

DESCRIPTION

TITLE

HDD UNIT AND ELECTRONIC DEVICE

FIELD

5 Embodiments described herein relate generally to an
HDD unit and an electronic device.

BACKGROUND

10 In an electronic device, for example, an HDD unit is
provided in a case. The HDD unit comprises an HDD (hard
disk drive), an HDD tray that holds the HDD, and an HDD
holder that drawably accommodates the HDD tray. The HDD
unit, for example, is configured to be disposed in the back
of the front surface portion of the case, wherein the HDD
is drawable from a slot opening formed in the front surface
15 of the case. The HDD, for example, is attached by screwed
in a plurality of locations of the HDD tray to which the
HDD is fastened.

CITATION LIST

PATENT LITERATURE

20 Patent Literature 1: Jpn. Pat. Appln. KOKAI
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BRIEF DESCRIPTION OF THE DRAWINGS

25 FIG. 1 is a perspective view showing the configuration
of a part of the electronic device according to the first
embodiment.

 FIG. 2 is a perspective view showing the configuration
of the HDD unit according to the same embodiment.

FIG. 3 is a perspective view showing the configuration in the first state of a part of the HDD unit.

FIG. 4 is a perspective view showing the configuration in the second state of a part of the HDD unit.

5 FIG. 5 is a perspective view of the HDD tray of the HDD unit.

FIG. 6 is a perspective view of the HDD tray.

FIG. 7 is a perspective view of the HDD tray.

10 FIG. 8 is an explanatory drawing of when the HDD units are replaced according to the same embodiment.

FIG. 9 is an explanatory drawing of when the HDD units are replaced according to the same embodiment.

15 FIG. 10 is a perspective view showing the configuration of the HDD tray according to another embodiment.

DETAILED DESCRIPTION

The HDD unit according to the embodiments comprises an HDD case and an HDD holder. The HDD case comprises an HDD tray and an HDD cover. The HDD tray is configured so that
20 an HDD can be placed therein. The HDD cover is configured to be switchable between the closed state of being disposed over an HDD placed on the HDD tray to cover the HDD, and the open state of being open above the HDD tray, and comprises energizing parts elastically abutting on the HDD
25 in the closed state. The HDD holder is configured to be able to accommodate the HDD case, and reciprocatably supports the HDD case along the predetermined first

direction.

[First Embodiment]

Hereinafter the configurations of an electronic device 10 and an HDD unit 12 according to the first embodiment of the present invention will be described with reference to FIGS. 1 to 5. FIG. 1 is a perspective view showing the configuration of a part of the electronic device 10 according to the present embodiment. FIG. 2 is a perspective view showing the configuration of the HDD unit 12. FIGS. 3 and 4 are perspective views showing the first and second states of a part of the HDD unit 12. FIGS. 5 to 7 are perspective views of an HDD tray 24. FIGS. 8 and 9 are explanatory drawings of the maintenance work of the HDD unit 12. Note that in FIG. 3, the display of an HDD cover 25 is omitted.

Note that arrows X, Y, and Z in the figures show three directions perpendicular to one another. Arrows X, Y, and Z extend along the first direction of the front-back direction, the second direction of the width direction, and the third direction of the up/down direction, respectively. Note that in the present embodiment, regarding the directions such as up and down, right and left, and front and back, an example of the directions when a case 11 is disposed so that its base plate faces downward as in FIG. 1 is shown; each direction varies as necessary according to the position of the electronic device 10.

As shown in FIGS. 1 and 2, the electronic device 10

comprises the case 11, and the HDD unit 12 provided in the case 11.

5 The case 11 comprises, for example, a rectangular top plate 11a, a base plate 11b oppositely disposed below the top plate 11a, a front plate 11c vertically provided from the front edge of the base plate, a pair of side plates 11d vertically provided from both side edges of the base plate, and a back plate vertically provided from the back end of the base plate 11b. The case 11 forms a rectangular
10 accommodation space surrounded by the top plate 11a, base plate 11b, front plate 11c, back plate, and pair of side plates 11d.

The case 11 comprises the plurality of HDD units 12 in the front end portion of the accommodation space and behind the front plate 11c. In addition, the case 11 accommodates
15 various electronic parts such as an optical drive unit, a cooling system, and a board unit, as well as a backboard 14 vertically provided in the back portion of each HDD unit 12.

In the front plate 11c of the case 11, a plurality of
20 slot openings 11f connecting to slots 40a of an HDD holder 23 detailed later are formed.

Each HDD unit 12 comprises, for example, a plurality of HDDs 21, a plurality of HDD cases 22 that hold the HDDs 21, respectively, and the HDD holder 23 that drawably
25 accommodates the plurality of HDD cases 22. Note that in the present embodiment, the HDD units 12 are exemplified as the HDD units 12 in which the HDD cases 22 are arranged on

an upper and lower level of a two-stage structure.

The HDD 21 is configured to be, for example, a rectangular block having a predetermined thickness size, and includes a plurality of magnetic disks that store data.

5 The HDD case 22 is made of, for example, a metallic material, and comprises the HDD tray 24 in which the HDD 21 is placed, and the HDD cover 25.

10 The HDD tray 24 comprises a rectangular base frame 31, a pair of side frames 32, and a front frame 33, and its top surface and back portion are open. The HDD tray 24 is slidably supported by the HDD holder 23 along the first direction. The HDD tray 24 is configured so that the HDD 21 can be placed therein.

15 The base frame 31 is configured to be, for example, a rectangular plate. The HDD 21 is placed in the top surface of the base frame 31. A circular hole portion 31a is formed in the front area of the base frame 31. The hole portion 31a is an opening to which a finger can be inserted at the time of an operation.

20 As shown in FIG. 6, in predetermined positions of the front end portion of the base frame 31, which are also the positions adjacent to the front of the portion where the HDD unit 21 is placed, a pair of restriction protrusions 31b that protrude upward are integrally provided as
25 restriction portions. The restriction protrusion 31b is a rib-shaped member formed by cutting out a part of the base frame 31 to be in the form of the letter U, and bending it

upward. The restriction protrusions 31b abut on the front surface of the HDD 21, thereby restricting the forward shifting of the HDD 21.

The front frame 33 is a plate member that is vertically provided in the front edge of the base frame 31, and covers the front portion of the base frame 31. In an edge of the front frame 33, a fastening member 34 that fastens the front frame 33 to the case 11 when closing the front frame 33 is provided.

The pair of side frames 32 are wall members that extend upward from both side portions of the base frame 31. The side frame 32 comprises, for example, a rail protrusion 32a that protrudes inward in its upper edge. The rail protrusion 32a comprises, in a predetermined position, a stepped portion 32b whose back portion is higher than its front portion. That is, the rail protrusion 32a is provided in each of one end and the other end of the stepped portion 32b, and the rail protrusion 32a in the back portion is positioned higher than the rail protrusion 32a in the front portion. The stepped portion 32b abuts on a lower rail protrusion 43a in the front portion of a link rail 43, thereby becoming a stopper that restricts the relative positional relationship with the link rail 43.

The pair of side frames 32 slidably engage with the pair of link rails 43 of the HDD holder 23, respectively. That is, the side frames 32 are disposed in the second guide slit 43c inside the link rail 43, whereby the back

end portion of the HDD tray 24 slidably engages with the front end portion of the HDD holder 23.

5 In the interior surface of the side frame 32, a spring plate 35 is provided. The spring plate 35 is, for example, a long and narrow plate, and comprises in its both end portions plate spring portions 35a that become energizing portions. The plate spring portion 35a is configured to be elastically deformable by the bending of the end of the spring plate 35 to protrude to the inside of the slot 40a
10 of the HDD holder 23. The plate spring portion 35a is positioned more inward than the side frame 32, and abuts on the side surface of the HDD 21 placed on the base frame 31 to elastically energize the HDD 21, thereby executing the function of GND grounding, and positioning the second
15 direction of the HDD 21.

In the front end portions of the pair of side frames 32, shaft holes 32c that rotatably support a shaft body 36 that rotatably supports the HDD cover 25 are formed. The shaft body 36 is inserted into the shaft holes 32c. The
20 shaft body 36 is supported in the front end portions of the side frames 32 by support members 32f such as E-rings.

As shown in FIGS. 6 and 7, in the back end portions of the pair of side frames 32, restriction walls 32d formed by bending parts of the pair of side frames 32 inward in the
25 width direction are provided as restriction portions. The restriction walls 32d are disposed in the positions adjacent to the back of the portion where the HDD 21 is

placed, form a flat surface perpendicular to, for example, the insertion direction, in the end portions in the width direction, and abut on the back end portion of the HDD 21, thereby restricting backward movement of the HDD 21.

5 The HDD cover 25 is, for example, a plate member made of metal, and is provided in the upper end of the front frame 33 and between the side frames 32 to be rotatable around the center of the shaft body 36. The HDD cover 25 is configured to be switchable between the closed state of
10 being disposed over the HDD 21 to cover the HDD 21, and the open state of being open above the HDD tray 24. The HDD cover 25 comprises, in both end portions in the width direction, projections 25a configured to be distant from the rotary shaft, and the center portion of the HDD cover
15 25 is configured to be close to the rotary shaft.

 The HDD cover 25 comprises, in the distal portions of the projections 25a, holding pieces 25b. The holding piece 25b is configured by diagonally bending it toward the rotation direction of the HDD cover 25 verging in the
20 closed state, that is, toward the HDD 21. The holding piece 25b, in the closed state, diagonally extends rearward and downward in the insertion direction, and is pressed into the top surface of the HDD 21.

 The HDD cover 25 comprises, in the projections 25a,
25 the first plate spring portion 25c and the second plate spring portion 25d, respectively.

 The first plate spring portion 25c is configured by

winding upward a spring piece made by cutting out a predetermined region of the projection 25a of the HDD cover 25 to be U-shaped. The first plate spring portion 25c is constructed to be cantilevered so that its back portion in the slide direction is a base end, and its front portion in the slide direction is a free end, for example, and its distal portion is inclined to be positioned upward. In the distal portion of the first plate spring portion 25c, a spring convex portion 25e that protrudes upward is formed.

The second plate spring portion 25d is configured by winding downward a spring piece made by cutting out a predetermined region of the base end portion of the projection 25a of the HDD cover 25 to be U-shaped. The second plate spring portion 25d is constructed to be cantilevered so that its central portion in the width direction is a base end, and its external side portion in the width direction is a free end, for example, and its distal end is inclined to be positioned downward. In the distal portion of the second plate spring portion 25d, the spring convex portion 25e that protrudes downward is formed.

The HDD cover 25 is rotatably configured between the closed position shown in FIG. 2, and the open position shown in FIG. 1. The size defined by the distal end position of the spring convex portion 25e of the first plate spring portion 25c and the distal end position of the spring convex portion 25e of the second plate spring portion 25d, in the thickness direction of the HDD cover 25,

is configured to be slightly larger than the height size between the top surface of the HDD 21 and the ceiling surface of the slot 40a. That is, the size is configured so that by the HDD cover 25 disposed between the ceiling
5 surface of the slot 40a and the top surface of the HDD 21 in the closed state, the top surface of the HDD 21 is pressed relatively downward by the second plate spring portions 25d and the holding pieces 25b.

The HDD holder 23 comprises a housing 41 configuring
10 an outer ward, two support frames 42 to which the HDD tray 24 is placed, and the link rails 43 that slidably support the HDD tray 24 in the support frames 42.

The HDD holder 23 is configured to be a tube whose cross section is rectangular, in which the top and bottom
15 and both side portions of the HDD holder 23 are surrounded by the housing 41, and the two-stage support frames 42. The HDD holder 23 comprises, by the housing 41, and the two-stage support frames 42, the slots 40a of the two stages in the longitudinal direction, each of which opens back and
20 forth.

The housing 41 integrally comprises a top wall portion 41a, and a pair of side wall portions 41b. The housing 41 comprises, in four points of the front, back, right, and left, fixing pieces 41c that extend from the side edges of
25 the top wall portion 41a, and have fastening holes of the fastening members. In addition, the housing 41 integrally comprises fixing flange pieces 41d that laterally extend

from the front edge of the side wall portions, and a pair of side flange pieces 41e that laterally extend from the lower edges of the side wall portions. The housing 41 integrally comprises, in its back end portion, board fixing portions 41f by which the base plate is fixed.

The support frames 42 are made of, for example, a metallic material, and integrally comprise a rectangular base plate 42a, and a pair of side walls 42b vertically provided in both side edges of the base plate.

The pair of side walls 42b are configured to be plates having a predetermined height size. The side wall 42b integrally comprises a rail protrusion 42c that protrudes inward in its upper edge. By this rail protrusion 42c, a guide slit 42d, which is a concave by which the link rail 43 is disposed in the inner wall of the side wall 42b, is formed.

The rail protrusion 42c comprises, in a predetermined position, a stepped portion 42g whose back portion is higher than its front portion. That is, the rail protrusion 42c is provided in each of one end and the other end of the stepped portion 42g, and the rail protrusion 42c in the back portion is positioned higher than the rail protrusion 42c in the front portion.

In predetermined positions of the pair of side walls 42b, plate spring portions 42e configuring energizing portions are provided. The plate spring portions 42e are configured to have spring pieces made by cutting out

predetermined regions of the pair of side walls 42b to be U-shaped. The plate spring portion 42e is constructed to be cantilevered so that its front portion in the slide direction is a base end, and its back portion in the slide direction is a free end, and in its distal portion, a
5 spring convex portion 42f that protrudes inward is formed.

The link rail 43 is a frame member that extends in the first direction, and comprises, in its upper end and lower end, the rail protrusions 43a that protrude to the inside
10 of the slot 40a. And its cross section is configured to be, for example, in the form of the letter U. The link rail 43, by the rail protrusions 43a, forms, in its inner wall, the second guide slit 43c that is a concave that extends along the first direction.

15 The link rail 43, by disposition of its back end region in the first guide slit 42d of the support frame 42, slidably engages with the support frame 42. In addition, the link rail 43, by disposition of the side portion of the HDD tray 24 in the second guide slit 43c configured in its
20 inner wall, guides the moving direction of the HDD tray 24 to the first direction.

The rail protrusion 43a comprises, in a predetermined position, a stepped portion 43b whose back portion is higher than its front portion. That is, the rail protrusion
25 43a is provided in each of one end and the other end of the stepped portion 43b, and the rail protrusion 43a in the back portion is positioned higher than the rail protrusion

43a in the front portion. The stepped portion 43b abuts on the lower rail protrusion 42c in the front portion of the side wall 42b, thereby becoming a stopper that restricts the relative positional relationship in the first direction between the link rail 43 and the support frame 42.

That is, by the HDD case 22, the support frame 42, and the link rail 43, a guide rail mechanism that is extendable in two stages is configured. The HDD tray 22 is reciprocatably supported by the HDD holder 23 along a predetermined first direction.

In a predetermined position of the link rail 43, a plate spring portion 43e configuring an energizing portion is provided. The plate spring portion 43e is configured to have a spring piece made by cutting out a predetermined region of the link rail 43 to be U-shaped. The plate spring portion 43e is constructed to be cantilevered so that its front portion in the slide direction is a base end, and its back portion in the slide direction is a free end, and in its distal portion, a spring convex portion 43f that protrudes inward is formed.

The backboard 14 is a board to which electronic parts are mounted, and vertically provided in the back portion of the HDD unit 12. The backboard 14 mounts, in, for example, the principal surface oppositely disposed in the back of the HDD 21, a connector to be connected with the HDD 21. If the HDD 21 is inserted into and stored in the slot 40a of the HDD holder 23, the terminal of the back end of the HDD

21 is disposed in the opening in the back portion of the slot 40a of the HDD holder 23, and electrically and mechanically connected with the connector of the backboard 14. The back end of the HDD 21 is connected with the backboard 14, whereby the back portion of the HDD 21 is supported.

In the HDD unit 12, the plate spring portions 25c, 25d, 35a, 42e, and 43e, which serve as a plurality of energizing portions, also serve as grounding points to the GND. That is, by the conductive plate spring portions 25c, 25d, and 35a provided in the HDD case made of metallic material, and the conductive plate spring portions 42e, and 43e provided in the HDD holder 23, and the link rail 43, electrical connection is made from the HDD 21 to the HDD case 22, and the HDD holder 23.

A replacement operation of the HDD21 of the HDD unit 12 configured as above will be described with reference to FIGS. 1 to 9.

In the first state shown in FIG. 4, in the HDD unit 12, the HDD tray 24 is pushed to be stored in the rear portion in the slot 40a, which is the back end portion in the slide direction. At this time, the HDD 21 is placed on the HDD tray 24, and the HDD cover 25 is in the closed position. In this first state, the HDD cover 25 covers the top surface of the HDD 21, and is disposed between the top surface of the HDD 21 and the ceiling portion of the slot 40a. At this time, the upper plate spring energizes the ceiling portion,

and the lower plate spring energizes the top surface of the HDD 21 downward. The holding pieces 25b of the HDD cover 25 are pressed to the top surface of the HDD 21. At this time, the guide rail mechanism comprised by the support frames 42 and the rail members is contracting.

In this first state, if the fastening member 34 is removed, and the HDD tray 24 is pulled in the drawing direction, the guide rail mechanism comprised by the HDD case 22, the support frames 42, and the link rails 43 extends, and the second state where the HDD tray 24 is drawn more forward than the front plate 11c is obtained. In this second state, the HDD cover 25 in the closed position is rotated to the open position to be in the open state, and above the HDD tray 24 is opened. Then, the HDD 21 is taken out, and another HDD 21 is set on the HDD tray 24.

After that, the HDD cover 25 in the closed position is rotated to the closed position to cover the HDD 21. Next, the HDD tray 24 is pushed into the rear portion of the slot 40a. Then, the guide rail mechanism contracts again, the HDD tray 24 is accommodated in the slot 40a to obtain the first state, and the fastening member 34 is fastened to complete the replacement operation.

The HDD unit 12 and the electronic device 10 configured as described above bring about advantages described below. That is, the HDD tray 24 is configured to comprise the HDD cover 25 that elastically holds the HDD 21 from above, whereby it becomes possible to position the

up/down direction of the HDD 21 and fix the HDD 21. Thereby,
screw-less mounting is possible, and it becomes easy to
perform maintenance work. Along with this, since it becomes
unnecessary to manage small parts such as a screw when
5 working in a special location such as a computer room,
workability and safety are improved.

In addition, by the formation of the plate spring
portions 25c, 25d, 35a, 42e, and 43e structured to be
cantilevered in the HDD tray 24, the link rails 43, and the
10 side wall portions of the support frames 42, movement
restrictions in the width direction of an HDD, and GND
grounding are compatible. In addition, by the configuration
of elastic energization in the width direction and the
up/down direction by the plate spring portions 25c, 25d,
15 35a, 42e, and 43e structured to be cantilevered, the
configuration with high vibration resistance can be
achieved.

The HDD tray 24 comprises the restriction protrusions
31d that restrict forward movement of the HDD 21, and the
20 restriction walls 32d that restrict backward movement of
the HDD 21, whereby movement of the HDD 21 in the front-
back direction is restricted.

In addition, since the HDD tray 24 is configured to be
supported by the HDD holder 23 by the guide rail mechanism
25 slidable in two stages, it is possible to completely draw
the HDD tray 24 from the case 11 to the outside, and
maintenance workability is high. In addition, even if the

HDD tray 24 is widely drawn from the electronic device 10, it is possible to curb downward warping caused by the deadweight.

Note that the present invention is not restricted to the above embodiments.

For example, as another embodiment, an HDD tray 24A shown in FIG. 10 comprises EMI (electromagnetic interference) gaskets 46 as energizing portions instead of the spring plates 35. The other configurations are the same as the HDD tray 24 according to the first embodiment. The EMI gaskets 46 comprise, for example, a spongy elastic member having cushioning characteristics, and a conductive covering material (covering portion) such as a conductive cloth to be wound around the surface of this elastic member. In the present embodiment, electrical connection is made from the EMI gaskets 46, and the HDD 21 to the metallic HDD tray 24A, and the metallic HDD holder 23 by the energizing portions 25c, 25d, and 46, whereby advantages similar to the above embodiments are also brought about.

While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the inventions. The accompanying claims

and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions.

CLAIMS

1. An HDD unit comprising:
an HDD case comprising:
5 an HDD tray configured so that an HDD is
placeable in the HDD tray; and
an HDD cover configured to be switchable between
a closed state of being disposed over the HDD placed
on the HDD tray to cover the HDD, and an open state of
10 being open above the HDD tray, and comprising
energizing portions elastically abutting on the HDD in
the closed state; and
an HDD holder comprising a slot and configured to
accommodate the HDD case, and reciprocatably supporting the
15 HDD case along a predetermined first direction, wherein
the HDD tray comprises a base frame in which the
HDD is placed, and side frames, and slidably engages with
the HDD holder along the first direction,
the side frames comprise energizing portions that
20 elastically abut on side portion of the HDD, and
the HDD cover is a plate member that is provided
in an end of the HDD tray in the first direction, and is
configured to be rotatable between the closed state of
covering at least a part of above the HDD placed on the HDD
25 tray, and the open state of being open above the HDD, is
disposed between a ceiling portion of the slot and the HDD,
and comprises, as the energizing portions, a first plate
spring that protrudes downward and energizes a top surface
of the HDD in the closed state, and a second plate spring
30 that protrudes upward and energizes the ceiling portion in
the closed state.

2. The HDD unit according to claim 1, wherein

the HDD tray comprises, in positions adjacent to a front portion and a back portion in the first direction of a place portion of the HDD, restriction portions that restrict a position of the HDD, respectively.

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3. The HDD unit according to claim 1 or 2, wherein the energizing portion of the HDD cover is a plate spring member that is made of a metallic material, and structured to be cantilevered, and

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the energizing portion, the HDD tray, and the HDD holder are electrically connected.

4. The HDD unit according to claim 1 or 2, wherein the energizing portion of the side frames is an EMI gasket comprising an elastic member, and a conductive covering portion that covers a surface of the elastic member, and

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the energizing portion, the HDD tray, and the HDD holder are electrically connected.

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5. An electronic device comprising:
the HDD unit according to claim 1;
a case configured to be a box that accommodates the HDD unit, and comprising a slot opening connecting to the slot; and

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a backboard that is vertically provided in a back of the HDD holder in the case, and mounts a connector to be connected with a terminal provided in a back portion in a drawing direction of the HDD.