film **202**. The width dimension of the top surface of the multilayer film **202** not covered with the electrode layers **91** and **91** is the optical read track width O-Tw.

[**0329**] The magnetic read track width M-Tw, determined by the width dimension of the sensitive region E not covered with the electrode layers **91** and **91**, is a width dimension T**48**, which is also the dimension of the sensitive region E.

[**0330**] In the twelfth embodiment, the electrode layers **91** and **91** formed on the multilayer film **202** fully cover the insensitive regions D and D, setting the optical read track width O-Tw and the magnetic read track width M-Tw (i.e., the width dimension of the sensitive region E) to approximately the same dimension.

[**0331**] It is not a requirement that the electrode layers **91** and **91** formed above the multilayer film **202** fully cover the insensitive regions D and D, and the electrode layer **91** may be narrower than the insensitive region D. In this case, the optical read track width O-Tw becomes larger than the magnetic read track width M-Tw.

[**0332**] The percentage of the sense current flowing from the electrode **91** to the multilayer film **202** without passing through the hard bias layers **89** and **89** is increased in this invention.

[**0333**] The electrode layers **91** and **91** extending over the insensitive regions D and D prevent the sense current from flowing into the insensitive regions D and D, thereby controlling the generation of noise.

[**0334**] The width dimension T**50** of each of the electrode layers **91** and **91** extending over the insensitive region D of the multilayer film **202** preferably falls within a range from 0 μm to 0.08 μm. More preferably, the width dimension T**50** of each of the electrode layers **91** and **91** falls within a range from 0.05 μm to 0.08 μm.

[**0335**] The angle θ**12** made between the top surface of the multilayer film **202** with the protective layer **15** removed, namely, the top surface **80***a* of the antiferromagnetic layer **80** in **FIG. 12**, and an end face **91***a* of the electrode layer **91** extending over the insensitive region of the multilayer film **202** is preferably 20 degrees or greater, and more preferably 25 degrees or greater. This arrangement prevents the sense current from shunting into the insensitive region, thereby controlling the generation of noise.

[**0336**] To prevent a short which is likely to occur between the electrode layers **91** and **91** and a top shield layer of a soft magnetic material when the top shield layer is deposited over the protective layer **15** and the electrode layers **91** and **91**, the angle θ**12** made between the top surface **80***a* and the end face **91***a* is preferably 60 degrees or smaller, and more preferably, 45 degrees or smaller.

[**0337**] Referring to **FIG. 12, a** magnetic coupling junction M between the multilayer film **202** and each of the hard bias layers **89** and **89** is fabricated of an interface with the end face of only the second free magnetic layer **87**, of both the first free magnetic layer **85** and the second free magnetic layer **87**. This arrangement controls the disturbance in the magnetization direction on both end portions in the free magnetic layer, permitting the width dimension T**48** of the sensitive region E to be enlarged.

[**0338**] As shown in **FIG. 12**, the protective layer **15** is deposited where the multilayer film **202** has no electrode layers **91** and **91** formed thereon. The electrode layers **91** and **91** are connected to the antiferromagnetic layer **80** with no protective layer **15** interposed therebetween.

[**0339**] This arrangement presents a smaller electrical resistance than the arrangement in which the electrode layers **91** and **91** are laminated on the protective layer **15**, improving the characteristics of the magnetoresistive-effect device.

[**0340**] **FIG. 13** is a cross-sectional view showing the magnetoresistive-effect device of a thirteenth embodiment of the present invention, viewed from an ABS side thereof.

[**0341**] This spin-valve type thin-film device is a so-called dual spin-valve type thin-film device, which includes a nonmagnetic material layer **106**, a first free magnetic layer **105** and a second free magnetic layer **107**, respectively lying under and over the nonmagnetic material layer **106**, nonmagnetic electrically conductive layers **104** and **108**, respectively lying under the first free magnetic layer **105** and over the second free magnetic layer **107**, a first pinned magnetic layer **103** and a third pinned magnetic layer **109**, respectively lying under the nonmagnetic electrically conductive layer **104** and over the nonmagnetic electrically conductive layer **108**, nonmagnetic layers **102** and **110**, respectively lying under the first pinned magnetic layer **103** and over the third pinned magnetic layer **109**, a second pinned magnetic layer **101** and a fourth pinned magnetic layer **111**, respectively lying under the nonmagnetic material layer **102** and over the nonmagnetic material layer **110**, and antiferromagnetic layers **100** and **112**, respectively lying under the second pinned magnetic layer **101** and over the fourth pinned magnetic layer **111**. The dual spin-valve type thin-film device provides a reproduction output higher in level than that of the spin-valve type thin-film devices (i.e., so-called single spin-valve type thin-film devices) shown in **FIG. 11** through **FIG. 13**. The layer lying at the bottom is a substrate **10**, while the layer lying on the top is a protective layer **15**. The laminate, composed of the layers from the substrate **10** through the protective layer **15**, constitutes a multilayer film **203**.

[**0342**] Referring to **FIG. 13**, the antiferromagnetic layer **100** extends on and along the substrate **10** in the X direction with a central portion thereof projected upward.

[**0343**] In the thirteenth embodiment, the antiferromagnetic layers **100** and **112** are made of a Pt—Mn (platinum-manganese) alloy. Instead of the Pt—Mn alloy, the antiferromagnetic layers **100** and **112** may be made of an X—Mn alloy where X is a material selected from the group consisting of Pd, Ir, Rh, Ru, and alloys thereof, or a Pt—Mn—X' alloy where X' is a material selected from the group consisting of Pd, Ir, Rh, Ru, Au, Ag, and alloys thereof.

[**0344**] The first free magnetic layer **105**, the second free magnetic layer **107**, the first pinned magnetic layer **103**, the second pinned magnetic layer **101**, the third pinned magnetic layer **109**, and the fourth pinned magnetic layer **111** are made of an Ni—Fe (nickel-iron) alloy, Co (cobalt), an Fe—Co (iron-cobalt) alloy, or an Fe—Co—Ni alloy, and the nonmagnetic electrically conductive layers **104** and **108** are made of a low electrical-resistance nonmagnetic electrically conductive material, such as Cu (copper).

[**0345**] Referring to **FIG. 13**, each of metallic layers **113** and **113**, made of Cr or the like, and functioning as a buffer layer or a alignment layer, extends from a horizontal portion