"Dampening Device for a Storage Device Tester and a Storage Device Tester Including Same"

FIELD OF THE INVENTION

The present invention relates to a dampening device for a storage device tester and a storage device tester including same. The invention is particularly suited to testing of Small Form Factor ("**SFF**") storage devices.

BACKGROUND TO THE INVENTION

The following discussion of the background to the invention is intended to facilitate an understanding of the present invention. It should be appreciated that the discussion is not an acknowledgment or admission that any of the material referred to was published, known or part of the common general knowledge in any jurisdiction as at the priority date of the application.

Storage devices undergo testing after manufacture to ensure that they operate within certain performance specifications. However, factors such as vibration of the storage device can affect the performance of the storage device during testing. The effect on performance can be so great that a storage device that is operable within the performance specifications may fail the testing.

One way of solving the vibration problem during testing is to apply a dampener or clamping device to the storage device. While this has been successful, the methods of applying the dampener or clamping device to the storage device have previously been distinct from the method of operation of the testing unit. In performing two separate methods of operation to prepare for testing, the operator thereby loses time that could otherwise be spent on testing.

It is therefore an object of the present invention to overcome, at least in part, some or all of the aforementioned problems.

SUMMARY OF THE INVENTION

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers, but not the exclusion of any other integer or group of integers.

In accordance with a first aspect of the invention there is a dampening device for a storage device tester comprising:

a slider slidably mounted on a base surface;

at least one crowder located in close proximity to a recess in the base surface.

where, when the slider is positioned at a first position, a portion of the slider disengages a compression connector module and, when the slider is positioned at a second position, the portion of the slider engages the compression connector module and the at least one crowder moves to dampen any storage device received in the recess.

The slider ideally has a handle to facilitate movement between the first position and the second position.

The crowder comprises at least one wedge protrusion and a compression spring and the slider comprises a corresponding number of recesses, such that when the at least one wedge protrusion is received within its recess, the compression spring relaxes and moves the crowder to dampen any storage device received in the recess and when the at least one wedge protrusion is not received within its recess the compression spring is compressed and forces the crowder away from the recess.

The crowder may comprise angled slides to facilitate the change in position of the crowder.

Alternatively, the crowder may comprise at least one rotating body having a guiding pin, a spring arm and an engaging arm and the

slider having a corresponding aperture therein for receiving the guiding pin, such that, when the slider is positioned at the first position, a compression spring attached to the spring arm is unable to rotate the rotating body and when the slider is positioned at the first position, the compression spring may partially relax and thereby rotate the rotating body to a second position such that the engaging arm connects with, and provides a dampening effect to, any storage device received in the recess.

The corresponding aperture may widen at a midpoint to facilitate the change in position of the crowder.

In accordance with a second aspect of the invention there is a test carrier comprising:

a slider slidably mounted on a carrier base;

a compression connector module mounted to the carrier base

at least one crowder located in close proximity to a recess in the carrier base.

where, when the slider is positioned at a first position, a portion of the slider disengages the compression connector module and, when the slider is positioned at a second position, the portion of the slider engages the compression connector module and the at least one crowder moves to dampen any storage device received in the recess.

BRIEF DESCRIPTION OF THE DRAWINGS

The following invention will be described with reference to the following drawings of which:

Figure 1 is a first isometric view of a test carrier in accordance with a first embodiment of the invention.

Figure 2 is an isometric view of the test carrier as shown in Figure 1 with the slider housing removed.

Figure 3 is a second isometric view of the test carrier as shown in Figure 1.

Figure 4 is a first isometric view of a test carrier in accordance with a second embodiment of the invention.

Figure 5 is an isometric view of a crowder.

Figure 6 is an isometric view of a slider.

Figure 7 is a partitioned view of the slider of Figure 6 having a series of crowders received therein.

Figure 8 is a partial isometric view of the test carrier as shown in Figure 4 in a first position.

Figure 9 is a partial isometric view of the test carrier as shown in Figure 4 in a second position.

PREFERRED EMBODIMENTS OF THE INVENTION

In accordance with a first embodiment of the invention there is a SFF storage device test carrier 10. The test carrier 10 is shown in Figure 1. As shown, the test carrier 10 is particularly adapted to test a 1.8 inch storage device 12.

The test carrier 10 incorporates a carrier base 14. The carrier base 14 has a slider housing 16 mounted thereon.

Also mounted on the carrier base 14 is a compression connector module ("**CCM**") 18. The CCM 18 is the subject of a corresponding application to be simultaneously filed by the applicants and as such will not be described in more detail here.

The slider housing 16 houses portions of a slider 20 and two opposing crowders 22. The slider 20 comprises a handle portion 24, a CCM activator portion 26 and four recesses 28. The four recesses 28 are arranged in opposing pairs.

The opposing crowders 22 are positioned at opposite sides of a first end 30 of the carrier base 14. (The CCM 18 is positioned at a second

end 32 of the carrier base 14, opposite the first end 30). Each crowder 22 comprises a base 34, wedge protrusions 36 and an engaging portion 38.

Each crowder 22 is arranged such that the base 34 sits underneath the slider 20 at the position of each pair of recesses 28 (or adjacent thereto depending on the current position of the slider 20). The wedge protrusions 36 extend from one end of the base 34. The wedge protrusions 36 are adapted to engage the recesses 28. The recesses 28 have angled sides to facilitate such engagement and disengagement.

Extending from the other end of the base 34 is the engaging portion 38. The engaging portion 38 is shorter in length than the storage device 12. Positioned at opposite ends of each engaging portion 38 are dampeners 40. Each dampener 40 is spaced from the carrier base 14 at a height substantially equivalent to the height of the storage device 12.

Interposed between the slider 20 and each engaging portion 38 are two compression springs 42. Each compression spring 42 connects with the engaging portion 38 at a position almost directly opposite a dampener 40.

This embodiment of the invention will now be described in the context of its intended use.

As best shown in Figure 2, in its first position the slider 20 is positioned such that wedge protrusions 36 do not engage the recesses 28. This causes significant compression of the compression springs 42.

When arranged in the first position, a user (not shown) can insert a 1.8 inch storage device 12 having a flexible printed circuit ("**FPC**") cable attached thereto. The inserted position of the storage device 12 is such that the FPC cable overlays the CCM 18 and the sides

thereof are in general alignment with the engaging portions 38. This is shown in more detail in Figure 3.

Once the storage device 12 has been correctly inserted into the test carrier 10, the user moves the handle portion 24 in the direction A, thus moving the slider to a second position.

When moved to the second position, the CCM activator portion 26 engages the CCM 18 and pushes the CCM 18 to a closed position. Thus, the FPC cable is clamped by the CCM 18 ready for testing.

Additionally, the wedge protrusions 36 are aligned with the recesses 28, allowing engagement of same. This engagement allows the compression springs 42 to at least partly relax. In turn, this pushes the engagement portions 38 against the storage device 12. In this state, the dampeners 40 sit directly over the top of the storage device 12. The end result is that the storage device 12 is prevented from significant movement in any direction.

To remove the storage device 12, the user moves the handle portion 24 in the direction B back to the first position. In doing so, the angled sides of each recess 28 facilitate disengagement of the wedge protrusions 36.

Disengagement of the wedge protrusions 36 pushes the wedge protrusions 36 back against side walls 44 of the test carrier 10. Due to its unitary construction, this also causes the engaging portions 38 to retract from the storage device 12 – again applying compression to the compression springs 42.

Additionally, when in the first position, the CCM activator portion 26 disengages the CCM 18. This allows the CCM 18 to move to an open position and release the hold it previously had on the FPC cable.

With the retraction of the engaging portions 38 and the release of the FPC cable, the storage device 12 may then be easily removed from the test carrier 10.

In accordance with a second embodiment of the invention, where like numerals reference like parts, there is a test carrier 100.

The test carrier 100 is shown in Figure 4. It comprises a slider 102, two CCMs 18, a carrier base 104 and a plurality of crowders 106.

The slider 102 shown in detail in Figure 6, is substantially "T" shaped. The slider 102 is slidably mounted to the carrier base 104 such that one part of the slider 102 bisects the carrier base 104 and the other part sits behind the two CCMs 18. Positioned at the intersection of the two parts of the slider 102 is a slider handle 108.

The part of the slider 102 that bisects the carrier base 104 has a series of apertures 112 provided therein. This part is also received within a slider housing 110. Another series of apertures 115 are provided on side surfaces 117 of the slider housing 110.

The crowder 106 shown in detail in Figure 5, each comprises a rotatable body 114 an engaging arm 116 and a spring arm 118. The rotatable body 114 is mounted to a top surface (not shown) of the slider housing 110 using a screw and nut assembly.

The spring arm 118 has a compression spring 120 extending therefrom in a direction parallel to the rotational axis of the rotatable body 114. Mounted on the rotatable body 114 at a position near to the engaging arm 116 is a guiding pin 122. Figure 7 shows this arrangement in more detail.

When properly mounted to the carrier housing 110, each crowder 106 is arranged such that the compression spring 120 makes contact with a side wall of the slider housing 110 at a position between two retaining bars 124. Further, the guiding pin 122 of the crowder 106 is received within its corresponding aperture 112.

This second embodiment of the invention will now be described in the context of its intended use.

In its open position, the compression spring 120 applies force to the spring arm 118 with the intention of rotating the rotatable body 114 in a first direction A. However, the receipt of the guiding pin 122 in its aperture 112 prevents this rotation. Furthermore, the receipt of the guiding pin 122 in its aperture 112 positions the engaging arm 116 at its retracted position. This allows a user to insert the storage devices desired to be tested.

Once the storage devices desired to be tested have been inserted, the user then guides the slider handle 108 towards a closed position.

As the slider handle 108 is moved towards the closed position, the guiding pin 122 traverses the length of its corresponding aperture 112. About midway along the length of the aperture 112, the aperture 112 widens. This increase in width allows the force of the compression spring 120 to finally move the guiding pin 122. As a result, the guiding pin 122 is moved to a position closer to the side wall of the slider housing 110 adjacent the storage device the crowder 106 is designed to clamp.

Because of the location of the guiding pin 122 relative to the engaging arm 116, the movement of the guiding pin 122 towards the side wall of the slider housing 110 also moves the engaging arm 116 to its engaged position. In its engaged position, the contact pressure applied to the storage device is maintained by the compressive force of the compression spring 120.

When positioned in the second position, the slider 102 engages the CCMs 18 and pushes them to the closed position.

It should be appreciated by the person skilled in the art that the present invention is not limited to the embodiments described. It should be further appreciated by the person skilled in the art that the

features described above, where not mutually exclusive, can be combined to form yet further embodiments of the invention.

- The test carriers 10, 100 may be adapted to be used in storage device tester units having a test bed size greater than or less than the 1.8" HDD tester unit mentioned above.

- The test carriers 10, 100 may be adapted to test storage devices other than SFF storage devices. It should be understood however, that the invention has particular suitability for use with SFF storage devices.

- The slider 20, 102 may be provided with retention clips that engage suitable retaining mechanisms provided for on their respective carrier base 14, 104 when the slider 20, 102 moves from the first position to the engaged position. Alternatively, other forms of retaining the slider 20, 102 in the engaged position may be implemented.

- The carrier base 14, 104 and associated components can be modified from that described in the second embodiment to allow for multiple SFF storage devices to be tested using a single carrier base 14, 104 configuration.

It should be further appreciated by the person skilled in the art that the features described above, where not mutually exclusive, can be combined to form yet further embodiments of the invention.

We Claim:

1. A dampening device for a storage device tester comprising:

a slider slidably mounted on a base surface;

at least one crowder located in close proximity to a recess in the base surface,

where, when the slider is positioned at a first position, a portion of the slider disengages a compression connector module and, when the slider is positioned at a second position, the portion of the slider engages the compression connector module and the at least one crowder moves to dampen any storage device received in the recess.

2. A dampening device according to claim 1, where the slider includes a handle to facilitate movement between the first position and the second position.

3. A dampening device according to any preceding claim, where the crowder comprises at least one wedge protrusion and a compression spring and the slider comprises a corresponding number of recesses, such that when the at least one wedge protrusion is received within its recess, the compression spring relaxes and moves the crowder to dampen any storage device received in the recess and when the at least one wedge protrusion is not received within its recess the compression spring is compressed and forces the crowder away from the recess.

4. A dampening device according to claim 3, where the crowder has angled slides to facilitate the change in position of the crowder.

5. A dampening device according to claim 1 or claim 2, where the crowder comprises at least one rotating body having a guiding pin, a spring arm and an engaging arm and the slider having a corresponding aperture therein for receiving the guiding pin, such

that, when the slider is positioned at the first position, a compression spring attached to the spring arm is unable to rotate the rotating body and when the slider is positioned at the first position, the compression spring may partially relax and thereby rotate the rotating body to a second position such that the engaging arm connects with, and provides a dampening effect to, any storage device received in the recess.

6. A dampening device according to claim 5, where the corresponding aperture widens at a midpoint to facilitate the change in position of the crowder.

7. A test carrier comprising:

a slider slidably mounted on a carrier base;

a compression connector module mounted to the carrier base

at least one crowder located in close proximity to a recess in the carrier base.

Where, when the slider is positioned at a first position, a portion of the slider disengages the compression connector module and, when the slider is positioned at a second position, the portion of the slider engages the compression connector module and the at least one crowder moves to dampen any storage device received in the recess.

8. A test carrier according to claim 7, where the slider includes a handle to facilitate movement between the first position and the second position.

9. A test carrier according to claim 7 or claim 8, where the crowder comprises at least one wedge protrusion and a compression spring and the slider comprises a corresponding number of recesses, such that when the at least one wedge protrusion is received within its recess, the compression spring relaxes and moves the crowder to dampen any storage device received in the recess and when the at

least one wedge protrusion is not received within its recess the compression spring is compressed and forces the crowder away from the recess.

10. A test carrier according to claim 9, where the crowder has angled slides to facilitate the change in position of the crowder.

11. A test carrier according to claim 7 or claim 8, where the crowder comprises at least one rotating body having a guiding pin, a spring arm and an engaging arm and the slider having a corresponding aperture therein for receiving the guiding pin, such that, when the slider is positioned at the first position, a compression spring attached to the spring arm is unable to rotate the rotating body and when the slider is positioned at the first position, the compression spring may partially relax and thereby rotate the rotating body to a second position such that the engaging arm connects with, and provides a dampening effect to, any storage device received in the recess.

12. A test carrier according to claim 11, where the corresponding aperture widens at a midpoint to facilitate the change in position of the crowder.

13. A test carrier according to any one of claims 7 to 12, where the slider has a retention mechanism for retaining the slider in the second position.

14. A dampening device substantially as described herein with reference to the Figures.

15. A test carrier substantially as described herein with reference to the Figures.