Description

This invention relates to thin film magnetic heads and, more particularly to a magnetic head having a magnetoresistive read transducer.

The use of a magnetoresistive (MR) sensor to sense magnetically recorded data has been known for many years. It is also known that both longitudinal and transverse bias can be provided to eliminate Barkhausen noise and to maintain the sensor in its most linear operating range. U.S. patent 4,024,489 describes an MR sensor in which a hard magnetic bias layer is used. In this sensor both the MR layer and the hard magnetic bias layer extend across the entire sensor to produce a transverse bias.

U.S. patent 3,840,898 discloses an MR sensor in which a transverse bias is produced. In the embodiment shown in Figs. 4 and 5 of U.S. patent 3,840,898 a magnetoresistive strip such as NiFe is treated in edge regions to produce a hard magnetic state. However the edge regions are arranged parallel to the direction of sense current and run along the entire strip to produce a transverse bias and would not produce longitudinal bias.

It has become increasingly difficult to produce MR read transducers in the small size needed to read the data recorded on ever decreasing track widths at ever increasing recording density. One solution proposed to meet these requirements is described in U. S. patent 4,663,685 in which transverse bias is produced in only a central active region of the sensor and longitudinal bias is produced in the inactive end regions by means of exchange coupling between the part of the ferromagnetic MR layer which extends into the end regions and antiferromagnetic layers which extend over only the end region. U. S. patent 4,639,806 shows an MR sensor which has longitudinal bias produced by exchange coupling between the MR layer and hard magnetic layers in the end regions only.

JP-A-64001112 discloses a magnetoresistance effect type head which prevents the production of a magnetic domain generated from both ends in the direction of a magnetic sensitive track by providing a hard magnetic material to be in contact with both ends in the broadwise direction of the magnetic sensitive track, according to the preamble of claim 1.

The invention provides a magnetoresistive read transducer comprising: a magnetoresistive sensor having hard magnetic passive end regions separated by a central active sensing region; a thin film of magnetoresistive conductive layer formed of magnetic material, said magnetoresistive conductive layer forming substantially only said central active region; a first and a second thin film of hard magnetic material each form an abutting junction having electrical and magnetic continuity with a respective different end of said magnetoresistive conductive layer, each of said thin film of hard magnetic material forming substantially only one of said passive end regions to produce a longitudinal bias in said magnetoresistive sensor, characterised in that each abutting junction comprises a tapered end of the magnetoresistive conductor layer overlapping with a tapered portion of one of the hard magnetic material ends.

The invention also provides a method for making a magnetoresistive read transducer as defined in claim 1 comprising the steps of: depositing a thin magnetoresistive layer of ferromagnetic material over at least the central active region of said transducer; producing a stencil covering the central active region of said transducer; etching away the part of said magnetoresistive material not covered by said stencil to form the central active region of said transducer; depositing a film of hard magnetic material over regions of said transducer not covered by said stencil to produce the passive end regions of said transducer, said hard magnetic material in said end regions forming an abutting junction with a respective different end of said layer of magnetoresistive material so that a longitudinal bias is produced in each of said passive end regions of said transducer, the abutting junctions each comprising a tapered end of the magnetoresistive conductor layer overlapping with a tapered portion of one of the hard magnetic material ends.

The preferred use of such magnetoresistive read transducers is in magnetic data storage devices such as hard discs.

In order that the invention may be fully understood, a preferred embodiment thereof will now be described by way of example with reference to the accompanying drawings in which:

Fig 1 is an end view of a prior art MR read transducer in which longitudinal bias is provided in the end regions only of the MR read transducer.

Fig 2 is a conceptual end view of an MR read transducer embodying the present invention.

Figs. 3 a - d Diagramatically show a specific embodiment of a process for fabricating a contiguous junction according to the present invention.

Fig. 4 is an exploded diagram showing in greater detail the formation of the contiguous junction according to a specific embodiment of the present invention.

Fig. 5 is an end view of a specific embodiment of an MR read transducer produced in accordance with the process illustrated in Figs. 3 and 4.

As shown in Fig. 1 of the drawings, a prior art MR read transducer of the type described and claimed in U.S. patent 4,663,685 comprises an MR layer 11 which extends over the entire transducer 10'. An exchange bias layer 12 extends over the end regions 14 only to produce a longitudinal bias field and a soft magnetic film layer 15, separated from the MR layer 11 by a thin non-magnetic spacer layer 13, produces a transverse bias field in at least part of the central active region 16. The read signal is sensed over the

central active region 16 which is defined in this embodiment by the spacing between conductors 18 and 20.

A conceptual view of an MR read transducer according to the present invention is shown in Fig. 2. The MR read transducer comprises an MR layer 22 which extends over substantially only the central active region 24 and a hard magnetic bias layer 26 in each end region 28 which forms an abutting junction 30 with the MR layer 22 to produce longitudinal bias in the MR read transducer 10. This embodiment does not require additional side-reading suppression components. Instead, the hard magnetic bias layer 26 in each end region 28 need only provide for electrical and magnetic continuity to the MR layer 22. The hard magnetic bias layer 26 can be provided with a single layer of metal such as Co Cr, Co Pt or Co Cr Pt, for example, although the use of under-and/or overcoats such as W or Au may be desirable. The thickness of a hard magnetic layer is chosen so as to provide the desired amount of bias flux. As known to those skilled in the art, transverse bias is also required in the central active region 24, and this bias can be provided by soft film bias, shunt bias, barber pole bias configuration, or any other compatible transverse bias techniques. However, the transverse bias structure has not been shown in the conceptual view of Fig. 2.

A specific embodiment of a process for fabricating a suitable junction between the MR layer 22 and the hard magnetic bias layer 26 is shown in Figs. 3 a - d. The process comprises the steps of depositing, upon a suitable substrate 21 a film of MR material such as NiFe, for example, over the length of the sensor. In the embodiment shown, a transverse bias structure comprising a soft magnetic film 23 and nonmagnetic spacer layer 25 are deposited on substrate 21 prior to deposition of the MR layer 22. The process then continues by depositing a film of a suitable material such as photoresist, and patterning the photoresist material to form a stencil 32 (Fig. 3a). Stencil 32 is used to define each edge of the MR layer 22 as the film of MR material 22 as well as the spacer layer 25 and the soft magnetic film 23 are subjected to a subtractive process such as sputter etching, ion milling or chemical etching to produce an MR trilayer structure 27 (Fig. 3b). The material for the hard magnetic bias layers 26 is then deposited as stencil 32 again defines edges of the bias layers 26 (Fig. 3c). Using the same stencil 32, a conductor layer is deposited to produce conductor leads 29 and 31. If desired, conductor leads 29 and 31 can be deposited in a later step if the conductor leads 29 and 31 are not coextensive with the hard bias layer 26. Note that a quantity of hard magnetic material and conductive material is also deposited on top of stencil 32. However this quantity of material is removed, along with stencil 32 in a lift-off process (Fig. 3d) to produce a sensor having hard magnetic bias layers 26 in the end regions only, each having a contiguous junction with the MR trilayer structure 27 which extends over only the central active region 24.

Although a square butted junction between the MR layer 22 and the hard magnetic bias layer 26 is shown conceptually in Figs. 2 and 3, the preferred embodiment comprises a junction in which the topography is well controllable so that the junction can be produced easily and reliably.

Fig. 4 shows in greater detail the formation of the contiguous junction according to an embodiment of the present invention. In this case the stencil 32 comprises a bi-layer resist formed by a thin underlayer 33 and a thick imaging layer 34. One exposure and one develop step defines the edge profile of the resist. An undercut is created by dissolution of the underlayer 33 in a suitable developer with the undercut distance determined by the develop time.

The unmasked areas of the layer of MR material 35 are then removed by the use of a unidirectional process such as ion milling, for example. The angle of incidence Φ is controlled by suitably tilting the substrate relative to the incident beam. In addition, circular symmetry is obtained by rotating the substrate about a normal to the substrate so that any given point sees the incident beam rotate conically about the azimuth angle Φ except near the stencil 32 whose edge shadows the film 35 during some segment of substrate revolution. As shown in Fig. 4, for an azimuth angle of 0 degrees, there is exposure of the film 35 to point C and the exposure limit point moves progressively to the left (as shown in Figure 4) until at an azimuth angle of 180 degrees the exposure limit point is moved to point a. The combined milling for this embodiment produces a curved taper 36 as a result of the removal during the milling process of the part 37 of the film shown in dashed lines.

The hard magnetic bias layer 38 is then deposited, by sputtering, for example, during a similar orientation and rotation of the substrate to produce a deposition profile such as that shown in dashed lines 39. The combined junction profile resulting from the deposition of bias layer 38 is shown in full line. Although the layer of MR material 35 is shown as a single layer in Fig. 4, it will be recognized that the MR element may comprise other layers, such as transverse bias layers, for example.

This junction profile comprises two overlapping tapers. The taper profile is determined by the height of the stencil 32, the selected angle of incidence Φ and the size of the undercut. In a specific embodiment the stencil thickness was about 1μm and the angle of incidence Φ was in the range of 70 to 80 degrees. This selected combination produced a taper length of about five times the thickness of the sensor (ie. the magnetoresistive layer). For electrical reliability the junction should be long, however, for magnetic reliability the junction should be short. For a particular

application, junction lengths within the range of 3 to 5 times the sensor thickness were shown to be suitable.

The magnetoresistive read transducer made by the above-described method is shown in Fig. 5 which shows the edge view of the sensor, i.e., the surface which is in close proximity to the magnetic recording medium from which previously recorded magnetic data is to be read. The transducer comprises an MR element 42 which extends over the central active region 44 of the transducer, and hard magnetic bias layers 46 which form an abutting junction 48 with the MR element 42. The hard magnetic bias layers 46 extend over the end regions 50 of the transducer so that a longitudinal bias can be produced in the end regions 50 only of the transducer.

Claims

1. A magnetoresistive read transducer (10) comprising:

   a magnetoresistive sensor having hard magnetic passive end regions (28) separated by a central active sensing region (24);

   a thin film of magnetoresistive conductive layer (22) formed of magnetic material, said magnetoresistive conductive layer forming substantially only said central active region;

   a first and a second thin film of hard magnetic material each form an abutting junction (30) having electrical and magnetic continuity with a respective different end of said magnetoresistive conductive layer, each of said thin film of hard magnetic material forming substantially only one of said passive end regions to produce a longitudinal bias in said magnetoresistive sensor, characterised in that each abutting junction comprises a tapered end of the magnetoresistive conductor layer overlapping with a tapered portion of one of the hard magnetic material ends.

2. A magnetoresistive read transducer as claimed in claim 1 wherein said abutting junctions comprise a substantially continuous curved surface.

3. A magnetoresistive read transducer as claimed in any of claims 1 or 2 wherein said abutting junctions have a length of between 3 and 5 times the thickness of said magnetoresistive layer.

4. A magnetoresistive read transducer as claimed in any of claims 1, 2, or 3 further comprising means for producing a transverse bias in at least a part of said central active region.

5. A magnetoresistive read transducer as claimed in claim 4 wherein said means for producing a transverse bias comprises a soft magnetic film spaced from said magnetoresistive layer.

6. A method for making a magnetoresistive read transducer (10) as claimed in claim 1 having hard magnetic passive end regions (28) separated by a central active sensing region (24) comprising the steps of:

   depositing a thin magnetoresistive layer of ferromagnetic material (22) over at least the central active region of said transducer;

   producing a stencil (32) covering the central active region of said transducer;

   etching away the part of said magnetoresistive material not covered by said stencil to form the central active region of said transducer;

   depositing a film of hard magnetic material (26) over regions of said transducer not covered by said stencil to produce the passive end regions of said transducer, said hard magnetic material in said end regions forming an abutting junction with a respective different end of said layer of magnetoresistive material so that a longitudinal bias is produced in each of said passive end regions of said transducer, the abutting junctions each comprising a tapered end of the magnetoresistive conductor layer overlapping with a tapered portion of one of the hard magnetic material ends.

7. A method for making a magnetoresistive read transducer as claimed in claim 6 wherein said etching step comprises the use of a directional etching method.

8. A method for making a magnetoresistive read transducer as claimed in claim 7 wherein said directional etching method comprises ion beam milling.

9. A method for making a magnetoresistive read transducer as claimed in any of claims 7 or 8 wherein said directional etching method is carried out at a non-zero angle of incidence to said transducer.

10. A method for making a magnetoresistive read transducer as claimed in claim 9 wherein said angle is within the range of 70 to 80 degrees.

11. A method for making a magnetoresistive read transducer as claimed in any of claims 9 or 10 wherein said transducer and angle of incidence of the etching beam are rotated relative to each other about the normal to the transducer during said etching step.

12. A method for making a magnetoresistive read

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application, junction lengths within the range of 3 to 5 times the sensor thickness were shown to be suitable.

The magnetoresistive read transducer made by the above-described method is shown in Fig. 5 which shows the edge view of the sensor, i.e., the surface which is in close proximity to the magnetic recording medium from which previously recorded magnetic data is to be read. The transducer comprises an MR element 42 which extends over the central active region 44 of the transducer, and hard magnetic bias layers 46 which form an abutting junction 48 with the MR element 42. The hard magnetic bias layers 46 extend over the end regions 50 of the transducer so that a longitudinal bias can be produced in the end regions 50 only of the transducer.

Claims

1. A magnetoresistive read transducer (10) comprising:

   a magnetoresistive sensor having hard magnetic passive end regions (28) separated by a central active sensing region (24);

   a thin film of magnetoresistive conductive layer (22) formed of magnetic material, said magnetoresistive conductive layer forming substantially only said central active region;

   a first and a second thin film of hard magnetic material each form an abutting junction (30) having electrical and magnetic continuity with a respective different end of said magnetoresistive conductive layer, each of said thin film of hard magnetic material forming substantially only one of said passive end regions to produce a longitudinal bias in said magnetoresistive sensor, characterised in that each abutting junction comprises a tapered end of the magnetoresistive conductor layer overlapping with a tapered portion of one of the hard magnetic material ends.

2. A magnetoresistive read transducer as claimed in claim 1 wherein said abutting junctions comprise a substantially continuous curved surface.

3. A magnetoresistive read transducer as claimed in any of claims 1 or 2 wherein said abutting junctions have a length of between 3 and 5 times the thickness of said magnetoresistive layer.

4. A magnetoresistive read transducer as claimed in any of claims 1, 2, or 3 further comprising means for producing a transverse bias in at least a part of said central active region.

5. A magnetoresistive read transducer as claimed in claim 4 wherein said means for producing a transverse bias comprises a soft magnetic film spaced from said magnetoresistive layer.

6. A method for making a magnetoresistive read transducer (10) as claimed in claim 1 having hard magnetic passive end regions (28) separated by a central active sensing region (24) comprising the steps of:

   depositing a thin magnetoresistive layer of ferromagnetic material (22) over at least the central active region of said transducer;

   producing a stencil (32) covering the central active region of said transducer;

   etching away the part of said magnetoresistive material not covered by said stencil to form the central active region of said transducer;

   depositing a film of hard magnetic material (26) over regions of said transducer not covered by said stencil to produce the passive end regions of said transducer, said hard magnetic material in said end regions forming an abutting junction with a respective different end of said layer of magnetoresistive material so that a longitudinal bias is produced in each of said passive end regions of said transducer, the abutting junctions each comprising a tapered end of the magnetoresistive conductor layer overlapping with a tapered portion of one of the hard magnetic material ends.

7. A method for making a magnetoresistive read transducer as claimed in claim 6 wherein said etching step comprises the use of a directional etching method.

8. A method for making a magnetoresistive read transducer as claimed in claim 7 wherein said directional etching method comprises ion beam milling.

9. A method for making a magnetoresistive read transducer as claimed in any of claims 7 or 8 wherein said directional etching method is carried out at a non-zero angle of incidence to said transducer.

10. A method for making a magnetoresistive read transducer as claimed in claim 9 wherein said angle is within the range of 70 to 80 degrees.

11. A method for making a magnetoresistive read transducer as claimed in any of claims 9 or 10 wherein said transducer and angle of incidence of the etching beam are rotated relative to each other about the normal to the transducer during said etching step.

12. A method for making a magnetoresistive read

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transducer as claimed in any of claims 6 to 11 wherein said stencil comprises two layers, the layer which is in contact with the magnetoresistive layer being recessed relative to the other layer.

13. A method for making a magnetoresistive read transducer as claimed in any of claims 6 to 11 wherein the portion of said stencil closest to the magnetoresistive layer is undercut from the remaining portion of the stencil.

14. A method for making a magnetoresistive read transducer as claimed in any of claims 12 or 13 wherein the profile of the tapered deposition is determined by the height of the stencil, the size of the undercut and the angle of incidence of the etching beam.

15. A method for making a magnetoresistive read transducer as claimed in any of claims 6 to 14 additionally comprising the step of depositing means for producing a transverse bias in at least a part of said central active region.

16. A method for making a magnetoresistive read transducer as claimed in claim 15 wherein said means for producing a transverse bias comprises a soft magnetic film spaced from said magnetoresistive layer.

17. A magnetic data storage device having a magnetoresistive read transducer as claimed in any of claims 1 to 5.

Patentansprüche

1. Ein magnetoresistiver Lesewandler (10), der folgendes aufweist:
einen magnetoresistiven Sensor mit hartmagnetischen passiven Seitenbereichen (28), die durch eine zentrale aktive Lesezone (24) getrennt sind;
einen Dünnfilm aus einer magnetoresistiven leitenden Schicht (22), gebildet aus magnetischem Material, wobei die genannte magnetoresistive leitende Schicht im wesentlichen nur den genannten zentralen aktiven Bereich bildet;
einen ersten und einen zweiten Dünnfilm aus hartmagnetischem Material, die jeweils eine aneinandergrenzende Übergangszone (30) bilden, die mit der jeweils anderen Seite der genannten magnetoresistiven leitenden Schicht elektrische und magnetische Kontinuität aufweist, wobei jeder der genannten Dünnfilme aus hartmagnetischem Material im wesentlichen nur einen der genannten passiven Seitenbereiche bildet, um eine Längsvormagnetisierung in dem genannten magnetoresistiven Sensor zu erzeugen, dadurch gekennzeichnet, daß jede aneinandergrenzende Übergangszone eine konische Seite der magnetoresistiven Leiterschicht umfaßt, die mit einem konischen Teil von einem der Seitenbereiche aus hartmagnetischem Material überlappt.

2. Ein magnetoresistiver Lesewandler nach Anspruch 1, bei dem die genannten aneinandergrenzenden Übergangszonen eine im wesentlichen durchgehende kurvenförmig verlaufende Fläche umfassen.

3. Ein magnetoresistiver Lesewandler nach jedem der Ansprüche 1 oder 2, bei dem die genannten aneinandergrenzenden Übergangszonen eine Länge aufweisen, die etwa das 3- bis 5-fache der Dicke der magnetoresistiven Schicht beträgt.

4. Ein magnetoresistiver Lesewandler nach jedem der Ansprüche 1, 2 oder 3, desweiteren Mittel zur Erzeugung einer Quervormagnetisierung zumindest in einem Teil des genannten zentralen aktiven Bereichs umfassend.

5. Ein magnetoresistiver Lesewandler nach Anspruch 4, bei dem das genannte Mittel zur Erzeugung einer Quervormagnetisierung einen weichmagnetischen Film umfaßt, der von der genannten magnetoresistiven Schicht einen Abstand aufweist.

6. Ein Verfahren zur Herstellung eines magnetoresistiven Lesewandlers (10) nach Anspruch 1, dessen hartmagnetische passive Seitenbereiche (28) durch einen zentralen aktiven Lesebereich (24) voneinander getrennt sind, das folgende Schritte aufweist:
Auftragen einen dünnen magnetoresistiven Schicht aus ferromagnetischem Material (22) über zumindest dem zentralen aktiven Bereich des genannten Wandlers;
Herstellen einer Schablone (32), die den zentralen aktiven Bereich des genannten Wandlers abdeckt;
Abtragen des Teils des genannten magnetoresistiven Materials, der von der genannten Schablone nicht abgedeckt wird, durch Ätzen, um den zentralen aktiven Bereich des genannten Wandlers zu bilden;
Auftragen eines Films aus hartmagnetischem Material (26) über den Bereichen des genannten Wandlers, die von der genannten Schablone nicht abgedeckt sind, um die passiven Seitenbereiche des genannten Wandlers zu bilden, wobei das genannte hartmagnetische Material in den genannten Seitenbereichen eine aneinandergrenzende Übergangszone mit der jeweils ande-

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ren Seite der genannten Schicht aus magnetoresistivem Material bildet, so daß eine Längsvormagnetisierung in jedem der genannten passiven Seitenbereiche des genannten Wandlers erzeugt wird, wobei die aneinandergrenzenden Übergangszonen jeweils eine konische Seite der magnetoresistiven Leiterschicht umfassen, die mit einem konischen Teil von einem der Seitenbereiche aus hartmagnetischem Material überlappt.

7. Ein Verfahren zur Herstellung eines magnetoresistiven Lesewandlers nach Anspruch 6, bei dem der genannte Ätzschritt die Verwendung einer Richtungsätzmethode umfaßt.

8. Ein Verfahren zur Herstellung eines magnetoresistiven Lesewandlers nach Anspruch 7, bei dem die genannte Richtungsätzmethode das Ionenstrahl-Ätzverfahren umfaßt.

9. Ein Verfahren zur Herstellung eines magnetoresistiven Lesewandlers nach jedem der Ansprüche 7 oder 8, bei dem das genannte Richtungsätzverfahren in einem Einfallswinkel zu dem genannten Wandler ausgeführt wird, der ungleich Null ist.

10. Ein Verfahren zur Herstellung eines magnetoresistiven Lesewandlers nach Anspruch 9, bei dem der genannte Winkel bei 70 bis 80 Grad liegt.

11. Ein Verfahren zur Herstellung eines magnetoresistiven Lesewandlers nach jedem der Ansprüche 9 oder 10, bei dem der genannte Wandler und der Einfallswinkel des Ätzstrahls während des genannten Ätzschritts, in bezug zueinander um die Senkrechte zu dem Wandler gedreht werden.

12. Ein Verfahren zur Herstellung eines magnetoresistiven Lesewandlers nach jedem der Ansprüche 6 bis 11, bei dem die genannte Schablone zwei Schichten umfaßt, wobei die Schicht, die mit der magnetoresistiven Schicht Kontakt hat, bezogen auf die andere Schicht eine Unterätzung aufweist.

13. Ein Verfahren zur Herstellung eines magnetoresistiven Lesewandlers nach jedem der Ansprüche 6 bis 11, in dem der Teil der genannten Schablone, der am dichtesten an der magnetoresistiven Schicht liegt, bezogen auf den verbleibenden Teil der Schablone unterätzt wird.

14. Ein Verfahren zur Herstellung eines magnetoresistiven Lesewandlers nach jedem der Ansprüche 12 oder 13, bei dem das Profil der konischen Beschichtung von der Höhe der Schablone, der Größe der Unterätzung und dem Einfallswinkel des Ätzstrahls bestimmt wird.

15. Ein Verfahren zur Herstellung eines magnetoresistiven Lesewandlers nach jedem der Ansprüche 6 bis 14, das außerdem den Schritt des Auftragens von Mitteln zur Erzeugung einer Quervormagnetisierung in mindestens einem Teil des genannten zentralen aktiven Bereichs umfaßt.

16. Ein Verfahren zur Herstellung eines magnetoresistiven Lesewandlers nach Anspruch 15, bei dem das genannte Mittel zur Erzeugung einer Quervormagnetisierung einen weichmagnetischen Film umfaßt, der zu der genannten magnetoresistiven Schicht einen Abstand aufweist.

17. Ein magnetisches Datenspeichergerät mit einem magnetoresistiven Lesewandler nach jedem der Ansprüche 1 bis 5.

Revendications

1. Transducteur de lecture magnétorésistif (10) comprenant:

un détecteur magnétorésistif ayant des régions d'extrémité passives magnétiques dures (28) séparées par une région de détection active centrale (24);

un film mince de couche conductrice magnétorésistive (22) formée de matériau magnétique, ladite couche conductrice magnétorésistive formant sensiblement uniquement ladite région active centrale;

un premier et un second films minces de matériau magnétique dur formant chacun une jonction en butée (30) ayant une continuité électrique et magnétique avec une extrémité différente respective de ladite couche conductrice magnétorésistive, chacun desdits films minces en matériau magnétique dur formant sensiblement uniquement l'une desdites régions d'extrémité passives pour produire une polarisation longitudinale dans ledit détecteur magnétorésistif, caractérisé en ce que chaque jonction en butée comprend une extrémité en biseau de la couche conductrice magnétorésistive se chevauchant avec une partie en biseau de l'une des extrémités du matériau magnétique dur.

2. Transducteur de lecture magnétorésistif selon la revendication 1 dans lequel lesdites jonctions en butée comprennent une surface courbe sensiblement continue.

3. Transducteur de lecture magnétorésistif selon l'une quelconque des revendications 1 ou 2 dans lequel lesdites jonctions en butée ont une lon-

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gueur comprise entre 3 et 5 fois l'épaisseur de ladite couche magnétorésistive.

4. Transducteur de lecture magnétorésistif selon l'une quelconque des revendications 1, 2 ou 3, comprenant en outre un moyen pour produire une polarisation transversale dans au moins une partie de ladite région active centrale.

5. Transducteur de lecture magnétorésistif selon la revendication 4 dans lequel ledit moyen pour produire une polarisation transversale comprend un film magnétique doux espacé de ladite couche magnétorésistive.

6. Procédé pour réaliser un transducteur de lecture magnétorésistif selon la revendication 1 comportant des régions d'extrémité passives magnétiques dures (28) séparées par une région de détection active centrale (24) comprenant les étapes suivantes:

dépôt d'une mince couche magnétorésistive de matériau ferromagnétique (22) sur au moins la région active centrale dudit transducteur;

production d'un stencil (32) recouvrant la région active centrale dudit transducteur;

attaque de la partie du matériau magnétorésistif non recouvert par ledit stencil pour former la région active centrale dudit transducteur;

dépôt d'un film de matériau magnétique dur (26) sur des régions dudit transducteur non recouvertes par ledit stencil pour produire les régions d'extrémité passives dudit transducteur, ledit matériau magnétique dur dans lesdites régions d'extrémité formant une jonction en butée avec une extrémité différente respective de ladite couche de matériau magnétorésistif de telle sorte qu'une polarisation longitudinale est produite dans chacune desdites régions d'extrémité passives dudit transducteur, les jonctions en butée comprenant chacune une extrémité en biseau de la couche conductrice magnétorésistive chevauchant une partie en biseau de l'une des extrémités de matériau magnétique dur.

7. Procédé de réalisation d'un transducteur de lecture magnétorésistif selon la revendication 6 dans lequel ladite étape d'attaque comprend l'utilisation d'un procédé d'attaque directionnel.

8. Procédé de réalisation d'un transducteur de lecture magnétorésistif selon la revendication 7 dans lequel ledit procédé d'attaque directionnelle comprend le mélange d'un faisceau d'ions.

9. Procédé de réalisation d'un transducteur de lecture magnétorésistif selon l'une quelconque des revendications 7 ou 8 dans lequel ledit procédé d'attaque directionnelle est effectué selon un angle d'incidence non nul sur ledit transducteur.

10. Procédé de réalisation d'un transducteur de lecture magnétorésistif selon la revendication 9 dans lequel ledit angle est situé dans une plage de 70 à 80 degrés.

11. Procédé de réalisation d'un transducteur de lecture magnétorésistif selon l'une quelconque des revendications 9 ou 10 dans lequel ledit transducteur et ledit angle d'incidence du faisceau d'attaque tournent l'un par rapport à l'autre autour de la normale au transducteur au cours de ladite étape d'attaque.

12. Procédé de réalisation d'un transducteur de lecture magnétorésistif selon l'une quelconque des revendications 6 à 11 dans lequel ledit stencil comprend deux couches, la couche qui est en contact avec la couche magnétorésistive étant en creux par rapport à l'autre couche.

13. Procédé de réalisation d'un transducteur de lecture magnétorésistif selon l'une quelconque des revendications 6 à 11 dans lequel la partie dudit stencil la plus proche de la couche magnétorésistive est creusée à partir de l'autre partie du stencil.

14. Procédé de réalisation d'un transducteur de lecture magnétorésistif selon l'une quelconque des revendications 12 ou 13 dans lequel le profil du dépôt en biseau est déterminé par la hauteur du stencil, la dimension du creux et l'angle d'incidence du faisceau d'attaque.

15. Procédé de réalisation d'un transducteur de lecture magnétorésistif selon l'une quelconque des revendications 6 à 14 comprenant en outre l'étape de dépôt de moyens de production d'une polarisation transversale dans au moins une partie de ladite région active centrale.

16. Procédé de réalisation d'un transducteur de lecture magnétorésistif selon la revendication 15 dans lequel ledit moyen pour produire une polarisation transversale comprend un film magnétique doux espacé de ladite couche magnétorésistive.

17. Dispositif magnétique de stockage de données comportant un transducteur de lecture magnétorésistif selon l'une quelconque des revendications 1 à 5.