thereof coextending a width dimension T51 of the antiferromagnetic layer **100** in the X direction, rising along the side end faces of the second pinned magnetic layer **101**, the nonmagnetic material layer **102**, the first pinned magnetic layer **103**, the nonmagnetic electrically conductive layer **104**, and the first free magnetic layer **105**. The use of the metallic layers **113** and **113** helps increase the strength of the bias magnetic field created by hard bias layers **114** and **114** to be described later.

[**0346**] Deposited on top of the metallic layers **113** and **113** are the hard bias layers **114** and **114** which are made of a Co—Pt (cobalt-platinum) alloy or a Co—Cr—Pt (cobalt-chromium-platinum) alloy.

[**0347**] Intermediate layers **115** and **115**, made of a nonmagnetic material such as Ta, are respectively deposited on the hard bias layers **114** and **114**. Electrode layers **116** and **116**, made of Cr, Au, Ta, or W, are respectively deposited on top of the intermediate layers **115** and **115**.

[**0348**] Since the antiferromagnetic layer **100** extends beneath and along the hard bias layers **114** and **114** as shown in **FIG. 13**, the thickness of the hard bias layers **114** and **114** can be made thinner. The hard bias layers **114** and **114** are thus easily produced using a sputtering technique.

[**0349**] Referring to **FIG. 13**, the first pinned magnetic layer **103** and the second pinned magnetic layer **101**, having different magnetic moments, are laminated to each other with the nonmagnetic material layer **102** interposed therebetween, and function as a single pinned magnetic layer P_1. The third pinned magnetic layer **109** and the fourth pinned magnetic layer **111**, having different magnetic moments, are laminated to each other with the nonmagnetic material layer **110** interposed therebetween, and function as a single pinned magnetic layer P_2.

[**0350**] The first pinned magnetic layer **103** and the second pinned magnetic layer **101** are in a ferrigmagnetic state with magnetization directions thereof being antiparallel, namely, 180 degrees opposite from each other, and the magnetization direction of the first pinned magnetic layer **103** and the magnetization direction of the second material layer **101** mutually pin each other. The magnetization direction of the pinned magnetic layer P_1, as a whole, is advantageously stabilized in one direction.

[**0351**] Referring to **FIG. 13**, the first pinned magnetic layer **103** and the second pinned magnetic layer **101** are manufactured of the same material with thicknesses thereof made different so that the two layers have different magnetic moments.

[**0352**] The third pinned magnetic layer **109** and the fourth pinned magnetic layer **111** are in a ferrimagnetic state with the magnetization directions thereof being antiparallel, namely, 180 degrees opposite from each other, and the magnetization direction of the third pinned magnetic layer **109** and the magnetization direction of the fourth pinned magnetic layer **111** mutually pin each other.

[**0353**] The nonmagnetic material layers **102** and **110** are preferably made of a material selected from the group consisting of Ru, Rh, Ir, Cr, Re, Cu, and alloys thereof.

[**0354**] The second pinned magnetic layer **101** and the fourth pinned magnetic layer **111** are respectively deposited on and in contact with the antiferromagnetic layers **100** and **112**, and are subjected to annealing under the presence of a magnetic field. An anisotropic magnetic field occurs through exchange coupling at each of the interfaces between the second pinned magnetic layer **101** and the antiferromagnetic layer **100**, and between the fourth pinned magnetic layer **111** and the antiferromagnetic layer **112**.

[**0355**] The magnetization direction of the second pinned magnetic layer **101** is pinned in the Y direction. When the magnetization direction of the second pinned magnetic layer **101** is pinned in the Y direction, the magnetization direction of the first pinned magnetic layer **103**, separated from the second pinned magnetic layer **101** by the nonmagnetic material layer **102**, is pinned to be antiparallel to the magnetization direction of the second pinned magnetic layer **101**. The direction of the sum of the magnetic moments of the second pinned magnetic layer **101** and the first pinned magnetic layer **103** becomes the direction of the pinned magnetic layer P_1.

[**0356**] When the magnetization direction of the second pinned magnetic layer **101** is pinned in the Y direction, the magnetization direction of the fourth pinned magnetic layer **111** is preferably pinned to be antiparallel to the Y direction. Then, the magnetization direction of the third pinned magnetic layer **109**, separated from the fourth pinned magnetic layer **111** by the nonmagnetic material layer **110**, is pinned to be antiparallel to the magnetization direction of the fourth pinned magnetic layer **111**, namely, pinned in the Y direction. The direction of the sum of the magnetic moments of the fourth pinned magnetic layer **111** and the third pinned magnetic layer **109** becomes the magnetization direction of the pinned magnetic layer P_2.

[**0357**] The first pinned magnetic layer **103** and the third pinned magnetic layer **109**, which are separated from each other by the first free magnetic layer **105**, the nonmagnetic layer **106**, and the second free magnetic layer **107**, are in an antiparallel state with the magnetization directions thereof being opposite by 180 degrees.

[**0358**] Referring to **FIG. 13**, as will be discussed later, a free magnetic layer F is formed of the first free magnetic layer **105** and the second free magnetic layer **107**, both laminated with the nonmagnetic layer **106** interposed therebetween. The first free magnetic layer **105** and the second free magnetic layer **107** are in a ferrimagnetic state with the magnetization directions thereof being antiparallel to each other.

[**0359**] The first free magnetic layer **105** and the second free magnetic layer **107** change magnetization directions thereof under the influence of an external magnetic field while keeping the ferrimagnetic state. If the first pinned magnetic layer **103** and the third pinned magnetic layer **109** are in an antiparallel state with the magnetization directions thereof being opposite by 180 degrees, the rate of change in resistance of the layers above the free magnetic layer F becomes equal to the rate of change in resistance of the layers below the free magnetic layer F.

[**0360**] Furthermore, the magnetization direction of the pinned magnetic layer P_1 and the magnetization direction of the pinned magnetic layer P_2 are preferably antiparallel to each other.

[**0361**] The magnitude of the magnetic moment of the second pinned magnetic layer **101** pinned in the Y direction