United States Patent [19]

Stoddard et al.

[11] **3,815,150**

[45] **June 4, 1974**

[54] **FLEXIBLE DISC DRIVE**

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[73] Assignee: **Memorex Corporation**

[22] Filed: **June 23, 1972**

[21] Appl. No.: **265,628**

[52] **U.S. Cl.** **360/97,** 346/137

[51] **Int. Cl.** **G11b 5/82**

[58] **Field of Search** ..... 346/137; 340/174.1 C; 274/4 H, 4 J, 9 R, 39 A; 179/100.50

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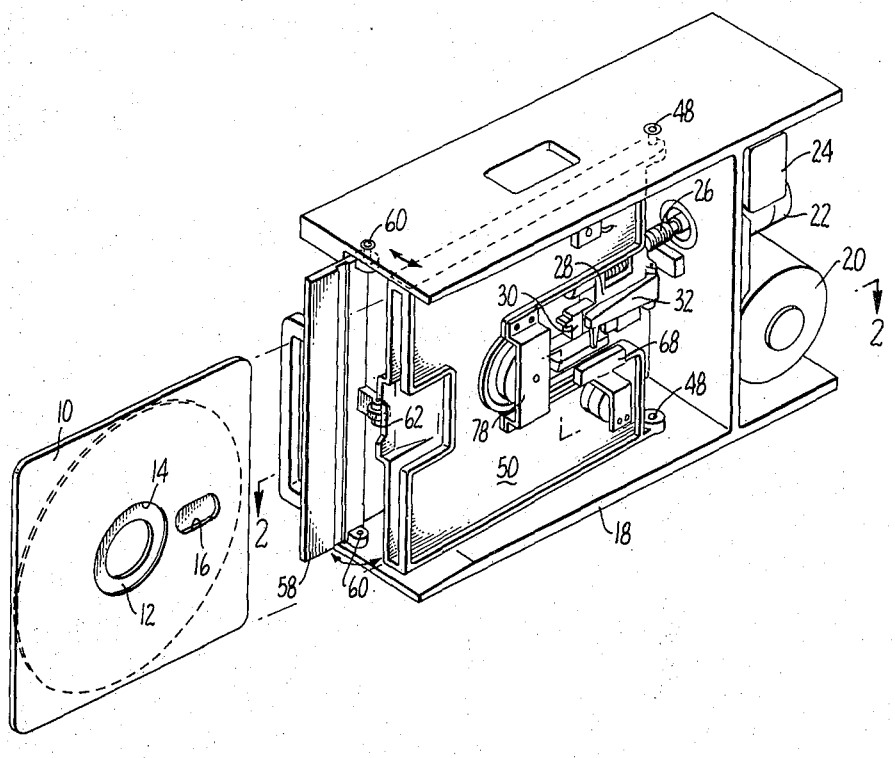
Attorney, Agent, or Firm—Karl A. Limbach

[57] **ABSTRACT**

A disc drive for flexible disc cartridge magnetic recording. The disc cartridge is placed in a holder without touching either the recording head or the disc drive spindle. Then the holder is pivoted generally parallel to the spindle axis to move the disc into engagement with the head and spindle. A special clamp on the holder clamps the disc to the spindle with a floating clamp member which can adapt itself to the axis of rotation of the spindle.

4 Claims, 5 Drawing Figures



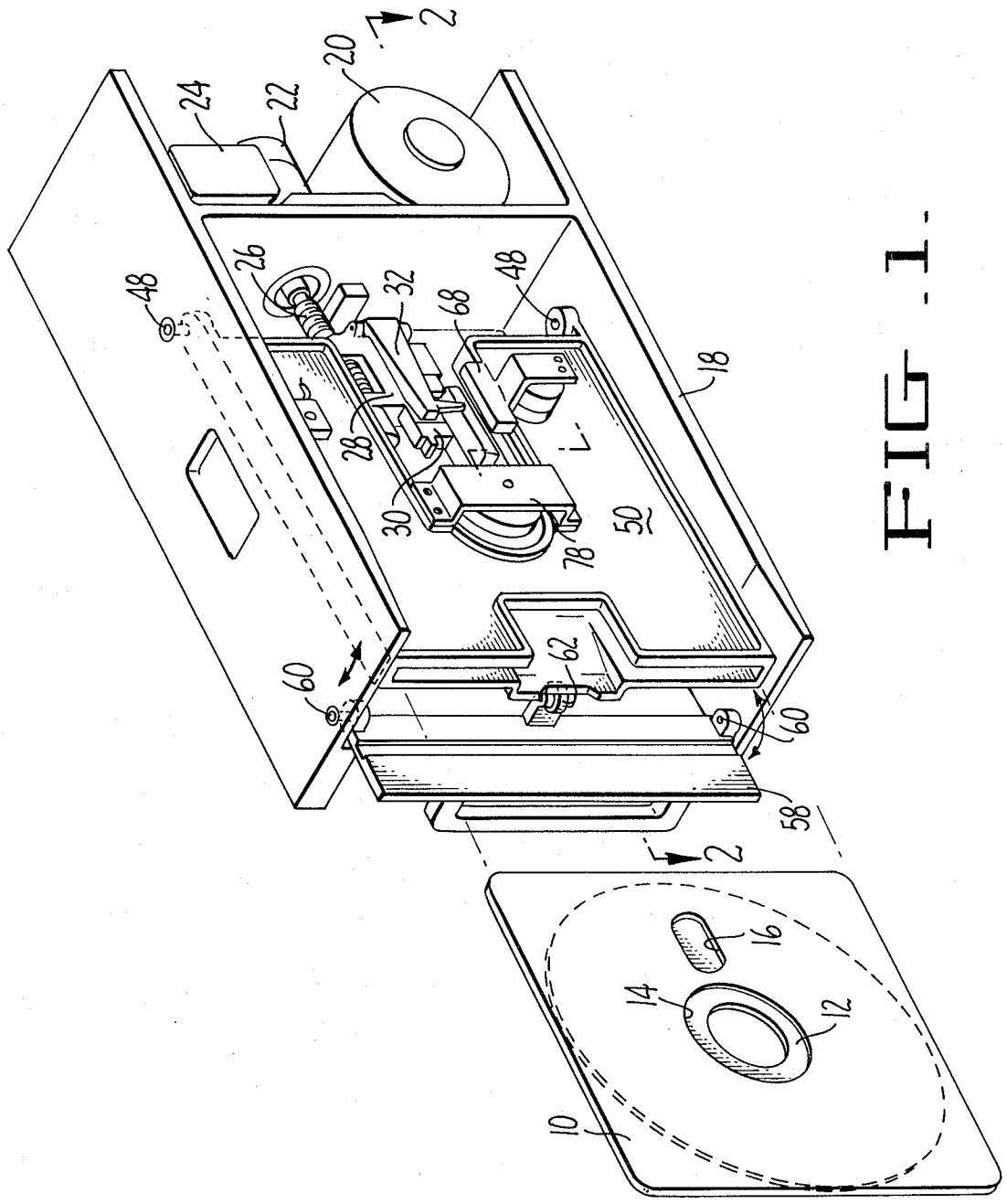


FIG. 1.

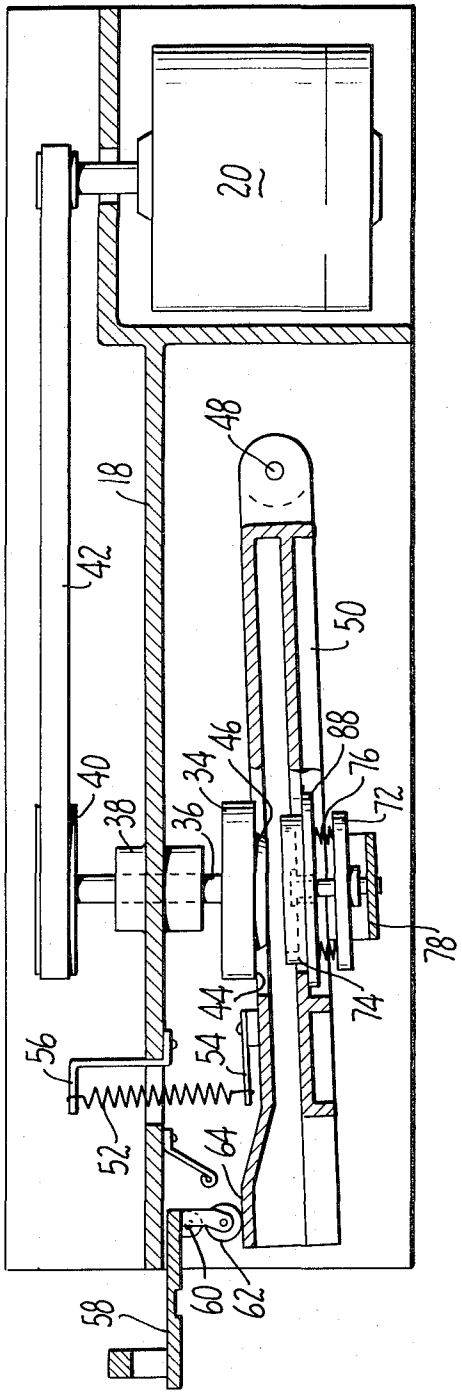

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FIG. 2.

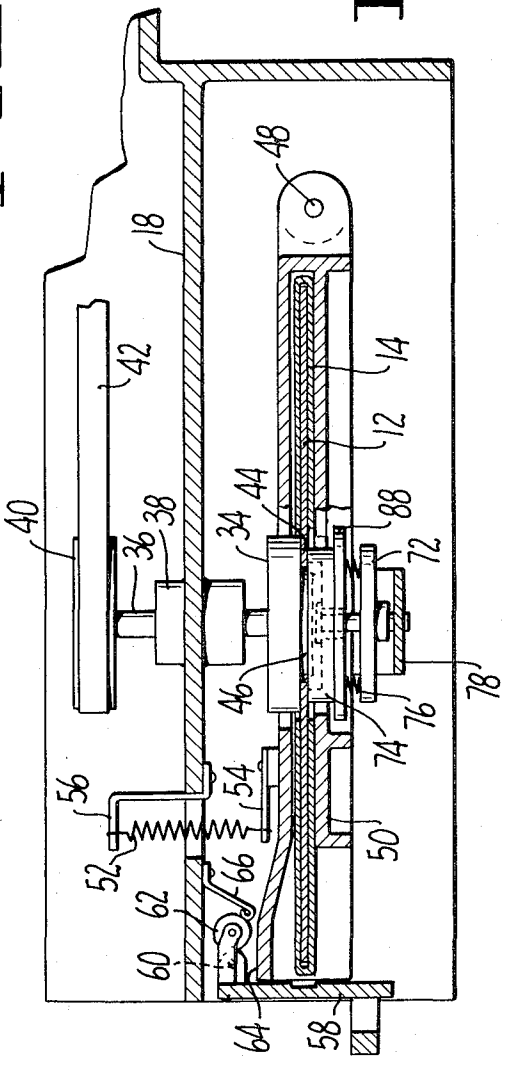
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FIG. 3.

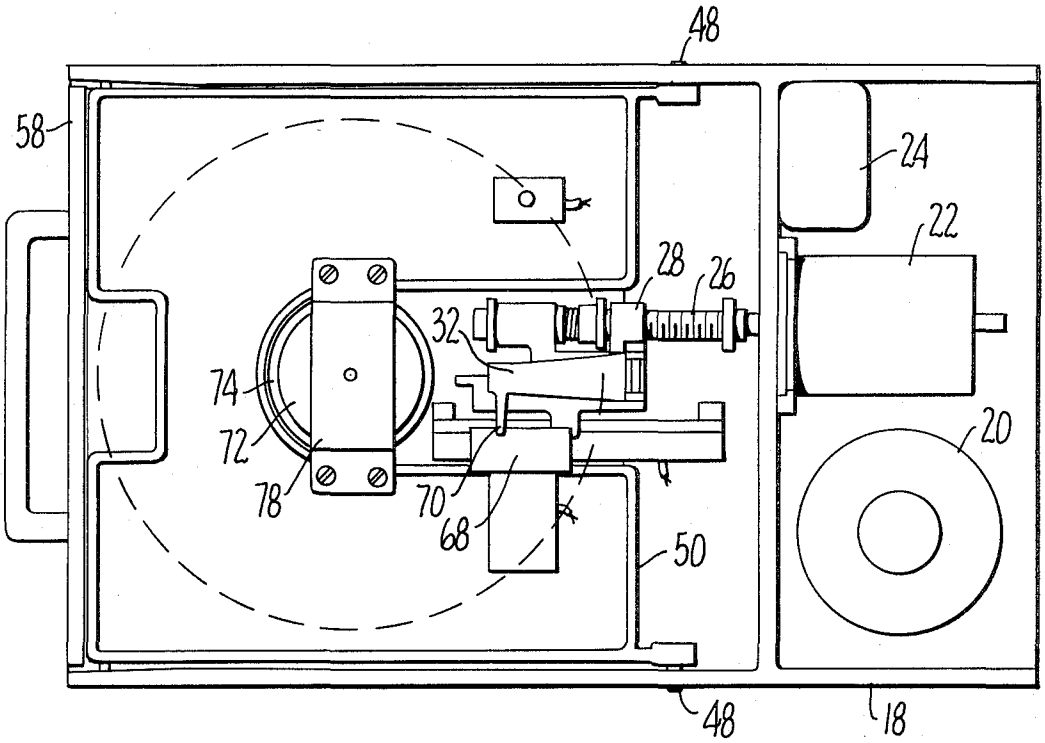
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FIG. 4.

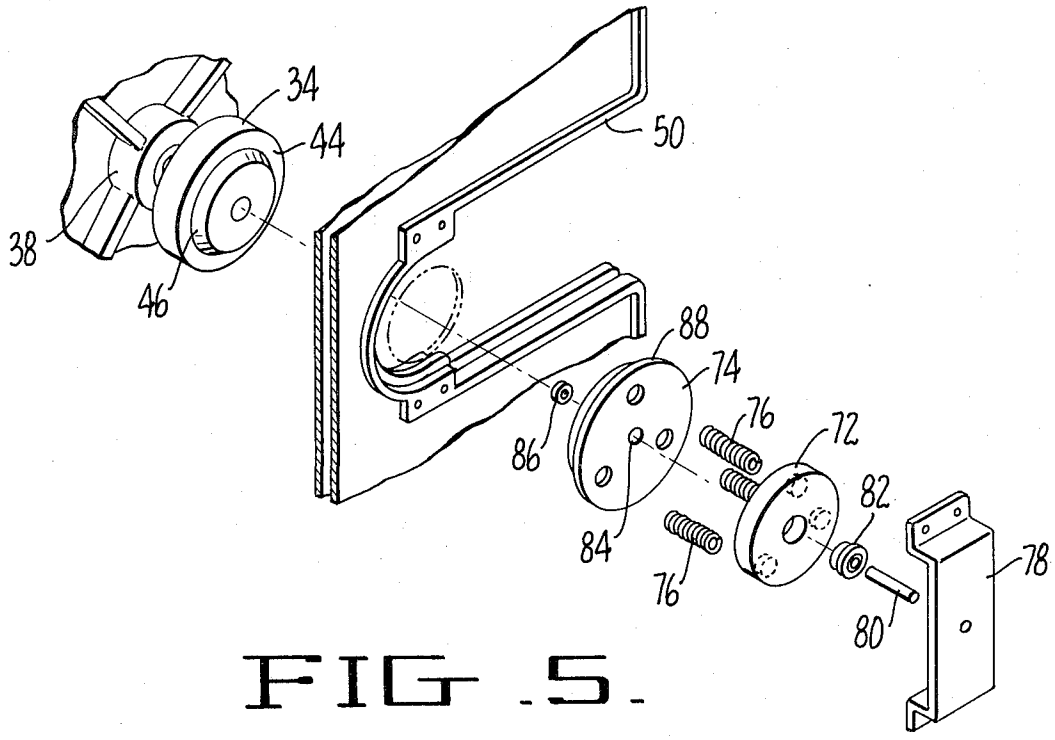
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FIG. 5.

FLEXIBLE DISC DRIVE

BACKGROUND OF INVENTION

A commercially available disc drive has been developed in recent years for handling computer programs prerecorded on flexible disc cartridges. The cartridge used with these drives is a flexible plastic disc coated with a magnetic recording layer and permanently supported in a flexible plastic envelope. The envelope has a central aperture for receipt of a drive spindle and a radial slot through which a magnetic reading head can engage the magnetic recording layer. These cartridges are inserted in a slot in the disc drive and then some element is operated manually to clamp the disc to a spindle.

A number of difficulties may be encountered with this commercially available disc drive. As the cartridge is inserted into the drive, the outside of the cartridge may touch the magnetic recording head which creates a risk of damage to the head. Mounting the head for retraction during cartridge loading is undesirable because retraction linkage will create complications with the precise head positioning linkage.

Additionally, problems may be encountered in the mechanism for clamping the disc to a spindle. If a clamp is part of the spindle, then the spindle construction is complex and expensive. If the clamp is mounted on a separate axis on the opposite side of the disc from the spindle, slight misalignment of the spindle and clamp axis will produce head tracking problems.

Additional problems are produced where the disc drive spindle is movably mounted for insertion into the central aperture of the cartridge after the cartridge has been inserted in the drive.

In accordance with this invention we have provided a new design for a disc cartridge drive in which all of these disadvantages are avoided. In our new drive, a simple spindle is mounted on a frame, and a disc cartridge holder is movably mounted, preferably pivoted so that it moves between a loading position and an operating position. When the holder is in the loading position, cartridges can be inserted into the drive in a direction parallel to their faces without touching the spindle or head. Thereafter, the holder pivots toward the spindle to mount the disc on the spindle and press the recording surface against the recording head.

An accurate disc locating surface is provided on the spindle for centering the disc as the holder moves and a clamp is mounted on the holder for holding the disc against the spindle as the spindle moves into the disc aperture. The clamp has a special free floating design which permits the clamp to accept the rotation axis of the spindle even when the axis of the clamp is misaligned with the spindle.

A simple cam operating mechanism for moving the disc holder completes the design to produce a drive for flexible disc cartridges which at the same time eliminates the difficulties of the commercially available drive and dramatically reduces the number of parts and cost of the drive.

Other features and advantages of the invention will become apparent from the following description of a preferred embodiment of the invention read in connection with the attached drawings in which:

FIG. 1 is an asymmetric view of a flexible disc cartridge recorder constructed in accordance with the principles of the invention;

FIG. 2 is a horizontal sectional view of the recorder of FIG. 1 taken slightly above the central spindle and illustrating the apparatus in open position for receipt of a cartridge;

FIG. 3 is a view similar to FIG. 2 showing the apparatus closed in recording position;

FIG. 4 is a side elevational view of the apparatus of FIG. 1, and

FIG. 5 is an exploded view of the disc clamping mechanism in the apparatus of FIGS. 1–4.

Referring now in detail to the drawings and particularly to FIG. 1, the flexible disc cartridge used with this apparatus includes a cartridge **10** containing a magnetic recording disc **12** and having a central aperture **14** through which the disc may be mounted on a spindle and a radial aperture **16** through which a magnetic recording head may extend for access to the recording surface of the disc.

The disc drive is built on a rigid frame **18** which supports a drive motor **20**, a head positioning motor **22**, and a number of electrical components, one of which is shown at **24**.

The head drive motor **22** operates a lead screw **26** to position a carriage **28** which supports a magnetic recording head **30** and a pressure plate **32**. When the disc cartridge is positioned in the machine in recording position, the magnetic recording head **30** extends through one of the apertures **16** on one side of the cartridge to engage the recording surface while the pressure plate **32** extends through the aperture **16** in the other wall of the cartridge to hold the magnetic recording disc **12** against the recording head **30**. The motor **22** may then be operated to advance the lead screw **26** to position the recording head **30** radially of the recording disc.

Referring to FIGS. **2** and **3**, a disc drive spindle **34** is mounted on a shaft **36** in a bearing assembly **38** on the frame **18**. The shaft **36** carries a drive pulley **40** which is driven from the motor **20** by a drive belt **42**.

The spindle **34** has a flat support surface **44** which engages the recording disc **12** when the disc is mounted in recording position. Additionally, the spindle **34** has a conical surface **46** which positions the disc accurately on the spindle, the conical surface **46** terminates at a cylindrical surface (not shown) adjacent to the flat surface **44** with a diameter slightly greater (**0.0001** inch) than the diameter of the central aperture in the disc **12**.

A pair of pivot pins **48** support a record holder **50** on the frame **18** and permits the holder **50** to swing between a cartridge loading position shown in FIG. **2** and a recording position shown in FIG. **3**. A spring **52** is connected between a bracket **54** on the holder **50** and a bracket **56** on the frame **18** for resiliently urging the holder **50** toward the recording position of FIG. **3**, and it will be noted that the spring **52** provides the clamping pressure by which the disc drive clamps a disc **12** to the spindle surface **44**. An access door **58** is pivotally mounted on the frame **18** at pivot axis **60**, and carries a roller **62** which cooperates with a cam surface **64** on the record holder **50** to move the holder **50** to the loading position of FIG. **2** when the door **58** is opened. A spring detent finger **66** engages the roller **62** to hold the door in a closed position.

A blade **68** is mounted on the holder **50** and engages a finger **70** on the pressure plate **32** to retract the pres-

sure plate **32** from the disc when the holder **50** is moved to the loading position of FIG. **2.**

With reference to FIG. **5,** the mechanism for clamping the recording disc onto the spindle **34** comprises a first member **72** and a second member **74** which are connected together by three compression springs **76.** The first member **72** is mounted on the cartridge holder **50** by means of a support bracket **78,** a pivot pin **80** and a bearing **82.** The pivot pin **80** extends through a central aperture **84** in the member **74** and is connected to a lock ring **86.** The aperture **84** is substantially larger than the pivot pin **80,** however, so that the member **74** can move radially of the axis of pivot pin **80** if the pivot pin **80** is not exactly aligned with the axis of the spindle **34.** The clamp member **74** has a forward face which engages the disc **12** and holds the disc against the surface **44** of the spindle in the recording position of FIG. **3,** and a central recess in the clamping member **74** provides clearance for entry of the conical portion **46** of the spindle. The clamping member **74** also has a peripheral flange **88** which engages the holder **50** in the cartridge loading position of FIG. **2,** but the flange **88** moves away from the cartridge holder **50** in the recording position of FIG. **3.** It will be apparent that the clamping member **74** in the recording position of FIG. **3** may contact only the disc **12** and the three springs **76.**

It will be apparent that the cartridge **10** may be inserted into the holder **50** when the apparatus is in the position of FIG. **2** and as the cartridge enters, no part of the cartridge or recording disc comes in contact with either the spindle **34** or the magnetic recording head **30.** As the access door **58** is closed, the holder **50** swings from the position of FIG. **2** to the position of FIG. **3** thereby bringing the recording surface on the disc **12** in contact with the recording head **30** and clamping the central hub of the disc accurately on the spindle **34.**

While one specific embodiment of the invention has been illustrated and described in detail herein, it is obvious that many modifications thereof may be made within the spirit and scope of the invention.

We claim:

1. A magnetic recording disc drive adapted to receive a flexible disc cartridge and rotate a flexible apertured disc in said cartridge which comprises:

a frame with a drive spindle mounted thereon for rotating a magnetic recording disc,

a magnetic transducer head on said frame for reading a disc which is rotating on said spindle,

a disc holder mounted on the frame for movement toward and away from said spindle with said holder adapted to removably receive a flexible disc cartridge with said holder positioned to support said cartridge away from said spindle and head and move the cartridge to said spindle and head as it moves toward the spindle, and

a clamp on the opposite side of said holder from said spindle movable toward said spindle as said holder moves toward said spindle to clamp a disc in said holder against said spindle with said clamp rotatable with the spindle, said disc drive characterized further in that said clamp comprises a first member mounted on said holder for rotation about an axis generally coaxial with said spindle and a second member adapted to engage and hold a disc against the spindle with said second member mounted on said first member for rotation therewith but free to move radially of said axis.

2. The disc drive of claim **1** in which a plurality of compression springs are connected between the first and second members of said clamp.

3. A disc drive for handling magnetic recording flexible disc cartridges comprising:

a unitary frame having a main web and a lateral web generally perpendicular thereto,

a spindle mounted on said main web for rotating a magnetic recording disc about an axis generally perpendicular to said main web,

a head positioning motor having a motor axle with a lead screw integrally formed with said axle with said motor mounted on said lateral web supporting said lead screw extending through said lateral web and cantilevered from said lateral web toward said spindle generally perpendicular to said lateral web, and

a magnetic head supported on said lead screw for motion toward and away from said spindle responsible to rotation of said axle.

4. A support hub for clamping a magnetic recording disc against a spindle comprising a first member adapted to be mounted for rotation about an axis generally coaxial with a spindle, a second member adapted to engage and hold a disc against a spindle, and a plurality of springs interconnecting said first and second members for rotation about said axis while permitting said second members to move radially of said axis.

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