lubricant can again flow back onto the disk surface to undesirably increase the magnetic spacing and negatively affect the slider-disk interface.

[0008] Thus, what is needed is a slider for a hard disk drive which eliminates the problems associated with transferred lubricants. Furthermore, other desirable features and characteristics will become apparent from the subsequent detailed description and the appended claims, taken in conjunction with the accompanying drawings and this background of the disclosure.

SUMMARY

[0009] According to ~~the Detailed Description, a slider for reading data from and writing data onto a hard disk is provided. The slider includes an air bearing surface and one or more structures for forming lubricant reservoirs. The air bearing surface provides a read/write sensor above the surface of the hard disk. And the one or more structures for forming lubricant reservoirs are fluidically coupled to the air bearing surface to prevent lubricant buildup thereon~~ a first aspect of the present invention, there is provided a slider for reading data from and writing data onto a hard disk, the slider comprising: an air bearing surface for providing a read/write sensor above the surface of the hard disk; at least one surface orthogonal to and having a shared edge with the air bearing surface; and one or more structures for forming lubricant reservoirs fluidically coupled to the air bearing surface to prevent lubricant buildup thereon, wherein at least one of the one or more structures are formed on the at least one surface orthogonal to the air bearing surface.

[0010] In accordance with a second~~another~~ aspect of the present invention, there is provided a hard disk drive system comprising: a hard disk comprising a plurality of layers, wherein at least a topmost one of the plurality of layers comprises a lubricant layer; and at least one slider structure for reading data from and writing data onto the hard disk, the at least one slider structure comprising: an air bearing surface including a read/write sensor for reading and writing the data from/onto the hard disk; at least one surface orthogonal to and having a shared edge with the air bearing surface; and one or more structures for forming lubricant reservoirs fluidically coupled to the air bearing surface to prevent lubricant buildup thereon, wherein at least one of the one or more structures are formed on the at least one surface orthogonal to the air bearing surface.~~, a hard disk drive system is provided. The hard disk drive system includes a hard disk and at least one slider structure for reading data from and writing data onto the hard disk. The hard disk includes a plurality of layers, and at least a topmost one of the plurality of layers comprises a lubricant layer. The at least one slider structure includes an air bearing surface and one or more structures for forming lubricant reservoirs. The air bearing surface includes a read/write sensor for reading and writing the data from/onto the hard disk. The one or more structures form the lubricant reservoirs which are fluidically coupled to the air bearing surface to prevent lubricant buildup on the air bearing surface.~~

[0010a] According to a third aspect of the present invention, there is provided a head-stack assembly for a hard disk drive system comprising: one or more actuator arms; and one or more slider structures for reading data from and writing data onto a hard disk, each of the one or more slider structures coupled to a distal end of one of the actuator arms and comprising: an air bearing surface for providing a read/write sensor above the surface of the hard disk; at least one surface orthogonal to and having a shared edge with the air bearing surface; and one or more structures for forming lubricant reservoirs fluidically coupled to the air bearing surface to prevent lubricant buildup thereon, wherein at least one of the one or more structures are formed on the at least one surface orthogonal to the air bearing surface.

[0010b] According to a fourth aspect of the present invention, there is provided a head-gimbal assembly for a hard disk drive system comprising: one or more arms; and one or more slider structures for reading data from and writing data onto a hard disk, each of the one or more slider structures coupled to a distal end of one of the arms and comprising: an air bearing surface for providing a read/write sensor above the surface of the hard disk; at least one surface orthogonal to and having a shared edge with the air bearing surface; and one or more structures for forming lubricant reservoirs fluidically coupled to the air bearing surface to prevent lubricant buildup thereon, wherein at least one of the one or more structures are formed on the at least one surface orthogonal to the air bearing surface.

CLAIMS

What is claimed is:

1. A slider for reading data from and writing data onto a hard disk, the slider comprising:

an air bearing surface for providing a read/write sensor above the surface of the hard disk;

at least one surface orthogonal to and having a shared edge with the air bearing surface; and

one or more structures for forming lubricant reservoirs fluidically coupled to the air bearing surface to prevent lubricant buildup thereon, wherein at least one of the one or more structures are formed on the at least one surface orthogonal to the air bearing surface.

2. The slider in accordance with Claim 1 wherein the at least one surface comprises a trailing edge surface.

3. The slider in accordance with either of Claims 1 or 2 wherein each of the one or more structures has a predetermined outline to form the lubricant reservoirs of one or more geometric shapes for the lubricant to enter the lubricant reservoirs by capillary action and the lubricant reservoirs to maintain the lubricant therein by surface tension.

4. The slider in accordance with Claim 3 wherein the one or more geometric shapes include a trapezoidal shape having a lubricant entry side with a

smaller length than a side opposite to and parallel to the lubricant entry side.

5. The slider in accordance with Claim 4 wherein the one or more geometric shapes include an entry portion having the trapezoidal shape and a remaining portion having a rectangular shape.

6. The slider in accordance with Claim 3 wherein the one or more geometric shapes include a trapezoidal shape having a lubricant entry side with a longer length than a side opposite to and parallel to the lubricant entry side.

7. The slider in accordance with Claim 6 wherein the one or more geometric shapes include an entry portion having a rectangular shape and a remaining portion having the trapezoidal shape.

8. The slider in accordance with Claim 3 wherein the one or more geometric shapes include a rectangular shape having a lubricant entry side with a substantially equal length to a side opposite to and parallel to the lubricant entry side.

9. The slider in accordance with any of Claims 1 to 8 wherein the air bearing surface has a depression formed therein by a plurality of surfaces, wherein the plurality of surfaces include deflecting surfaces adjacent one or more lubricant channels and forming a portion of the depression along the shared edge of the air bearing surface and the at least one surface having the structures formed thereon, and wherein the deflecting surfaces conduct the lubricant away from the read/write sensor.

10. The slider in accordance with Claim 9 wherein some of the one or more structures has one of one or more rails connected thereto and leading to the shared edge, wherein the one or more structures and the one or more rails are formed of a high surface energy material for wicking the lubricant from the lubricant channels on the air bearing surface to the lubricant reservoirs.

11. The slider in accordance with Claim 10 wherein the high surface energy material is gold.

12. The slider in accordance with Claim 9 wherein the lubricant channels comprise two lubricant channels.

13. The slider in accordance with Claim 9 wherein the lubricant channels comprise four lubricant channels.

14. The slider in accordance with any of Claims 9, 12 or 13 wherein the depression formed in the air bearing surface includes one or more trenches, the one or more trenches having a depth greater than a remainder of the depression and formed in the air bearing surface to direct the lubricant towards the lubricant channels.

15. The slider in accordance with Claims 9, 12, 13 or 14 wherein a film comprising high surface energy material is patterned onto the at least one surface at one or more locations adjacent exits from the lubricant channels onto the at least one surface.

16. The slider in accordance with any of Claims 9, 12, 13, 14 or 15 wherein pillars comprising high surface energy material and having a predetermined shape and size are formed on the at least one surface.

17. The slider in accordance with any of Claims 1 to 16 wherein the one or more structures are bonding pads formed on the at least one surface.

18. The slider in accordance with Claim 17 wherein the bonding pads are formed of a high surface energy metal.

19. A hard disk drive system comprising:

a hard disk comprising a plurality of layers, wherein at least a topmost one of the plurality of layers comprises a lubricant layer; and

at least one slider structure for reading data from and writing data onto the hard disk, the at least one slider structure comprising:

an air bearing surface including a read/write sensor for reading and writing the data from/onto the hard disk;

at least one surface orthogonal to and having a shared edge with the air bearing surface; and

one or more structures for forming lubricant reservoirs fluidically coupled to the air bearing surface to prevent lubricant buildup thereon, wherein at least one of the one or more structures are formed on the at least one surface orthogonal to the air bearing surface.

20. The hard disk drive system in accordance with Claim 19 wherein each of the one or more structures has a predetermined outline to form the lubricant reservoirs of one or more geometric shapes for the lubricant to enter the lubricant reservoirs by capillary action and the lubricant reservoirs to maintain the lubricant therein by surface tension.

21. The hard disk drive system in accordance with either of Claims 19 or 20 wherein the one or more structures for guiding movement of the lubricant from the air bearing surface to the lubricant reservoirs are selected from the group of structures comprising a depression formed in the air bearing surface, one or more deflecting surfaces forming one side of the depression, channels formed alongside the one or more deflecting surfaces, deep trenches formed in the depression and connected to the channels, rails from the channels to some of the one or more structures formed on the at least one surface, high surface energy metal used to form the rails and/or the one or more structures, and high surface energy metallic materials patterned onto the at least one surface either as films adjacent exits from the channels or as pillars of a predetermined shape and size arrayed on the at least one surface.

22. A head-stack assembly for a hard disk drive system comprising:

one or more actuator arms; and

one or more slider structures for reading data from and writing data onto a hard disk, each of the one or more slider structures coupled to a distal end of one of the actuator arms and comprising:

an air bearing surface for providing a read/write sensor above the surface of the hard disk;

at least one surface orthogonal to and having a shared edge with the air bearing surface; and

one or more structures for forming lubricant reservoirs fluidically coupled to the air bearing surface to prevent lubricant buildup thereon, wherein at least one of the one or more structures are formed on the at least one surface orthogonal to the air bearing surface.

23. The head-stack assembly in accordance with Claim 22 wherein the one or more structures for guiding movement of the lubricant from the air bearing surface to the lubricant reservoirs are selected from the group of structures comprising a depression formed in the air bearing surface, one or more deflecting surfaces forming one side of the depression, channels formed alongside the one or more deflecting surfaces, deep trenches formed in the depression and connected to the channels, rails from the channels to some of the one or more structures formed on the at least one surface, high surface energy metal used to form the rails and/or the one or more structures, and high surface energy metallic materials patterned onto the at least one surface either as films adjacent exits from the channels or as pillars of a predetermined shape and size arrayed on the at least one surface.

24. A head-gimbal assembly for a hard disk drive system comprising:

one or more arms; and

one or more slider structures for reading data from and writing data onto a hard disk, each of the one or more slider structures coupled to a distal end of one of the arms and comprising:

an air bearing surface for providing a read/write sensor above the surface of the hard disk;

at least one surface orthogonal to and having a shared edge with the air bearing surface; and

one or more structures for forming lubricant reservoirs fluidically coupled to the air bearing surface to prevent lubricant buildup thereon, wherein at least one of the one or more structures are formed on the at least one surface orthogonal to the air bearing surface.

CLAIMS

What is claimed is:

1. A slider for reading data from and writing data onto a hard disk, the slider comprising: an air bearing surface for providing a read/write sensor above the surface of the hard disk; at least one surface orthogonal to and having a shared edge with the air bearing surface; and one or more structures for forming lubricant reservoirs fluidically coupled to the air bearing surface to prevent lubricant buildup thereon, wherein at least one of the one or more structures are formed on the at least one surface orthogonal to the air bearing surface.

2. The slider in accordance with claim 1 wherein the at least one surface comprises a trailing edge surface.

3. The slider in accordance with claim 1 wherein each of the one or more structures has a predetermined outline to form the lubricant reservoirs of one or more geometric shapes for the lubricant to enter the lubricant reservoirs by capillary action and the lubricant reservoirs to maintain the lubricant therein by surface tension.

4. The slider in accordance with claim 3 wherein the one or more geometric shapes include a trapezoidal shape having a lubricant entry side with a smaller length than a side opposite to and parallel to the lubricant entry side.

5. The slider in accordance with claim 4 wherein the one or more geometric shapes include an entry portion having the trapezoidal shape and a remaining portion having a rectangular shape.

6. The slider in accordance with claim 3 wherein the one or more geometric shapes include a trapezoidal shape having a lubricant entry side with a longer length than a side opposite to and parallel to the lubricant entry side.

7. The slider in accordance with claim 6 wherein the one or more geometric shapes include an entry portion having a rectangular shape and a remaining portion having the trapezoidal shape.

8. The slider in accordance with claim 3 wherein the one or more geometric shapes include a rectangular shape having a lubricant entry side with a substantially equal length to a side opposite to and parallel to the lubricant entry side.

9. The slider in accordance with claim 1 wherein the air bearing surface has a depression formed therein by a plurality of surfaces, wherein the plurality of surfaces include deflecting surfaces adjacent one or more lubricant channels and forming a portion of the depression along the shared edge of the air bearing surface and the at least one surface having the structures formed thereon, and wherein the deflecting surfaces conduct the lubricant away from the read/write sensor.

10. The slider in accordance with claim 9 wherein some of the one or more structures has one of one or more rails connected thereto and leading to the shared edge, wherein the one or more structures and the one or more rails are formed of a high surface energy material for wicking the lubricant from the lubricant channels on the air bearing surface to the lubricant reservoirs.

11. The slider in accordance with claim 10 wherein the high surface energy material is gold.

12. The slider in accordance with claim 9 wherein the lubricant channels comprise two lubricant channels.

13. The slider in accordance with claim 9 wherein the lubricant channels comprise four lubricant channels.

14. The slider in accordance with claim 9 wherein the depression formed in the air bearing surface includes one or more trenches, the one or more trenches having a depth greater than a remainder of the depression and formed in the air bearing surface to direct the lubricant towards the lubricant channels.

15. The slider in accordance with claim 9 wherein a film comprising high surface energy material is patterned onto the at least one surface at one or more locations adjacent exits from the lubricant channels onto the at least one surface.

16. The slider in accordance with claim 9 wherein pillars comprising high surface energy material and having a predetermined shape and size are formed on the at least one surface.

17. The slider in accordance with claim 1 wherein the one or more structures are bonding pads formed on the at least one surface.

18. The slider in accordance with claim 17 wherein the bonding pads are formed of a high surface energy metal.

19. A hard disk drive system comprising: a hard disk comprising a plurality of layers, wherein at least a topmost one of the plurality of layers comprises a lubricant layer; and at least one slider structure for reading data from and writing data onto the hard disk, the at least one slider structure comprising: an air bearing surface including a read/write sensor for reading and writing the data from/onto the hard disk; at least one surface orthogonal to and having a shared edge with the air bearing surface; and one or more structures for forming lubricant reservoirs fluidically coupled to the air bearing surface to prevent lubricant buildup thereon, wherein at least one of the one or more structures are formed on the at least one surface orthogonal to the air bearing surface.

20. The hard disk drive system in accordance with claim 19 wherein each of the one or more structures has a predetermined outline to form the lubricant reservoirs of one or more geometric shapes for the lubricant to enter the lubricant reservoirs by capillary action and the lubricant reservoirs to maintain the lubricant therein by surface tension.

21. The hard disk drive system in accordance with claim 19 wherein the one or more structures for guiding movement of the lubricant from the air bearing surface to the lubricant reservoirs are selected from the group of structures comprising a depression formed in the air bearing surface, one or more deflecting surfaces forming one side of the depression, channels formed alongside the one or more deflecting surfaces, deep trenches formed in the depression and connected to the channels, rails from the channels to some of the one or more structures formed on the at least one surface, high surface energy metal used to form the rails and/or the one or more structures, and high surface energy metallic materials patterned onto the at least one surface either as films adjacent exits from the channels or as pillars of a predetermined shape and size arrayed on the at least one surface.

22. A head-stack assembly for a hard disk drive system comprising: one or more actuator arms; and one or more slider structures for reading data from and writing data onto a hard disk, each of the one or more slider structures coupled to a distal end of one of the actuator arms and comprising: an air bearing surface for providing a read/write sensor above the surface of the hard disk; at least one surface orthogonal to and having a shared edge with the air bearing surface; and one or more structures for forming lubricant reservoirs fluidically coupled to the air bearing surface to prevent lubricant buildup thereon, wherein at least one of the one or more structures are formed on the at least one surface orthogonal to the air bearing surface.

23. The head-stack assembly in accordance with claim 22 wherein the one or more structures for guiding movement of the lubricant from the air bearing surface to the lubricant reservoirs are selected from the group of structures comprising a depression formed in the air bearing surface, one or more deflecting surfaces forming one side of the depression, channels formed alongside the one or more deflecting surfaces, deep trenches formed in the depression and connected to the channels, rails from the channels to some of the one or more structures formed on the at least one surface, high surface energy metal used to form the rails and/or the one or more structures, and high surface energy metallic materials patterned onto the at least one surface either as films adjacent exits from the channels or as pillars of a predetermined shape and size arrayed on the at least one surface.

24. A head-gimbal assembly for a hard disk drive system comprising: one or more arms; and one or more slider structures for reading data from and writing data onto a hard disk, each of the one or more slider structures coupled to a distal end of one of the arms and comprising: an air bearing surface for providing a read/write sensor above the surface of the hard disk; at least one surface orthogonal to and having a shared edge with the air bearing surface; and one or more structures for forming lubricant reservoirs fluidically coupled to the air bearing surface to prevent lubricant buildup thereon, wherein at least one of the one or more structures are formed on the at least one surface orthogonal to the air bearing surface.