

DISK HOLDING DEVICE

Field of the Invention

5 This invention generally relates to a disk holding device. More particularly, this invention relates to a locking mechanism for a disk holding device.

Background of the Invention

10 Hard drive disks and semi-conductor wafers typically are manufactured in one location and packaged in disk holding devices, which are subsequently placed in a container for shipment to another location. The disk holding devices eventually are removed from the containers and used to store the hard drive disks during distribution in a production process. The hard drive disks must be protected during all phases of a normal production cycle.

15 A variety of disk holding devices have been developed for packaging, shipping and distributing disks. Typical disk holding devices include a cassette portion, a cover, a base portion and a latch to lock the device closed. As is known, hard drive disks are received within a plurality of slots within the cassette portion interior. One example is shown in U.S. Patent No. 6,902,059. Other disk holding devices are also known.

20 During the production process, it is often necessary for the cover to be removed from the cassette portion of the disk holding device to access the hard drive disks stored within. Automated machinery is often utilized to unlock and remove the cover of the disk holding device. To achieve this result, and because of the locking design of the latch arm of known disk holding devices, the automated
25 machinery must manipulate the latch arm by applying an outward pulling force on the latch arm in a direction away from the interior of the disk holding device to unlock and remove the cover. The manipulation applied by the automated machinery may fail to unlock the latch arm in a relatively large number of instances. Disadvantageously, this may result in decreased production efficiency and increased
30 manufacturing complaints concerning the disk holding devices.

As such, there is a need for an improved arrangement for locking a disk holding device that achieves improved interaction with automated machinery used in

the distribution process. This invention provides an improved latch arm that satisfies that need.

SUMMARY OF THE INVENTION

5 An exemplary disclosed disk holding device includes a latch arm for locking the disk holding device. The latch arm has a locking tab near an end of the latch arm that extends in a direction facing away from an interior of the disk holding device. This orientation of the locking tab is the opposite of what has been the standard approach.

10 One example disk holding device comprises a cassette portion having side walls and includes a base portion on one side of the cassette portion and a cover on the opposite side of the cassette portion.

 In one example, the latch arm extends from the cover toward the base portion and selectively engages at least one locking surface on the base portion. In one
15 example, a locking tab of the latch arm selectively engages the locking surface on the base portion. With such an arrangement a force toward the interior of the cassette applied to the latch arm enables unlocking the disk holding device.

 One example latch arm includes a lifting ledge that extends from the latch arm in substantially the same direction as the locking tab.

20 One disclosed example includes a disk holding device having a cover including a latch arm near one end of the cover. The latch arm of this example includes a first surface that faces generally toward an opposite end of the cover and a second surface that faces opposite of the first surface. A locking tab protrudes from the second surface in a direction away from the cover.

25 The various features and advantages of this invention will become apparent to those skilled in the art from the following detailed description. The drawings that accompany the detailed description can briefly be described as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

30 Figure 1 schematically shows a disk holding device including a latch arm designed according to one embodiment of this invention.

 Figure 2 is a side view of the cover for the disk holding device of Figure 1.

Figure 3 illustrates the disk holding device of Figure 1 in an assembled condition.

Figures 4A and 4B schematically show a process for unlocking the example disk holding device.

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DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Figure 1 schematically shows a disk holding device 10 for housing a plurality of disks 12. The illustrated disk holding device 10 comprises a cassette portion 14, a base portion 16 and a cover 18. The cassette portion 14 includes two side walls 20, 22 and two end walls 24, 26 which are configured to form an interior 28 for safely packaging the plurality of disks 12. The side walls 20, 22 are aligned generally parallel to one another and are designed to minimize contact between and provide support to the plurality of disks 12, keeping them spaced apart from one another and in a generally stable position within the disk holding device 10. The disks 12 are received in a plurality of slots 30 formed in the side walls 20, 22 of the cassette portion 14.

At least one of the opposing end walls 24, 26 includes a channel 34. In one example, both end walls 24 and 26 include a channel 34. In the illustrated example, the channel 34 is generally U-shaped. The channel 34 is provided on at least one end wall 24, 26 for access to the hard drive disks 12 when packaged in the cassette portion 14.

In the illustrated example, the base portion 16 is secured on one side of the cassette portion 14 using an interference fit, for example. In another example, the base portion 16 is formed as a single piece, integral with the cassette portion 14. The cover 18 is received against an opposite side of the cassette portion 14 from the base portion 16. The cover 18 includes a latch arm 32 for locking the disk holding device 10 that extends toward the base portion 16 and is selectively secured to a locking surface 36 of the base portion 16. In one example, the cover 18 includes two latch arms 32, with one latch arm 32 positioned at each end of the cover 18.

In one disclosed example, Referring to Figures 1 and 2, the latch arm 32A is positioned near one end 38 of the cover 18. The latch arm 32A extends transversely from the cover 18 (i.e., toward the base portion 16). A first surface 40 of the latch

arm 32A faces generally toward an end 42 of the cover 18 which is opposite the end 38. The latch arm 32A includes a second surface 44 which faces opposite the first surface 40. In other words, the second surface 44 faces away from the end 42 of the cover 18.

5 The example latch arm 32 includes a locking tab 46 that protrudes from the second surface 44 away from the cover 18. In one example, the locking tab 46 is positioned at a distal end of the latch arm 32. The latch arm also includes a lifting ledge 48 and at least one finger grip 50. The lifting ledge 48 may assist automated removal of the cover 18 as described below. In the disclosed example, two finger
10 grips 50 are included on the latch arm 32. The finger grips 50 may assist a user in manually manipulating the cover 18 relative to the disk holding device 10.

 In one example, the lifting ledge 48 and at least one finger grip 50 extend in substantially the same direction as the locking tab 46. The example lifting ledge 48 is positioned on the second surface 44 of the latch arm 32 between the finger grip 50
15 and the locking tab 46. Each of the locking tab 46, the lifting ledge 48 and the finger grip 50 protrude in a transverse direction away from the second surface 44 of the latch arm 32. The transverse direction faces away from the interior 28 of the disk holding device 10, for example. Having a latch arm 32 with features such as the locking tab 46 that face away from the interior 28 of the disk holding device 10
20 is the opposite of previous designs. The example embodiment facilitates improves interaction between the disk holding device 10 and automated machinery used to manipulate the latch arm 32 during a production process.

 An exemplary base portion 16 includes a locking surface 36 near one end wall 53. In one example, the end wall 53 includes arm portions 58 adjacent the
25 locking surface 36 to provide support and rigidity. The locking surface 36 extends between the two arm portions 58. A groove 60 exists between the end wall 53 and the locking surface 36. At least a portion of the latch arm 32 is received through the groove 60 when the cover 18, the cassette portion 14 and the base 16 are assembled as shown in Figure 3, for example.

30 A groove 52 is formed on the latch arm 32 between the two finger grips 50. The groove 52 on the surface 44 exists, in part, to establish a boss 54 that extends from the first surface 40 of the latch arm toward the interior of the device 10. The

boss 54 selectively engages the channel 34 of an end wall 24, 26 to seal the disk holding device 10 when the cover 18 is received and locked on the cassette portion 14 (see figure 3, for example).

5 An assembled disk holding device 10 is illustrated in Figure 3. In this example, the cover 18 is secured to the disk holding device 10 in a locked position. The latch arm 32 at least partially extends through the groove 60 of base portion 16. The locking tab 46 at least partially abuts the locking surface 36. The locking tab 46 is received against the locking surface 36 of the base portion 16 as the portion of the latch arm 32 moves through the groove 60. As best appreciated from Figure 2, the
10 locking tab 46 has an angled surface 62 that facilitates inserting the tab through the groove 60. The locking tab 46 also has a locking surface 64 that contacts the locking surface 36 on the base 18.

Figure 4A schematically shows a machine 70 that manipulates the latch arm 32 of the cover 18 by applying a force F on the latch arm in a direction toward the interior 28 of the disk holding device 10. In the illustrated example, the force F is
15 applied to the surface 44 below the lifting ledge 48. The example machine 70 has an arm 72 that contacts the surface 44 to apply the force F. The arm 72 moves a distance sufficient to push the locking surface 64 clear of the locking surface 36 so that the locking tab 46 is aligned with the groove. The resiliency of the latch arm 32
20 biases the locking tab 46 away from the interior 28 of the cassette portion 14 such that the locking surfaces 36 and 64 cooperate to keep the device 10 closed. The force F is sufficient to overcome that bias.

While maintaining the force F on the latch arm 32, the arm 72 moves in an opening direction D2 to remove the cover 18 from the disk holding device 10, as is
25 illustrated in Figure 4B. In the illustrated example, the second direction D2 is transverse to the direction of the force F. The lifting ledge 48 may assist the arm 72 in lifting the cover off the base 18 and the cassette 14.

In another example, the latch arm 32 and the cover 18 are manually manipulated to remove the cover 18. For example, an individual may press against
30 the surface 44 and use the finger grips 50 to manipulate the cover as desired.

The illustrated example includes various features that provide improved interaction between production machinery and a disk holding device to achieve a

more simple method of unlocking a latch arm, for example. The illustrated example includes a combination of improved latch arm and base portion features. For example, the position of the latch arm 32 within the groove 60 provides more security compared to previous arrangements where a latch arm engaged a base from the outside edge of the base. Those skilled in the art that have the benefit of this description will be able to utilize a latch arm having a locking tab, a base portion with a locking surface, a lifting ledge or finger grips or any combination of these features to meet the needs of their particular situation.

The preceding description is exemplary rather than limiting in nature. Variations and modifications to the disclosed examples may become apparent to those skilled in the art that do not necessarily depart from the essence of this invention. The scope of legal protection given to this invention can only be determined by studying the following claims.

CLAIMS

1. A disk holding device, comprising:

5 a latch arm for locking the disk holding device having a locking tab near an end of the latch arm extending in a direction facing away from an interior of the disk holding device.

10 2. The device as recited in claim 1, comprising a cassette portion having opposing side walls and opposing end walls for forming the interior of the disk holding device, wherein at least one of the opposing end walls includes a channel and the latch arm includes a boss that selectively engages the channel when the disk holding device is locked.

15 3. The device as recited in claim 2, comprising a base portion and a cover, the base portion on one side of the cassette portion and the cover on an opposite side of the cassette portion, wherein the latch arm extends from the cover toward the base portion and selectively engages at least one locking surface of the base.

20 4. The device as recited in claim 3, wherein the base portion comprises a groove and the latch arm extends at least partially through the groove such that the locking tab at least partially abuts the at least one locking surface.

25 5. The device as recited in claim 1, wherein the latch arm includes a lifting ledge extending in substantially the same direction as the locking tab.

30 6. The device as recited in claim 1, wherein the latch arm includes at least one finger grip extending transverse to the latch arm in substantially the same direction as the locking tab.

7. A disk holding device, comprising:

a cassette portion including a base portion having at least one locking surface, opposing side walls and opposing end walls which form an interior for housing at least one disk; and

5 a cover including a latch arm near one end of the cover, the latch arm having a first surface facing generally toward an opposite end of the cover and a second surface facing opposite the first surface and having a locking tab that protrudes from the second surface in a direction away from the cover.

10 8. The device as recited in claim 7, wherein the base portion comprises a distinct component from the cassette portion.

9. The device as recited in claim 7, comprising a lifting ledge disposed on the latch arm between the cover and the locking tab and protruding substantially in the
15 same direction as the locking tab.

10. The device of claim 7, wherein at least one of the opposing end walls comprises a channel and the latch arm includes a boss extending transverse from the first surface toward the opposite end of the cover for selectively engaging the
20 channel of the at least one of the opposing end walls.

11. The device as recited in claim 7, wherein the latch arm includes at least one finger grip extending transverse to the latch arm in substantially the same direction as the locking tab.

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12. A method of opening a disk holding device including a cassette portion and a cover having a latch arm, comprising the step of:

manipulating the latch arm in a first direction toward an interior of the device to unlock the latch arm.

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13. The method as recited in claim 12, comprising manipulating the latch arm in a second, transverse direction away from the interior of the device to remove the cover from the cassette portion.

5 14. The method as recited in claim 12, comprising automatically manipulating the latch arm.

15. The method as recited in claim 12, comprising manually manipulating the latch arm.

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16. The method as recited in claim 13, comprising applying a force in the first direction to unlock the latch arm and maintaining the force in the first direction while manipulating the latch arm in the second, transverse direction.

15 17. The method as recited in claim 13, comprising engaging a first surface of the latch arm in the first direction to unlock the latch arm and engaging a second, transverse surface in the second, transverse direction to remove the cover from the cassette portion.