26; 27, 28, 29; 30, 31, 32, respectively. The connections to the Wheatstone bridge are made via conductive pads 16, 17, 18 and 19. The advantage of a Wheatstone bridge configuration is that the output signal is larger than the output signal of one sensor 1 and that the signal to noise ratio is improved.

For AMR sensors, it is relatively simple to add additional correction elements with reference directions rotated over any suitable angle. Only the mask design used for deposition of the ferromagnetic layers has to be changed to incorporate this correction.

For GMR or TMR sensors with pinned layers it is more difficult to define different bias directions on one sensor chip. In sensors biased by Ir—Mn, the bias direction can be defined during deposition. However, it is difficult to impose six different magnetic field directions to a small sensor chip simultaneously. After deposition, the bias direction can be changed if the elements are heated above the blocking temperature of the exchange biasing. By selective heating of single elements in a sufficiently strong magnetic field the bias direction of each element can be set in any direction. Selective heating can be done by sending a large current through selected elements, by laser heating or by other ways of selectively heating localized spots on a wafer using light.

An alternative method is to use the dispersion that is present in some ferromagnetic layers when they are deposited on an anti ferromagnetic (AF) layer in a magnetic field, which is especially large when the ferromagnetic layer is thin (<2–3 nm). The average bias direction of these layers is in the direction of the magnetic field but the dispersion causes the bias directions on a microscopic scale to spread over an angular range that increases with decreasing thickness of the ferromagnetic layer. A dispersion well over +/−45 degrees has a similar effect as the correction scheme using additional GMR elements with discrete bias directions as can be seen in FIG. 8. The dispersion reduces the maximum GMR effect.

While the invention has been shown and described with reference to preferred embodiments, it will be understood by those skilled in the art that various changes or modifications in form and detail may be made without departing from the scope and spirit of this invention.

What is claimed is:

1. A sensor arrangement including a first and a second magnetoresistive sensor (1), comprising a main sensing element (2) with a main reference magnetization axis (3), for determining an angle between the main reference magnetization axis (3) and a magnetic field direction, characterized in that the main sensing element (2) is electrically connected to a first correction sensing element (6) with a first reference magnetization axis (9) and a second correction sensing element (8) with a second reference magnetization axis (10), the first (9) and the second (10) reference magnetization axes making correction angles Θ between 5° and 85° of opposite sign with the main reference axis (3), and in that the main reference magnetization axis (3) of the second sensor is rotated over a quarter period of a periodic output signal of the main sensing element of he first sensor and the correction angles being ⅛ period for each correction sensing element.

2. A sensor arrangement according to claim 1, characterized in that the first and the second correction sensing elements (6,8) have a resistance value of substantially $1/\sqrt{2}$ times the resistance of the ma n sensing elements.

3. A sensor as claimed in claim 1, comprising additional sensing elements of the same type as the first and second correction sensing elements (6,8), the additional sensing elements having a reference magnetization axis making angles of opposite sign with respect to the main reference magnetization axis of substantially n.1/16 of the periodic output signal of the first main sensor (1), n being an integer.

4. A sensor arrangement comprising four magnetoresistive sensors (1) of the type defined in claim 1, incorporated in a Wheatstone bridge configuration.

5. A method of manufacturing a magnetoresistive sensor of the type defined in claim 1, according to which method all of the sensing elements (2,6,8) are sputter deposited on a single substrate and the angles Θ between the reference magnetization axes (9,10) of the first and the second correction sensing elements (6,8) and the main reference magnetization axis (3) are formed by patterning the sputtered material.

6. A method as claimed in claim 5, characterized in that the angle Θ between the main reference magnetization axis (3) and the reference magnetization axis (9,10) of the first and the second correction sensing elements (6, 8) is formed by locally and individually heating the first and the second sensing elements (6, 8) in a biasing magnetic field having the same direction as the correction angle Θ between the main reference magnetization axis (3) and the reference magnetization axis (9,10) for the first correction sensing element (6) and the second correction sensing element (8).

7. A method as claimed in claim 6, characterized in that the local heating is done by passing an electric current through the first correction sensing element (6) or the second correction sensing element (8).

8. A method as claimed in claim 7, characterized in that the heating is done by means of a laser.

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