[0029] **FIG. 4***c* illustrates a view of the deposited lead layers **416***a*, **416***b*. The leads **416***a*, **416***b* are formed on the protective cap layer **414**. Lead material **416***c* is also formed on the photoresist **450** and will be removed along with the photoresist **450** during liftoff (not shown). Because of the absence of oxidation, there is very low resistance between the lead layers **416***a* **416***b* and the underlying protective cap layer **414**.

[0030] **FIG. 4***d* illustrates a view the sensor after liftoff of the photoresist (**450** in **FIG. 4***c*).

[0031] **FIG. 4***e* illustrates the use of an ion milling operation **452** to remove an exposed portion, indicated by reference number **415**, of the protective cap layer **414**. The ion milling operation **452** renders the original protective cap layer **414** into two remaining portions. In subsequent Figures the two remaining portions of the original protective cap layer **414** shall be referred to as two separate layers and are labeled with reference numbers **414***a* and **414***b*. Typically, the ion milling operation **452** is only used to remove material **415** which is not covered by the leads **416***a*, **416***b*. Thus the possibility of damaging the bias layer **410** other than the exposed area **415** is greatly minimized.

[0032] **FIG. 4***f* illustrates the use of a fluorine reactive ion etch **454** to remove an exposed portion **413** of the cap layer **412**. The fluorine reactive ion etch **454** renders the original cap layer **412** into two remaining portions. In subsequent Figures the two remaining portions of the cap layer are labeled with reference numbers **412***a* and **412***b*. The bias layer **410** serves as an effective etch stop for fluorine reactive ion etching **454**.

[0033] **FIG. 4***g* illustrates the use of an oxygen reactive ion etch **456** to quench the magnetic moment of an exposed portion **411** of the bias layer **410**. Some of the material in the exposed portion **411** may be removed and some may remain after the oxygen reactive ion etch **456**. The magnetic moment of the exposed portion of the bias layer **410** is destroyed regardless of whether material is removed. The thin nonmagnetic coupling layer **408** serves as an etch stop during oxygen reactive ion etching **456** thus protecting the free layer **406** from damage. Once the magnetic moment of the exposed portion **411** of the bias layer **410** is quenched, the portion **407** of the free layer **406** directly opposite the quenched portion **411** becomes responsive to an external magnetic field. The width **460** of the quenched portion **411** of the bias layer **410** determines the width **462** of the active portion **407** of the free layer **406**.

[0034] **FIG. 4***h* illustrates a view of the completed sensor **400**. The pinned layer **402**, the nonmetallic conducting layer **404**, the free layer **406**, and the nonmagnetic coupling layer **408** have remained during the construction of the sensor **400**. Some of the exposed portion **411** of the biasing layer (**410** in **FIG. 4***a*) may remain after exposure to the oxygen reactive ion etch (**456** in **FIG. 4***g*). Overcoat layers **434***a*, **434***b*, typically formed from tantalum have been formed over the leads **416***a*, **416***b*. The magnetoresistive sensor **400** as illustrated in **FIG. 4***h* includes two bias stabilization tabs **438***a*, **438***b*. Although the bias layer, the cap layer and the protective cap layer were originally deposited as continuous layers, the construction of the sensor has rendered each of these layers into two portions. Therefore, it is convenient to describe the remaining portions of these layers separately. Accordingly, the first bias stabilization tab **438***a* includes a first bias layer **410***a* formed over a portion **408***a* of the nonmagnetic coupling layer **408**, a first cap layer **412***a*, and a first protective cap layer **414***a*. The second bias stabilization tab **438***b* includes a second bias layer **410***b* formed over a portion **408***b* of the nonmagnetic coupling layer **408**, a second cap layer **412***b*, and a second protective cap layer **414***b*.

[0035] A read element according to the present invention includes a protective cap layer. This protective cap layer effectively protects the cap layer from oxidation. Since the cap layer is protected from oxidation, ion milling is not necessary to remove oxide and the bias layer in the bias stabilization tabs are protected from ion milling damage. The parasitic resistance is significantly reduced. 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. Those skilled in the art will readily recognize other embodiments which fall within the scope of the invention.

We claim:

**1**. A spin valve magnetoresistive sensor, comprising:

a ferromagnetic pinned layer;

a conducting nonmagnetic layer disposed over said pinned layer;

a ferromagnetic free layer disposed over said conducting nonmagnetic layer;

a nonmagnetic coupling layer disposed over said free layer, said nonmagnetic coupling layer having a first portion and a second portion;

a first antiparallel coupled bias stabilization tab comprising: a first ferromagnetic bias layer formed over said first portion of said nonmagnetic coupling layer, a first cap layer formed over said first ferromagnetic bias layer, and a first protective cap layer formed over said first cap layer; and,

a second antiparallel coupled bias stabilization tab comprising: a second ferromagnetic bias layer formed over said second portion of said nonmagnetic coupling layer, a second cap layer formed over said second ferromagnetic bias layer, and a second protective cap layer formed over said second cap layer.

**2**. A spin valve magnetoresistive sensor as in claim 1 wherein said nonmagnetic coupling layer is formed from ruthenium.

**3**. A spin valve magnetoresistive sensor as in claim 1 wherein said first cap layer and said second cap layer are formed from tantalum.

**4**. A spin valve magnetoresistive sensor as in claim 1 wherein said first protective cap layer and said second protective cap layer are formed from rhodium.

**5**. A spin valve magnetoresistive sensor as in claim 1 wherein said first protective cap layer and said second protective cap layer are formed from gold.

**6**. A spin valve magnetoresistive sensor as in claim 1 wherein said first protective cap layer and said second protective cap layer are formed from ruthenium.

**7**. A disk drive, comprising:

a disk;

a write element for writing data onto said disk;