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[54] **APPARATUS FOR POLISHING A SPHERICAL SURFACE ON A MAGNETIC RECORDING TRANSDUCER**

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[52] **U.S. Cl.** **51/121,** 51/401

[51] **Int. Cl.** **B24b 7/00,** B24b 9/00, B24d 11/00

[58] **Field of Search** 51/121–124, 51/401

[56] **References Cited**

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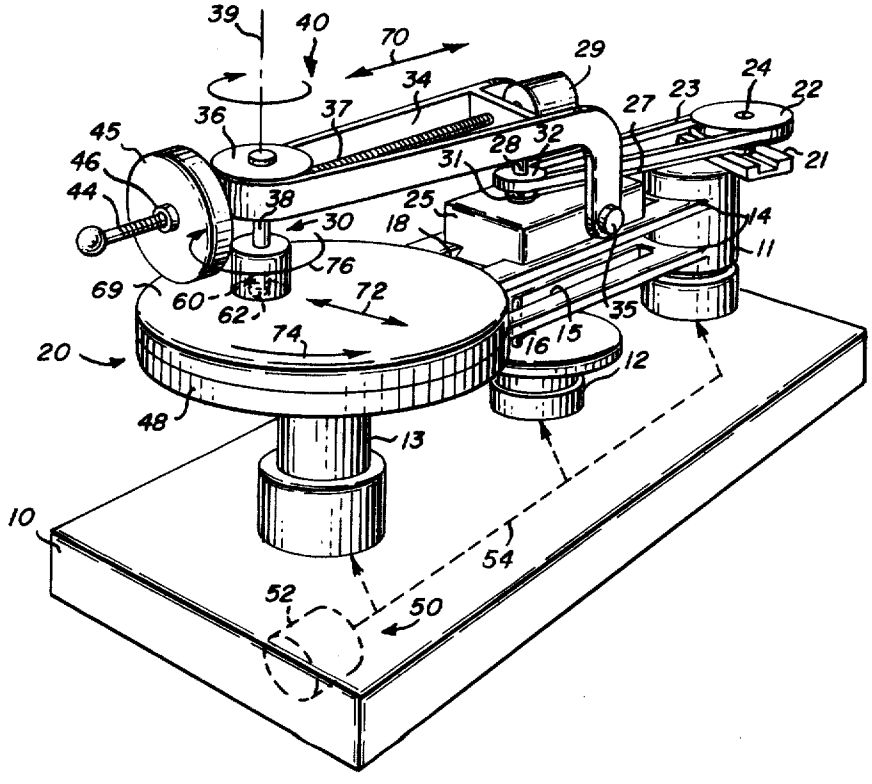
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Attorney, Agent, or Firm—Schatzel & Hamrick

[57] **ABSTRACT**

Apparatus for polishing a spherical work surface comprising a resilient polishing pad formed on a flat rotatable base and including at least one layer of resilient material sandwiched between a flexible abrasive sheet and the base, a workpiece holder for urging a workpiece against the polishing pad with a uniform pressure while simultaneously rotating the workpiece at a uniform rotational speed, an oscillatory motion generator for causing the holder to move randomly over the surface of the polishing pad, the holder and the oscillatory motion generator. The durometer of the resilient layer, the flexibility of the abrasive sheet and the size of the spherical work surface are all matched so that the abrasive surface uniformly conforms to the shape of the work surface to achieve a substantially uniform polishing thereof.

19 Claims, 5 Drawing Figures



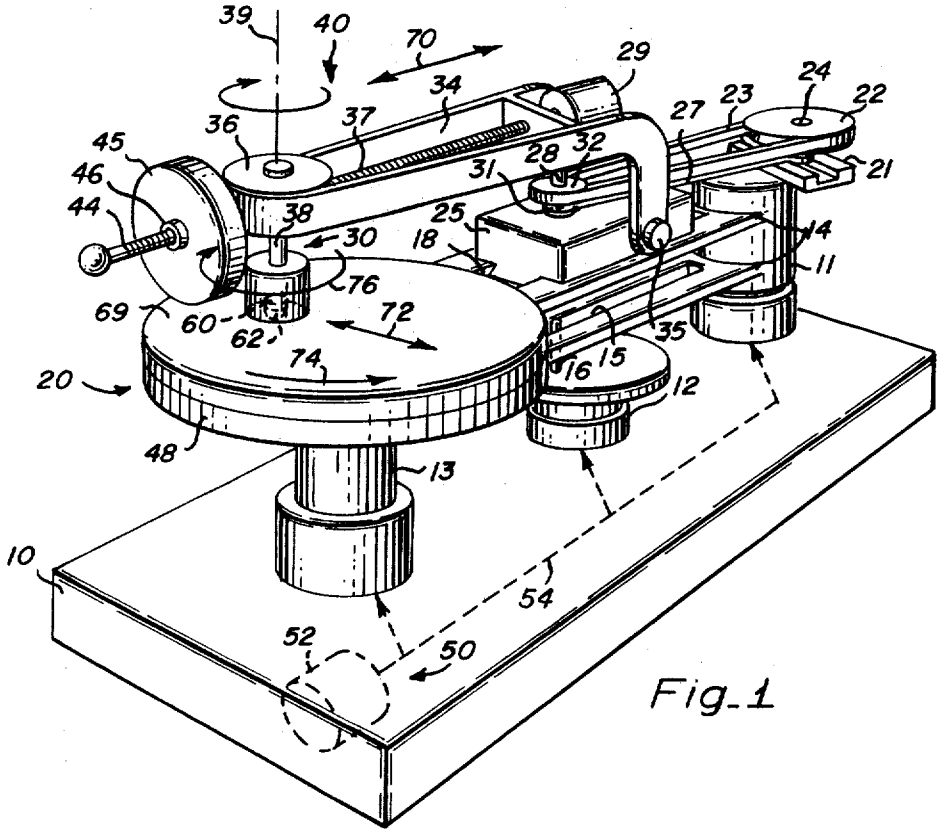

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Fig_1

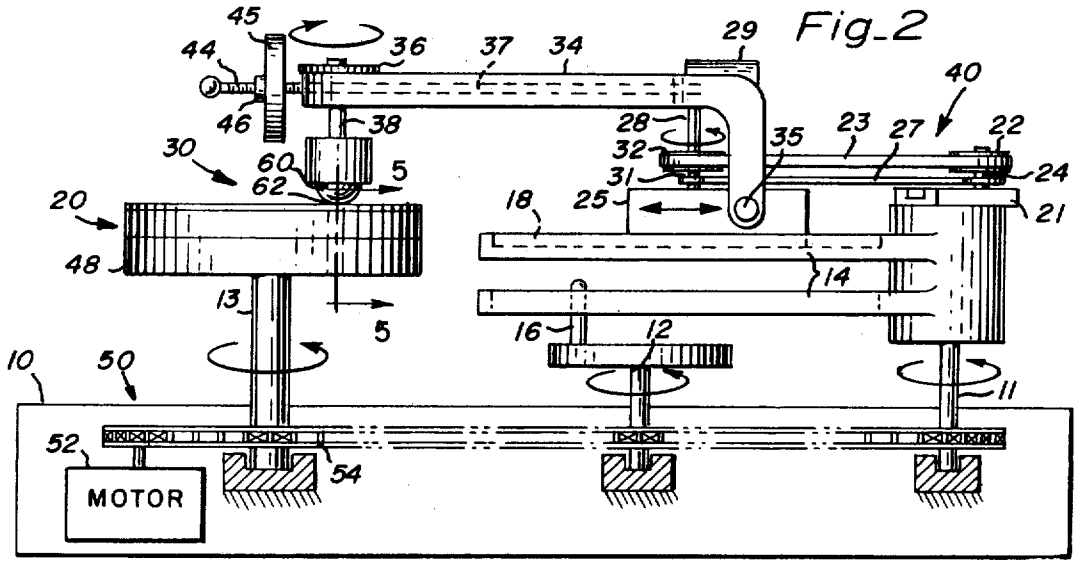

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MOTOR

Fig_2

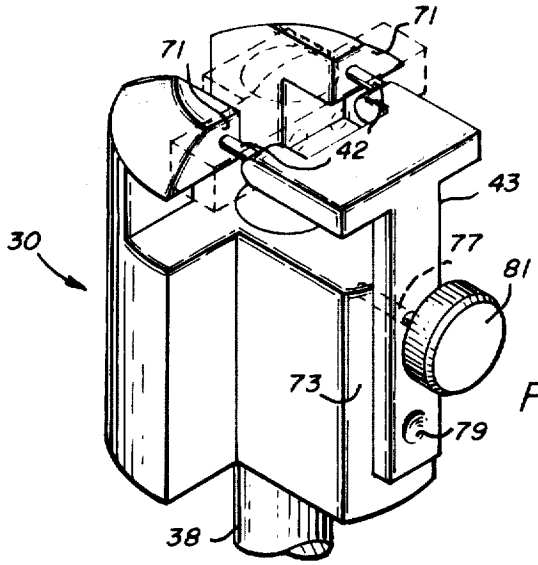


Fig_3

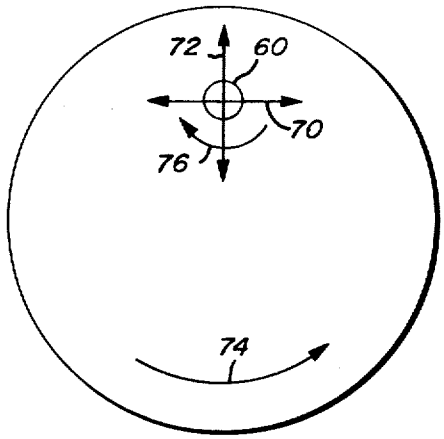


Fig_4

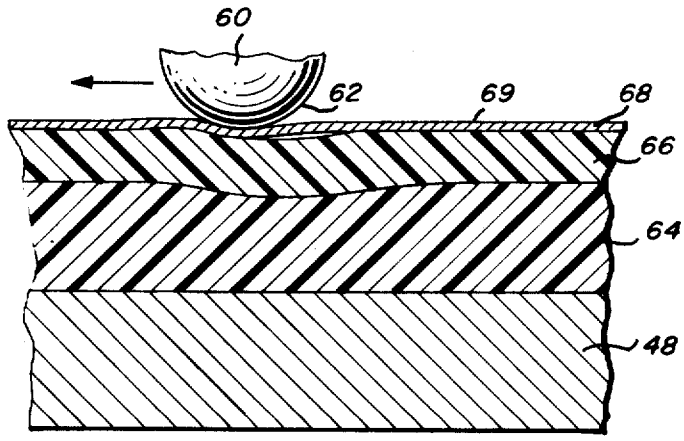


Fig_5

APPARATUS FOR POLISHING A SPHERICAL SURFACE ON A MAGNETIC RECORDING TRANSDUCER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to polishing apparatus and, more particularly, to apparatus for polishing a workpiece having a substantially spherical work surface.

2. Description of the Prior Art

Lapping and polishing machines have long been used to provide smooth surfaces on workpieces of various sizes and shapes. However, throughout the years the smoothness requirements have become more stringent as the dimensions of the work surfaces have decreased. Lapping and polishing machines are extensively used in the data processing industry, particularly in polishing the recording surfaces of magnetic recording heads which read and write bits of information on magnetic media moving relative to the recording head. In some data processing applications information is stored on magnetic media in the form of disk files comprising one or more magnetically-coated disks.

One type of disk file system uses disks fabricated from a flexible mylar substrate having magnetic material adhered to each face to provide recording surfaces. In recording and reproducing information in these systems, the magnetic transducers normally contact the recording surface and compliance between the transducer and the flexible medium is effected by utilizing pressure pads which continuously conform the disk against the contour of the surface of the transducing head assembly. As a result of the moving contact, rough spots in the magnetic recording head abrade the magnetic medium, tending to destroy the medium and, more importantly, cause recorded information to eventually become unintelligible. Consequently, continuous efforts are being made to generate magnetic recording heads with extremely smooth media-contacting surfaces.

The efforts to achieve smoothness are made difficult because of the geometry associated with the transducing head surface and the several materials that are used in fabricating the recording head. In particular, one type of recording head has a semi-spherically shaped transducing surface. This head is comprised of a housing assembly that is fabricated from a very hard material such as stainless steel, and a magnetic transducer element having pole tips which are formed from a relatively soft material, such as a high mu magnetic material, and which extend through the housing so as to terminate flush with the head surface. An example of such a magnetic recording head is found in the copending patent application, Ser. No. 423,170, filed Dec. 10, 1973, and entitled "Magnetic Head Assembly Having a Slotted Body Portion of Elastic Material for Carrying a Transducer and Method of Manufacture Therefor," by Herbert E. Thompson, and assigned to the assignee of the present invention.

Heretofore, prior art spherical surface lapping and polishing machines have required elaborate fixturing which has significantly contributed to high manufacturing costs. For example, one prior art lapping technique requires the use of a tool that is precisely machined to define an internal concave working portion that approximates a spherical cavity. The tool is then used to transfer the spherical radius of the defined cavity onto the magnetic head. However, this technique is very costly, time consuming and inadequate to reliably provide the smoothness required on magnetic recording head surfaces.

Another prior art polishing apparatus uses several cupped wheels, each with successively finer polishing abrasives. However, since the process associated with this apparatus requires successive lapping operations, a tremendous amount of time is required to obtain a spherical surface with the desired surface finish. In addition, it is quite difficult to generate cupped wheels of different sizes which all have precisely the required radius of concavity and as a result, the wheels are very costly.

In yet another prior art lapping apparatus, the surface of a lapping plate is drawn to a desired curvature and covered with a liquid abrasive slurry that includes a plurality of fine diamond particles. However, in this apparatus it is a formidable task to form the desired curvature on the lapping plate, by either machining or by selective deformation, since the plates are generally of hard steel and have relatively large surface areas. In addition, the abrasive particles freely move about in the liquid slurry making standardization of the lapping process associated with this apparatus extremely difficult. It should also be noted that in polishing operations, when liquid slurries are used, the abrasive particles floating therein tend to become embedded in the surface of the magnetic recording element as the head is moved over the lapping plate.

SUMMARY OF THE PRESENT INVENTION

It is therefore a primary object of the present invention to provide a simple apparatus for polishing the spherical surface of a workpiece such as a magnetic recording head.

Another object of the present invention is to provide such apparatus which removes uniform amounts of material directly from a spherical work surface.

Still another object of the present invention is to provide such apparatus which does not include complex fixtures and yet provides an extremely smooth polished spherical surface.

Still another object of the present invention is to provide a spherical surface polishing apparatus which utilizes fixed abrasives.

Briefly, the present invention is directed toward an apparatus for polishing a spherical surface of a workpiece such as a magnetic recording head. The apparatus comprises means forming a resilient polishing pad including a flat base, at least one layer of resilient material that is elastic and non-metallic, and a layer of abrasive material defining an outer polishing surface, a holder for carrying the workpiece with the spherical work surface exposed and for urging the workpiece against the polishing pad with a uniform rotational speed, an oscillatory motion generator for causing the holder to move randomly over the surface of the polishing pad, and a drive source for supplying driving energy to the polishing pad, the holder and the oscillatory motion generator. The durometer of the resilient layer, the flexibility of the abrasive sheet and the size of the spherical work surface are all matched so that the abrasive surface uniformly conforms to the shape of the work surface to achieve a substantially uniform polishing thereof. The polishing pad may include a second

layer that overlays the first layer and is comprised of an elastic material that is harder than the material comprising the first layer. The second layer prevents the first layer from forcing the polishing surface into conformance with all minute indentations of the work surface and, thus, reduces the tendency of the polishing surface to erode softer portions of the work surface.

A principal advantage of the present invention is that it is simple in structure yet performs a highly uniform polishing operation on a spherical work surface.

Another advantage of the present invention is that it does not contaminate the surfaces of workpieces, such as magnetic transducing heads, with free abrasives.

Yet another advantage of the present invention is that it does not require tight locational tolerances.

These and other objects and advantages of the present invention will no doubt become apparent to those of ordinary skill in the art after having read the following detailed description of the preferred embodiments which are illustrated in the several figures of the drawings.

In the drawing:

FIG. **1** is a perspective view of the apparatus for polishing a spherical work surface of a workpiece in accordance with the present invention.

FIG. **2** is a diagrammatic side elevational view of the polishing apparatus of FIG. **1**.

FIG. **3** is a perspective view of the fixture that carries the workpiece in accordance with the present invention.

FIG. **4** is a plan view of the polishing pad with the workpiece, and the relative motion of the pad and the workpiece, shown diagrammatically.

FIG. **5** is a side elevational sectional view taken through the lines **5—5** of FIG. **2** illustrating a portion of the polishing pad and the magnetic recording head.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and more particularly, to FIGS. **1** and **2** thereof, an apparatus for polishing a spherical surface of a workpiece is illustrated in perspective view and diagrammatically in accordance with the present invention. The apparatus comprises a base **10**, means forming a polishing pad, generally designated by the numeral **20**, a workpiece holder generally designated by the numeral **30**, disposed above the polishing pad for rotating the workpiece which urges its work surface against the polishing pad with a substantially uniform contact pressure, an oscillatory motion generator **40** for causing the holder to move in a random fashion across the top surface of the polishing means **20**, and drive means **50** for supplying driving energy to the polishing pad **20**, the holder **30** and the oscillatory motion generator **40**. The polishing of the work surface **62** of the workpiece **60** is accomplished by the conforming engagement of the abrasive top surface of the polishing pad with the work surface as the workpiece is rotated and randomly moved across the upper surface of the polishing pad.

The base **10** is a block that is rectangular in shape. Three drive spindles **11**, **12** and **13** extend upwardly from the top surface of the base. Each of the spindles is substantially cylindrical in shape and is rotatable about an axis disposed centrally therethrough. The three spindle axes lie in a plane that is substantially normal to the top surface of the base. A drive means **50** such as a motor **52** is housed within the base **10** and is coupled to each of the spindles by a chain **54**. The motor supplies the energy to rotatingly drive the spindles about their respective axes. The spindle **11** is known as an axial reciprocating drive spindle and includes a pair of swing arms **14** that are unitary with, and extend parallel to one another outwardly from, the outer surface of the spindle in a direction toward spindle **13** so that the swing arms **14** lie generally over the spindle **12**. The bottom arm **14** includes a central slot **15** for receiving a pin **16** which protrudes upwardly from the top surface of spindle **12**, which serves to couple the swing movement of the arms **14** to the spindle **12**. The pin **16** is off-center with respect to the spindle axis. Thus, when the spindle **12** rotates, it reciprocatingly drives the arms **14** in a relatively small arc so that they describe a path in a direction substantially transverse to an axis defined by a line through the axes of the spindles **11**, **12**, and **13**. The pin coupling prevents the spindle **11** from rotating freely through a 360° angle. A way **18** protrudes above the top surface of the upper swing arm **14**.

The spindle **11** also includes an eccentric drive mechanism which comprises a crank arm **21**, a fixed pulley **22** and a drive belt **23**. The crank arm **21** is rotatably secured to a shaft associated with and extending above the spindle **11**. The pulley **22** is secured to a pin **24** protruding above the top surface of the crank arm **21**.

A slide **25** with a slot therein mates with the way **18** so as to be slideable therealong. Extending upwardly from the top surface of the slide **25** is a shaft **31**. A pulley **32** is secured to the shaft **31** and coupled to the fixed pulley **22** by the drive belt **23**. Secured to the upper surface of the pulley **32** is a drive shaft **28**, a portion of which is shown. A rigid connecting arm **27** interconnects the crank arm **21** and the slide **25** and serves to convert the rotary drive motion of spindle **11** to reciprocating motion so as to drive the slide **25** in a direction substantially axially with respect to a line through the three spindle axes.

A rigid L-shaped arm **34** is secured to slide **25** by bolts **35**. The distal end of the arm **34** extends over the top surface of the base of the spindle **13**. The arm is pivotal about an axis through the bolts **35** so as to enable the arm **34** to be raised or loaded toward the polishing pad **20** in a manner that will be subsequently described. Included at that outer end of the arm **34** is a substantially cylindrical housing **36** for receiving a drive rod **37** which is coupled to drive shaft **28** through a first spur gear assembly, designated by the numeral **29**. Extending outwardly from the distal end of the rigid arm is a threaded bolt **44**. A weight **45** having a central aperture therethrough is positioned over the bolt **44** and secured against the arm **34** by a nut **46**. The weight functionally loads the workpiece holder **30** downwardly so as to force the spherical work surface of the workpiece that is being polished into the polishing pad **20**. Depending downwardly from within the housing **36** is a thin rotatable shaft **38** which is coupled to the drive rod **37** by a second worm gear assembly (not shown).

Affixed to the lower end of shaft **38** is a fixture **30**, previously referred to as the workpiece holder **30**. Referring to FIG. **3**, the fixture has a recessed interior, a first portion of which is defined by flat spaced-apart coplanar reference surfaces for receiving corresponding mating surfaces of the workpiece that is to be polished. Extending outwardly from the reference surfaces **71**

are two mounting pins **42** which protrude through corresponding apertures in the workpiece. The workpiece is illustrated in phantom by dashed lines and shown to be a magnetic recording head. A second portion of the fixture includes a flat outer surface **73** which has a recess and a threaded hole **77** therein. A clamp **43** having a dimple **79** and carrying a thumb screw **81** which mate with the recess and the hole **77**, respectively, clamps the head against the reference surfaces **42** such that the apex of the spherical work surface is on a center line through the fixture.

The upper portion of spindle **13** forms a base **48** that has a flat surface for supporting the polishing pad **20**. As shown, the supporting surface is substantially circular in plan view.

In operation, the motor **52** housed within the base **10** rotatably drives the spindles **11, 12** and **13** through the chain **54**. As the spindle **11** rotates, it causes the crank arm **21** to be driven eccentrically. The motion of the crank arm **21** is transferred to the slide **25** through the connecting arm **27** thereby to reciprocatingly drive the slide **25** in a direction illustrated by the arrows **70**. consequently, the motion of the slide is transferred through arm **34** to reciprocatingly drive the fixture **30** across the top of the polishing pad **20** on the spindle **13** in an axial direction corresponding to that illustrated by the arrows **70**. Simultaneously, with the reciprocating axial motion, the rotation of spindle **12** is transmitted through the off-center pin **16** to the swing arm **14** so as to move the swing arms in an arcuate pattern that is in a direction substantially transverse to the arrows **70**. Because of the connecting relationship between the slide **25**, the arm **34** and the fixture **30**, the fixture **30** is correspondingly moved in a transverse direction illustrated by the arrows **72**. Accordingly, the rotational motion of the spindles **11** and **12** has been effectively converted to reciprocatingly move the fixture **30** in axial and transverse directions across the base **48** of the spindle **13**.

In addition, spindle **13** is rotatably driven by the motor **52** in a counterclockwise direction, as illustrated by the arrows **74**. As the crank arm **21** associated with spindle **11** is driven by the motor, pulley **32** is rotatably driven by the drive belt **23**, which transmits energy to rotate the vertical drive shaft **28**. In turn, this energy is coupled to rotate the horizontal drive shaft **37** by the first spur gear assembly **29**. The rotation of the drive shaft **37** is similarly transmitted to rotatably drive the downwardly depending vertical shaft **38** by the second gear assembly **41** disposed within the housing **36**. Accordingly, the fixture **30** which is carried by the shaft **38** is rotatably driven about the axis **39** in a direction illustrated by the arrows **76**. It should be noted that the direction of rotation of the fixture **30** is in a clockwise direction, opposite to that of the supporting surface of the base **48**. The machine assembly hereinbefore described comprises many of the same features as the precision optical polishing machine manufactured by the City Tool-Die and Manufacturing Company of San Jose, California, which is designated by that company as the CT-D.

Referring now to FIG. **4**, the movement of the workpiece **60** across the surface of the polishing pad **20** is illustrated. The motion of the workpiece is illustrated as comprising axial motion **70**, transverse motion **72** and rotary motion **76** in a clockwise direction. The simultaneous axial and transverse motions cause the workpiece to move in a pattern that comprises a plurality of cycles. Each cycle generally resembles a "FIG. 8," and is offset from the previously described cycle. When this pattern is combined with the clockwise rotation **76** of the workpiece **30** and the counterclockwise rotary motion **74** of the polishing pad **20**, a substantially random pattern results.

One of the features of this invention is the polishing pad **20** which is best illustrated in FIG. **5**. As shown therein, the pad **20** comprises the base **48**, a first layer **64** of resilient material, a second layer **66** of resilient material, and a flexible abrasive sheet **68** overlaying the upper surface of the layer **66** and forming a resilient abrasive surface **69**. The layers **64** and **66**, and the sheet **68** are thus juxtaposed together in a sandwich structure. The outer periphery of the pad **20** defines a circle so as to conform, in general, to the shape of the base **48** of the underlying support means. Thus, each of the layers **64, 66** and **68** resembles a thin flat disk.

The first layer **64** is comprised of a material that is elastic and non-metallic, and that has a thin, flat, cylindrical shape. Similarly, the second layer **64** is comprised of a material that is elastic and non-metallic, and that also has a flat, cylindrical shape, although the layer **66** is much thinner in cross-section than the layer **64**. Most importantly, the second layer has a hardness characteristic that is greater than that of the first layer. The abrasive sheet **68** overlays the second layer **66** and is comprised of a solid sheet or layer of abrasive material which defines a flat resilient outer abrasive surface **69** and is designated as the polishing surface.

In the preferred embodiment the polishing pad of the present invention is used to polish a magnetic recording head **60** which has a substantially spherical work surface **62**, although it is recognized that this apparatus can be used to polish spherical surfaces on other objects.

The magnetic recording head is, more particularly, one similar to that described in copending patent application, Ser. No. 423,170, filed Dec. 10, 1973, and entitled "Magnetic Head Assembly Having a Slotted Body Portion of Elastic Material for Carrying a Transducer and Method of Manufacture" by Herbert E. Thompson. As described in that application, the magnetic recording head has a semi-spherically shaped transducing surface as is comprised of a housing assembly that is fabricated from a very hard material, stainless steel, and a magnetic transducer element having pole tips which are formed from a relatively soft material, high mu 800 magnetic material, and which extend through the housing so as to terminate flush with the head surface. The housing includes two apertures through which the pins **42** of the fixture **30** are inserted. Since the high mu 800 material is softer than the stainless steel, it has a tendency to erode at a much quicker rate.

In order to secure the magnetic head to the fixture **30**, the L-shaped arm **34** is pivoted upwardly to facilitate the mounting operation by exposing the mounting pins **42**. The magnetic recording head **60** is then mounted on the fixture **30** by inserting the fixture pins **42** through the apertures in the head and by securing the clamp **43** against the head. Consequently, because of the head geometry, the apex of the substantially spherical media-contacting work surface is centered on the axis **39**. The arm **34** is then lowered into its operating condition so as to position the work surface of the head on the polishing surface of the resilient polishing

pad **20**. The weight **45** urges the work surface **62** against the abrasive surface **69** with a substantially uniform contact pressure and causes the work surface to depress the adjacent portion of the polishing pad **20** such that the abrasive surface **69** of the abrasive sheet **68** conforms to the shape of the work surface **62**. As previously described the polishing apparatus drives the fixture so that the work surface describes a substantially random pattern through the resilient polishing pad. When this occurs, the stiff second layer **66**, which is harder than the first layer **64**, functions as a mechanical filter in that it allows the first layer to conform to the relatively large diameter of the work surface but does not allow conformation to smaller radius indentations, such as for example, scratches or magnetic core irregularities. If the second layer were not present, the high mu 800 material portions would wear at a faster rate than the stainless steel, thereby tending to cause depressed regions on the work surface. It has been found that in polishing workpieces that are comprised of a single material, in some instances, the second layer is not necessary since the entire work surface wears uniformly.

In the polishing apparatus used to polish the described magnetic head, the first layer **64** is preferably urethane, that has a hardness characteristic of between 60 and 70 Durometer and is 0.25 inches in thickness. The second layer **66** is polyvinylchloride that has a hardness characteristic greater than that of the base portion and is 0.015 inches in thickness. The abrasive sheet **68** is a disk-shaped solid lapping film comprised of aluminum oxide particles which are made up of three grit sizes. The grit sizes are **12**, **3** and 0.3 microns, and are chosen to provide a rough, medium and fine polish, respectively, during a single polishing operation. The solid film disk is between 3 and 10 mils in thickness, and is available commerically. One type of aluminum oxide polishing disk is manufactured by the Minnesota Manufacturing and Mining Corporation.

In alternative embodiments the first layer is comprised of neoprene and the second layer is comprised of mylar or other urethane materials having a hardness characteristic that is greater than that of the first layer.

In still another embodiment the first and second layers are comprised of a plurality of laminations, sandwiched together in a unitary structure. In this embodiment the lamination juxtaposed subjacent the polishing sheet is characterized by a greater hardness characteristic than are laminations disposed farther therefrom.

In yet another embodiment, the first and the second layers are unitary and comprised of a urethane material that has a variable density, the density of the urethane closest to the polishing sheet being higher than that more removed therefrom.

As previously mentioned, the weight **45** loads or forces the work surface of the head into the polishing pad. It has been found that when a 4 pound weight is used, the load is such as to provide an acceptably polished work surface in a relatively short time. For example, with the **4** pound weight, a work surface having A 2.2 inch radius can be polished in 20 seconds with a 9 micron aluminum oxide polishing sheet and in 30 seconds with a 3 micron aluminum oxide polishing sheet. It should also be noted as the radius of curvature of the work surface is changed, the optimum weight of load varies. For example, for radii of curvatures in the range between 1.8 inches and 2.5 inches, weights within the range between 1 and 8 pounds can be used. Generally, the larger the radius of curvature, the smaller the weight required. Experience has indicated that loads less than 1 pound should not be used. It has been found that when the load is too small, the work surface is susceptible to non-compliance with the polishing surface and to chattering effects.

The terms "up" and "down" and words of similar import as used herein are intended to apply only to the position of the parts as illustrated in the drawings, since polishing apparatus, of the general type illustrated, may be mounted or oriented in many different positions during operation.

From the above, it can been seen that a polishing apparatus has been described which fulfills all of the objects and advantages set forth above.

While there has been described what are at present considered to be the preferred embodiments of the invention, it will be understood that various modifications may be made therein and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. Apparatus for polishing a substantially spherical work surface of a workpiece comprising:

means forming a polishing pad including a rotatable base having a flat upper surface, at least one layer of resilient material disposed on said flat surface, and a flexible abrasive sheet overlaying the upper surface of said one layer and forming a resilient abrasive surface;

a workpiece holder disposed above said polishing pad for rotating said workpiece while urging said work surface against said abrasive surface with a substantially uniform contact pressure;

an oscillatory motion generator for causing said holder to move in random fashion across said abrasive surface; and

drive means for supplying driving energy to said polishing pad, said holder and said oscillatory motion generator, whereby polishing of said work surface is accomplished by the conforming engagement of said abrasive surface thereto as said workpiece is rotated and randomly moved across the upper surface of said polishing pad.

2. Apparatus for polishing a substantially spherical work surface of a workpiece as recited in claim **1** wherein said spherical surface is comprised of materials that have different hardness characteristics, said at least one layer including first and second layers of resilient material, said second layer overlying said first layer and being comprised of a material that is harder than the material comprising said first layer so as to stiffen said at least one layer and reduce the conforming engagement of said abrasive surface with said work surface, thereby to reduce the tendency of said abrasive surface to erode softer portions of said work surface.

3. Apparatus for polishing a substantially spherical work surface of a workpiece as recited in claim **2** wherein said first and second layers have substantially constant thicknesses, the thickness of said first layer being substantially thicker than said second layer.

4. Apparatus for polishing a substantially spherical work surface of a workpiece as recited in claim **2** wherein said workpiece is a magnetic recording head and wherein said spherical surface includes stainless steel and mu metal materials, said first layer being a

material having a hardness characteristic of at least 60 Durometer.

5. Apparatus for polishing a substantially spherical work surface of a workpiece as recited in claim 2 wherein said first layer is comprised of urethane, and said second layer is comprised of polyvinylchloride.

6. Apparatus for polishing a substantially spherical work surface of a workpiece as recited in claim 5 wherein said urethane is about 0.25 inches thick and wherein said polyvinylchloride is about 0.015 inches thick.

7. Apparatus for polishing a substantially spherical work surface of a workpiece as recited in claim 5 and including loading means coupled to said holder for urging said work surface against said abrasive surface with a preselected load.

8. Apparatus for polishing a substantially spherical work surface of a workpiece as recited in claim 7 wherein said preselected load is in the range between 1 and 8 pounds.

9. Apparatus for polishing a substantially spherical work surface of a workpiece as recited in claim 1 wherein said abrasive sheet is comprised of aluminum oxide having a thickness of at least 3 mils.

10. Apparatus for polishing a substantially spherical work surface of a workpiece as recited in claim 1 wherein said one layer comprises a plurality of laminations, the lamination juxtaposed subjacent said abrasive sheet being characterized by a greater hardness characteristic than a lamination disposed farther therefrom.

11. Apparatus for polishing a substantially spherical work surface of a workpiece as recited in claim 1 wherein said one layer is comprised of a material characterized as having a variable density, the density of said layer decreasing as its separation from said abrasive sheet increases.

12. In apparatus for polishing a substantially spherical surface of a magnetic recording head, the apparatus including a rotatable base having a flat upper surface, a polishing pad disposed on said flat surface and forming an abrasive upper surface, a workpiece holder disposed above said polishing pad for rotating said workpiece while urging said work surface against said abrasive surface with a substantially uniform contact pressure, and an oscillatory motion generator drivingly connected to said holder for moving same randomly across said pad, the improvement comprising:

polishing pad means including a first layer of resilient material disposed on said flat surface, and a flexible abrasive sheet overlaying the upper surface of said first layer and forming a resilient abrasive surface, whereby polishing of said spherical surface is accomplished by the conforming engagement of said abrasive surface thereto as said magnetic recording head is rotated and randomly moved across the upper surface of said polishing pad.

13. In apparatus for polishing a substantially spherical surface of a magnetic recording head as recited in claim 12 wherein said spherical surface is comprised of materials that have different hardness characteristics, said polishing pad including a second layer of resilient material overlaying said first layer and being comprised of a material that is harder than the material comprising said first layer, the upper surface of said second layer providing a stiffened interface with said abrasive sheet and reducing the conforming engagement of said abrasive surface with said spherical surface, thereby to reduce the tendency of said abrasive surface to erode softer portions of said spherical surface.

14. In apparatus for polishing a substantially spherical surface of a magnetic recording head as recited in claim 13 wherein said spherical surface includes stainless steel and mu metal materials, said first layer being a material having a hardness characteristic of at least 60 Durometer.

15. In apparatus for polishing a substantially spherical surface of a magnetic recording head as recited in claim 13 wherein said first layer is comprised of urethane, and said second layer is comprised of polyvinylchloride.

16. In apparatus for polishing a substantially spherical surface of a magnetic recording head as recited in claim 12 and including loading means coupled to said holder for urging said spherical surface against said abrasive surface with a preselected load.

17. In apparatus for polishing a substantially spherical surface of a magnetic recording head as recited in claim 16 wherein said preselected load is in the range between 1 and 8 pounds.

18. In apparatus for polishing a substantially spherical surface of a magnetic recording head as recited in claim 13 wherein said first layer comprises a plurality of laminations, a lamination disposed subjacent said abrasive sheet being characterized by a greater hardness characteristic than a lamination disposed farther therefrom.

19. In apparatus for polishing a substantially spherical surface of a magnetic recording head as recited in claim 13 wherein said first layer is comprised of a material characterized as having a variable density, the density of said material decreasing as its separation from said abrasive sheet increases.

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