Description

Field of the Invention

The present invention relates to a record disk cartridge-shutter combination for use in a disk drive unit having an abutment member wherein the record disk cartridge comprises a record disk mounted for rotation within the cartridge, aperture means in the cartridge, shutter means comprising a shutter blade for the aperture means mounted within the cartridge for movement of the shutter blade between an aperture-closed position at least partially closing the aperture means and an aperture-opened position opening the aperture means, and biasing means including a spring for urging the shutter blade toward its aperture-closed position.

Description of the Prior Art

Record disks have been used for many years to store information for use in various types of devices, such as for example word processors and computer systems. In many cases, such disks are carried in rigid or semi-rigid enclosures to protect the record disk from physical damage and from dust, fingerprints, and other contaminants. An inner enclosure or liner may also be provided to afford further protection against contamination and abrasion of the disk. In such a disk assembly, at least one aperture is provided in the enclosure through which a read and/or write head can be received so that the record disk need not be removed from the enclosure during use. When using such an enclosure, however, dust as well as other contaminants can reach the record disk surface through the aperture. To inhibit this, an openable shutter is sometimes provided, as shown in U.S. Patent Nos. 3,593,327; 4,120,012; and 4,471,397; and Japanese Patent Application No. 58-17573(A).

In the type of construction to which the present invention is directed, the shutter is spring loaded to its closed position and is opened by the act of moving the enclosure endwise into a disk drive unit in which it is to be used. Because the force required to open the shutter is derived from endwise enclosure movement, and tends to resist insertion, the maximum force required will be inversely related to the distance through which the enclosure moves endwise while effecting the shutter opening operation. In the construction shown in U.S. Patent 4,131,199, for example, the actuating element of the shutter blade is engaged near the center of the inserted end of the enclosure by a fixed abutment member in the machine. However, to prevent the abutment member from damaging the disk, the former does not enter the region of the enclosure occupied by the disk, thus severely limiting its effective movement of the actuating element and requiring a correspondingly high insertion force. Alternatively, to reduce the insertion force, some prior art enclosures include an internal linkage operable by an actuating member that is movable along a substantial portion of one edge of the enclosure, beyond the region occupied by the shutter. This type of construction obviously entails substantial complication of the enclosure construction and, because the resisting force is along one edge, also tends to cause the enclosure to cock or rotate it when it is inserted in the machine, because the resisting force is along one edge. This is particularly significant in the case of a relatively small enclosure intended to be loaded with one hand. In addition to the aforementioned problems inherent in the constructions of the prior mentioned patents, another problem occurring in constructions of the type shown in Japanese Patent Application 58-17573(A) is the generation of force components, by the interaction of the abutment member and spring-biased shutter blade, tending to eject the disk assembly or cartridge from its recording position.

SUMMARY OF THE INVENTION

An object of the present invention is to improve a record disk assembly having an enclosure with a shuttered aperture and with a shutter opening mechanism by making it reliable and economical to manufacture while at the same time improving the ease with which it can be loaded into a disk recorder, disk player or similar disk drive unit without the provision of additional means for holding the record disk assembly in its recording position.

The objects of the invention are accomplished by a record disk cartridge-shutter combination which is characterized by surface means on the shutter blade for engaging the abutment member of the disk drive unit upon movement of the cartridge to its recording position relative to the abutment member for effectively moving the shutter blade from its aperture-closed position to its aperture-opened position, the surface means having a surface portion parallel with a line passing through the centers of the cartridge and the aperture means in the recording position of the cartridge.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described with respect to the drawings, wherein:

Fig. 1 is a top plan view of the record disk and liner portion of the record disk assembly in accordance with the present invention;

Fig. 2 is a side sectional view of a portion of the record disk and liner shown in Fig. 1;

Fig. 3 is a top plan view of a record disk assembly in accordance with the present invention with the shutter mechanism in its aperture-closing posi-

tion;

Fig. 4 is a bottom plan view of the record disk assembly as shown in Fig. 3 with the shutter mechanism in its aperture-closing position;

Fig. 5 is a view similar to Fig. 4 with the shutter mechanism in its aperture-opening position;

Fig. 6 is a side sectional view of an edge portion of the record disk assembly shown in Fig. 4;

Fig. 7 is a side sectional view of a central portion of the record disk assembly shown in Fig. 4; and

Fig. 8 is an exploded perspective view of the record disk cartridge shown in Fig. 4.

DETAILED DESCRIPTION OF THE INVENTION

Because record disk cartridges and disk drive units used therewith are well known, the present description will be directed in particular to elements forming part of, or cooperating directly with, apparatus in accordance with the present invention. It is to be understood that elements not specifically shown or described may take various forms well known to those skilled in the art.

Figs. 1 and 2 show a record disk 10 and a jacket/liner 12 in which the record disk is sealed. For purposes of illustration, the record disk is shown as a magnetic floppy disk, but other types of recording media may be used in accordance with the present invention. Disk 10 has a circular aperture which is concentric with the outer circumference of the disk. A disk hub 16 is located within the aperture and has centering and drive features 18 and 20 for engagement by a disk drive unit.

Liner 12, into which record disk 10 is inserted and sealed, is formed from a sheet of material fabricated by bonding a liner of porous, fibrous, low-friction, antistatic material 22, to a layer 24 of solid, outer material. The liner has a circular aperture 26 located at its center and generally coaxially with hub 16 of record disk 10, although the record disk is somewhat movable within the liner. An oval magnetic head aperture 28 is located symmetrically along a line from the center of circular aperture 26 orthogonal to a side 30 of the liner. Similar apertures may be provided on the other liner wall and aligned with apertures 26 and 28.

By placing record disk 10 into a protective member such as liner 12, handling operations before final assembly are facilitated. Liner 12 also provides a protective barrier between the cartridge shutter mechanism and the fragile record disk, as will become apparent later in this specification.

Referring to Figs. 3 and 4, a record disk cartridge 34 is shown in top and bottom views, respectively. The disk cartridge 34 comprises a record disk and liner combination, as described above with refetence to Figs. 1 and 2. The cartridge is formed of top and bottom panel walls 36 and 38, respectively, which are hingably connected at edge 40. The panel walls 36 and 38 have peripheral lips which when joined together form a compartment for the record disk 10.

Top and bottom panel walls 36 and 38 are preferably formed of rigid molded material to protect record disk 10 therein. Once loaded and closed, the panel walls can be sealed together such as by adhesive or ultrasonic bonding to prevent removal of the record disk and liner.

Top and bottom panel walls 36 and 38 include aperture means for insertion therethrough of a transducer head of a disk drive unit and through which record disk 10 can be rotated by the drive member of such a disk drive unit. The aperture means includes an opening 42 in top half 36 and an opening 44 in bottom half 38. Openings 42 and 44 are aligned with oval apertures 28 in liner 12, whereby access is provided to the record disk through the openings and those apertures. Further, opening 44 in bottom half 38 is enlarged to align with hub 16 of the record disk so that centering and drive features 18 and 20 can be engaged by the drive member of a disk drive unit.

A shutter mechanism is provided for closing off openings 42 and 44 to protect the record disk from physical damage from dust, fingerprints, and other contaminants. The shutter mechanism includes top and bottom shutter blades 46 and 48, respectively, which are joined at a pin 50 for simultaneous rotation about the axis of the pin. The shutter mechanism is urged toward an aperture-closed position, as shown in Figs. 3 and 4, by a torsion spring 52 shown in Fig. 4. In that position, the shutter mechanism underlies openings 42 and 44 to protect the record disk and to inhibit insertion through the openings of foreign objects.

Referring now to Figs. 4-6, it can be seen that opening 44 in bottom panel wall 38 extends to the peripheral edge 53 of the cartridge (Fig. 8) which is opposite hinged edge 40. This permits entry into opening 44 of an abutment member 54 of a disk drive unit, not shown, as the record disk cartridge is loaded into the disk drive unit. The abtument member 54 comprises a pin having an enlarged head 60. The abutment member enters opening 44 along a path parallel to, and on one side of, a diametrical cord D-D (see Fig. 5) passing through the centers of record disk 10 and openings 42 and 44. The path of abutment member 54 relative to the cartridge as it is moved to its recording position is on one side of the diametrical chord D-D, which is on the opposite side from pin 50 about which top and bottom shutter blades 56 and 58 rotate.

As abutment member 54 enters opening 44, it initially engages a first surface 56 of surface means associated with the shutter mechanism. Further movement of the abutment member into the cartridge to a position within the cylindrical projection of the outer circumference of record disk 10 is effective to move the shutter mechanism from its aperture-closed

position to its aperture-opened position. The surface means associated with the shutter mechanism, as best seen in Fig. 5, comprises first and second substantially orthogonal surfaces 56 and 58, respectively, of bottom shutter blade 48. First surface 56 is substantially perpendicular to a radius of record disk 10 as best seen in Fig. 4. The surface means further includes a third nose surface 59 merging with surface 58 and terminating in a fourth base surface 61 which extends in a generally radial direction of the disk.

Movement of abutment member 54 into cartridge 34 causes bottom shutter blade 48 to rotate about the axis of pin 50 against the return force of spring 52 as abutment member 54 moves along surface means 56, 58, 59, and 61 of the shutter blade. Such movement continues until abutment member 54 has reached the position shown in Fig. 5, at which time the shutter blades are fully opened to provide access to the record disk and and its hub. In this fully opened position, shutter spring 52 applies a biasing force to fixed abutment member 54 by base surface 61 in a direction generally perpendicular to the aforementioned diametrical chord D-D passing through the centers of record disk 10 and openings 42 and 44. Since no effective component of the shutter biasing force is directed along diametrical chord D-D tending to eject the cartridge from its recording position, the prior known need for the provision of additional means for holding the cartridge in its recording position against the biasing force of the shutter spring is obviated.

As can be seen in Fig. 7, top half 36 of enclosure 34 has a depending annular rib 62 which serves to center hub 16 of record disk 10 to inhibit lateral shifting of the record disk and to thereby prevent possible damage to the circumference thereof. Top shutter blade 46 has been provided with a recess 64 to accommodate annular rib 62 when the shutter blade is in its aperture-closed position.

Claims

1. A record disk cartridge-shutter combination for use in a disk drive unit having an abutment member (54), wherein the record disk cartridge comprises a record disk (10) mounted for rotation within the cartridge, aperture means (42, 44) in the cartridge, shutter means (46, 48) comprising a shutter blade (48) for the aperture means (42, 44) mounted within the cartridge for movement of the shutter blade between an aperture-closed position at least partially closing the aperture means and an aperture-opened position opening the aperture means, and biasing means including a spring (52) for urging the shutter blade toward its aperture-closed position, characterized by:

surface means (56, 58, 59, 61) on the shutter blade (48) for engaging the abutment member (54) of the disk drive unit upon movement of the cartridge to its recording position relative to the abutment member for effectively moving the shutter blade from its aperture-closed position to its aperture-opened position, the surface means having a surface portion (61) parallel with a line passing through the centers of the cartridge and the aperture means (42, 44) in the recording position of the cartridge.

2. The record disk cartridge-shutter combination as defined in Claim 1, characterized in that the surface means comprises first (56), second (58), third (59), and fourth (61) surfaces which are engaged in sequence by the abutment member (54), the first and second surfaces (56 and 58) being substantially orthogonal surfaces, and the third surface (59) being a nose surface.

3. The record disk cartridge-shutter combination as defined in Claim 2, characterized in that the first surface (56) is substantially perpendicular to a radius of the record disk when the shutter blade (48) is in the aperture-closed position.

4. The record disk cartridge-shutter combination as defined in Claim 3, characterized in that:

the abutment member (54) of the disk drive unit enters the cartridge upon movement of the cartridge relative to the abutment member along a first path parallel to and on one side of a predetermined diametrical chord of the record disk passing through the centers of the disk (10) and aperture means (42, 44); and

the shutter means (46, 48) is supported for rotation about a second axis parallel to the axis of rotation of the record disk, the second axis being on the side of the diametrical chord opposite to the first path.

5. The record disk cartridge-shutter combination as defined in Claim 1, characterized in that:

a liner (12) encloses the record disk (10);

the aperture means (42, 44) includes registering apertures in the cartridge and liner on both sides of the record disk;

the shutter means includes (1) a pair of shutter blades (46, 48) mounted on opposed sides of the record disk, between the liner and the cartridge, and (2) connecting means (50) interconnecting the shutter blades for common movement; and

the surface means (56, 58, 59, 61) is associated with only one of the shutter blades (48), whereby the abutment member (54) entering into the cartridge on one side of the record disk upon movement of the cartridge relative to the abutment member will effect movement of both of the shutter blades to the aperture-opened position.

Patentansprüche

1. Kassette/Verschluß-Kombination für eine Speicherplatte zur Verwendung in einem einen

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Patentansprüche

1. Kassette/Verschluß-Kombination für eine Speicherplatte zur Verwendung in einem einen

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Anschlag (54) aufweisenden Plattenlaufwerk, wobei die Speicherplattenkassette eine in der Kassette drehbar gelagerte Speicherplatte (10), eine in der Kassette angeordnete Öffnung (42, 44), einen Verschluß (46, 48) mit einem in der Kassette gelagerten, zwischen einer die Öffnung wenigstens teilweise verschließenden Stellung und einer die Öffnung freigebenden Stellung bewegbaren Verschlußelement (48) für die Öffnung (42, 44), und eine Spanneinrichtung mit einer das Verschlußelement in einer die Öffnung verschlossen haltenden Feder (52) aufweist, **gekennzeichnet** durch

eine an dem Verschlußelement (48) ausgebildete Steuerkurve (56, 58, 59, 61), welche beim Verbringen der Kassette in ihre Betriebsstellung von dem Anschlag (54) erfaßt wird, derart, daß das Verschlußelement von seiner Schließstellung in eine Offenstellung bewegt wird, wobei die Steuerkurve einen Kurvenabschnitt (61) aufweist, der bei in Betriebsstellung befindlicher Kassette parallel zu einer die Mittelpunkte von Kassette und Öffnung (42, 44) verbindenden Linie verläuft.

2. Kassette/Verschluß-Kombination nach Anspruch 1, dadurch gekennzeichnet, daß die Steuerkurve erste (56), zweite (58), dritte (59), und vierte (61) Kurvenabschnitte umfaßt, die nacheinander von dem Anschlag (54) erfaßt werden, wobei die ersten und zweiten Kurvenabschnitte (56 und 58) im wesentlichen rechtwinklig zueinander verlaufen und der dritte Kurvenabschnitt (59) einen Vorsprung bildet.

3. Kassette/Verschluß-Kombination nach Anspruch 2, dadurch gekennzeichnet, daß der erste Kurvenabschnitt (56) sich im wesentlichen tangential zur Speicherplatte erstreckt, wenn sich das Verschlußelement (48) in seiner Schließstellung befindet.

4. Kassette/Verschluß-Kombination nach Anspruch 3, dadurch gekennzeichnet,

daß der Anschlag (54) des Plattenlaufwerks beim Bewegen der Kassette in Richtung auf den Anschlag entlang eines Streckenabschnitts, welcher parallel zu einer die Mittelpunkte von Speicherplatte (10) und Öffnung (42, 44) verbindenden Linie verläuft,

in die Kassette eintritt, und daß die Drehachse des Verschlusses (46, 48) achsparallel zur Drehachse der Speicherplatte angeordnet ist, wobei sich Streckenabschnitt und Drehachse auf gegenüberliegenden Seiten einer durch die Platten- und Öffnungsmittelpunkte führenden Plattendiametrale befinden.

5. Kassette/Verschluß-Kombination nach Anspruch 1, dadurch gekennzeichnet,

daß die Speicherplatte (10) von einer Einlage (12) umschlossen ist;

die Öffnung (42, 44) deckungsgleiche Öffnungen in der Kassette und Einlagen jeweils auf beiden Seiten der Speicherplatte (10) aufweist;

der Verschluß a) zwei auf beiden Seiten der Speicherplatte zwischen Einlage und Kassette angeordnete Verschlußelemente (46, 48), und b) eine die Verschlußelemente zur Ausführung einer gemeinsam erfolgenden Bewegung verbindende Verbindungseinrichtung (50) aufweist;

und die Steuerkurve (56, 58, 59, 61) nur an einem der Verschluß-elemente (48) angeordnet ist, wobei der auf einer Seite der Speicherplatte bei Bewegung der Kassette in Richtung des Anschlags in die Kassette eintretende Anschlag (54) die Bewegung beider Verschlußelemente in eine die Öffnung freigebende Stellung bewirkt.

Revendications

1. Combinaison obturateur/cassette à disque pour enregistrement utilisable dans une unité d'entrainement de disque munie d'une butée (54), dans laquelle la cassette à disque comprend un disque (10) d'enregistrement monté à rotation à l'intérieur de la cassette, des moyens d'ouverture (42,44) dans la cassette, un moyen d'obturation (46,48) comprenant un volet (48) coopérant avec les moyens d'ouverture (42,44) et montés dans la cassette pour se déplacer entre une position fermée où le volet couvre au moins partiellement les moyens d'ouverture et une position ouverte où le volet découvre les moyens d'ouverture, et un moyen de sollicitation muni d'un ressort (52) pour solliciter le volet vers la position fermée, caractérisée par :

des surfaces (56,58,59,61) disposées sur le volet (48) pour venir en prise avec la butée (54) de l'unité d'entrainement du disque lors du déplacement de la cassette par rapport à la butée vers sa position d'enregistrement pour déplacer avec certitude le volet de sa position fermée à sa position ouverte, lesdites surfaces ayant une partie (61) parallèle à une ligne passant par le centre de la cassette et le centre des moyens d'ouverture (42,44) lorsque la cassette est en position d'enregistrement.

2. Combinaison selon la revendication 1, caractérisée en ce que lesdites surfaces, comprennent une première (56), une deuxième (58), une troisième (59), et une quatrième (61) surface, chacune venant en prise séquentiellement avec la butée (54), la première surface (56) et la seconde surface (58) étant pratiquement orthogonales et la troisième surface (59) servant de came.

3. Combinaison selon la revendication 2, caractérisée en ce que la première surface (56) est pratiquement perpendiculaire au rayon du disque lorsque le volet (48) est en position fermée.

4. Combinaison selon la revendication 3, caractérisée en ce que :

la butée (54) de l'unité d'entrainement de disque pénètre dans la cassette lors du déplacement de la cassette par rapport à la butée suivant une première trajectoire qui est parallèle au diamètre du dis-

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que passant par le centre des moyens d'ouverture (42,44) et qui est disposé sur un des côtés de ce diamètre ; et en ce que

le moyen d'obturation (46,48) est monté à rotation autour d'un axe qui est parallèle à l'axe de rotation du disque et qui est disposé, par rapport audit diamètre, sur le côté opposé à la première trajectoire.

5. Combinaison selon la revendication 1, caractérisée en ce que :

le disque (10) d'enregistrement est entouré par une chemise (12) ;

les moyens d'ouverture (42,44) comprennent des ouvertures en repérage faites dans la cassette et dans la chemise ;

le moyen d'obturation comprend 1) une paire de volets (46,48) montés sur les côtés opposés du disque entre la chemise et la cassette et 2) des moyens de liaison (50) relient les volets pour un déplacement commun ; et

lesdites surfaces (56,58,59,61) ne sont disposées que sur l'un des volets (48), de ce fait l'introduction de la butée (54) dans la cassette sur l'un des côtés du disque lors du déplacement de la cassette par rapport à la butée provoque le déplacement des deux volets vers la position ouverte.

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