

ABSTRACTMAGNETORESISTIVE SENSOR HAVING ANTIFERROMAGNETIC
LAYER FOR EXCHANGE BIAS

A magnetoresistive (MR) sensor comprising a sputtered layer of
5 ferromagnetic material and a sputtered layer of antiferromagnetic nickel-
manganese (Ni-Mn) to provide an exchange coupled longitudinal bias field
in the MR element is described. The antiferromagnetic layer overlays the
MR layer and may be patterned to provide the longitudinal bias field only
in the end regions of the MR layer. Alternatively, the antiferromagnetic
10 layer can underlay the MR layer with a Zr underlayer to enhance the
exchange-coupled field. As initially deposited, the Ni-Mn layer is face-
centered-cubic and exhibits little or no exchange-coupled field. After
one annealing cycle at a relatively low temperature, the Ni-Mn layer is
face-centered-tetragonal and exhibits increased crystallographic ordering
15 and provides sufficient exchange coupling for the MR element to operate.
Addition of chromium to the Ni-Mn alloy provides increased corrosion
resistance.

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