[0083] **FIG. 6** is a schematic cross sectional view for explaining the state of crystal orientation based on X-ray diffractiometry for the magnetic domain control film and the magnetic domain control underlayer according to the present invention. Indication of the orientation face is in accordance with X-ray observation face.

[0084] State A1 shows a case in which crystal grains with the C axis of hexagonal closed packed lattice of a magnetic domain control Co alloy thin film are vertical and parallel relative to the film plane are mixed, with no predominant orientation to one of them.

[0085] State A2 shows a case where the C axis of a hexagonal closed packed lattice of the magnetic control Co alloy thin film vertical with respect to the film plane.

[0086] State A3 shows a case where the C axis of a hexagonal closed packed lattice of the magnetic control film Co alloy thin film vertical with respect to the film plane.

[0087] State C shows a case where the C axis of a hexagonal closed packed lattice of the magnetic control Co alloy thin film is parallel with respect to the film plane.

[0088] State B shows a case in which the C axis of the hexagonal closed packed lattice of the magnetic domain control film Co alloy thin film is oriented isometrically neither parallel nor vertical with respect to the film plane with no characteristic orientation. The situation of State B can be obtained by controlling the oxidation conditions for the surface of the magnetic domain control amorphous film.

[0089] In the case of Co crystals, it has been confirmed also experimentally on simulation that the crystal magnetic anisotropy thereof is in the direction of the C axis and were developed coercivity in the direction of the C axis. Since the crystal magnetic anisotropy is in the vertical direction by the orientation of the C axis of the Co crystal in the direction vertical to the film plane, the coercivity along the direction in the film plane is lowered. The crystal orientation of the CoCrPt/Cr thin film formed on the NiTa amorphous film is in the state of State C in **FIG. 6** of Cr(200) Co(11.0), and it is probable that the C axis of the CoCrPt film is in parallel with the film plane and, accordingly, the direction of the crystal magnetic anisotropy is in the film plane to increase the coercivity within the film plane.

[0090] By the use of the NiTa amorphous film as the underlayer for the CoCrPt/Cr film, good magnetic properties of the CoCrPt thin film are obtainable even on the thin film in a state of stopping the ion beam etching at the intermediate portion of the stack of magnetoresistive layers-thin film. Thus, a reading head was prepared actually to demonstrate the properties. The read track width was 0.2 μm and the reading head was prepared by the manufacturing method described above. The residual magnetization of the magnetic domain control film **11** was set to 200 Gμm in this case. As a result, when the properties of the head were compared with those of a head of an existent structure having the same residual magnetization, substantially the same properties of the head could be obtained, with good head sensitivity, output fluctuation and noise properties, with no generation of Barkhausen noise. Further, while the CoFe film was used as the pinned layer **5** in this embodiment, good magnetic properties, head sensitivity and noise properties could be obtained in the same manner also in a case of using a pinned layer of a stacked ferri structure. Further, while an explanation has been made of the stack of magnetoresistive layers-underlayer **3** of the two-layered constitution, the same effect can be attained also with the three-layered constitution, which is within the scope of the present invention. Further, the ion beam etching depth is not restricted to the depth level at the underlayer **3**, the anti-ferromagnetic layer **4** and the ferromagnetic layer **5** of the pinned layer in the stack of magnetoresistive layers, but good head properties can be obtained also at the level of the non-magnetic layer **6**. Further, the depth may be at the intermediate position of each of the layers.

EMBODIMENT 2

[0091] **FIG. 2** shows a second embodiment of the present invention showing a structure of an arrangement in which the central height of the free layer and the central height of a magnetic domain control film at a position near the free layer are aligned with each other and a cross sectional structure in a case where the thickness of the magnetic domain control film is formed into a thickness less than that of the free layer. Portion A shows a joined portion between the end of the stack of magnetoresistive layers and the stack of films from the magnetic domain control underlayer to the electrode film, and details of portion A specifically describe the structure.

[0092] To demonstrate the effect of the present invention, the state of applying the magnetic domain control film bias magnetic field has to be evaluated specifically. To specifically evaluate whether the bias magnetic field of the magnetic domain control film **11** is properly applied to the free layer **7** or not, an external magnetic field was applied to operate the free layer **7** and a transfer curve as the magnetic resistance curve in this case was measured to conduct evaluation. The evaluation method is to be described.

[0093] **FIG. 7** shows the operating principle of the transfer curve. As the external magnetic field, an alternating magnetic field at ±700 (Oe) is applied in a direction (hMR direction) perpendicular to the direction of the track width (Tw direction) to measure the magnetic resistance. The example is shown as a ΔVH waveform in **FIG. 7**(*a*). In the actual measurement, reproducibility of waveforms has also to be taken into consideration and the ΔVH waveform is measured as an average of measurements made 30 times. The magnetic resistance is minimized when the magnetizing direction of the free layer is directed to the direction identical with the magnetizing direction of the pinned layer by the external magnetic field (**FIG. 7**(*b*)). The magnetic resistance is maximized when the magnetizing direction of the free layer is directed to the direction opposite to the magnetizing direction of the pinned layer by the external magnetic field (**FIG. 7**(*d*)). When the external magnetic field is zero or removed, the free layer has to be directed in a direction perpendicular to the magnetizing direction of the pinned layer by the magnetic domain control magnetic field (bias magnetic field) and the induced magnetic anisotropy added to the free layer (**FIG. 7**(*c*)). The magnetic resistance takes an intermediate value between the maximum and minimum values in this case.

[0094] In a case where the magnetic domain control bias magnetic field applied to the free layer is insufficient or inappropriate, a deviation is caused in the waveforms near the zero magnetic field of the ΔVH transfer curve or the