

Description

BACKGROUND OF THE INVENTION:

The present invention relates to a read/write head carrying mechanism for a floppy disk drive. More particularly, the present invention concerns improvements of a read/write head carrying mechanism which is adapted to bring upper and lower heads, respectively, into close contact with both sides of a floppy disk placed in a loaded position, cause the upper and lower heads reciprocate along a predetermined head moving path, and swing open the upper and lower heads away from each other during the loading or unloading of the floppy disk, thereby facilitating the insertion and ejection of a disk cartridge.

Hitherto, various types of floppy disk drives have been put to practical use so as to effect the reading/writing of information in a magnetic medium known as a floppy disk, particularly a 3.5-inch floppy disk, incorporated in a disk cartridge.

Among these types of floppy disk drives, a double head type having a pair of upper and lower heads and capable of effecting the reading/writing of information on both sides of a floppy disk has been a mainstream, and these upper and lower heads are reciprocated along a predetermined head moving path set in the radial direction of the floppy disk.

A typical floppy disk drive employs a longitudinally mounted carriage whose longitudinal axis extends in the direction of the aforementioned head moving path, and the longitudinal axis of the carriage is arranged to be in alignment with the head moving path, the carriage being reciprocated by a motor or the like. An example of such disk drive is disclosed in JP-A-60-20368.

In addition to such a longitudinally mounted carriage, a transversely mounted carriage whose longitudinal axis is arranged perpendicularly to a head moving path has also been proposed, and these two different types of carriages are used each in its proper way, as required.

In both of these types, however, a space must be secured for the upper and lower heads to permit the insertion or removal of a disk cartridge during the loading or unloading of the disk cartridge. Conventionally, either one of the heads, normally the upper head, is swung open upwardly, and the insertion and removal of the disk cartridge are carried out through a clearance formed thereby.

Hence, with a conventional apparatus, there has been a problem in that the thickness of the floppy disk drive increases for securing a space for the springing up of the upper head.

A floppy disk drive having such a large thickness has a drawback in that it is unable to cope with the trend toward a small thickness which computers have in recent years have been required to be provided.

SUMMARY OF THE INVENTION:

Accordingly, an object of the present invention is to provide an improved read/write head carrying mechanism which allows the thickness of a floppy disk drive to be small and makes it possible to decrease the amount of movement of a carrier, accommodating a disk cartridge, between a loading position and an unloading position, thereby overcoming the above-described drawbacks of the conventional art.

To this end, in accordance with the present invention, there is provided a read/write head carrying mechanism of a transversely mounted type in which a single guide rail is secured to a frame at a position spaced apart a predetermined distance from and parallel with a head moving path set in the radial direction of a floppy disk, and a carriage is slidably and swingably supported by the guide rail.

An upper arm is swingably supported by the carriage, and a lower head and an upper head are respectively secured to the carriage and the upper arm.

The carriage and the upper arm are respectively disposed on the lower and upper sides of the carrier, the carriage being adapted to be pushed upwardly by a pushup portion provided on the carrier. When the carrier moves upwardly from a loading position to an unloading position, the upper arm is swung open upwardly, and, at the same time, the carriage is swung open downwardly.

In accordance with the present invention, the carriage and the upper arm form a carriage assembly, and this carriage assembly is pivotally supported by the single guide rail. The carriage assembly is provided with a substantially uniform weight balance between the left- and right-hand sides of the guide rail serving as a swinging shaft. For this reason, at the time of the swinging open of the upper arm and the carriage as well as during a read/write operation, a stable swinging operation is ensured.

Accordingly, in accordance with the present invention, the carrier moves vertically during the loading or unloading of a disk cartridge, the upper arm is swung open upwardly and the carriage downwardly simultaneously with the vertical movement of the carrier from the loading position to the unloading position. Thus, by virtue of this double swinging-open action, it becomes possible to secure a sufficient space for movement of the heads

so as to load or unload a disk cartridge.

In addition, in accordance with the present invention, since not only the upper arm but also the carriage effects an opening operation, the required amount of movement of the carrier between the loading position and the unloading position can be made smaller than with the conventional apparatus, so that a mechanism for driving the carrier can be arranged more simply.

Furthermore, as described above, since the carriage assembly in accordance with the present invention has a substantially uniform weight balance between the left- and right-hand sides of the guide rail serving as a swinging shaft, the opening operation can be effected with a stable balance when the upper arm is swung open upwardly and the carriage downwardly. In addition, there is another advantage in that, even if a carriage assembly swingable by means of a single guide rail is used, it is possible for heads attached to the carriage assembly to maintain stable postures during a usual read/write operation, since there is virtually no imbalance in the weight during the movement of the carriage.

The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description of the invention when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS:

Fig. 1 is a cross-sectional view of an essential section of a read/write head carrying mechanism incorporated in a floppy disk drive, illustrating a loaded state in accordance with an embodiment of the present invention;

Fig. 2 is a top plan view of the essential section shown in Fig. 1; and

Fig. 3 is a cross-sectional view of the essential section of the read/write head carrying mechanism in an unloaded state.

DESCRIPTION OF THE PREFERRED EMBODIMENT:

Referring now to the accompanying drawings, a description will be given to a preferred embodiment of the present invention.

Fig. 1 is a cross-sectional view of an essential section of a floppy disk drive incorporating a read/write head carrying mechanism in accordance with an embodiment of the present invention, illustrating a state in which a disk cartridge is inserted in the floppy disk drive in a loaded state. In addition, Fig. 2 is a top plan view of the embodiment, illustrating a state in which the carriage has been moved to the central side of the floppy disk accom-

modated in the disk cartridge in the loaded state.

As is known, a carrier 12 is provided within a frame 10 in such a manner as to be vertically movable between a loading position and an unloading position. The vertical movement of this carrier 12 is controlled by a slide plate and other members, but since this carrier mechanism is conventionally known, a description and detailed illustration thereof will be omitted in this embodiment.

The carrier 12 itself is configured as a frame, and a disk cartridge 14 can be mounted detachably in the interior thereof. The disk cartridge 14 shown in this embodiment is a 3.5 inch-type disk cartridge, and a floppy disk 16 is rotatably accommodated therein, as is well known.

In the illustrated floppy disk loading position, the disk cartridge 14 is positioned by a plurality of reference pins 18, 20 provided on the frame 10.

As shown in Fig. 2, a pulley 22 which rotates integrally with a rotating hub of the floppy disk 16 is disposed rotatably at a substantially central position of the floppy disk drive. A desired rotating force is transmitted to the floppy disk 16 as the pulley 22 is rotated by a spindle motor 24 via a belt 26.

A pair of upper and lower heads are respectively brought into close contact with the both sides of the floppy disk 16, the upper and lower heads being denoted by reference numerals 28 and 30 in the drawings. As is known, these upper and lower heads 28, 30 are required to perform reciprocating movement integrally with each other along a head moving path 100 (Fig. 2) set in the radial direction of the floppy disk 16. In the present invention, an improved read/write head carrying mechanism is provided for moving the upper and lower heads 28, 30.

To effect the aforementioned reciprocating movement along the head moving path 100 while carrying the two heads 28, 30, the lower head 30 is fixedly mounted on one end of the carriage 32 via a lower head-attaching plate 34, while the upper head 28 is secured to an upper arm 36 which is swingably supported by the carriage 32.

The carriage 32 is supported by a guide rail 38 in such a manner as to be slidable and swingable. In the present invention, the guide rail 38 comprises a single guide rail fixed to the frame 10 at a position spaced apart a predetermined distance from and disposed parallel with the head moving path 100. Although not shown in detail, this guide rail 38 is constituted by a round rod with its ends fixedly held by the frame 10 and, in the present invention, serves as a swinging shaft for the carriage 32, which will be described later, thus permitting the swinging open of both the carriage and the upper arm, which is a characteristic feature of the

present invention.

In this embodiment the carriage 32 is formed by bending a flat plate and is disposed below the carrier 14. The upper and lower heads 28, 30 are reciprocated along the head moving path 100 via the carriage 32 and the upper arm 36 upon rotation of a feed motor 42 with a rack plate 40 secured to a portion of the carriage 32 meshing with a pinion 44 of the feed motor 42.

As described above, the lower head 30 is secured to a portion of the carriage 32, and, in this embodiment, the lower head 30 is secured to the lower head mounting plate 34 by means of bonding or other similar means via a lower head baseplate 45. The other end of this carriage 32 detours the carrier 12 and extends upwardly, and an end of its upwardly extending portion forms an upper arm-fixing portion 32a.

Meanwhile, the upper arm 36 carries at a distal end thereof the upper head 28 via an upper head baseplate 46, and an upper arm-holding spring 48 constituted by a leaf spring is secured at one end thereof to a proximal end of the upper arm 36. The other end of this upper arm-holding spring 48 extends toward the upper arm-fixing portion 32a and is fixedly secured by an arm holder 50.

Accordingly, the upper arm 36 is swingably supported by the carriage 32 on the upper surface side of the carrier 12.

As is apparent from Fig. 2, ends of a pair of arm legs 36a, 36b provided on lateral sides of the upper arm 36 extend to the upper surface of the upper arm-fixing portion 32a, accurately positioning the upper arm 36 with respect to the carriage 32. In addition, two arm springs 52 held by the upper arm-fixing portion 32a span the carriage 32 and the upper arm 36 and constantly urge the upper arm 36 toward the carriage 32, causing the upper and lower heads 28, 30 to be brought into close contact with the both sides of the floppy disk 16 in a loaded state.

In the present invention, the carriage 32 and the upper arm 36 form a carriage assembly 37, which is pivotally supported by the guide rail 38 in such a manner to be swingable about the swinging shaft constituted by the guide rail 38. A characteristic feature of the present invention lies in that this carriage assembly 37 is disposed with a horizontally uniform balance of weight with the swinging shaft, i.e., the guide rail 38, as a center. For this reason, there is an advantage in that, during an ordinary read/write operation by the upper and lower heads 28, 30 or during an opening operation at the time of loading or unloading of the disk cartridge 14, no error attributable to the gravity occurs in the moving action of the carriage assembly 37.

In the present invention, in order to obtain the aforementioned uniform weight balance, the distribution of weight with the guide rail 38 as a center is calculated at the time of the designing of the carriage and the upper arm. In the illustrated embodiment as well, large overhangs of the carriage 32 and the upper arm 36 are provided on the side of the upper and lower heads 28, 30 which is remote from the side where the guide rail 38 is provided, the weight of the upper and lower heads normally increasing in the manner of a cantilever, thereby obtaining the aforementioned weight balance.

However, in this embodiment, a sufficient weight balance cannot be obtained through such design-wise consideration alone. In the embodiment, therefore, one end of the lower head-attaching plate 34 is extended to form a retaining tongue 34a, and urging forces of balance springs 39, 41 are imparted to this retaining tongue 34a.

One end of each of the balance springs 39, 41 is securely fixed to a spring holder 43 secured to the frame 10, and a free end thereof engages with the retaining tongue 34a.

Accordingly, in the loaded state shown in Fig. 1, the retaining tongue 34a is clamped by the balance springs 39, 41 and assumes a usual horizontal position. In this state, the urging forces of the balance springs 39, 41 are not unidirectionally applied to the carriage assembly 37; however, when the carriage assembly 37 swings about the guide rail 38 due to some cause, the balance springs 39, 41 impart desired returning forces to the carriage assembly 37, so that the carriage assembly 37 is capable of assuming a substantially uniform balance of weight as a whole.

A characteristic feature of the present invention lies in that, when the carrier 12 moves upwardly from the loading position to the unloading position, the upper arm 36 is swung open upwardly and, at the same time, the carriage 32 is swung open downwardly. For this purpose, in the present invention, the carrier 12 is provided with a pushing-up portion, and the pushing-up portion in the embodiment is formed by a carriage-pushup spring 54 secured on the upper surface side of the carrier 12. This carriage pushup spring 54 has a substantially L-shaped section, and its long portion is secured on the upper surface of the carrier 12, while its short portion extends to the undersurface side of the upper arm-fixing portion 32a of the carriage 32 in proximity thereto.

Accordingly, this pushup spring 54 is capable of pushing the left-hand side of the carriage 32 upwardly, as viewed in Fig. 3, at a position which is on the side of the upper and lower heads 28, 30 which is remote from the side where the guide rail 38 is provided.

In addition, in accordance with this embodiment, the upper arm 36 is provided with a projection 56 for adjusting the height of the upper arm, and, when the carrier 12 moves upwardly to the unloading position, the upper surface of the carrier 12 is brought into direct contact with the projection 56, thereby moving the upper arm 36 upwardly against the resiliency of the arm springs 52.

The embodiment of the present invention is arranged as described above, and its operation will be described hereinafter.

In Fig. 1, since the carriage 32 does not abut against the carriage pushup spring 54, and neither the upper arm 36 abuts against the projection 56 for adjusting the height of the upper arm, an urging force in a closing direction is applied by the arm springs 52 between the carriage 32 and the upper arm 36.

Accordingly, the upper and lower heads 28, 30 are brought into close contact with the upper and lower surfaces of the floppy disk 16 at the illustrated loading position with a predetermined pressure.

Meanwhile, when the disk cartridge 14 is removed from the carrier 12, the carrier 12 moves upwardly from the loading position shown in Fig. 1 toward an unloading position shown in Fig. 3, as is known. During the unloading of the disk cartridge 14 at this unloading position, the upper and lower heads 28, 30 must move away from the floppy disk 16 and must be retracted from an unloading area for the disk cartridge 14.

Conventionally, the disk cartridge 14 moves upwardly and thereby moves away from the lower head 30, and at that juncture only the upper head 28 is swung open upwardly, thereby forming the unloading area for the disk cartridge 14. With such a conventional apparatus, however, there is the problem that the distance of upward movement of the disk cartridge 14 must be made large, so that there has been a drawback in that the thickness of the floppy disk increases.

The present invention is aimed at overcoming this conventional drawback, and, as is apparent from Fig. 3, the carriage pushup spring 54 first pushes the upward arm-fixing portion 32a of the carriage 32 during the upward movement of the carrier 12. Subsequently, the carrier 12 itself is brought into contact with the projection 56 for adjusting the height of the upper arm, thereby pushing the same upwardly.

As is apparent from the unloading position shown in Fig. 3, the pushing up of the carriage 32 by the carriage pushup spring 54 causes the carriage 32 to swing clockwise, as viewed in the drawing, with the guide rail 38 serving as a fulcrum.

In the drawing, when the carriage 32 is swung open downwardly, the retaining tongue 34 pushes

down the lower balance spring 39, as shown in the drawing, and a balancing force at this time applies an urging force for returning the carriage 32 upwardly.

As the left-hand side of the carriage 32, as viewed in Fig. 3, is thus pushed upwardly, the lower head 30 retracts downwardly from the loading position shown in Fig. 1.

Hence, a space sufficient for unloading the carrier 12 is created by the portion of this retraction without the disk cartridge 14 coming into collision with the lower head 30 even if the amount of upward movement of the carrier 12 decreases.

It goes without saying that, at this juncture, the upper arm 36 is swung open upwardly as the projection 56 for adjusting the height of the upper arm comes into contact with the carrier 12, as described above, and the upper head 28 can retract sufficiently from the disk cartridge 14 in the same way as the prior art.

Therefore, in accordance with the present invention, there is an advantage in that, by virtue of the swinging open of the two heads 28, 30, a space sufficient for unloading the disk cartridge 14 can be created while the amount of upward movement of the carrier 12 is reduced.

Although in the above-described embodiment, a resilient carriage pushup spring 54 is used for moving the left-hand side of the carriage 32 upwardly, as viewed in the drawing, and moving the lower head 30 downwardly, it goes without saying that, in the present invention, this carriage pushup portion can be provided with another arbitrary configuration. In addition, this pushup portion may be arranged such that the upper arm 36 is directly pushed upwardly by the pushup portion, and this pushing force may be used as it is so as to swing the carriage 32.

For this purpose, in accordance with the present invention, the pushup portion is provided on the side of the upper and lower heads 28, 30 which is remote from the side where the guide rail 38 is provided.

As described above, since the carriage assembly 37 in accordance with the present invention is arranged such that, in consideration of the distribution of its weight in design and, by virtue of urging forces of balance springs, the weight balance of the carriage assembly 37 between the left and right-hand sides of the guide rail 38 is arranged to be substantially uniform with the guide rail 38 serving as a swinging shaft. Accordingly, there is the advantage that the posture of the carriage assembly 37 during movement thereof can be maintained in a stable state.

As described above, in accordance with the present invention, at the time of unloading a disk cartridge, the carrier causes the right-hand side of

carriage, as viewed in Fig. 3, to swing open downwardly and the upper arm upwardly. Consequently, the disk cartridge can move away from the upper and lower heads by virtue of this opening operation in the two directions, and the amount of movement of the carrier from the loading position to the unloading position can be reduced. Accordingly, there is the advantage in that the thickness of the floppy disk drive can be made small without any need to provide a large extra vacant space within the frame of the floppy disk drive.

In addition, since the carriage assembly in accordance with the present invention is provided with a substantially uniform weight balance on the left- and the right-hand sides of its swinging shaft, there is an advantage in that no extra external force is applied to the movement of the carriage and the upper arm during a swinging or read/write operation.

Claims

1. A read/write head carrying mechanism including a frame (10) and a carrier (12) in which a disc cartridge (14) accommodates a floppy disc (16) is detachably loaded and which is capable of assuming a loading and an unloading position in conformity with a vertical movement of said carrier (12) with respect to the frame, said carrying mechanism comprising a carriage (32) with an upper arm (36) holding an upper head (28) and a lower plate (34) holding a lower head (30) in close contact with either side of the disc in a loaded state, the carriage being able to reciprocate along guidance means defining a head moving path (100) in the radial direction of the disc; characterized in that the guidance means consists of a single guide rail (38) secured to the frame (10); in that the carriage (32) is disposed underneath said carrier (12) and is supported slidably and pivotably by said guide rail (38), said upper arm (36) being swingably supported by said carriage (32) on the upper surface of said carrier (12); and in that a push up portion (54) is provided on said vertically moving carrier (12) in such a way that, when the carrier (12) moves in an upward direction, the push up portion pushes that part of the carriage (32) which is remote from the heads (28,30) also in an upward direction so that said carriage (32) pivots about the guide rail (38) such that the lower plate (34) is lowered and the upper arm (36) swings open upwardly.
2. A read/write head carrying mechanism according to claim 1, characterized in that said read/write head carrying mechanism further comprises:
 - (a) a pulley(22) for driving a rotary hub of the floppy disk(16) in a loaded state by being engaged with said rotary hub, said pulley(22) being provided rotatably on said frame;
 - (b) a spindle motor(24) secured to said frame(10) at a position spaced apart from said carrier(12), adapted to move vertically between the loading position and the unloading position; and
 - (c) a belt(26) for transmitting the rotation of said spindle motor(24) to said pulley(22).
3. A read/write head carrying mechanism according to claim 1, characterized in that said carriage(32) is formed of a bent flat plate.
4. A read/write head carrying mechanism according to claim 1, characterized in that said read/write head carrying mechanism further comprises:
 - (a) a feed motor(42) secured to said frame(10) at a position spaced apart from a moving area of said carrier(12) and including a pinion(44) provided on a main spindle of the feed motor(42);
 - (b) a rack plate (40) provided on a part of said carriage(32), and adapted to reciprocate said upper and lower heads(28, 30) along said head moving path(100) via said carriage(32) and said upper arm(36), upon rotation of said feed motor(42) leading said rack plate(40) to engage with said pinion(44) of the feed motor(42).
5. A read/write head carrying mechanism according to claim 1, characterized in that another end portion of said carriage(32), opposite to the end portion provided with said lower head(30) meanders said carrier and extends toward the upper arm side in an L-shaped configuration, said another end portion forming an upper arm fixing portion.
6. A read/write head carrying mechanism according to claim 5, characterized in that said read/write head carrying mechanism further comprises:
 - (a) an upper arm-holding spring(48), constituted by a leaf spring and having one end secured to said upper arm-fixing portion and the other end secured to a proximal end of said upper arm(36), for supporting the upper arm(36);



carriage, as viewed in Fig. 3, to swing open downwardly and the upper arm upwardly. Consequently, the disk cartridge can move away from the upper and lower heads by virtue of this opening operation in the two directions, and the amount of movement of the carrier from the loading position to the unloading position can be reduced. Accordingly, there is the advantage in that the thickness of the floppy disk drive can be made small without any need to provide a large extra vacant space within the frame of the floppy disk drive.

In addition, since the carriage assembly in accordance with the present invention is provided with a substantially uniform weight balance on the left- and the right-hand sides of its swinging shaft, there is an advantage in that no extra external force is applied to the movement of the carriage and the upper arm during a swinging or read/write operation.

Claims

1. A read/write head carrying mechanism including a frame (10) and a carrier (12) in which a disc cartridge (14) accommodates a floppy disc (16) is detachably loaded and which is capable of assuming a loading and an unloading position in conformity with a vertical movement of said carrier (12) with respect to the frame, said carrying mechanism comprising a carriage (32) with an upper arm (36) holding an upper head (28) and a lower plate (34) holding a lower head (30) in close contact with either side of the disc in a loaded state, the carriage being able to reciprocate along guidance means defining a head moving path (100) in the radial direction of the disc; characterized in that the guidance means consists of a single guide rail (38) secured to the frame (10); in that the carriage (32) is disposed underneath said carrier (12) and is supported slidably and pivotably by said guide rail (38), said upper arm (36) being swingably supported by said carriage (32) on the upper surface of said carrier (12); and in that a push up portion (54) is provided on said vertically moving carrier (12) in such a way that, when the carrier (12) moves in an upward direction, the push up portion pushes that part of the carriage (32) which is remote from the heads (28,30) also in an upward direction so that said carriage (32) pivots about the guide rail (38) such that the lower plate (34) is lowered and the upper arm (36) swings open upwardly.
2. A read/write head carrying mechanism according to claim 1, characterized in that said read/write head carrying mechanism further comprises:
 - (a) a pulley(22) for driving a rotary hub of the floppy disk(16) in a loaded state by being engaged with said rotary hub, said pulley(22) being provided rotatably on said frame;
 - (b) a spindle motor(24) secured to said frame(10) at a position spaced apart from said carrier(12), adapted to move vertically between the loading position and the unloading position; and
 - (c) a belt(26) for transmitting the rotation of said spindle motor(24) to said pulley(22).
3. A read/write head carrying mechanism according to claim 1, characterized in that said carriage(32) is formed of a bent flat plate.
4. A read/write head carrying mechanism according to claim 1, characterized in that said read/write head carrying mechanism further comprises:
 - (a) a feed motor(42) secured to said frame(10) at a position spaced apart from a moving area of said carrier(12) and including a pinion(44) provided on a main spindle of the feed motor(42);
 - (b) a rack plate (40) provided on a part of said carriage(32), and adapted to reciprocate said upper and lower heads(28, 30) along said head moving path(100) via said carriage(32) and said upper arm(36), upon rotation of said feed motor(42) leading said rack plate(40) to engage with said pinion(44) of the feed motor(42).
5. A read/write head carrying mechanism according to claim 1, characterized in that another end portion of said carriage(32), opposite to the end portion provided with said lower head(30) meanders said carrier and extends toward the upper arm side in an L-shaped configuration, said another end portion forming an upper arm fixing portion.
5. A read/write head carrying mechanism according to claim 5, characterized in that said read/write head carrying mechanism further comprises:
 - (a) an upper arm-holding spring(48), constituted by a leaf spring and having one end secured to said upper arm-fixing portion and the other end secured to a proximal end of said upper arm(36), for supporting the upper arm(36);



(b) a pair of arm legs provided on lateral both sides of said upper arm(36) respectively, tips of said arm legs extending toward the upper surface of said upper arm-fixing portion so as to contact with said fixing portion; and

(c) at least one arm spring(52) held by said arm-fixing portion one end of said arm spring(52) abutting against said upper arm-(36), thereby urging said upper arm(36) toward said carriage.

7. A read/write head carrying mechanism according to claim 1, characterized in that said carriage(32) carrying said upper and lower heads(28, 30), and said upper arm constitute a carriage assembly, and said carriage assembly has a weight balance substantially uniform with said guide rail(38) serving as a swinging shaft.

8. A read/write head carrying mechanism according to claim 7, characterized in that said read/write head carrying mechanism further comprises:

- (a) an attaching plate(34) for fixing said lower head(30) to said carriage(32);
- (b) a retaining tongue(34a) formed by extending an end of said attaching plate(34);
- (c) a balance spring (39,41) secured to said frame(10) and having a free end engaging with said retaining tongue(34a);

whereby the weight balance of said carriage assembly is adjusted by the urging force of said balance spring(39, 41).

9. A read/write head carrying mechanism according to claim 8, characterized in that:

said balance spring(39, 41) has a U-shaped configuration;

said retaining tongue(34a) is clamped by the mutually opposing portions of the balance spring(39, 41) at the loading state of said carrier(12), said retaining tongue(34a) assuming a horizontal position not subject to the unidirectional resilient force of said balance spring(39, 41);

whereby said carriage assembly is set in a balanced state.

10. A read/write head carrying mechanism according to claim 1, characterized in that;

said pushup portion(54) is formed by a carriage pushup spring(54) secured to the upper surface of said carrier(12), a part of the carriage pushup spring(54) is adapted to push said carriage upwardly when said carrier(12) moves from the loading position to the unloading position.

11. A read/write head carrying mechanism according to claim 10, characterized in that said carriage pushup spring(54) has a L-shaped configuration consisting of a long side and a short side, the long side being secured to the upper surface of said carrier(12) while the short side being disposed near the undersurface side of said upper arm-fixing portion.

12. A read/write head carrying mechanism according to claim 1, characterized in that said read/write head carrying mechanism further comprises:

a projection(56) provided on the upper arm(36) for adjusting the height of said upper arm(36) and being capable of contacting with the upper surface of said carrier(12).

Patentansprüche

1. Lese/Schreibkopf-Führungsmechanismus mit einem Rahmen (10) und einem Träger (12), in den eine Plattenhülle (14) für eine Floppy-Disk (16) entnehmbar geladen wird und der eine Ladeposition und eine Entladeposition in Übereinstimmung mit einer vertikalen Bewegung des Trägers (12) in Bezug auf den Rahmen einnehmen kann, wobei der Führungsmechanismus einen Schlitten (32) mit einem oberen Arm (36) zum Halten eines oberen Kopfes (28) aufweist und eine untere Platte (34) zum Halten eines unteren Kopfes (30), wobei dies in einem Ladezustand in engem Kontakt mit der jeweiligen Seite der Floppy-Disk erfolgt, und wobei der Schlitten längs einer Führungseinrichtung, die einen Kopf-Bewegungspfad (100) in radialer Richtung der Floppy-Disk definiert, hin und her bewegbar ist, dadurch gekennzeichnet, daß die Führungseinrichtung aus einer einzigen Führungsschiene (38) besteht, die an dem Rahmen (10) befestigt ist; daß der Schlitten (32) unterhalb des Trägers (12) angeordnet und gleitend und schwenkbar mittels der Führungsschiene (38) getragen ist, daß der obere Arm (36) schwenkbar mittels des Schlittens (32) auf der oberen Oberfläche des Trägers (12) getragen ist und daß ein Aufdrückabschnitt (54) an dem vertikal bewegbaren Träger (12) derart vorgesehen ist, daß, wenn der Träger (12) in eine Aufwärtsrichtung bewegt wird, der Aufdrückabschnitt auch den Teil des Schlittens (32) in eine Aufwärtsrichtung drückt, der von den Köpfen (28, 30) entfernt ist, so daß der Schlitten (32) derart um die Führungsschiene (38) schwenkbar ist, daß die untere Platte (34) abgesenkt wird und



der obere Arm (36) nach oben aufschwenkt.

2. Lese/Schreibkopf-Führungsmechanismus nach Anspruch 1,

dadurch gekennzeichnet,

daß der Lese/Schreibkopf-Führungsmechanismus weiterhin aufweist:

(a) eine Rolle (22) zum Antreiben einer Rotationsnabe der Floppy-Disk (16) in einem geladenen Zustand, indem sie mit der Rotationsnabe im Eingriff steht, wobei die Rolle (22) drehbar auf dem Rahmen vorgesehen ist;

(b) einen Spindelmotor (24), welcher an dem Rahmen (10) an einer Position entfernt von dem Träger (12) befestigt ist, um vertikal zwischen der Ladeposition und der Entladeposition bewegt werden zu können; und

(c) einen Riemen (26) zum Übertragen der Rotation des Spindelmotors (24) auf die Rolle (22).

3. Lese/Schreibkopf-Führungsmechanismus nach Anspruch 1,

dadurch gekennzeichnet,

daß der Schlitten (32) aus einer gebogenen flachen Platte gebildet ist.

4. Lese/Schreibkopf-Führungsmechanismus nach Anspruch 1,

dadurch gekennzeichnet,

daß der Lese/Schreibkopf-Führungsmechanismus weiterhin aufweist:

(a) einen Antriebsmotor (42), welcher an dem Rahmen (10) an einer Position entfernt von einem Bewegungsbereich des Trägers (12) befestigt ist und welcher ein Ritzel (44) aufweist, das auf einer Hauptspindel des Antriebsmotors (42) vorgesehen ist,

(b) eine Zahnstangenplatte (40), welche auf einem Teil des Schlittens (32) vorgesehen ist, und die ausgelegt ist, den oberen und unteren Kopf (28, 30) entlang des Kopf-Bewegungspfad (100) mittels des Schlittens (32) und des oberen Armes (36) als Folge der Rotation des Antriebsmotors (42) hin und her zu bewegen, wodurch die Zahnstangenplatte (40) mit dem Ritzel (44) des Antriebsmotors (42) kämmt.

5. Lese/Schreibkopf-Führungsmechanismus nach Anspruch 1,

dadurch gekennzeichnet,

daß ein anderer Endabschnitt des Schlittens (32), der dem Endabschnitt gegenüberliegt, an dem der untere Kopf (30) vorgesehen ist, den Träger umwindet und sich bis zur oberen Armseite in einer L-förmigen Konfiguration er-

streckt, wobei der andere Endabschnitt einen Befestigungsabschnitt für den oberen Arm bildet.

6. Lese/Schreibkopf-Führungsmechanismus nach Anspruch 5,

dadurch gekennzeichnet,

daß der Lese/Schreibkopf-Führungsmechanismus weiterhin aufweist:

(a) eine Haltefeder (48) für den oberen Arm, welche durch eine Blattfeder gebildet ist, und ein Ende hat, welches am Befestigungsabschnitt für den oberen Arm befestigt ist, und das andere Ende an einem proximalen Ende des oberen Armes (36) befestigt ist, um den oberen Arm (36) zu stützen;

(b) ein Paar von Armschenkeln, welche jeweils an beiden lateralen Seiten des oberen Armes (36) vorgesehen sind, wobei Spitzen der Armschenkel sich bis zur oberen Oberfläche des Befestigungsabschnittes für den oberen Arm erstrecken, um in Kontakt mit dem Befestigungsabschnitt zu kommen; und

(c) wenigstens eine Armfeder (52), welche durch den Befestigungsabschnitt des Arms gehalten wird, wobei ein Ende der Armfeder (52) an den oberen Arm (36) anstößt, wodurch der obere Arm (36) gegen den Schlitten (32) gezwungen wird.

7. Lese/Schreibkopf-Führungsmechanismus nach Anspruch 1,

dadurch gekennzeichnet,

daß der Schlitten (32), welcher den oberen und unteren Kopf (28, 30) trägt, und der obere Arm eine Schlitteneinheit bilden, und die Schlitteneinheit ein Gleichgewicht hat, welches im wesentlichen mit der Führungsschiene (38) übereinstimmt, die als eine Schwenkachse dient.

8. Lese/Schreibkopf-Führungsmechanismus nach Anspruch 7,

dadurch gekennzeichnet,

daß der Lese/Schreibkopf-Führungsmechanismus weiterhin aufweist:

(a) eine Befestigungsplatte (34) zum Befestigen des unteren Kopfes (30) an dem Schlitten (32);

(b) eine Stützzunge (34a), welche durch Erweitern eines Endes der Befestigungsplatte (34) gebildet ist;

(c) eine Ausgleichsfeder (39, 41), welche an dem Rahmen (10) befestigt ist, und welche ein freies Ende besitzt, das mit der Stützzunge (34a) im Eingriff steht; wodurch das Gleichgewicht der Schlitteneinheit durch die



Zwangskraft der Ausgleichsfeder (39, 41) eingestellt wird.

9. Lese/Schreibkopf-Führungsmechanismus nach Anspruch 8,

dadurch gekennzeichnet,

daß die Ausgleichsfeder (39, 41) eine U-förmigen Konfiguration hat;

daß die Stützzunge (34a) durch sich wechselseitig gegenüberliegende Abschnitte der Ausgleichsfeder (39, 41) im Ladezustand des Trägers (12) festgeklampt wird, wobei die Stützzunge (34a) eine horizontale Position einnimmt, die nicht der ungerichteten Rückstellkraft der Ausgleichsfeder (39, 41) ausgesetzt ist; wodurch die Schlitteneinheit in einen ausgewogenen Zustand versetzt wird.

10. Lese/Schreibkopf-Führungsmechanismus nach Anspruch 1,

dadurch gekennzeichnet,

daß der Aufdrückabschnitt (54) durch eine Schlitten-Aufdrückfeder (54) gebildet ist, welche an der oberen Oberfläche des Trägers (12) befestigt ist, wobei ein Teil der Schlitten-Aufdrückfeder (54) ausgelegt ist, den Schlitten aufwärts zu drücken, wenn der Träger (12) sich von der Ladeposition zur Entladeposition bewegt.

11. Lese/Schreibkopf-Führungsmechanismus nach Anspruch 10,

dadurch gekennzeichnet,

daß die Schlitten-Aufdrückfeder (54) eine im wesentlichen L-förmige Konfiguration hat, welche aus einer langen Seite und einer kurzen Seite besteht, wobei die lange Seite an der oberen Oberfläche des Trägers (12) befestigt ist,

während die kurze Seite in der Nähe der Oberfläche der Unterseite des Befestigungsabschnittes für den oberen Arm angeordnet ist.

12. Lese/Schreibkopf-Führungsmechanismus nach Anspruch 1,

dadurch gekennzeichnet,

daß der Lese/Schreibkopf-Führungsmechanismus weiterhin aufweist:

einen Vorsprung (56) zur Einstellung der Höhe des oberen Armes (36), wobei der Vorsprung am oberen Arm (36) vorgesehen ist, und mit der oberen Oberfläche des Trägers (12) in Kontakt kommen kann.

Revendications

1. Mécanisme porteur d'une tête de lecture/écriture comprenant un châssis (10) et

un support (12) dans lequel est chargée de manière amovible une cartouche de disque (14) recevant un disque souple (16) et pouvant prendre une position de chargement et une position de déchargement conformément à un mouvement vertical du support (12) par rapport au châssis, ce mécanisme porteur comprenant un chariot (32) muni d'un bras supérieur (36) portant une tête supérieure (28) et d'une plaque inférieure (34) portant une tête inférieure (30) en contact étroit avec chaque côté du disque dans une position de chargement, le chariot pouvant aller et venir le long de moyens de guidage définissant un chemin de déplacement (100) des têtes dans la direction radiale du disque; mécanisme porteur caractérisé en ce que les moyens de guidage consistent en un rail de guidage unique (38) fixé au châssis (10); en ce que le chariot (32) est disposé au-dessous du support (12) et supporté en glissement et en pivotement par le rail de guidage (38), le bras supérieur (36) étant supporté en basculement par le chariot (32) sur la surface supérieure du support (12); et en ce qu'une pièce de poussée vers le haut (54) est montée sur le chariot mobile verticalement (12) de façon que, lorsque le support (12) se déplace vers le haut, la pièce de poussée vers le haut pousse également vers le haut la partie du chariot (32) la plus éloignée des têtes (28, 30) pour que le chariot (32) pivote autour du rail de guidage (38) de manière à abaisser la plaque inférieure (34) et à faire pivoter le bras supérieur (36) vers le haut en position d'ouverture.

2. Mécanisme porteur d'une tête de lecture/écriture selon la revendication 1, caractérisé en ce que ce mécanisme porteur de la tête de lecture/écriture comprend en outre:

(a) une poulie (22) destinée à entraîner un moyeu rotatif du disque souple (16) dans une position de chargement en s'engageant sur ce moyeu rotatif, la poulie (22) étant montée en rotation sur le châssis;

(b) un moteur à pivot (24) monté sur le châssis (10) dans une position écartée du support (12) et destiné à se déplacer verticalement entre la position de chargement et la position de déchargement; et

(c) une courroie (26) destinée à transmettre à la poulie (22) la rotation du moteur à pivot (24).

3. Mécanisme porteur d'une tête de lecture/écriture selon la revendication 1, caractérisé en ce que le chariot (32) est constitué par une plaque plate courbée.



4. Mécanisme porteur d'une tête de lecture/écriture selon la revendication 1, caractérisé en ce que ce mécanisme porteur de la tête de lecture/écriture comprend en outre:

- (a) un moteur d'alimentation (42) monté sur le châssis (10) dans une position écartée de la zone de déplacement du support (12) et comprenant un pignon (44) monté sur l'arbre principal du moteur d'alimentation (42);
- (b) une plaque de crémaillère (40) montée sur une partie du chariot (32) et destinée à faire aller et venir la tête supérieure (28) et la tête inférieure (30) le long du chemin (100) de déplacement des têtes par l'intermédiaire du chariot (32) et du bras supérieur (36), sous l'effet de la rotation du moteur d'alimentation (42) amenant la plaque de crémaillère (40) à venir en prise avec le pignon (44) du moteur d'alimentation (42).

5. Mécanisme porteur d'une tête de lecture/écriture selon la revendication 1, caractérisé en ce que l'autre partie d'extrémité du chariot (32), opposée à la partie d'extrémité portant la tête inférieure (30), se replie autour du support et s'étend vers le côté du bras supérieur dans une configuration en forme de L, cette autre partie d'extrémité formant une partie de fixation du bras supérieur.

6. Mécanisme porteur d'une tête de lecture/écriture selon la revendication 5, caractérisé en ce que ce mécanisme porteur de la tête de lecture/écriture comprend en outre:

- (a) un ressort de support de bras supérieur (48) constitué par une lame de ressort dont une extrémité est fixée à la partie de fixation de bras supérieur tandis que l'autre extrémité est fixée à l'extrémité proximale du bras supérieur (36), de manière à supporter ce bras supérieur (36);
- (b) une paire de pattes de bras formées respectivement sur les deux côtés latéraux du bras supérieur (36), les bouts de ces pattes de bras s'étendant vers la surface supérieure de la partie de fixation de bras supérieure de manière à venir en contact avec cette partie de fixation; et
- (c) au moins un ressort de bras (52) maintenu par la partie de fixation de bras (52) venant buter contre le bras supérieur (36) pour pousser ainsi ce bras supérieur (36) vers cette partie.

7. Mécanisme porteur d'une tête de lecture/écriture selon la revendication 1, caractérisé en ce que le chariot (32) portant la tête supérieure (28) et la tête inférieure (30) consti-

tue, avec le bras supérieur, un dispositif de chariot, et en ce que ce dispositif de chariot présente un équilibrage de poids sensiblement uniforme, le rail de guidage (38) servant d'arbre de basculement.

8. Mécanisme porteur d'une tête de lecture/écriture selon la revendication 7, caractérisé en ce que ce mécanisme porteur de la tête de lecture/écriture comprend en outre:

- (a) une plaque de fabrication (34) destinée à fixer la tête inférieure (30) au chariot (32);
- (b) une languette de retenue (34a) formée en prolongeant une extrémité de la plaque de fixation (34);
- (c) un ressort d'équilibrage (39, 41) fixé au châssis (10) et comportant une extrémité libre s'engageant contre la languette de retenue (34a);

ce qui permet ainsi de régler l'équilibrage de poids du dispositif de chariot par la force de poussée du ressort d'équilibrage (39, 41).

9. Mécanisme porteur d'une tête de lecture/écriture selon la revendication 8, caractérisé en ce que:

le ressort d'équilibrage (39, 41) présente une configuration en forme de U;

la languette de retenue (34a) est bloquée par les parties mutuellement opposées du ressort d'équilibrage (39, 41) dans la position de chargement du support (12), la languette de retenue (34a) prenant une position horizontale non soumise à la force élastique unidirectionnelle du ressort d'équilibrage (39, 41);

ce qui permet ainsi de régler le dispositif de chariot dans un état d'équilibrage.

10. Mécanisme porteur d'une tête de lecture/écriture selon la revendication 1, caractérisé en ce que:

la pièce de poussée vers le haut (54) est formée par un ressort de poussée vers le haut (54) du chariot, ce ressort étant fixé à la surface supérieure du support (12), une partie du ressort de poussée vers le haut (54) du chariot étant destinée à pousser le chariot vers le haut lorsque le support (12) se déplace de la position de chargement à la position de déchargement.

11. Mécanisme porteur d'une tête de lecture/écriture selon la revendication 10, caractérisé en ce que le ressort de poussée vers le haut (54) du chariot présente une configuration en forme de L comprenant un côté long et un côté court, le côté long étant fixé à la



surface supérieure du support (12) tandis que le côté court est disposé au voisinage du côté de la surface inférieure de la partie de fixation du bras supérieur.

12. Mécanisme porteur d'une tête de lecture/écriture selon la revendication 1, caractérisé en ce que ce mécanisme porteur de la tête de lecture/écriture comprend en outre:

une saillie (56) formée sur le bras supérieur (36) pour régler la hauteur de ce bras supérieur (36), cette saillie pouvant venir en contact avec la surface supérieure du support (12).

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