thereby resulting in high reproduction output, compared with the conventional magnetoresistive-effect devices.

[0577] One of the reasons for the increase in the reproduction output is that the sense current flows with ease from the electrode layer **318** into chiefly the nonmagnetic electrically conductive layer **313** of the multilayer film **316**, leading to a large magnetoresistive effect.

[0578] The magnetoresistive effect is exhibited by the three layers of the pinned magnetic layer **312**, the nonmagnetic electrically conductive layer **313**, and the free magnetic layer **314**. The magnetization direction of the pinned magnetic layer **312** is pinned in the Y direction, and the magnetization of the free magnetic layer **314**, aligned in the direction of the track width (i.e., the X direction), freely varies in response to the external magnetic field. When the magnetization of the free magnetic layer **314** varies in response to the external magnetic field, the sense current flows into the nonmagnetic electrically conductive layer **313**. When electrons move from one of the free magnetic layer **314** and the pinned magnetic layer **312** to the other, the electrons scatter in the interface between the nonmagnetic electrically conductive layer **313** and the pinned magnetic layer **312** or in the interface between the nonmagnetic electrically conductive layer **313** and the free magnetic layer **314**, causing the electrical resistance to vary. A voltage change in response to the electrical resistance variation gives rise to a reproduction output.

[0579] As shown in **FIG. 35**, in accordance with the present invention, the electrode layers **318** and **318** are formed to extend over the multilayer film **316** so that the sense current directly flows from the electrode layer **318** into the multilayer film **316**. The sense current also flows into the free magnetic layer **314** on top of the nonmagnetic electrically conductive layer **313** of the multilayer film **316**, although the sense current chiefly flows into the nonmagnetic electrically conductive layer **313** with ease.

[0580] In contrast, the conventional magnetoresistive-effect device shown in **FIG. 33** is designed so that the sense current flows from the electrode layer **8** via the hard bias layer **5** to the multilayer film **9** from its side face (in the X direction). With this arrangement, the sense current shunts to not only the nonmagnetic electrically conductive layer **3** but also the antiferromagnetic layer **1**, the pinned magnetic layer **2** and the free magnetic layer **4**. The quantity of the sense current flowing into the nonmagnetic conductive layer **3** is reduced.

[0581] Compared with the construction of the conventional magnetoresistive-effect device, the construction of the magnetoresistive-effect device in this embodiment allows the sense current to substantially flow into the nonmagnetic electrically conductive layer **313**. A large magnetoresistive effect results, improving the reproduction output.

[0582] With the pinned magnetic layer **312** employed, the sense current is less likely to shunt into the hard bias layer **317** from the electrode layer **318** even if the thickness h2 of the electrode layer **318** formed in contact with the multilayer film **316** is made thinner. This arrangement allows the sense current to directly flow into the multilayer film **316** from the electrode layer **318**.

[0583] The use of the thin electrode layer **318**, having a thickness of h**2**, formed in contact with the multilayer film **316** reduces the size of a step between the top surface of the electrode layer **318** and the top surface of the multilayer film **316**. This arrangement allows an upper gap layer **379** to be formed over the border area between the electrode layer **318** and the multilayer film **316** with an improved step coverage and with no film discontinuity involved, and provides sufficient insulation.

[0584] However, there is a limitation on the extension of the electrode layer **318** over the multilayer film **316**. Referring to **FIG. 35**, the portion, having the width dimension T2, in the center of the multilayer film **316** is the sensitive region E, while the portions, each having the width dimension T1, on both sides of the sensitive region. E are the insensitive regions D and D.

[0585] In the sensitive region E, the magnetization of the pinned magnetic layer **312** is correctly pinned in the Y direction as shown. Since the magnetization of the free magnetic layer **314** is correctly aligned in the X direction, the magnetization of the pinned magnetic layer **312** is perpendicular to the magnetization of the free magnetic layer **314**. The magnetization of the free magnetic layer **314** in the sensitive region E varies sensitively in response to an external magnetic field from the recording medium. In other words, the sensitive region E is a portion that substantially exhibits the magnetoresistive effect.

[0586] In contrast, in the insensitive regions D and D arranged on both sides of the sensitive region E, the magnetizations of pinned magnetic layer **312** and the free magnetic layer **314** are greatly affected by the hard bias layers **317** and **317**, and the magnetization of the free magnetic layer **314** is less susceptible to the external magnetic field. In other words, the insensitive regions D and D provide a weak magnetoresistive effect with a reproduction capability thereof reduced.

[0587] In the twentieth embodiment of the present invention, the width dimension T2 of the sensitive region E, and the width dimension of the insensitive region D of the multilayer film **316** are measured through the previously discussed micro track profile method (see **FIG. 31**).

[0588] Referring to **FIG. 35**, in this embodiment of the present invention, the electrode layers **318** and **318** directly formed on the hard bias layers **317** and **317** on both sides of the multilayer film **316** are formed to extend over the insensitive region D of the multilayer film **316** by a width dimension of T3. The width dimension of the top surface of the multilayer film **316** not covered with the electrode layers **318** and **318** is defined as an optical read track width O-Tw measured through an optical method.

[0589] The width dimension T2 of the sensitive region E not covered with the electrode layers **318** and **318** substantially functions as a track width, and this width dimension is defined as a magnetic read track width M-Tw.

[0590] In the twentieth embodiment shown in **FIG. 35**, the optical read track width O-Tw, the magnetic read track width M-Tw, and the width dimension T2 of the sensitive region E substantially have the same dimension.

[0591] In the twentieth embodiment of the present invention, the electrode layer **318** overlaps the insensitive regions D and D of the multilayer film **316**. The sense current is more likely to dominantly flow from the electrode layer **318**