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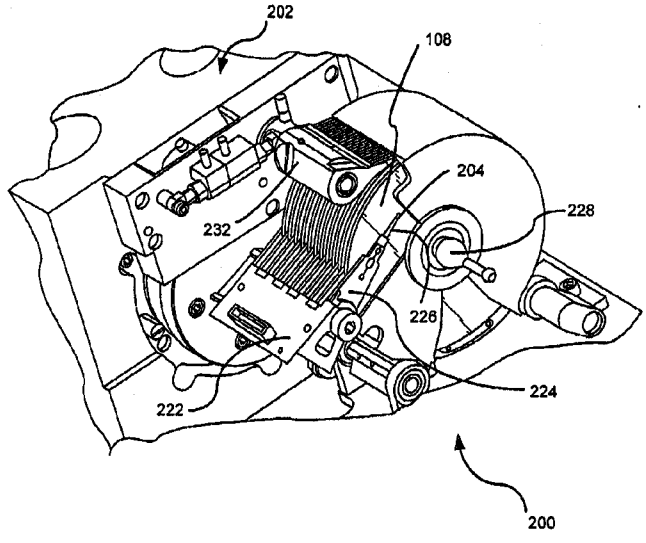
(54) Title: VERTICALLY-ORIENTED SERVO TRACK WRITER AND METHOD



(57) Abstract: A vertically-oriented servo track writer assembly and method for recording servo pattern on a disc surface includes a spindle hub assembly that rotates one or more discs in a substantially vertical plane and an actuator assembly that pivots an E-block about a substantially horizontal axis. The E-block includes one or more actuator arms and associated flexures, with each flexure including a servo recording head. Pivoting motion of the E-block moves each servo recording head in a substantially vertical plane adjacent a surface of an associated disc to record servo pattern information on the disc surface. The method further includes laterally moving the actuator assembly into and out of engagement with the spindle hub assembly to simplify loading and unloading discs from the spindle hub assembly.

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VERTICALLY-ORIENTED SERVO TRACK WRITER AND METHOD

Related Applications

This application claims priority of United States provisional application Serial Number 60/295,275, filed June 1, 2001, which is herein incorporated by reference.

Field of the Invention

This application relates generally to magnetic disc drives and more particularly to a vertical multi-disc servo track writer assembly and method for recording servo patterns on information storage discs.

Background of the Invention

Disc drives are data storage devices that store digital data in magnetic form on a rotating disc. Modern disc drives comprise one or more rigid information storage discs that are coated with a magnetizable medium and mounted on the hub of a spindle motor for rotation at a constant high speed. Information is stored on the discs in a plurality of concentric circular tracks typically by an array of transducers ("heads") mounted to a radial actuator for movement of the heads relative to the discs. During a write operation sequential data is written onto the disc track, and during a read operation the head senses the data previously written onto the disc track and transfers the information to an external environment. Important to both of these operations is the accurate and efficient positioning of the head relative to the center of the desired track on the disc. Head positioning within a desired track is dependent on head-positioning servo patterns, i.e., a pattern of data bits recorded on the disc surface and used to maintain optimum track spacing and sector timing. Servo patterns or information can be located between the data sectors on each track of a disc ("embedded servo"), or on only one surface of one of the discs within the disc drive ("dedicated servo"). Regardless of whether a manufacturer uses "embedded" or "dedicated" servos, the servo patterns are typically recorded on a target disc during the manufacturing process of the disc drive.

Recent efforts within the disc drive industry have focused on developing cost-effective disc drives capable of storing more data onto existing or smaller-sized discs. One potential way of increasing data storage on a disc surface is to increase the recording density of the magnetizable medium by increasing the track density (i.e., the number of tracks per

millimeter). Increased track density requires more closely-spaced, narrow tracks and therefore enhanced accuracy in the recording of servo-patterns onto the target disc surface. This increased accuracy requires that servo-track recording be accomplished within the increased tolerances, while remaining cost effective.

Servo patterns are typically recorded on the magnetizable medium of a target disc by a servo-track writer ("STW") assembly during the manufacture of the disc drive. One conventional STW assembly records servo pattern on the discs following assembly of the disc drive. In this embodiment, the STW assembly attaches directly to a disc drive having a disc pack where the mounted discs on the disc pack have not been pre-recorded with servo pattern. The STW essentially uses the drive's own read/write heads to record the requisite servo pattern directly to the mounted discs. An alternative method for servo pattern recording utilizes a separate apparatus having dedicated servo recording transducers or heads for recording servo pattern onto one or more discs. The dedicated servo recording heads can be used to record servo information to a number of discs simultaneously, which are subsequently loaded into the disc drive for use. In light of the trend toward higher track density, there is a demand for dedicated STW assemblies that are capable of recording servo patterns simultaneously to multiple discs for high density disc drives.

Conventional dedicated STW assemblies are oriented in a horizontal direction with the discs mounted in a horizontal plane. Such dedicated STW assemblies typically utilize one or more actuator arms having one or more transducers or heads on each arm which, in turn, move in a horizontal plane along a radius of the magnetizable medium on the target disc. That is, conventional dedicated STWs have both discs and actuator arms that rotate in a horizontal plane about a vertical STW bearing axis so that a head at a distal end of each actuator arm moves in a horizontal path across the disc surface.

Shortcomings of the prior art horizontally-oriented STW assemblies include disc alignment errors and imperfections in the recording system resulting from the horizontal orientation of both the discs and the actuator arms, as well as the flexible "suspensions" connecting the servo-writing heads to the actuator arms. Specifically, while the discs are formed from a relatively stiff metal material, the discs are nonetheless subject to gravity-induced warping, particularly along the outer circumference of the discs. Even miniscule amounts of gravity-induced disc warpage can lead to unacceptable servo-writing errors, particularly in light of the higher track densities demanded by current disc drive users.

Accordingly, improvements in servo pattern recording accuracy are required by dedicated STW assemblies as well as improvements in the time it takes to manufacture discs

having the appropriate servo pattern. The present invention provides a solution to this and other problems, and offers other advantages over the prior art.

Summary of the Invention

The present invention relates to a vertically-oriented servo track writer assembly for recording servo pattern information on a disc for use within a disc drive.

In accordance with one embodiment of the present invention, the servo track writer assembly has a spindle hub assembly including a hub supporting the disc in a substantially vertical plane for rotation at a predetermined rate. An actuator assembly includes an E-block and a motor for rotating the E-block about a substantially horizontal axis which, in turn, rotates an actuator arm and a flexure in a substantially vertical plane. A servo recording head is mounted to a distal end of the flexure so that the head moves in a substantially vertical plane along a surface of the disc to record the servo pattern information on the disc surface.

The servo track writer assembly preferably supports a plurality of discs stacked on the spindle hub assembly, and the E-block preferably includes a plurality of actuator arms and attached flexures to provide simultaneous recording of servo pattern information on each of the vertically-oriented discs. The servo track writer assembly may also include a platform and a slide mechanism coupling the actuator assembly to the platform to allow lateral movement of the actuator assembly between a first position wherein the actuator arms engage the discs for writing servo pattern information, and a second position wherein the plurality of actuator arms are laterally spaced from the plurality of discs.

The present invention can also be implemented as a method of recording servo pattern information on a disc in a vertically-oriented servo track writer assembly, where the method includes the steps of positioning the disc on a substantially horizontally-oriented spindle hub assembly and activating the spindle hub assembly to rotate the disc in a substantially vertical plane. A further step includes pivoting an E-block of an actuator assembly about a substantially horizontal axis to rotate an actuator arm and an attached flexure along an arcuate path in a substantially vertical plane adjacent a surface of the disc. A servo recording head is then signaled to record servo pattern information on the surface of the vertically-oriented disc.

The present invention can further be implemented as a servo track writer assembly having means for moving a servo recording head in a substantially vertical plane to record servo pattern information on a surface of a disc while rotating the disc in a substantially vertical orientation. The servo track writer assembly may also include means for

simultaneously recording servo pattern information on a plurality of discs rotating in a substantially vertical orientation. In one preferred embodiment, the servo track writer assembly includes means for selectively engaging and disengaging the plurality of servo recording heads from the plurality of discs while the vertically-oriented discs are rotating.

These and various other features as well as advantages which characterize the present invention will be apparent from a reading of the following detailed description and a review of the associated drawings.

Brief Description of the Drawings

FIG. 1 is a top plan view of a disc drive assembly manufactured using an embodiment of the present invention.

FIG. 2 is a top view of a vertically oriented servo-track writer illustrating an actuator assembly and a spindle motor rotatably supporting a plurality of vertically oriented discs in accordance with an embodiment of the present invention.

FIG. 3 is a perspective view of the vertically oriented multi-disc servo-track writer shown in FIG. 2 illustrating the actuator assembly and the spindle motor in a disc load/unload position.

FIG. 4 is a perspective view of the actuator assembly of FIG. 2 engaging the plurality of vertically oriented discs on a spindle motor hub assembly, wherein the spindle motor has been removed for purposes of clarity.

FIG. 5 is a flow diagram showing the steps for writing servo pattern on discs in a vertically-oriented servo-track writer in accordance with a preferred embodiment of the present invention.

Detailed Description

A disc drive **100** manufactured in accordance with an embodiment of the present invention is shown in FIG. 1. The disc drive **100** includes a base **102** to which various components of the disc drive are mounted. A top cover **104**, shown partially cut away, cooperates with the base **102** to form an internal, sealed environment for the disc drive **100** in a conventional manner. The components include a spindle motor **106** which rotates one or more discs **108** at a constant high speed. Information is written to and read from tracks, as illustrated by broken line **109**, on the discs **108** through the use of an actuator assembly **110**, which rotates about a bearing shaft assembly **112** positioned adjacent the discs **108**. The actuator assembly **110** includes a plurality of actuator arms **114** which extend towards the

discs **108**, with one or more flexures **116** extending from each of the actuator arms **114**. Mounted at the distal end of the flexures **116** is a head **118** which includes an air bearing slider (not shown) enabling the head **118** to fly in close proximity above the corresponding surface of the associated disc **108**.

Radial positioning of the heads **118** is controlled through the use of a voice coil motor **120**, which typically includes a coil **122** attached to the actuator assembly **110**, as well as one or more permanent magnets **124**, which establish a magnetic field in which the coil **122** is immersed. The controlled application of current to the coil **122** causes a magnetic interaction between the permanent magnets **124** and the coil **122** so that the coil **122** moves in accordance with the well known Lorentz relationship. As the coil **122** moves, the actuator assembly **110** pivots about the bearing shaft assembly **112** and the heads **118** are caused to move across the surfaces of the discs **108**.

Movement and positioning of the heads **118** over the disc surface relies upon pre-recorded servo information or "servo pattern" on the disc. Servo pattern provides information that specifies the radial positions of the heads, which information is then compared to the desired head position, allowing for appropriate signals to be sent to move the heads **118** accordingly. There are two types of servo pattern commonly used in conventional disc drives: dedicated servo, i.e., a dedicated disc or servo disc used exclusively for servo information, and embedded servo, i.e., servo information regularly interspaced on a disc where a head following a disc track is regularly reading servo pattern to control its position. As will be clear from the discussion that follows, either type of servo pattern can be recorded onto a target disc using the methods and apparatus of the present invention.

The present invention provides a dedicated, vertically oriented, multi-disc servo track writer ("STW") for the accurate positioning and movement of servo recording heads during servo pattern recording on a disc as well as a method for recording servo pattern to a disc. FIGS. 2-4 illustrate a multi-disc STW **200** in accordance with one embodiment of the present invention. The vertically-oriented STW **200** includes an actuator assembly **202** for providing rotating servo recording heads **204** (see FIG. 4) necessary for recording servo pattern onto a target disc **108**; a spindle motor hub assembly **206** for vertically positioning one or more target discs **108** onto which the servo pattern is to be recorded; a vacuum chuck **208** for rigidly securing the actuator assembly **202** in a desired position for servo track writing; and a laser interferometer **210** for measuring the angular displacement and consequent positioning of the servo-recording heads **204** of the actuator assembly **202** for servo pattern recording.

FIG. 2 illustrates that the entire multi-disc servo writer **200** sits upon a substantially immobile and horizontally positioned platform or base **212**. The platform **212** is substantially resistant to movements from impact type collisions and is preferably a granite slab or other like material having sufficient size to support all the components of the STW **200**. The actuator assembly **202** is connected to the platform **212** via a slide mechanism **214** for lateral movement (as indicated by arrow **216**) over the platform **212** between a servo recording position **218** and a disc loading and un-loading position **220**, as is discussed in greater detail below. The spindle motor hub assembly **206** and vacuum chuck **208** are directly and non-moveably secured to the platform **212**.

Contrary to prior art STWs, the actuator assembly **202** and the spindle hub assembly **206** of the STW **200** are both vertically oriented. Thus, the plurality of discs **108** secured to the spindle hub assembly **206** are vertically positioned relative to the platform **212**. It is believed that the substantially vertical orientation of the discs **108** improves the accuracy of the servo pattern that is written to each of the discs by the STW **200**, as explained in greater detail below. Similarly, the actuator assembly **202** includes an E-block **222** having a plurality of actuator arms **224** (FIG. 4) that are also arranged for movement in substantially vertical planes relative to the platform **212**. Each actuator arm **224** includes one or more flexures **226** connecting a distal end of the actuator arm to a corresponding one of the servo-writing heads **204**. The vertical orientation of the actuator arms **224** also increases the accuracy of the servo writing process as described below.

FIG. 3 illustrates the STW **200** in the load/unload position **220** where the actuator assembly **202** has been moved away from the spindle hub assembly **206** via the slide mechanism **214**. In this position, a stack of discs **108** may be loaded onto spindle hub assembly **206** to start the servo writing process. In a preferred embodiment of the invention, the spindle hub assembly **206** may include a detachable spindle hub **228** (FIG. 4) so that the hub **228** and the stack of discs **108** may be detached from a spindle motor (not shown in FIG. 4) to ease the process of loading and unloading the discs **108** from the spindle hub **228**. However, it is noted that the present invention is not limited to the use of a detachable spindle hub **228**.

Once the discs **108** have been loaded on the spindle hub assembly **206** with a predetermined gap between adjacent discs, the discs **108** are secured to the spindle hub assembly **206** by means of a clamp ring **230** (FIG. 3). The actuator assembly **202** is then preferably moved laterally along the platform **212** (in the direction of arrow **216**) toward the spindle hub assembly **206**. While the flexures **226** on each of the actuator arms **224** tend to

bias their corresponding heads **204** as is well known in the art, a comb **232** (FIG. 4) is preferably used to maintain proper separation between the heads **204** so that the actuator assembly **202** and the disc stack on the spindle hub assembly **206** may merge without unintentional contact between the heads **204** and the discs **108**. The comb **232** preferably moves together with the actuator assembly **202** as shown in FIG. 4 and acts to separate the heads **204** against the bias force of the flexures **226**. Once the actuator assembly **202** is locked into the servo writing position **218** so that the heads **204** are positioned within the gaps between the adjacent discs **108**, the comb **232** is rotated away from the E-block **222** to allow the heads **204** to engage their respective discs as a result of the bias force provided by the flexures **226**. Of course, the heads **204** do not make physical contact with the data regions of their respective disc surfaces. Rather, the spindle hub assembly **206** is activated to spin the discs **108** at a predetermined rate prior to disengaging the comb **232**. As described above, the rotational motion of the discs **108** generates wind so that the heads **204** ride an air bearing in lieu of actually contacting the disc surface. This air bearing counters the bias force applied by the flexures **226** and protects the fragile magnetic coatings on the disc surfaces.

Once the comb **232** is removed so that the heads **204** are fully engaged with their respective discs **108**, servo writing signals are applied to the heads **204** to begin the process of recording the servo pattern. During the recording process, the E-block **222** is rotated about a horizontal axis by a motor and bearing assembly within the actuator assembly **202** so that the heads **204** move radially across the surface of their respective discs **108**. The position of the heads **204** is determined by the laser interferometer **210** which utilizes interferometric techniques to track movement of the heads along the disc radius, and the interferometer **210** sends position signals back to control the operation of the actuator assembly **202** and thus the radial position of the heads **204**.

Upon completion of the servo writing process, the E-block **222** is rotated back to position the heads **204** adjacent an outer circumference of the discs **108**, while the comb **232** is rotated into contact with the flexures **226** to disengage the heads **204** from the discs **108**. The actuator assembly **202** is then moved laterally away from the spindle hub assembly **206** to the load/unload position **220** so that the discs **108** (complete with their newly written servo patterns) can be removed from the spindle hub assembly **206** and ultimately installed in the disc drive **100**.

The vertical orientation of the actuator assembly **202** provides an important benefit over prior art (horizontally-oriented) STWs since the force of gravity does not act to pull the heads **204** downward. This is important both during the loading and unloading of the heads

204 onto the discs 108 as well as during the servo writing process itself. For instance, while the comb 232 acts to separate the heads 204 prior to the loading process, it is noted that the comb 232 typically contacts the flexures 226 rather than the fragile heads 204 located at a distal end of the flexures 226. Thus, with horizontally-oriented STWs, the force of gravity may tend to pull the heads 204 downward below the level of the individual comb arm or tine, thereby creating a danger of inadvertent contact between the hanging head 204 and the disc 108 prior to the disengagement of the comb 232 from the flexures 226. This danger is avoided in the current invention since the force of gravity does not tend to pull the heads 204 in the direction of the discs. Additionally, during the servo writing process utilizing the present invention, the force of gravity does not tend to pull the heads 204 either toward or away from their respective disc surfaces as in the prior art. That is, in a horizontally-oriented STW, half of the heads are typically positioned adjacent a top surface of a disc, while the other half of the heads are positioned adjacent a bottom surface of a disc. For those heads positioned above their respective discs, the force of gravity on the flexure 226 and the head 204 is combined with the preload force generated by the flexure 226, while for those heads positioned below their respective discs the force of gravity acts against the preload force. This dichotomy can create fluctuations in the preload force for the different heads within the STW which ultimately leads to discrepancies in the "fly height" of the head over the disc surface. While the preload force provided by the flexure is typically much greater than the weight of the flexure and head combined, even minor discrepancies in the fly height of the head during the servo writing process can lead to errors in the servo pattern.

In addition to the above-described benefits relating to the substantially vertical orientation of the actuator assembly 202 (i.e., the movement of the actuator arms 224, the flexures 226 and the heads 204 in a vertical plane), the substantially vertical orientation of the discs 108 on the spindle hub assembly 206 also provides benefits over prior art horizontally-oriented STWs. Specifically, while the discs 108 are formed from a relatively stiff material (such as aluminum), the discs are nonetheless subject to gravity-induced warping, particularly along the outer circumference of the discs. As described above, even miniscule amounts of disc warpage can lead to unacceptable servo-writing errors, particularly in light of the higher track densities utilized with the discs. However, by maintaining the discs 108 in a vertical orientation during the servo writing process, the force of gravity does not act to pull the disc surface from its nominal vertical plane. Thus, the vertical orientation of the STW 200 of the present invention (i.e., the substantially vertical orientation of both the actuator assembly 202 and the discs 108) provides a number of benefits over prior art horizontally-oriented STWs.

A flow chart of the steps involved in recording servo pattern to a target disc for use in a disc drive in accordance with one embodiment of the present invention is shown in FIG. 5. In operation **500**, one or more discs **108** are loaded onto a horizontally oriented spindle hub assembly **206** so that each disc **108** extends in a substantially vertical plane. In operation **502**, the spindle hub assembly **206** is actuated to rotate the discs **108** for servo-track writing. In operation **504**, an actuator assembly **202** is moved into position relative to the spindle hub assembly **206** for servo-track writing, wherein the actuator assembly **202** includes a plurality of actuator arms **224** oriented for movement in a substantially vertical plane. In operation **506**, servo-writing heads **204** located at a distal end of each of the actuator arms **224** are merged with their respective discs **108**, such as by the removal of a comb **232** which was previously used to separate the heads **204** from one another. In operation **508**, the actuator assembly **202** moves the actuator arms in a vertical plane over the surfaces of the discs **108**, such as by rotating an E-block **222** attached to a proximal end of each of the actuator arms **224** about a horizontal access. In operation **510**, the heads **204** are signaled by known servo-track writer circuitry to write servo pattern on each of the disc surfaces in a manner that is well known in the art. In operation **512**, the actuator assembly **202** moves the heads **204** away from the discs **204** (such as by rotating the E-block **222**) upon receiving a signal that the servo-pattern is complete for the disc or discs. As part of operation **512**, the comb **232** may be merged with the actuator arms **224** or flexures **226** of the actuator assembly **202** to prevent the heads **204** from contacting one another. In operation **514**, the actuator assembly **202** is moved away from the spindle hub assembly **206** to allow for easy removal of the discs **108** from the spindle hub assembly **206**. In operation **516**, the discs **108** having newly recorded servo pattern are removed from the spindle hub assembly **206** and optionally installed in a disc drive **100**.

In summary, a servo track writer assembly (such as **200**) for recording servo pattern information on a disc (such as **108**) in accordance with an exemplary preferred embodiment of the present invention has a spindle hub assembly (such as **206**) including a hub (such as **228**) supporting the disc (such as **108**) in a substantially vertical plane and a motor for rotating the hub and the attached disc at a predetermined rate. An actuator assembly (such as **202**) includes an E-block (such as **222**) and a motor for rotating the E-block about a substantially horizontal axis. The E-block (such as **222**) supports an actuator arm (such as **224**) and a flexure (such as **226**) extending from a distal end of the actuator arm (such as **224**) in a substantially vertical plane. A servo recording head (such as **204**) is mounted to a distal end of the flexure (such as **226**) so that the head (such as **204**) moves in a substantially

vertical plane along an arcuate path adjacent a surface of the disc (such as **108**) to record the servo pattern information on the disc surface as the spindle hub assembly (such as **206**) rotates the disc (such as **108**) and the actuator assembly (such as **202**) rotates the E-block (such as **222**).

In preferred embodiments of the invention, the servo track writer assembly (such as **200**) includes a plurality of discs (such as **108**) stacked on the spindle hub assembly (such as **202**) and the E-block (such as **222**) includes a plurality of actuator arms (such as **224**) and attached flexures (such as **226**), where each flexure includes a servo recording head (such as **204**) to provide simultaneous recording of servo pattern information on each vertically-oriented disc (such as **204**). An embodiment of the servo track writer assembly (such as **200**) also includes a platform (such as **212**) defining a substantially horizontal surface and a slide mechanism (such as **214**) coupling the actuator assembly (such as **202**) to the platform (such as **212**) to allow lateral movement of the actuator assembly (such as **202**) along the substantially horizontal surface between a first position wherein the actuator arms (such as **224**) engage the discs (such as **204**) for writing servo pattern information on the discs, and a second position wherein the plurality of actuator arms (such as **224**) are laterally spaced from the plurality of discs (such as **204**). A vacuum chuck (such as **208**) may be used in one embodiment to secure the actuator assembly (such as **202**) in the first position for servo pattern writing. In a further embodiment of the present invention, a comb (such as **232**) engages the plurality of flexures (such as **226**) to maintain separation between adjacent servo recording heads (such as **204**) when the actuator assembly (such as **202**) is in the second position, although the comb (such as **232**) is removed from contact with the plurality of flexures (such as **226**) once the actuator assembly (such as **202**) is moved to the first position.

In another exemplary preferred embodiment of the present invention, a method of recording servo pattern information on a disc (such as **108**) in a vertically-oriented servo track writer assembly (such as **200**) includes the step (such as **500**) of positioning the disc (such as **108**) on a substantially horizontally-oriented spindle hub assembly (such as **206**). The method further includes the step (such as **502**) of activating the spindle hub assembly (such as **206**) to rotate the disc (such as **108**) in a substantially vertical plane. A further step (such as **508**) includes pivoting an E-block (such as **222**) of an actuator assembly (such as **202**) about a substantially horizontal axis to rotate an actuator arm (such as **224**) and an attached flexure (such as **226**) extending from the E-block (such as **222**) along an arcuate path in a substantially vertical plane adjacent a surface of the disc (such as **108**). A further step (such as **510**) includes signaling a servo recording head (such as **204**) attached to a distal

end of the flexure (such as **226**) to record servo pattern information on the surface of the vertically-oriented disc (such as **108**).

In yet a further exemplary preferred embodiment of the present invention, a servo track writer assembly (such as **200**) for recording servo pattern information on a disc (such as **108**) includes a servo recording head (such as **204**) and means for moving the servo recording head (such as **204**) in a substantially vertical plane to record servo pattern information on a surface of the disc (such as **108**) while rotating the disc in a substantially vertical orientation. In one preferred embodiment, the servo track writer assembly (such as **200**) includes means for simultaneously recording servo pattern information on a plurality of discs rotating in a substantially vertical orientation. In a further preferred embodiment, the servo track writer assembly (such as **200**) includes means for selectively engaging and disengaging the plurality of servo recording heads (such as **204**) from the plurality of discs (such as **108**) while the discs rotate in the substantially vertical orientation.

It will be clear that the present invention is well adapted to attain the ends and advantages mentioned as well as those inherent therein. While a presently preferred embodiment has been described for purposes of this disclosure, numerous changes may be made which will readily suggest themselves to those skilled in the art. For example, while twelve discs **108** are shown in FIGS. 2-4, the spindle hub assembly **206** may hold fewer or greater than twelve discs, and in some embodiments may hold just a single disc **108**. Similarly, the STW **200** may be used to write both embedded and dedicated servo information on the discs **108**. Additionally, while the preferred embodiment of the STW **200** defines a stationary spindle hub assembly **206** and a moveable actuator assembly **202**, the present invention encompasses have a stationary actuator assembly and a moveable spindle hub assembly, or even having both assemblies being moveable relative to the stationary platform **212**. Furthermore, while specific embodiments of the comb **232** and the interferometer **210** were described above, the present invention encompasses alternative means known to those skilled in the art for both separating the heads **204** on the actuator assembly **202** and for determining the position of the heads **204** during the servo-writing process. Accordingly, all such modifications, changes and alternatives are encompassed in the spirit of the invention disclosed and as defined in the appended claims.

WHAT IS CLAIMED IS:

1. A servo track writer assembly for recording servo pattern information on a disc comprising:

a spindle hub assembly removably supporting the disc in a substantially vertical plane in relation to a motor coupled to the spindle hub assembly with a substantially horizontally disposed axis or rotation for rotating the supported disc;

an actuator assembly movably supporting a servo recording head in a substantially vertical plane to record the servo pattern information on the disc as the disc rotates.

2. The servo track writer assembly of claim 1 wherein:

a plurality of discs are stacked on the spindle hub assembly with a predetermined spacing provided between adjacent discs; and

the actuator includes a plurality of actuator arms and attached flexures, and each flexure includes a servo recording head to provide simultaneous recording of servo pattern information on each disc.

3. The servo track writer assembly of claim 2 further comprising:

a slide mechanism coupling the actuator assembly to a platform to allow lateral movement of the actuator assembly between a first position whereat the plurality of actuator arms engage the plurality of discs for writing servo pattern information on the discs, and a second position whereat the plurality of actuator arms are laterally spaced from the plurality of discs.

4. The servo track writer assembly of claim 3 further comprising a vacuum chuck secured to the platform for rigidly securing the actuator assembly in the first position for servo pattern writing.

5. The servo track writer assembly of claim 3 further comprising a comb engaging the plurality of flexures to maintain separation between adjacent servo

recording heads when the actuator assembly is in the second position, wherein the comb is removed from contact with the plurality of flexures once the actuator assembly is moved to the first position.

6. The servo track writer assembly of claim 5 wherein the second position of the actuator assembly provides sufficient room to load the plurality of discs on and unload the plurality of discs from the spindle hub assembly.

7. A method for recording servo pattern information on a disc in a servo track writer assembly, the method comprising:

removably positioning the disc on a spindle hub assembly in a substantially vertically-oriented disposition in relation to a motor coupled to the spindle hub assembly having a substantially horizontally-oriented axis of rotation;

activating the motor to rotate the disc;

moving an actuator assembly supporting a servo recording head in a plane adjacent a surface of the disc; and

signaling the servo recording head to record servo pattern information on the disc.

8. The method of claim 7 wherein:

the removably positioning step further comprises removably positioning a plurality of discs on the spindle hub assembly;

moving step moves a plurality of servo recording heads in planes adjacent the plurality of discs; and

the signaling step further comprises signaling the plurality of servo recording heads to record servo pattern information on the plurality of discs.

9. The method of claim 8 further comprising a step of laterally moving the actuator assembly on a support platform between a first position whereat the plurality of servo recording heads engage the plurality of discs for writing servo pattern information on the discs, and a second position whereat the plurality of servo recording heads are laterally spaced from the plurality of discs.

10. The method of claim 9 further comprising a step of securing the actuator assembly in the first position for servo pattern writing.

11. The method of claim 9 further comprising a step of removing the plurality of discs from the spindle hub assembly following the signaling step.

12. A servo track writer assembly for recording servo pattern information on a disc comprising:

a servo recording head; and

means for supporting the servo recording head adjacent the disc supported by a removable spindle hub to record servo pattern information on the disc while rotating the disc in a substantially vertically-oriented plane in alignment with earth's gravitational force.

13. The servo track writer assembly of claim 12 further comprising means for simultaneously recording servo pattern information on a plurality of discs.

14. The servo track writer assembly of claim 13 wherein the means for simultaneously recording servo pattern information on the plurality of discs comprises:

means for rotating the plurality of discs in ~~a~~ substantially vertically oriented planes; and

means for rotating a plurality of servo recording heads, each adjacent one of the plurality of discs.

15. The servo track writer assembly of claim 14 further comprising means for selectively engaging and disengaging the plurality of servo recording heads from the plurality of discs while the discs rotate.