bias layers **163** and **163** is thinner in the regions thereof in contact with the multilayer film **161**, and the top surface of the hard bias layers **163** and **163** are downwardly inclined or curved toward the multilayer film **161** as shown. Referring to **FIG. 17, a** layer **163***a* having the same composition as that of the hard bias layers **163** and **163** is formed on top of the resist layer **162**.

[**0408**] In the manufacturing step shown in **FIG. 17**, the hard bias layers **163** and **163** are preferably formed so that the height position of the top edge or the bottom edge (in the Z direction) of the magnetic coupling junction between the multilayer film **161** and each of the hard bias layers **163** and **163** is at the same level as the height position of the top surface or the bottom surface of the free magnetic layer or the magnetoresistive-effect layer in the direction of the advance of the recording medium.

[**0409**] It is sufficient if each of the hard bias layers **163** and **163** is magnetically coupled with the free magnetic layer only or the magnetoresistive-effect layer only. The influence of the magnetic field generated from the bias layers **163** and **163**, on the magnetization direction of the pinned magnetic layer, is controlled if the hard bias layers **163** and **163** remain magnetically uncoupled with the pinned magnetic layer.

[**0410**] If the multilayer film **161** includes a free magnetic layer which is composed of a plurality of soft magnetic thin-film layers having different magnetic moments and separated from each other by nonmagnetic material layers, like the multilayer film of one of the thin-film devices shown in **FIG. 10** through **FIG. 13**, the hard bias layers **163** and **163** are preferably formed so that the magnetic coupling junction between the multilayer film **161** and each of the hard bias layers **163** and **163** is fabricated of an interface with the end face of only one of the plurality of the soft magnetic thin-film layers forming the free magnetic layer.

[**0411**] If the magnetic coupling junction between the multilayer film **161** and each of the hard bias layers **161** and **161** is fabricated of an interface with the end face of only one of the plurality of the soft magnetic thin-film layers forming the free magnetic layer, the magnetization direction of the soft magnetic thin-film layer on both end portions is free from disturbance.

[**0412**] In a manufacturing step shown in **FIG. 18**, the electrode layers **165** and **165** are obliquely grown on the hard bias layers **163** and **163** at an angle to the multilayer film **161**. In this case, the electrode layers **165** and **165** are grown into the undercuts **162***a* and **162***a* formed on the underside of the resist layer **162** arranged on top of the multilayer film **161**.

[**0413**] Referring to **FIG. 18, a** target **166** having the same composition as that of the electrode layer **165** is inclined at an angle to the substrate **160** having the multilayer film **161** formed thereon, and the electrode layers **165** and **165** are grown on the hard bias layers **163** and **163** using the ion-beam sputtering method while moving the target **166** transversely across the substrate **160**. The electrode layers **165** and **165** sputtered at an angle to the multilayer film **161** are formed not only on the hard bias layers **163** and **163** but also into the undercuts **162***a* and **162***a* of the resist layer **162**. Specifically, the electrode layers **165** and **165** formed within the undercuts **162***a* and **162***a* are grown on the insensitive regions D and D of the multilayer film **161**.

[**0414**] Referring to **FIG. 18**, the target **166** is moved at an angle with respect to a fixed substrate **160**. Alternatively, the substrate **160** may be moved at an angle with respect to a fixed target **166**. As shown in **FIG. 18, a** layer **165***a* having the same composition as the electrode layers **165** and **165** is deposited on top of the layer **163***a* on the resist layer **162**.

[**0415**] When the portions of the protective layer, formed on top of the multilayer film **161** and having no contact with the resist layer **162**, are removed to expose the underlayers beneath the protective layer, the electrode layers **165** and **165** are deposited on and in direct contact with the free magnetic layer, the antiferromagnetic layer or the magnetoresistive-effect layer beneath the protective layer as in the magnetoresistive-effect devices shown in **FIG. 11** through **FIG. 14**.

[**0416**] In a manufacturing step shown in **FIG. 19**, the resist layer **162** shown in **FIG. 18** is removed through a lift-off process, and this completes a magnetoresistive-effect device having the electrode layers **165** and **165** formed on top of the insensitive regions D and D of the multilayer film **161**.

[**0417**] In the film forming process of the electrode layers **165** and **165**, the angle θ made between the end face **165***b* of the electrode layer **165** formed into the undercut **162***a* and the top surface **161***a* of the multilayer film **161** 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.

[**0418**] In the manufacturing method shown in **FIG. 15** through **FIG. 19**, increasing the angle θ made between the top surface **161***a* and the end face **165***b* is difficult. If the angle θ made between the top surface **161***a* and the end face **165***b* is too large, a short is likely to occur between the electrode layers **165** and **165** and a top shield layer of a soft magnetic material when the top shield layer is deposited over the multilayer film **161** and the electrode layers **165** and **165**. The angle θ made between the top surface **161***a* and the end face **165***b* is preferably 60 degrees or smaller, and more preferably, 45 degrees or smaller.

[**0419**] **FIG. 20** is a cross-sectional view showing the magnetoresistive-effect device of a fifteenth embodiment of the present invention, viewed from an ABS side thereof.

[**0420**] The magnetoresistive-effect device shown in **FIG. 20** includes, on the multilayer film **200** having the same construction as the one in the magnetoresistive-effect device shown in **FIG. 10, a** laminated insulator layer **131** constructed of $Al_2O_3$, and electrode layers **130** and **130** with end their faces **130***a* and **130***a* in direct contact with both sides of the insulator layer **131**.

[**0421**] The construction and materials of the layers of the multilayer film **200** remain the same as those of the magnetoresistive-effect device shown in **FIG. 10**.

[**0422**] Metallic layers **76** and **76**, hard bias layers **77** and **77** and intermediate layers **78** and **78**, coextending the width dimension T**56** of the antiferromagnetic layer **70** extending in the X direction, are identical, in construction and material, to the counterparts in the magnetoresistive-effect device shown in **FIG. 10**.