PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : G11B 5/39 | A1

(11) International Publication Number: WO 99/16057

(43) International Publication Date: 1 April 1999 (01.04.99)

(21) International Application Number: PCT/US98/19732

(22) International Filing Date: 22 September 1998 (22.09.98)

(30) Priority Data:
60/059,484 22 September 1997 (22.09.97) US

(71) Applicant *(for all designated States except US)*: SEAGATE TECHNOLOGY, INC. [US/US]; 920 Disc Drive, Scotts Valley, CA 95067–0360 (US).

(72) Inventors; and

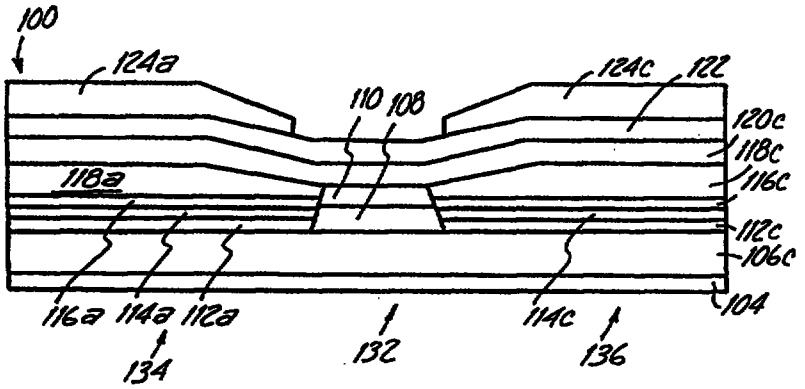
(75) Inventors/Applicants *(for US only)*: DING, Juren [CN/US]; 16781 Hutchinson Drive, Lakeville, MN 55044 (US). XUE, Song, Sheng [CN/US]; 7150 Cahill Road, Edina, MN 55439 (US). FERNANDEZ deCASTRO, Juan [US/US]; 17245 Jasmine Court, Lakeville, MN 55044 (US). DOLEJSI, James [US/US]; 9260 Kiowa Trail, Channhassen, MN 55317 (US). RYAN, Patrick, Joseph [US/US]; 1249 Scheffer Avenue, Saint–Paul, MN 55116 (US).

(74) Agent: ANGUS, Robert, M.; Kinney & Lange, P.A., Kinney & Lange Building, 312 South Third Street, Minneapolis, MN 55415–1002 (US).

(81) Designated States: CN, DE, GB, JP, KR, SG, US.

Published
With international search report.

(54) Title: OVERLAID MR STRUCTURE WITH MAGNETOSTATIC STABILIZED SOFT ADJACENT LAYER



(57) Abstract

The present invention is a magnetoresistive (MR) sensor (100) that combines the advantages of abutted junction structure and regular overlaid structure. The abutted junction design is used with the soft adjacent layer (SAL) (108) and the overlaid structure is used with the MR element (120). The method of making the MR sensor (100) comprises depositing SAL (108) on top of the gap layer (106) and depositing spacer material (110) on top of the SAL (108). A mask (130) is placed over the central region of the spacer material (110) and SAL (108). The spacer material (110) and SAL (108) are removed in the areas not covered by the mask (130). An underlayer material (112) is deposited in the areas where the SAL (108) and spacer material (110) were removed. A hard–biasing material (114) is deposited on top of the underlayer (112). The mask (130) is removed and the MR element (120) is deposited on top of the spacer material (110) in the active region of the sensor (132) and on top of the hard–biasing material (114) in the passive regions of the sensor (134, 136). A cap layer (122) is deposited on top of the MR element (120) in the active (132) and passive regions (134, 136) of the MR sensor (100). Contacts (124) are placed on top of the cap layer (122) in the passive regions of the sensor (134, 136). In another embodiment of the method, additional material is added to separate the hard–biasing material (114), thus improving the signal to noise ratio. A low resistivity material (116) is added after the first hard–biasing material (114) and a second hard–biasing material (118) is deposited on top of the low–resistivity material (116). The additional materials are deposited before the mask (130) is removed. Once the mask (130) is removed, the MR sensor (100) is built in accordance with the first embodiment.