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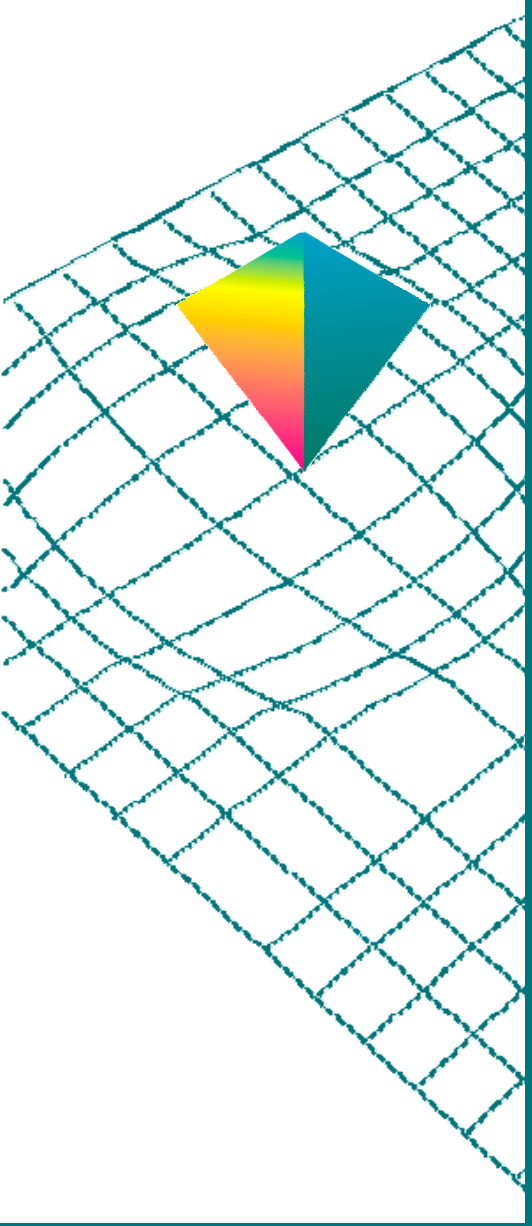

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V.V. Minchenya / V.A. Rudnitsky / N.T. Minchenya

Design of the Measurement Systems on the Base of the Precision Inductive Sensors with Distributed Parameters

ABSTRACT

In 1972 Dr. Nikolay Minchenya presented new design of the inductive sensor – the inductive sensor with distributed parameters. This design became a basis for wide variety of measurement instruments created so far. The work presented is intended to demonstrate the ways of improving and to widen the ranges of application of the systems based on the inductive sensors technology opening several new sides of the subject.

INTRODUCTION

Measurement technology makes its steps forward with increasing efficiency and progressing capability to solve metrological problems unreachable so far. The primary task of modern metrology is to perform at the edge of today's engineering needs. The work presented is intended to demonstrate the ways of improving and to widen the ranges of application of the systems based on the inductive sensors technology.

COMMON CONSIDERATIONS

There are at least two approaches to the building of the measurement systems on the basis of inductive sensors. One of them imply the term of impedance or full resistance of the sensor's circuit. The other is based on the resonant properties of the circuits with reactive parameters.

The most reliable scheme is based on the sensors with a changeable air gap. The sensors are connected in an AC bridge circuit, which is actually the most efficient solution. Another good practice is to make sensors operate differentially to increase the working range of displacement. One also can increase the sensitivity of the measurement channel using operational amplifiers with low drifts and offset voltages as well as precise resistors and capacitors in generators and peak detectors. But there is another way of increasing the efficiency and reliability of the systems with inductive sensors – to improve the sensor itself.

THE DESIGN OF THE INDUCTIVE SENSOR WITH DISTRIBUTED PARAMETERS

In 1972 Dr. Nikolay Minchenya presented new design of the inductive sensor – the inductive sensor with distributed parameters. Precision linear measurements, weighing, machinery and medicine are yet not all the areas where the solution was used. The main idea of the technology was to distribute each half of the AC inductive bridge in space. It implies using a group of cores with windings connected in series or in parallel to form each half of the bridge (fig. 1). This means, that the sensitivity of the system is multiplied times the number of coils involved in each half of the bridge. The linearity range is increased dramatically as long as the gap between the armature and the cores is constant in this design and the sensor is differential.

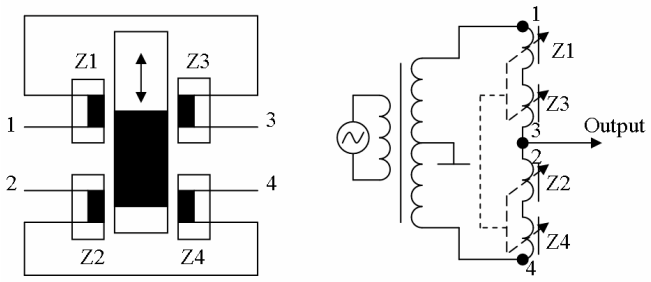

Fig.1. Fundamentals of the design of the differential inductive sensor with distributed parameters.

CONCLUSION

The system considered made it possible to obtain highly effective weighing systems for the weighing of automobiles and trains for instance. These systems operate with high precision showing as much as 8000 points per working range with uncertainty much less than 0.5 of the last digit. The inductive sensors with distributed parameters appear to be a good alternative to the resistance strain gauges. High efficiency makes this solution very prospective in many metrological applications.

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