

DISC STREAK PATTERN FORMING METHOD AND APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method and an apparatus for forming streak patterns on a disc in which streak patterns having a predetermined angle of intersection are formed on the disc such as a magnetic disc or the like.

2. Description of the Prior Art

In recent years, the capacity of a magnetic disc increases at a high rate, and in the near future, it is expected that a magnetic disc will have a capacity capable of storing information of several giga bites.

With such a magnetic disc having a great capacity and a high density, in order to enhance its magnetic property, it is desirous to provide a surface of the disc with streak patterns having an angle of crossing or intersection ranging from 20 degrees to 30 degrees, as clearly illustrated in Fig. 10.

A known streak pattern forming technology for a magnetic disc of this kind is illustrated in Figs. 11(a) and 11(b). Fig. 11(a) is a schematic plan view showing a polishing step, and Fig. 11(b) is a schematic view showing a texturing step in which streak patterns are formed on a surface of a magnetic disc after being subjected to a polishing process.

of a predetermined size and having a surface and a center, the method comprising the steps of:

providing a plurality of ring-shaped polishing means each having a central axis and each defining a central bore;

placing the plurality of ring-shaped polishing means in contact with the surface of the disc, with spaced-apart portions of the disc surface disposed inside the central bores of the ring-shaped polishing means;

driving the plurality of ring-shaped polishing means to travel about the center of the disc; and

driving the plurality of ring-shaped polishing means to rotate about their own respective central axes while maintaining contact with the disc surface so as to form a disc streak pattern on the disc surface.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side elevational view, partially cut-away along a line A-A of Fig. 1(a), of a streak pattern forming apparatus for a disc according to one embodiment of the present invention:

Fig. 1(a) is a front elevational view thereof;

Fig. 1(b) is a cross sectional view thereof taken along a line B-B of Fig. 1;

Fig. 2 is a front elevational view showing an arrangement of three pad rotating members;

Fig. 3 is a schematic view showing how to set the internal diameter of a polishing pad;

manner.

First, in the system of Fig. 4, the magnetic disc 200 is placed inside the annular frame 91 and clamped at its peripheral portion by means of the clamber 92. Thus, the magnetic disc 200 is fixedly held inside the annular frame 91 and at the same time, the central axes L of the drums 2 of the pair of the streak pattern forming apparatuses 1-1, 1-2 are placed in alignment with the center of the magnetic disc 200.

With this state, the holder 9 is moved to the right in Fig. 4, i.e., in a direction toward the second streak pattern forming apparatus 1-2, so that the right-hand side surface of the magnetic disc 200 is placed in contact with the polishing pads 4 of the second streak pattern forming apparatus 1-2. Thereafter, the piston 84 is operated to contact the piston rod 85 to thereby move the first streak pattern forming apparatus 1-1 toward the holder 9, thus causing the polishing pads 4 in contact with the left-hand side surface of the magnetic disc 200.

That is, as shown in Fig. 6, the first streak pattern forming apparatus 1-1 is fixedly held on the moving frame 80 with the polishing pads 4 of the first and second streak pattern forming apparatuses 1-1, 1-2 being placed in contact with the opposite sides of the magnetic disc 200.

Accordingly, as illustrated in Fig. 3, the information storage surface 201 of the magnetic disc 200 is disposed inside the central bore 40 in each polishing pad 4 while being in sliding contact with the polishing pads 4 of the streak pattern forming apparatuses 1-1, 1-2 (a contacting step).

speed of the first motor 5 with the same magnitude of the revolving velocity vector V_s . In other word, streak patterns with an angle of intersection θ_1 ranging from 20 degrees to 30 degrees can be obtained by suitably setting the rotational speed of the second motor 6 in such a manner that the magnitude of the self-rotating velocity vector V_p is in the range of from 6 to 12 m/min, while maintaining or setting the rotational speed of the first motor 5 such that the magnitude of the revolving velocity vector V_s is 70 m/min.

In this manner, according to the streak pattern forming apparatuses of this embodiment, the rotating polishing pads 4 are placed in contact with the magnetic disc 200 to thereby form streak patterns on the information storage surface 201 thereof, so that there are provided fine streak patterns having a center line average roughness of about 10Å. As a consequence, the magnetic property of the magnetic disc 200 can be improved and the polishing step and the texturing step can be concurrently carried out in a single step, thus serving to reduce the cost of production facilities as well as the cost of manufacture.

Moreover, by changing the rotation speed of the second motor 6 in an appropriate manner, the angle of intersection of streak patterns can be adjusted to a desired value, so that the finishing accuracy of the magnetic disc 200 can be enhanced.

Here, it is to be noted that the present invention is not limited to the above-described embodiment but instead various modifications and changes thereof can be made without departing from the spirit or scope of the claimed subject matter of the present invention.

WHAT IS CLAIMED IS:

1. A disc streak pattern forming method for use in polishing an annular disc having a storage surface, a radially outer periphery and a radially inner periphery, and a center, the method comprising the steps of:

providing a ring-shaped polishing means having a central axis and defining a central bore therein;

placing the ring-shaped polishing means in contact with the surface of said disc, with at least one portion of the surface disposed inside the central bore of said ring-shaped polishing means;

driving said ring-shaped polishing means to revolve about the center of said disc;

driving said ring-shaped polishing means to rotate around its central axis; and

said ring-shaped polishing means comprising at least one ring-shaped polishing pad, with said at least one ring-shaped polishing pad being disposed in such a manner that the radially outer periphery and the radially inner periphery of said at least one portion of the surface of said disc are both disposed inside the central bore of said at least one ring-shaped polishing pad,

whereby the surface of said disc is polished and provided with streak patterns by said ring-shaped polishing means.

2. The disc streak pattern forming method according to claim 1, wherein the surface of said disc is annular and has an annular band area with a radially outer periphery and a radially inner periphery defining a radial width therebetween, and the central bore of said ring-shaped polishing means has a diameter equal to or greater than the radial width of the annular band area of said ring-shaped polishing means.

3. A disc streak pattern forming apparatus for use in polishing an annular disc having a surface, a radially outer periphery and a radially inner periphery, and a center, the apparatus comprising:

ring-shaped polishing means having a central axis, a central bore and a working surface in contact with said disc;

a drive unit supporting thereon said ring-shaped polishing means in such a manner that at least a portion of the surface of said disc is disposed inside the central bore of said ring-shaped polishing means, said drive unit being operable to revolve said ring-shaped polishing means around the center of said disc and rotate said ring-shaped polishing means about its central axis while maintaining contact with the surface of said disc, thereby polishing the surface of said disc and forming streak patterns thereon; and

said ring-shaped polishing means comprises at least one ring-shaped polishing pad, with said at least one ring-shaped polishing pad being disposed in such a manner that the radially outer periphery and the radially inner periphery of said at least one portion of the surface of said disc are both disposed inside the central bore of said at least one ring-shaped polishing pad.

4. The disc streak pattern forming apparatus according to claim 3, wherein said drive unit comprises:

revolving means having a center and capable of revolving around the center of said disc;

self-rotating means mounted on said revolving means for rotation relative thereto; and

driving means for driving said revolving means to revolve around the center of said disc and for driving said self-rotating means to rotate said ring-shaped polishing means about its central axis while maintaining contact with the surface of said disc, so as to polish the surface of said disc and form streak patterns thereon.

5. The disc streak pattern forming apparatus according to claim 3, wherein the surface of said disc has an annular band area with a radially outer periphery and a radially inner periphery defining a radial width

therebetween, and the central bore of said ring-shaped polishing means has a diameter equal to or greater than the radial width of the annular band area of said ring-shaped polishing means.

6. The disc streak forming apparatus according to claim 3, wherein said ring-shaped polishing means comprises a plurality of ring-shaped polishing pads disposed about the center of said disc in such a manner that the radially outer periphery and the radially inner periphery of said at least one portion of the surface of said disc are both disposed inside the central bore of each of said ring-shaped polishing pads.

7. The disc streak pattern forming apparatus according to claim 4, wherein said revolving means has a toothed portion formed on its outer periphery; and said self-rotating means comprises a shaft member rotatably supported on said revolving means, a mounting member mounted on one end of said shaft member and having one end extended from said revolving means, said ring-shaped polishing means attached to the extended end of said mounting member, and a driven gear wheel mounted on the other end of said shaft member; and said driving means comprises a first motor having a first drive gear wheel in meshing engagement with said toothed portion of said revolving means for driving said revolving means through the meshing engagement of said first drive

gear wheel and said toothed portion, and a second motor having a second drive gear wheel in meshing engagement with said driven gear wheel of said self-rotating means for driving said self-rotating means through the meshing engagement of said second drive gear wheel and said driven gear wheel.

8. A-disc streak pattern forming method for use in polishing an annular disc having a storage surface, a radially outer periphery and a radially inner periphery, and a center, the method comprising the steps of:

providing a ring-shaped polishing means having a central axis and defining a central bore therein, said ring-shaped polishing means comprising a plurality of ring-shaped polishing pads;

placing the ring-shaped polishing means in contact with the surface of said disc, with at least one portion of the surface disposed inside the central bore of said ring-shaped polishing means;

driving said ring-shaped polishing means to revolve about the center of said disc;

driving said ring-shaped polishing means to rotate around its central axis;

disposing said plurality of ring-shaped polishing pads about the center of said disc in such a manner that the radially outer periphery and the radially inner periphery of said at least one portion of the surface of

said disc are both disposed inside the central bore of each of said ring-shaped polishing pads; and

subjecting said respective ring-shaped polishing pads to said contacting revolving and self-rotating steps,

whereby the surface of said disc is polished and provided with streak patterns by said ring-shaped polishing means.