applying a bias magnetic field to the free layer **7**, it has been found with respect to the crystallographic orientation of the Co alloy magnetic film that the coercivity is lowered and the magnetic operation of the free layer **7** is instable in the structure where the C axis of the hexagonal closed packed polycrystal structure is directed vertically relative to the film plane (**FIG. 6**: State A3) and the magnetic operation of the free layer **7** is instable in a structure where the C axis of the hexagonal closed packed polycrystal structure is directed in parallel relative to the film plane (**FIG. 6**: State C). That is, it has been found that the magnetic operation of the free layer is instable when the C axis crystal orientation of the Co alloy magnetic field of the magnetic domain control film **11** has a specified intense orientation relative to the film plane. It is generally considered that the C axis is preferably oriented within the film plane for increasing the bias magnetic field (**FIG. 6**: State C), but it is estimated that a portion with a reduced thickness at the top end of the magnetic domain control film **11** is present above the stack of magnetoresistive layers and, accordingly, magnetization by intense C axis orientation generates variations in the state of magnetization at the topmost end, so that the bias magnetic field applied to the free layer **7** is varied, making magnetic operation of the free layer instable. With the reason described above, the Co alloy magnetic film is preferably an isometric polycrystal thin film having no particular orientation of C axis (**FIG. 6**: State B), which is attained by neither Cr (110) face nor Cr(100) face of body-centered cubic lattice but by isometric orientation (**FIG. 6**: State B) of the Cr underlayer.

[**0064**] The present invention is based on the finding of the fact that the crystal state of the Co alloy thin film (magnetic domain control film **11**) on the Cr underlayer can be controllably adjusted by using the amorphous alloy thin film **9**. As a result, it has been found that the Co alloy thin film is most preferably in a state of the isometric orientation of State B or non-orientation.

[**0065**] By the application of the structure shown in **FIG. 1** and the manufacturing process described above, it is possible to align the height of the free layer **7** with that of the Co alloy magnetic film of the magnetic domain control film **11** and apply an optimal bias magnetic field. Further, it is also possible to adjust the composition of the Co alloy magnetic film and increase the saturation magnetic flux density to localize an intense bias magnetic field and apply the same to the free layer **7**. That is, as shown in **FIG. 4**(*a*) and in **FIG. 2**, the end of the stack of magnetoresistive layers is etched only to the surface of the fixed layer ferromagnetic body **5** or to the intermediate portion of the fixed layer ferromagnetic body **5** by ion beam etching, while leaving the fixed layer ferromagnetic film **5**. The bias magnetic field should usually be applied only to the free layer **7** and, when the saturation magnetic flux density of the Co alloy magnetic film is increased and the thickness of the magnetic domain control film **11** is reduced to a thickness less than that of the free layer, it is possible to attain a structure capable of applying the bias magnetic field only to the free layer **7**, which provides more preferred application system. The localization of the bias magnetic field can decrease the magnetic field intensity applied to the pinned layer **5** and eliminate the cause for forming the dead area.

[**0066**] The structure described above can be formed by substantially the same manufacturing steps as those for the existent structure. **FIG. 5** shows a schematic cross sectional view for manufacturing steps. A lift-off photoresist is coated and formed on a stack of magnetoresistive layers-thin film (**FIG. 5**(*a*)). The resist has a two-stepped structure in which the lateral size of a lower resist **21** is made narrower than that of an upper resist **22**, so that the photoresist can be peeled and removed easily even after the formation of the magnetic domain control film **11** and the electrode film **12**. Thus, even after the deposition of the magnetic domain control film **11** and the electrode film **12**, a gap is formed between the deposition film formed on the resist and the deposition film formed at the end of the stack of magnetoresistive layers, which facilitates removal of the resist by the wet processing even after film formation. The track width of the stack of magnetoresistive layers is determined depending on the width of the upper resist.

[**0067**] Then, a portion of the magnetoresistive laminate thin film is etched and removed by the dry etching process. **FIG. 5**(*b*) shows a cross sectional shape after the etching treatment. For the dry etching method, an ion beam etching process is used and conditions capable of transferring the size of the track width of the upper resist to the shape after etching as exactly as possible and conditions capable of making the angle at the end of the free layer abrupt are selected. In the magnetic sensor of the existent structure, etching is applied as far as the Al_3O_3 layer of the lower gap layer **2** but etching is applied in the case of the structure of the present invention as far as the anti-ferromagnetic layer **4** constituting the pinned layer, or the ferromagnetic layer **5** constituting the pinned layer, or the non-magnetic layer **6**. The etching depth is determined such that the height of the magnetic domain control film **11** is substantially aligned with the height of the free layer **7**. Control of the depth position can easily be controlled by controlling the ion beam etching time. The depth of the ion beam etching can be made 3% or less within the plane of the substrate and between substrates by using, for example, a technique of applying etching while monitoring the etching depth by simultaneously conducting observation by SiMs analysis during ion beam etching to sufficiently ensure the reproducibility.

[**0068**] During ion beam etching, etched substances are deposited on the lateral side of the resist to form a re-deposition layer **23**. Therefore, the size of the track width of the upper resist end does not completely agree with the track width of the free layer, and the angle of inclination at the end of the free layer is moderated by the re-deposition layer. The conditions of the resist size and the conditions of the ion beam etching are selected such that the angle of inclination at the end of the free layer becomes abrupt as much as possible. The angle at the end of the free layer **7** is preferably at a an acute high angle. It is desirable to conduct manufacture under the processing conditions such that the angle at the end is 45° or more. When the angle at the end is 45° or less, the angle at the end of the magnetic domain control film **11** is also decreased to 45° or less, by which the residual magnetic flux density is lowered, making it difficult to form an intense bias magnetic field.

[**0069**] Subsequently, a magnetic domain control film amorphous layer **9**, a magnetic domain control film underlayer **10**, a magnetic domain control film layer **11** and an electrode film layer **12** are formed continuously by using a sputtering process. **FIG. 5**(*c*) shows a schematic cross sectional view after forming the deposition films. The mag-