permalloy (NiFe). FeHfN also has a resistivity about eight times higher than the permalloy in the magnetic shields.

[**0026**] The high resistance soft magnetic material may be deposited by any of well known methods such as sputtering. The stoichimetric composition of the high resistance magnetic materials does not appear to be critical and in general has about equal atomic ratios. The thickness of the high resistance magnetic layer is preferably in the range of about 0.07 microns to about 2 microns. The lower limit of this thickness range is partially established by the ability to form a thin layer relatively free of defects.

[**0027**] Referring to **FIGS. 4**a, **4**b, and **4**c, the presence of the high resistance soft magnetic material effectively creates two gaps in the read element **400**. The first gap is the magnetic read gap which partly determines the areal density which may be supported by the read element. The magnetic read gap is the distance between the magnetically active portions of the shields disposed near the sensor stack. Thus, in **FIG. 4**a the magnetic read gap **420** is the distance between the two high resistance soft magnetic layers **414**, **415**. In **FIG. 4**b the magnetic read gap **422** is the distance between the high resistance soft magnetic layer **414** and the upper magnetic shield **406**. In **FIG. 4**c the magnetic read gap **424** is the distance between the high resistance soft magnetic layer **415** and the lower magnetic shield **405**. The second gap, the electrical gap, is the distance between the conductive magnetic shields. The electrical gap is indicated by element **430** in **FIG. 4**a, element **432** in **FIG. 4**b, and element **434** in **FIG. 4**c. The electrical gap is the electrically important distance which determines the ability of the read element **400** to withstand electrostatic damage. In general, as the electrical gap is increased the ability of the sensor to withstand electrostatic damage is improved.

[**0028**] Another advantage of using a layer of high resistance soft magnetic material in conjunction with a nonmagnetic thin insulating layer between a sensor stack and a magnetic shield is that a single small defect in either layer is unlikely to adversely affect the sensor. Since there are two layers which are either insulating or having high resistance between the sensor stack and the shields, the importance of small defects such as pin holes in either the insulating layers or the high resistance soft magnetic layers is greatly diminished.

[**0029**] A read element according to the present invention supports very high recording densities and additionally exhibits greatly improved resistance to defects and electrostatic damage. Although specific embodiments of the invention have been described and illustrated, the invention is not to be limited to the specific forms or arrangements thus described. For example, the present invention is also very useful when used with magnetoresistive sensors having exchanged coupled bias stabilization tabs rather than hard bias structures. Those skilled in the art will recognize other embodiments which fall within the scope of the invention.

We claim:

1. A magnetoresistive sensor, comprising:

a magnetoresistive sensor stack responsive to an external magnetic field;

a first and second magnetic shield wherein said magnetoresistive sensor stack is disposed between said first and second magnetic shield;

a first insulating layer disposed between said magnetoresistive sensor stack and said first magnetic shield;

a second insulating layer disposed between said magnetoresistive sensor stack and said second magnetic shield;

a high resistance soft magnetic layer disposed between at least one of said insulating layers and one of said magnetic shields.

2. A magnetoresistive sensor, comprising:

a magnetoresistive sensor stack responsive to an external magnetic field;

a first and second magnetic shield wherein said magnetoresistive sensor stack is disposed between said first and second magnetic shields;

a first insulating layer disposed between said magnetoresistive sensor stack and said first magnetic shield;

a second insulating layer disposed between said magnetoresistive sensor stack and said second magnetic shield; and,

a first high resistance soft magnetic layer disposed between said first insulating layer and said first magnetic shield and a second high resistance soft magnetic layer disposed between said second insulating layer and said second magnetic shield.

3. A magnetoresistive sensor as in claim 1 wherein said high resistance soft magnetic layer has a composition of A-B-C where A is selected from the group consisting of Fe and Co, B is selected from the group consisting of Hf, Y, Ta, and Zr, and C is selected from the group consisting of O and N.

4. A magnetoresistive sensor as in claim 1 wherein said high resistance soft magnetic layer has a composition of CoFeHfO.

5. A magnetoresistive sensor as in claim 1 wherein said high resistance soft magnetic layer has a composition of FeHfN.

6. A magnetoresistive sensor as in claim 3 wherein said high resistivity soft magnetic layer has a magnetic moment greater than about 80 emu/cc.

7. A magnetoresistive sensor as in claim 3 wherein said high resistivity soft magnetic layer has a resistivity greater than 2000 micro-ohm-cm.

8. A magnetoresistive sensor as in claim 3 wherein said high resistivity soft magnetic layer has a permeability greater than about 200.

9. A magnetoresistive sensor as in claim 1 wherein said high resistance soft magnetic layer has a thickness of about 0.07 microns to about 2 microns.

10. A magnetoresistive sensor as in claim 1 wherein said insulating layer comprises a material selected from the group consisting of alumina, silicon oxide, silicon nitride, and tantalum oxide.

11. A disk drive, comprising:

a magnetic disk;

a write head for writing information to said disk;

a magnetoresistive sensor for reading information from said disk, wherein said magnetoresistive sensor includes: