UNLATCHING APPARATUS FOR MEDIA DISK CADDY

FIELD OF THE INVENTION

[001] The present invention relates to a container for storing and transporting media disks.

BACKGROUND OF THE INVENTION

[002] Media disks are subjected to numerous manufacturing processes to store data magnetically or optically. During processing the disks are transported to different stations in a caddy where it is necessary to repeatedly disengage and engage the top cover. The disks are vulnerable to contamination during processing, and must be sealed in a clean environment. Sealing the caddy with both a top and bottom cover prevents airborne particulates from adhering to the disk surfaces.

[003] Fig. 1 illustrates one example of a disk caddy 100 that is used for transporting disks. The disk caddy is composed of a top cover 130, disk cassette 110 and a bottom cover (not shown). Top cover 130 has flaps 132 that extend downward from a rectangular surface 133 of the cover 130. Housing 110 has two sidewalls 115 with slots 104 on the interior and two end walls 113. Disks 10 occupy slots 104 in an axial configuration. Each end wall 113 has a recess 119. Recess 119 is defined by a ledge 114 below which is an extension 114a. Flaps 132 have protrusions 36 that fasten onto extension 107 to secure top cover 130 to cassette 110. Caddy 100 is sealed when top cover engages to channel 108 on the upper edge of cassette 110, thereby closing off recesses with flaps 132. To remove the standard top cover 130, an operator pulls a flap 132 outward at point 131.

[004] Fig. 2 illustrates a disk caddy that has been used to store media disks having a diameter of 2 inches. The disk caddy includes a top cover 135 with extensions 51. Each extension 51 has a tab 53 that slides into an opening 28 and engages with a second opening 38. Tab 53 latches onto a projection 88 that is integral with bottom cover 270. Top cover 135 is removed in two steps from the body of caddy 122. First, an operator pushes on projection 88 to separate tab 53 from lower cover 270; then the extension 51 is pulled upward through openings 70 and 72. This type of unlatching mechanism would be unsuitable for caddies that have a recess on each sidewall as there would be no place to position opening 70 on the caddy.

[005] As disk caddies shrink in size to house smaller disks, it is difficult for an operator to grip the flap of the top cover using a caddy similar to the design of either Fig. 1 or Fig. 2, without causing damage to the disks. The present invention overcomes this problem by providing an improved method and apparatus for removing disks from a caddy.

SUMMARY OF THE INVENTION

[006] To remedy the problems in the prior art, an unlatching apparatus is disclosed for storing media disks that comprises a disk cassette; a bottom cover for sealing the lower portion of the disk cassette; and a top cover that has a leverage arm attached to each distal end thereof.

[007] The invention is also directed to a method for storing a media disk in a caddy comprising a) providing a caddy that includes a disk cassette having an upper edge, a bottom cover, and a top cover; the top cover having parallel flaps extending downward from a primary surface, each flap having an offset region; the disk cassette having a

recess on each of two opposing end walls that are covered when the top cover engages to the cassette; b) placing a first gripper under a leverage arm located adjacent to the offset region of the flap, while holding the opposite end of the caddy with a second gripper; c)

lifting the top cover away from the cassette by pulling the leverage arm outward and upward with the first gripper; and then removing or inserting at least one disk into the disk cassette.

BRIEF DESCRIPTION OF THE DRAWINGS

[008] FIG. 1 is a perspective view of a caddy in accordance with the prior art.

[009] FIG. 2 is a perspective view of a prior art caddy in accordance with the prior art.

[010] FIG. 3A is a side view of the top cover in accordance with the present invention.

[011] FIG. 3B is a top planar view of the cover profile.

[012] FIG. 3C is a planar view of the interior surface of the top cover.

[013] FIG. 4 is a perspective view of an operator removing the top cover from the media disk caddy in accordance with the present invention.

[014] FIG. 5 is a perspective view of the media disk caddy of the present invention.

[015] FIG. 6 is an exploded view of the flap portion of the top cover.

[016] FIG. 7 is an exploded view of an alternative embodiment of the leverage arm.

[017] FIG. 8A is a front view of a first embodiment of a releasable tab on the top cover.

[018] FIG. 8B is a side view of a FIG. 8A.

[019] FIG. 9A is a side view of a second embodiment of a releasable tab.

[020] FIG. 9B is a front view of the releasable tab of FIG. 9A.

[021] FIG 9C is a perspective view of a receiving slot for the releasable tab of FIG. 9A.

[022] FIG 9D is a perspective view of a second receiving slot for the releasable tab of FIG. 9A and FIG. 9B.

DETAILED DESCRIPTION OF THE INVENTION

[023] The media disk caddy of the present invention includes a disk cassette that is similar to the cassette shown in Fig. 1. Specifically, the cassette is a box-like structure defined by two parallel end walls and two parallel sidewalls. The sidewalls have slots on the interior for transporting one or more disks. Open areas on each end wall and on the top of the cassette allow an operator or machine member (such as a robotic handler) to access the disks for processing purposes. The open top and the curvature of the open end walls interact with a top cover to form a sealed environment that protects the disks from contamination. The cassette of the present invention has a disk capacity of between 25 - 33 disks.

[024] Media disks are fragile because of their size and composition. Although the unlatching apparatus of the present invention may be applicable to caddies of various sizes, it is preferably designed to hold media disks having a diameter of one inch or smaller. Each disk 15 has a smooth surface that is either metallic or glass. If the disks rotate within the slots of the cassette, debris is generated which is damaging to the disk substrate. In the case of glass substrates, disk rotation can also cause the disks to shatter thereby introducing additional debris to the delicate disk surfaces. The present invention provides a means for unlatching a caddy cover without causing the disks to scatter out of their slots.

[025] Referring to Fig. 3A, top cover 200 is shown as having a raised surface 20 flanked by grooves 28 within a profile 50. At each distal end 12 of cover 200 is a

leverage arm 24 and 26. Fig. 3B illustrates a side view of two flaps 22A, 22B extending downwardly at each distal end 12 of cover 200. Each flap 22A, 22B has an offset region 43 that snaps into recess 119 and protrusions 47 that fasten onto a rib on the exterior of the cassette at end wall 113. In order to provide flaps 22 with sufficient flexure, a support beam 29 is placed on the underside of cover 200 between the terminal points of the channel at each distal end of cover 200.

[026] On the opposite side of the cover profile is an interior surface shown in Fig. 3C. Projecting from the interior surface is a pair of skirts 27a and 27b that apply a force on each loaded disk. The force should be just sufficient to prevent disk rotation. The interior of cover 200 also has a pair of channels 55A and 55B that engage with the upper edges of cassette 110. When cover 200 is secured to cassette 225, the two skirts 27a and 27b serve to stabilize disks 15 and to avoid particle generation within the disk caddy.

[027] To facilitate the removal of top cover from a smaller cassette, a leverage arm is added to one or more of the flaps 22. In a preferred embodiment, each flap 22 has a leverage arm that a gripper contacts to disengage cover 200 from cassette 130. The gripper can be either a mechanical member or a human operator. In a preferred embodiment, the gripper is an operator that manipulates either a tool to grasp the leverage arm or grasps the leverage arm with a portion of his hand. Leverage arm 24, 26 comprises a cantilevered structure on a lower portion of flap 22. Preferably leverage arm 24 is located below offset 43 as shown in Fig. 3A. Leverage arm 26 can be a finger well 26, as well as a gusset 24. Less preferred leverage arms include rings and releasable tabs.

[028] A gripper contacts each leverage arm, as shown in FIG. 4, and pulls both leverage arms simultaneously outward and then upward to lift cover 200 off cassette 110. Although Fig. 4 illustrates an embodiment where a finger well 26 and a gusset 24 are

leverage arms, preferably cover 200 will have a pair of leverage arms that are of the same type. Preferably, leverage arms 24 and 26 are both finger wells, or they are both releasable tabs. In a more preferred embodiment, leverage arms 24 and 26 are gussets.

[029] FIG. 5 is a perspective view of the media disk caddy of the present invention. L1 represents the length of the cover profile, which excludes the leverage arms. H1 represents the height of cover 200, and W1 represents the width of the cover profile taken from the outermost boundaries of channels 55.

[030] Without limiting the scope of the invention it is preferred to implement the present invention in a caddy for carrying disks having a 1-inch diameter wherein the disk cassette has approximate length X width X height dimensions of 7.5 inches X 1.2 inches X 2 inches. However, the present invention could instead be applicable to caddies that store media disks having a diameter greater than one inch. For example, the present invention also applies to caddies that store 3-inch disks. In addition, the invention may apply to caddies that store wafers of various sizes.

[031] On the periphery of the interior of top cover 200 are channels 55a and 55b that engage to the upper edges of sidewalls 115 of cassette 110. Channels 55A and 55B can be seen more clearly in Fig. 3C. Disk cassette 110 also has an open bottom 62 that is defined by the two end walls and two sidewalls. Each component of the caddy is preferably molded from thermoplastic materials such as polycarbonate, polypropylene and other similar type of materials.

[032] Fig. 6 illustrates an enlarged view of circled area A of Fig. 3B to describe the construction of the flap portion of the top cover in greater detail. In order to reinforce

flap 22 and to provide it with ample flexure, a support beam 29 is located at each distal end of cover 200. The point at which beam 29 intersects with offset 43 is the pivot point 30 (not shown) and marks the beginning of the U-shaped offset on the exterior of flap 22.

[033] The following are the preferred characteristics of gusset 24 of Fig. 6. Head 24a is bolstered in position by brackets 24c. An operator places a tool or finger behind lip 24b to grasp leverage arm 24 and pull up and out so as to disengage cover 200 from cassette 130. Gusset 24 in Fig. 4 consists of three elements: head 24a, lip 24b, and brackets 24c. The length of the gusset head 24a is $1/10^{th}$ the length of the cover profile (L1), the height of the top cover (H2) is six times the height of the gusset. The width of the gusset is 1/3 the width of the cover profile (W1).

[034] Figure 7 illustrates an embodiment of the invention where the leverage arm comprises a ring 40 attached to flap 22 at nub 60. Ring 40 should be sized to enable an operator or a robotic handler to grasp and leverage the ring upward and outward when disengaging the cover from the cassette. In a preferred embodiment, both leverage arms should be rings to facilitate the removal of cover 200 from cassette 110.

[035] Fig 8A is a first embodiment of a releasable tab 81 suitable for use in the present invention. Tab 81 has prongs 83 that fit into a receiving slot 25 on end wall 112. Prongs 83 are squeezed together by a gripper when inserting tab 81 into receiving slot 25. After prongs 83 enter receiving slot 25, the gripper releases tab 81 causing prongs 83 to expand and catch onto slot 25, thereby capturing cover 200 into a closed position. As can be seen from Figure 8B, receiving slot 25 has an opening that penetrates through its bottom surface; the opening is wide enough to receive tab 81 when prongs 83 are compressed together. To remove cover 200 from cassette 120, a gripper squeezes prongs 83 together and then pushes tab 81 upward through receiving slot 25 until tab 81 is

disengaged from receiving slot 25. A more preferred embodiment for a releasable tab will be discussed in reference to Figures 9A and 9B.

[036] Figures 9A – 9B illustrate various views of an alternative releasable tab for the leverage arm in the present invention. This tab preferably extends from the lower end of each opposing flap on cover 200. Thus, in a preferred embodiment, cover 200 has a pair of releasable tabs 80, each tab 80 comprises a vertical portion and a hook 84 for engaging to the cassette. The hook 84 faces away from the disk cassette and has a width W2 of approximates 1.0 -1.5 mm. The vertical portion 82 of releasable tab 80 has a width W3 of approximately 3 – 10 mm. Top cover 200 is secured to a cassette by inserting tabs 80 into receiving slots 25. The receiving slots 25 may be located within the lip 89 of the end wall recess 119 as shown in Fig. 9C. Alternatively, the receiving slot 25 may project from sidewall 112 as shown in Fig. 9D, which is a perspective view of Fig. 9B. FIG. 9D illustrates receiving slot 25 flush with lip 89, and positioned below recess 119. Receiving slot 25 has an opening that penetrates through a portion of its bottom surface. The hook 84 on the releasable tab 80 engages with the rim 25A of receiving slot 25 to lock cover 200 in place.

[037] The various ways in which a gripper interacts with the releasable tab of the present invention will now be discussed. When a gripper needs to remove top cover 200 in Fig. 9A, the gripper simultaneously depresses on each hook 84 causing the lower portion of tabs 80 to be able to clear their respective slot 25. The gripper then pushes the base 85 of each hook 84 upward through the opening of receiving slot 25. Tabs 80 are then pulled upward through each receiving slot 25 until cover 200 is disengaged from disk cassette 120. The gripper can instead remove cover 200 by depressing on each hook 84, and while the hooks are depressed, or immediately thereafter, pushing each tab 80 through their respective slots 25 to disengage cover 200 from cassette 120.

[038] Still another way of removing cover 200 is to use two different types of grippers together. A first gripper such as a vacuum or a robotic handler, detaches the channels of cover 200 from wall edges on cassette 120. Afterwards, a second gripper such as a pneumatic actuator simultaneously pushes each tab 80 inward and maintains each hook 84 in a depressed position where it is able to clear through slot 25. For cover 200 to be disengaged from cassette 120, each tab 80 must be moved upward beyond a catch point. The catch point is the point at which hooks 84 lock into slots 25. Fig. 9A illustrates a caddy with cover 200 engaged with slots 25, specifically tabs 80 are in a locked position on slots 25. In the locked position, the distance between the upper surface of hook 84 and the bottom surface of slot 25 — ΔH— is a miniscule distance, preferably between 0 - 1 mm. The first gripper is triggered to begin lifting cover 200 when tab 80 is captivated in an inclined position such that tab 80 is in contact with cassette 120. When pneumatic actuator senses that tabs 80 are moved upward beyond the catch point, about a 1.0 to 3.0 mm displacement from their locked position, the pneumatic actuator releases each hook 84 so that the first gripper can complete the removal of cover 200 from cassette 120.

[039] The examples described herein of the various leverage arms are solely representative of the present invention. It is understood that various modifications and substitutions may be made to the foregoing examples and methods of operation of the unlatching apparatus without departing from either the spirit or scope of the invention. In some instances certain features of the invention will be employed without other features depending on the particular situation encountered by the ordinary person skilled in the art. It is therefore the intent that the scope of the invention is to be defined by the appended claims.

What is claimed is:

1. An apparatus for storing a disk comprising:

(a) a disk cassette having opposing side walls with slots that store one or more disks in a spaced apart configuration, and opposing end walls connected to the side walls;
(b) a bottom cover for sealing the lower portion of the disk cassette;
(c) a top cover for sealing the upper portion of the disk cassette; wherein a leverage arm is attached to at least one distal end of the top cover.

2. The apparatus of claim 1, wherein the leverage arm is located next to or below an offset area on at least one flap of the top cover.

3. The apparatus of claim 1, wherein the leverage arm is selected from the group consisting of finger wells, gussets, rings, releasable tabs, and a combination thereof.

4. An apparatus for storing a disk comprising:

a) a disk cassette comprising a wall structure having an open upper portion, two sidewalls, and two end walls, each end wall having a recess with a lip thereon;
b) a bottom cover for closing an open lower portion of the disk cassette; and
c) a top cover for covering the upper portion and each recess, the top cover having opposing flaps, each flap including an offset area, at least one flap having a first leverage arm adjacent to the offset area to facilitate removal of the cover.

5. The apparatus of claim 4, wherein the first leverage arm is located adjacent to or below the offset area on at least one flap of the top cover.

6. The apparatus of claim 4, wherein the first leverage arm is selected from the group consisting of a finger well, a gusset, a ring, or a releasable tab.

7. The apparatus of claim 6 wherein the releasable tab comprises a vertical portion extending from the flap, and having a hook thereon.

8. The apparatus of claim 4, further comprising a second leverage arm adjacent to or below the offset area of a second flap.

9. The apparatus of claim 8, wherein the leverage arms are selected from the group consisting of finger wells, gussets, rings, releasable tabs, and a combination thereof.

10. The apparatus of claim 8, wherein the leverage arms face downward relative to the bottom cover.

11. The apparatus of claim 4 further comprising an opening on the disk cassette for receiving the first leverage arm.

12. The apparatus of claim 11 wherein the opening is located on the lip of the end wall.

13. The apparatus of claim 11, wherein the opening projects from the end wall below the lip of the recess.

14. A method for storing a disk in a caddy, the method comprising:

a) providing a caddy that includes a disk cassette having an upper edge, a bottom cover, and a top cover; the top cover having a primary surface and parallel flaps extending downward from the primary surface, each flap having an offset region; the disk cassette having a recess on each of two opposing end walls that are covered when the top cover is engaged to the upper edge of the cassette;

b) placing a first gripper under a leverage arm located adjacent to the offset region of the flap, while holding the opposite end of the caddy with a second gripper;

c) lifting the top cover by pulling the leverage arm outward and upward with the first gripper; and then removing or inserting at least one disk into the disk cassette.

15. The method of claim 14, wherein the gripper comprises either a mechanical member or a portion of a human hand.

16. The method of claim 14, wherein the leverage arm is selected from the group consisting of a finger well, a gusset, a ring, or a releasable tab.

17. The method of claim 14, further comprising attaching the top cover to the caddy by causing the channel of the top cover to engage with the upper edge of the disk cassette.

18. The method of claim 17, wherein the top cover is secured to the caddy by engaging a pair of protrusions on a flap to a rib located below at least one recess of the disk cassette.

19. The method of claim 14, further comprising a second leverage arm at a second distal end of the top cover.

20. The method of claim 19 wherein the second gripper is placed under the second leverage arm and the flaps are simultaneously pulled outward and upward to remove the top cover from the disk cassette.

21. The method of claim 20, wherein the second gripper comprises either a mechanical member or a portion of a human hand.

22. The method of claim 18, wherein the leverage arms are selected from the group consisting of finger wells, gussets, rings, releasable tabs, or a combination thereof.

23. A method for storing a disk in a caddy, the method comprising:

a) providing a caddy that includes a disk cassette having an upper edge, a bottom cover, and a top cover; the top cover having a primary surface and parallel flaps extending downward from the primary surface, each flap having an offset region; the disk cassette having a recess on each of two opposing end walls, each recess being covered when the top cover engages to the upper edge of the disk cassette;

b) placing a first gripper on a vertical portion of a leverage arm located adjacent to the flap, while holding the opposite end of the caddy with a second gripper;

c) removing the top cover by pushing the vertical portion of the leverage arm inward and then upward; and

d) removing or inserting at least one disk into the disk cassette.

24. The method of claim 23, wherein the first gripper comprises either a mechanical member or a portion of a human hand.

25. The method of claim 23, wherein the leverage arm is a releasable tab that comprises a vertical portion extending from the flap, and having a hook thereon.

26. The method of claim 23, wherein the top cover is secured to the disk cassette by engaging the hook of the tab to a lip located below at least one recess of the disk cassette.

27. The method of claim 23, wherein the top cover is secured to the disk cassette by engaging the hook of the tab to an opening that projects from the end wall.

28. The method of claim 23, wherein a second gripper is placed under a second leverage arm and the tabs are simultaneously pushed inward and upward to remove the top cover.

29. The method of claim 28, wherein the second gripper comprises either a mechanical member or a portion of a human hand.