[0544] Specifically, the electrode layers **156** and **156** formed within the undercuts **153***a* and **153***a* are grown on the insensitive regions D and D of the multilayer film **151**.

[0545] The end face **156***b* of each of the electrode layers **156** and **156** is in contact with both side walls of the insulator layer **152**.

[0546] Referring to **FIG. 29**, the target **157** is moved at an angle with respect to a fixed substrate **150**. Alternatively, the substrate **150** is moved at an angle with respect to a fixed target **157**. As shown in **FIG. 29, a** layer **156***a* having the same composition as that of the electrode layers **156** and **156** is formed on top of the layer **154***a* on the resist layer **154**.

[0547] When the portions of the protective layer, formed on top of the multilayer film **151**, are removed to expose the underlayer beneath the protective layer, the electrode layers **156** and **156** are formed on the free magnetic layer beneath the protective layer as in the magnetoresistive-effect device shown in **FIG. 21**.

[0548] In a manufacturing step shown in **FIG. 30**, the resist layer **153** shown in **FIG. 29** is removed through a lift-off process, and this completes a magnetoresistive-effect device having the electrode layers **156** and **156** formed on top of the insensitive regions D and D of the multilayer film **151** and the insulator layer **152** formed between the electrode layers **156** and **156**.

[0549] In the film forming process of the electrode layers **156** and **156**, the angle θ made between the end face **156***b* of the electrode layer **156** extending over the insensitive region D and in contact with the side walls of the insulator layer **152** and the top surface **151***a* of the multilayer film **151** is preferably 60 degrees or greater, and more preferably 90 degrees or greater. This arrangement allows a certain quantity of sense current to continuously flow through the electrode layer **156**, way down to the tip thereof. The magnetoresistive-effect device manufactured in this way is more effective than the magnetoresistive-effect devices shown in **FIG. 1** through **FIG. 14** in the prevention of the sense current from shunting into the insensitive region, thereby in the control of the generation of noise.

[0550] Since the location of the insulator layer **152** on the multilayer film **151** is accurately set, the electrode layers **156** and **156** are prevented from extending beyond the insensitive region and from narrowing the area of the magnetoresistive-effect device capable of detecting the magnetic field.

[0551] Tests have been conducted to measure the relationship of the width dimension of each electrode, formed to extend over the multilayer film constituting the magnetoresistive-effect device, with the direct current resistance (DCR) and the noise generation rate.

[0552] The magnetoresistive-effect device tested in measurements is a spin-valve type thin-film device shown in **FIG. 5**. The width dimension of the top surface of the multilayer film in the magnetoresistive-effect device is 1.4 μm.

[0553] The electrode layers formed on both sides and above the multilayer film extend over the multilayer film. The width dimension of the electrode layer extending over the multilayer film is increased from 0 μm to 0.12 μm in steps of 0.01 μm to produce a plurality of magnetoresistive-effect devices. In each of the magnetoresistive-effect devices, the relationship of the width dimension of each electrode, formed to extend over the multilayer film, with the direct current resistance (DCR) and the noise generation rate, is measured. The test results are plotted in **FIG. 32**.

[0554] **FIG. 32** shows that the larger the width dimension of the electrode layer extending over the multilayer, the smaller the direct current resistance. When the electrode layer is formed on the multilayer film with its width dimension enlarged, the electrode layer covers the insensitive region D in the side end portion of the multilayer film, and the sense current from the electrode layer is effectively conducted to the sensitive region E. As the junction area of the electrode layer with the multilayer film is increased, the direct current resistance is reduced.

[0555] As shown in **FIG. 32**, when the width dimension of the electrode layer extending over the multilayer film is 0.08 μm, the direct current resistance is smaller than the one with no electrode layer formed at all on the multilayer film (i.e., the direct current resistance at an electrode layer width dimension of 0 μm) and no noise is generated in the reproduction output.

[0556] It is found that an excessively large width dimension of the electrode layer formed on the multilayer film generates noise in the reproduction output.

[0557] The noise generation rate rises as shown in **FIG. 32**, when the width dimension of the electrode layer formed on the multilayer film increases above 0.08 μm. This is because the area of the multilayer film as wide as 0.08 μm from its edge is the insensitive region D. If the electrode layer extends beyond the 0.08 μm area, the electrode layer extends into the sensitive region E. Although the sensitive region E exhibits effectively the magnetoresistive effect, a portion of the sensitive region E having the electrode layer deposited thereon falls outside the magnetic read track width M-Tw, and the output produced therein becomes noise. The test results show that the electrode layer extending over the multilayer film preferably extends over the insensitive region D but not into the sensitive region E beyond the insensitive region D.

[0558] From the above discussion, the width dimension of the electrode layers on both sides of the multilayer film is preferably within a range from 0 μm to 0.08 μm.

[0559] In accordance with the present invention, the electrode layers, above and on both sides of the multilayer film, are formed to extend over the insensitive regions, on both side portions of the multilayer film, having a poor magnetoresistive effect without reproduction capability. This arrangement makes it easier for the sense current to flow into the multilayer film from the electrode layers without passing through the hard bias layers. The junction area between the electrode layers and the multilayer film thus increases, reducing the direct current resistance, and thereby improving the reproduction characteristics.

[0560] In accordance with the present invention, the electrode layers are formed to reliably and easily extend over the insensitive regions of the multilayer film with the lift-off resist employed, using the ion-beam sputtering method.

[0561] **FIG. 35** is a cross-sectional view showing the construction of the magnetoresistive-effect device of a twentieth embodiment of the present invention, viewed from an