary coil. The exchange of active energy of an electromagnetic field is identical and consequently the balance of capacity isn't broken, and the element in essence becomes linear. From here also follows both simplicity of manufacturing of the linear converter, and variety of construction various on topology and designs of sensors convenient in application. The target signal from them will simply be transformed and can be a source of solid current data for the majority of control systems.

In case nonlinear, it is possible to linearize a target signal of VPP with the help: changes of the sizes and topology (configuration) of the interconnected coils; selection of electric parameters (supply voltage, current, frequency and signal capacity); use of microprocessor equipment (as a last resort).

We developed various to destination and to execution sensors for control of mechanical parameters. They generally provide: control of linear parameters - a plane-parallel and cylindrical design; angular transpositions- a disk design; the hemispherical - one - two - and three-coordinate sensors allowing independently to supervise angular parameters of a vector raised electromagnetic field in a range ($-85^{\circ} \leq \alpha, \beta, \gamma \leq 85^{\circ}$); the multilayered open – cylindrical, truncated and conic and hemispherical designs.

Especially it should be noted possibility of creation of galvanic untied measuring contours because of their mutual spatial orthogonality and symmetry or mutual shift of plane-parallel contours of coils for compensation of signals of

hindrances creating additional not informative signals or their outcomes.

Now works on construction and improvement of multi-sectional VPP allowing are conducted not only to increase sensitivity and capacity of a target signal, but also to linearize target characteristics especially three-coordinate to a hemispherical of converters which can be used not only in: industrial robots for control of spatial provisions, its mobile parts; artificial limbs of extremities with bigger degree of freedom; multi-sectional "trunks" with variable length of each section, but also in other areas of a science and equipment [3-6].

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