is raised to 300 to 500° C., and then, the layer is formed by the high vacuum layer forming apparatus having a maximum degree of vacuum of 10^{-11} Torr, or the top surface of the lower shield exposed is irradiated with an oxygen ion using an ECR ion source to oxidize the surface, so that γ-Fe2O3 can be precedably grown. In this case, the same effect as in the method (2) is found to be given.

[**0056**] The method (4) as another example of the present invention has the structure of **FIG. 6**. A magnetic domain control layer **601** in this case is a layer by alternately laminating CoCrPt of 1.5 nm and SiO2 of 1.1 nm. The thickness ratio of CoCrPt/SiO2 is between 2:1 and 1:2, CoCrPt has a layer thickness of 0.5 to 2 nm, a specific resistance not less than 10 mΩcm, a coercivity not more than about 1.0 kOe, and a residual magnetization of 2 to 4 kG, so as to give the same effect as described above. However, in this case, it is more effective that Al2O3 not less than 10 nm is inserted for the underlayer.

[**0057**] In the methods (2) to (4) of this example, even when the gap between the read shields (gap distance) is not more than 70 nm, the read characteristic is not found to be deteriorated due to the conduction of the magnetoresistive sensor layer and the magnetic domain control layer.

Example 2

[**0058**] The magnetoresistive sensor in Example (1) described above has the structure by lamination from the lower portion. The structure in which the upper and lower portions are reversed can also give the same effect.

Example 3

[**0059**] In Example (1) described above, in formation of the magnetic domain control layer using a spinel type oxide such as γ-Fe2O3, on the underlayer **304** of the magnetic domain control layer **303**, is formed, in place of the CoO layer, an oxide layer having a crystal structure of NaCl type such as Mg (200), NiO (200), EuO (200), FeO (200) or ZnO (200) as well as a (200) plane. Then, the spinel ferrite formed thereon can be crystallized at low temperature. As a method of forming this layer, there is a method of manufacturing these layers by the sputtering method, the ion beam sputtering method or the cluster ion beam method. As a method other than this, on the lower shied **302** a layer of Co, Mg, Ni, Eu, Fe or Zn is formed in a thickness of 1-5 nm. This layer is exposed to oxygen in vacuum, is irradiated with oxygen using ECR plasma, or is exposed to low-pressure oxygen by heating the substrate (100 to 250° C.) so as to form an oxide layer, thereby forming a spinel ferrite thereon. This method can give equivalent results.

[**0060**] As a spinel type oxide formed on the oxide underlayer **304**, there are γ-Fe2O3 and Co-γ-Fe2O3. The latter is thought to be a solid solution of γ-Fe2O3 and CoFe2O3, and is represented by the chemical formula (Co(y)Fe(8-2y)/3)O4(γ-Fe2O3). The ratio of Co is varied to change the coercivity. As compared with the case that these are formed on a glass substrate, a high coercivity increased 1.5 to 2 times is exhibited in the same thickness as that of these formed on the oxide underlayer, and when the Co/Fe ratio is 0.08, a coercivity of 2.6 kOe in 10 nm.

Example 4

[**0061**] Before forming the magnetic domain control layer of Example 1 (1), as shown in **FIG. 7**, portions **701** are formed with MnZn ferrite as a soft magnetic layer having high electric resistivity, an insulator and a metal magnetic material are alternately laminated, or there is formed a granular layer in which these are sputtered at the same time into a mixed state, for example, a layer by laminating, by 25 number of layers, Co90Fe10 layers having a thickness of 1.4 nm and Al2O3 layers having a thickness of 1.0 nm. Thereafter, the outside of the layer is removed by the ion milling in the position several mm away from the outer peripheral portion of the magnetoresistive sensor layer, and then metal magnetic layers such as CoCrPt as represented by **502** are formed in the removed portions. This structure has no shunting since the metal magnetic domain control layers **502** are not in direct contact with the magnetoresistive sensor layer. However, since a layer with soft magnetic properties is disposed therebetween, the magnetic field of the magnetic domain control is effectively applied to the magnetoresistive sensor layer.

Example 5

[**0062**] In the magnetoresistive sensor with the magnetoresistive sensor layer is exposed, according to a three-dimensional schematic diagram exploding the structure of the magnetoresistive sensor, as shown in **FIG. 10**, the magnetic domain control layers **106** are arranged on opposite ends of the magnetoresistive sensor layer **105**, and the magnetic shields **103** and **109** are disposed at the upper and lower sides thereof. In the present invention described in the above examples, the layer **106** is a material having high electric resistivity. There is a magnetoresistive sensor of another structure, that is, a magnetoresistive sensor provided with a yoke structure as the write sensor. **FIG. 11** is a three-dimensional diagram schematically showing a representative yoke structure and the magnetic domain control layer. In this structure, a magnetoresistive sensor layer **1105** is not exposed from the surface opposite the media. In the gap between a lower magnetic shield **1103** and an upper magnetic shield **1107**, made of Ni81Fe19, are arranged yoke layers made of a similar soft magnetic material. The properties of this structure described below are observed. In **FIG. 11**, the yoke layers in C ring form consist of an upper yoke **1106** joined to a lower yoke **1102**. Other than this, the lower yoke is reduced on the end thereof, or has a thick film, or the yoke is discontinuous under the magnetoresistive sensor layer. In the diagram, a magnetic domain control layer **1101** is shown. The magnetic domain control layer having high electric resistivity shown in Example 1 of the present invention is used as the layer. This magnetic domain-controls at least the lower yoke and the magnetoresistive sensor layer and has no shunting in the periphery. The magnetic domain control layer has a type for magnetic domain-controlling the upper and lower yoke layers and the magnetoresistive sensor layer at the same time, and a type for magnetic domain-controlling each. In either structure, it is found that the good magnetic domain control is possible without shunting.

[**0063**] The above-mentioned **FIG. 11** is a block diagram for simply showing the position of the magnetic domain control layer in the yoke structure. In detail, the magnetic domain control layer is manufactured in a structure of the magnetoresistive sensor layer as one example of the present invention viewed from the media-opposed surface and a structure represented by the diagram showing a section of the depth direction, as shown in **FIGS. 8 and 9**.