

MAGNETORESISTIVE SENSOR

ABSTRACT

A magnetoresistive (MR) sensing system comprises an MR sensor 20 with a layered spin valve structure including thin first 28 and second 34, 38 layers of ferromagnetic material separated by a thin layer 32 of nonmagnetic metallic material. The magnetization direction of the first layer at a zero applied magnetic field is substantially parallel to the longitudinal dimension of the MR sensor and substantially perpendicular to the fixed or "pinned" magnetization direction of the second layer. A thin keeper layer 24 of ferromagnetic material is separated by a thin spacer layer 26 from the layered spin valve structure. This keeper layer has a fixed magnetization direction substantially opposite that of the second layer and a moment-thickness product substantially equal to that of the second layer for cancelling the magnetostatic field from the second layer. A current flow is produced through the MR sensor to produce a magnetic field of a sign and magnitude which cancels the ferromagnetic exchange coupling between the first and second layers. Variations in resistivity of the MR sensor due to difference in rotation of the magnetizations in the first and second layers are sensed as a function of the magnetic field being sensed.

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