



CLAIMS

1. A magnetoresistive (MR) sensing system comprising:

an MR sensor comprising a layered spin valve structure including first and second layers of ferromagnetic material separated by a layer of nonmagnetic metallic conductive material, the magnetization direction of said first layer at a zero applied magnetic field being substantially parallel to the longitudinal axis of the MR sensor and substantially perpendicular to a fixed magnetization direction of said second layer, and a keeper layer of ferromagnetic material separated from the layered spin valve structure by a spacer layer of high resistivity material, said keeper layer having a fixed magnetization direction substantially opposite that of said second layer and a magnetic moment thickness product substantially equal to that of said second layer for cancelling a magnetostatic field from the second layer;

means for producing a current flow through the MR sensor to produce a magnetic field having a direction and magnitude which cancels a magnetic field generated by ferromagnetic exchange coupling between said first and second layers; and

means for sensing variations in resistivity of the MR sensor due to the difference in rotation of the magnetizations in said first and second layers as a function of the magnetic field being sensed.

2. The sensing system of claim 1, wherein the MR sensor comprises a substrate and the keeper layer has a coercivity substantially equal to that of said second layer and substantially higher than that of said first layer and is disposed between the substrate and first layer.

3. The sensing system of claim 1, wherein the MR sensor comprises a substrate and the keeper layer has a coercivity substantially equal to that of said first layer and substantially less than that of said second layer and is disposed between the substrate and first layer.



4. The sensing system of claim 1, wherein the second layer is between the first layer and keeper layer, and the keeper layer is of a magnetic material having a coercivity substantially equal to that of the second layer.

5. A magnetoresistive (MR) sensor comprising:

a layered spin valve structure including first and second layers of ferromagnetic material separated by a layer of nonmagnetic metallic conductive material, the magnetization direction of said first layer at a zero applied magnetic field being substantially parallel to the longitudinal axis of the MR sensor and substantially perpendicular to a fixed magnetization direction of said second layer;

a spacer layer of nonmagnetic high resistivity material; and

a keeper layer of ferromagnetic material separated by the nonmagnetic spacer layer from the layered spin valve structure and having a fixed magnetization direction substantially opposite that of said second layer and a magnetic moment thickness product substantially equal to that of said second layer for cancelling a magnetostatic field from the second layer.

6. The sensor of claim 5, including a substrate, and wherein the keeper layer has a coercivity substantially equal to that of said second layer and substantially higher than that of said first layer and is disposed between the substrate and first layer.

7. The sensor of claim 5, including a substrate, and wherein the keeper layer has a coercivity substantially equal to that of said first layer and substantially less than that of said second layer and is disposed between the substrate and first layer.

8. The sensor of claim 5, wherein the second layer is between the first layer and keeper layer, and the keeper layer is of a magnetic material having a coercivity substantially equal to that of the second layer.

9. A magnetic storage device comprising:

at least one rotatable magnetic recording disk onto which data can be written and from which data can be read;



at least one magnetic transducer associated with each disk, each transducer comprising a magnetoresistive (MR) sensor, each MR sensor comprising:

a layered spin valve structure including first and second layers of ferromagnetic material separated by a layer of nonmagnetic metallic conductive material, the magnetization direction of said first layer at a zero applied magnetic field being parallel to the longitudinal axis of the MR sensor and substantially perpendicular to a fixed magnetization direction of said second layer, and a keeper layer of ferromagnetic material separated from the layered spin valve structure by a spacer layer of high resistivity nonmagnetic material, said keeper layer having a fixed magnetization direction substantially opposite that of said second layer and a magnetic moment thickness product substantially equal to that of said second layer for cancelling a magnetostatic field from the second layer;

actuator means coupled to the magnetic transducer(s) for moving the transducer(s) relative to the disk(s) during rotation of the disk(s);

means for producing a current flow through a selected MR sensor to produce a magnetic field having a direction and magnitude which cancels a magnetic field generated by ferromagnetic exchange coupling between the first and second layers of that selected sensor; and

means for sensing from data read from an associated disk variations in resistivity of the selected MR sensor due to the difference in rotation of the magnetizations in said first and second layers as a function of the magnetic field being sensed.