High-Spatial-Resolution Magnetic-Field Measurement by Giant Magnetoresistance Sensor – Applications to Nondestructive Evaluation and Biomedical Engineering

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Abstract

Giant magnetoresistance (GMR) sensor has been developed and widely applied to use as magnetic read head in data storage industry. This paper describes new applications of magnetic-field measurement with high spatial-resolution and high sensitivity to nondestructive evaluation and biomedical engineering. For nondestructive evaluation, the GMR sensor, used as magnetic sensor based on eddy-current testing technique, was applied to the detection of micro-crack on micro-conductor for the purpose of printed circuit board inspection and the detection of micro-solder-ball grid array. For biomedical engineering, the weight density of magnetic fluid for cancer treatment was measured by the GMR sensor. In addition, the GMR sensor was applied to measure micro-current and these can lead to the direct detection of nervous action.