

Specification



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Title of the Invention:

Portable electronic apparatus, disk drive unit, loading member, and computer housing

Detailed Description of the Invention:

[Field of the invention]

The present invention relates to such a disk drive unit as a hard disk drive, etc., more particularly to a technique preferred for loading the disk drive unit in a lap-top personal computer.

[Background art]

Hard disk drive units (HDD) are the most popular external storage units employed for computers. Each of those hard disk drive units is structured so as to dispose one or more magnetic disks on one and the same shaft and drive the disk(s) with use of a spindle motor. The hard disk unit (HDD) has a magnetic

head disposed so as to face each magnetic disk and read/write data from/on the disk. This magnetic head is driven by an actuator, generally by a voice coil motor. The magnetic disks, the magnetic heads, and the actuator are all housed in a housing referred to as an enclosure case.

Generally, such an HDD is attached to a personal computer (hereinafter, to be referred to as a PC) by screws. Conventionally, however, there have been proposed various methods for attaching an HDD to a PC. For example, Published Unexamined Patent Application No. 11-73760 discloses an HDD whose position can be easily adjusted after it is fixed to a PC.

Because the HDD includes such dynamic mechanisms as a spindle motor for rotating magnetic disks and an actuator for a magnetic head, it is sensitive to impacts. Such the HDD is also installed in respective lap-top personal computers. Because lap-top PCs are often carried around, they receive impacts more frequently and more strongly than desk-top PCs. This is why the HDD installed in respective lap-top PCs is required to have higher resistance to impacts. And, in order to assure such the high impact resistance, the HDD must be fastened firmly to the subject lap-top PC.

An HDD configured by a 2.5-inch form factor is installed in the present lap-top PCs respectively. The representative value of this form factor is  $100.2 \pm 0.25$  mm (l)  $\times$   $69.85 \pm 0.25$  mm (w)  $\times$   $9.5 \pm 0.2$  mm (t). The lap-top PC body is provided with a space referred to as an HDD slot (or a medium bay or device bay), so that an HDD is loaded and fixed in this space.

The HDD is provided with a connector for receiving a power supply used to send/receive data to/from external devices. This HDD connector is connected to a connector of the subject lap-top PC. Due to this connection to the lap-top PC via the connectors, the HDD is fixed to the PC more firmly. However, such the connection by the connector is insufficient to fix the

HDD to the PC entirely, so the HDD is also fixed by screws that go through the housing of the lap-top PC, more concretely through the HDD slot vertically so as to assure the impact resistance of the HDD.

[Problems to be solved by the invention]

The lap-top PC has been attempted so as to be reduced more in weight and thickness, thereby improving its portability. The lap-top PC has been thinned in millimeters. The conventional method for fixing such the HDD to the subject lap-top PC has been one of the problems to appear in the thinning process of the PC. Figure 12 shows a cross sectional structure of the HDD attached to a PC by screws. In Figure 12, reference numeral 90 denotes HDD housing, reference numeral 91 denotes lap-top PC housing, and reference numeral 92 denotes a screw. As shown in Figure 12, a recess 91a is formed in the lap-top PC housing 91 so that the head 92a of the screw 92 is prevented from direct extrusion from the outer surface of the PC 91. In case the head 92a of the screw 92 is exposed to the outer surface of the PC 91, the head 92a comes in contact with the surface on which the PC is put, thereby the surface comes to have an unfavorable step. This is why the recess 91a is formed in the PC 91 and the head 92a of the screw 92 is embedded therein. In order to form such the recess 91a, the PC housing 91 must be thickened according to the depth of the formed recess 91a. And, this has been an obstacle for thinning the lap-top PC in structure.

On the other hand, the HDD must be fixed firmly to the subject lap-top PC. And, there has been no technique developed to make the lap-top PC thin satisfactorily and fix the HDD to the PC firmly.

Under such circumstances, it is an object of the present invention to provide a fixing structure for enabling the portable electronic apparatus to be thinned and such an electronic device as an HDD to be firmly fixed to the portable electronic apparatus such as a lap-top PC. And, it is another

object of the present invention to provide a disk drive unit, a loading member, and computer housing provided respectively with such a fixing structure.

[Summary of the invention]

The present inventor has examined employment of a structure having screws disposed in parallel to the plane direction of the housing of the subject lap-top PC, thereby fixing an HDD to the PC firmly and solve the above conventional problems. This is because the heads of the screws are prevented from exposure to the surface on which the lap-top PC is put when the screws are disposed in parallel such way.

In this case, what is a matter is only whether or not the HDD can be fixed firmly to the subject lap-top PC. In the case of the conventional lap-top PC, the HDD is fixed to the subject lap-top PC by fastening the bottom of the HDD housing to the lower wall of the HDD slot of the PC with screws. In case the screws are used in parallel to the plane direction of the PC, however, it is impossible to employ the conventional method that fixes the bottom of the HDD housing directly to the lower wall of the HDD slot of the lap-top PC with screws. This indicates that the fixing force is insufficient in case screws are simply used in parallel to the plane direction to fix the HDD to the PC.

When no clearance is designed between the HDD housing and the HDD slot, the HDD can be fixed firmly to the lap-top PC. When no clearance is formed between the HDD housing and the HDD slot, however, it is not so easy to load the HDD into the HDD slot. The loading of the HDD into the HDD slot is done manually. When such a proper clearance is not formed between the HDD housing and the HDD slot, it needs more time for loading the HDD into the HDD slot than when the clearance is formed. The production efficiency thus goes low. In order to solve the problem, therefore, the conventional lap-top PC has required such a predetermined clearance between the HDD housing

and the HDD slot. It should thus be avoided to eliminate this clearance in the present circumstances so as not to lower the productivity.

As described above, the HDD loaded in the HDD slot of the lap-top PC is fixed firmly to the wall surface of the HDD slot so as to improve the resistance to impacts. And, the present invention has examined employment of a structure for fixing the HDD closely to the wall surface of the HDD slot step by step as the HDD is loaded in the HDD slot on the assumption that a predetermined clearance is formed between the HDD housing and the HDD slot. Hereinafter, this concept of the present invention will be described with reference to Figure 11.

Figure 11 is a side cross sectional view of the HDD 60 to be loaded in the HDD slot 70 of the lap-top PC.

In Figure 11, an HDD side slope member 61 is provided on a side surface of the HDD 60. The slope member 61 has a slope inclined from upper right to lower left and facing down. The HDD slot 70 is partitioned by an upper wall 71, a lower wall 72, and a pair of side walls (not illustrated). The HDD slot 70 includes a slot side slope member 74 having a slope inclined from upper right to lower left and facing down.

Figures 11(A) through (C) also show the order for loading the HDD 60 in the HDD slot 70 of the lap-top PC. As shown in Figure 11, when the HDD 60 shown in Figure 11(A) is further inserted into the HDD slot 70, the slope of the HDD side slope member 61 comes in contact with the slope of the slot side slope member 74 as shown in Figure 11(B). And, when the HDD 60 shown in Figure 11(B) is further inserted into the slot, the HDD side slope member 61 goes up on the slope of the slot side slope member 74. Consequently, the HDD 60 itself to which the HDD side slope member 61 is attached moves on the slope of the slot side slope member 74. The HDD 60 thus comes in contact with the upper wall 71 of the HDD slot 70 as shown in Figure 11(C).

As shown in Figure 11, the present inventor proposes that the HDD 60 should include the HDD side slope member 61 and the HDD slot 70 should include the slot side slope member 74 so that the HDD 60 comes in close contact with the upper wall 71 (or the lower wall 72) of the HDD slot 70 with good use of the sliding movements of both of those slope members 61 and 74. The HDD side slope member 61 and the slot side slope member 74 may be conversion members for converting a displacement of the HDD 60 in the plane direction to a displacement in a vertical direction.

In order to achieve the above object, therefore, the portable electronic apparatus of the present invention includes a housing having a slot in which an electronic unit is to be loaded and fixed while the electronic unit having a plane area and thickness that are predetermined; an electronic unit to be fixed in the slot; a fastening member for generating a fastening force in the direction for loading and fixing the electronic unit in the slot of the housing; and a conversion member for converting the displacement in the direction for loading the electronic unit in the housing to the displacement in the direction vertical to the plane area when the electronic unit is loaded in the housing.

The portable electronic apparatus of the present invention also includes fastening members, typically screws for generating a fastening force respectively in the direction for loading and fixing the electronic unit in the slot of the housing. Consequently, there is no need to fasten the electronic unit with screws in the direction vertical to the housing while it is needed conventionally. It is thus possible to make the housing, concretely, the portable electronic apparatus thin more in structure.

Furthermore, because the portable electronic apparatus of the present invention includes a conversion member enabled to convert the displacement in the direction for loading the electronic unit in the slot to the displacement in the

direction vertical to the plane area, the electronic unit can be stuck closely to the upper or lower wall of the slot when the electronic unit is loaded in the slot. The conversion member can convert the displacement in the direction for loading the electronic unit in the slot to the displacement in the direction vertical to the plane direction according to the fastening action of each fastening member. This makes it to fasten the electronic unit to the housing of the portable electronic apparatus more firmly. This is why the portable electronic apparatus can ease received impacts.

The conversion member of the portable electronic apparatus should have a slope as described with reference to Figure 11. Concretely, the conversion member employed in the portable electronic apparatus of the present invention is configured by the first member moving by following the electronic unit and the second member disposed in the slot, and the first member and/or the second member has a slope at a predetermined angle from the direction for loading the electronic unit into the housing and another member goes up/down on the slope of the first or second member, thereby the electronic unit can move in the direction vertical to the plane area. In case a slope is formed on either the first member at the electronic unit side or on the second member at the housing side, the slope functions as the above conversion member.

In the portable electronic apparatus of the present invention, the fastening force of each fastening member should be able to press the electronic unit against the upper or lower wall of the slot via the conversion member.

Furthermore, the portable electronic apparatus of the present invention should also include a loading member for loading the electronic unit into the slot. The loading member may be structured so as to have a slope that functions as the first member and be fixed to the housing by the fastening members while it is fixed to the electronic unit. Concretely, the present invention enables the electronic unit itself to be

fixed to the housing by fastening members, for example, screws. However, it is also possible to load in and fix the electronic unit to the housing via this loading member. In that case, the present invention enables the loading member to function just like the first member.

It is another object of the present invention to provide a disk drive unit preferred for the portable electronic apparatus as described above. Concretely, the disk drive unit of the present invention can be attached to a computer apparatus removably. The disk drive unit includes a body which has a front end portion and a rear end portion and is to be inserted in the computer apparatus from the rear end portion. The disk drive unit also has a slope member having a slope inclined along the front end portion from the rear end portion.

The disk drive unit of the present invention provides the body of the disk drive unit with a slope inclined along the front end side from the rear end side thereof. Consequently, in case the housing of the computer apparatus is provided with a member sliding on this slope, the member functions just like the conversion member for converting the displacement in the plane direction of the disk drive unit to the displacement in the direction vertical to the plane direction when the disk drive unit is loaded in the housing of the computer apparatus. The slope may go up towards the front end side from the rear end side and go down from the rear end side towards the front end side.

The disk drive unit of the present invention may also include a loading member for loading the disk drive unit into the computer apparatus and the slope member may be configured by the loading member. In addition, the loading member may be formed unitarily with the housing of the disk drive unit.

The disk drive unit of the present invention is loaded and fixed in the computer apparatus by the fastening force of each screw. The body or the loading member has screw holes through

which each screw goes in a direction parallel to the plane direction of the disk drive unit body. Concretely, because the screws are disposed in a direction parallel to the body of the disk drive unit even when the disk drive unit is fixed to the housing of the computer apparatus by screws, the present invention has an effect that can reduce the computer apparatus in thickness.

The present invention also provides a loading member preferred for the computer apparatus of the present invention. Concretely, the present invention provides a loading member enabled to load and fix the disk drive unit in the slot of the computer housing. The loading member includes a fixing member for fixing itself to the disk drive unit and a slope member having a slope inclined along the direction for loading the disk drive unit in the slot.

This loading member is inserted in the slot located in the housing of the computer while it is fixed to the disk drive unit. In case another member to slide on the slope is provided in this slot, it can function just like the conversion member that converts the displacement in the plane direction of the disk drive unit to the displacement in the direction vertical to the plane direction when the disk drive unit is loaded in the housing of the computer. And, in order to make it easier to load the disk drive unit into the slot, this loading member should preferably include a grip to be held when the disk drive unit is loaded in the slot.

Furthermore, the present invention provides such a housing preferred for the computer apparatus of the present invention. Concretely, the present invention provides the housing of the computer apparatus including a slot in which the disk drive unit is to be loaded. The housing includes an loading hole formed at the slot, an upper wall and/or a lower wall for partitioning the slot, and a slope member disposed in the slot and having a slope inclined along the loading direction from the loading hole. In case the disk drive unit to be loaded in

the slot is provided with another member that slides on the slope, the member can function just like the conversion member for converting the displacement in the plane direction of the disk drive unit to the displacement in the direction vertical to the plane direction when the disk drive unit is loaded in the housing.

[Preferred embodiment]

Hereunder, the preferred embodiments of the present invention will be described with reference to the accompanying drawings.

<First Embodiment>

Figure 1 shows a perspective view of a lap-top PC 1 in the first embodiment of the present invention. The lap-top PC 1 is configured by a PC body 2 and a liquid crystal display 3. In the PC body 2 is mounted an HDD 4, which is a disk drive unit used as an external storage device.

Figure 2 shows a perspective view of PC housing 5. The PC housing 5 is injection-molded with resin as a single item. In addition to an HDD slot 6, the PC housing 5 also includes a CD-ROM drive slot 7 for loading a CD-ROM drive therein. Because the HDD slot 6 is a space for housing the HDD 4, this space is partitioned by walls. The PC housing 5 in this embodiment includes an upper wall 51, a lower wall 52, a pair of side walls 53. At the loading hole of the HDD slot 6 are made screw holes 50 for fastening an HDD door 8 (to be described later) with screws 9.

Figure 3 is a perspective view of the HDD 4 from which the HDD door 8 is removed. Figure 4 is a perspective view of the HDD 4 to which the HDD door 8 is attached.

The HDD 4 has a plane area and thickness that are both predetermined. The HDD 4 is loaded in the HDD slot 6 located at the PC housing 5 of the PC body 2.

The HDD door 8 is a member for making it easier to load the HDD 4 in the PC housing 5, as well as sticking the HDD 4 closely to the upper wall 51 of the PC housing 5. The HDD door 8 is configured by a fixing member 81 and a door member 82. The fixing member 81 has holes 81h. The fixing member 81 also has a slope 83 coming in contact with a slope 54 of the PC housing 5 (to be described later). This slope 83 is inclined along the direction for loading the HDD 4 into the HDD slot 6, more concretely going down in the direction for loading the HDD 4 into the HDD slot 6. The fixing member 81 has screw holes in which the screws 9 for fastening the HDD 4 in the HDD slot 6 are set. The door member 82 is attached to the fixing member 81 rotationally. Figure 3 shows the HDD door 8 opened and Figure 4 shows the HDD door 8 closed.

The HDD 4 also has projections 41 formed on both side walls. The projections 41 are embedded in the holes 81h of the HDD door 8 whereby the HDD door 8 is attached to the front end portion of the HDD 4. And, a connector 42 is disposed at the rear end portion of the HDD 4.

When the HDD 4 is to be loaded in the HDD slot 6 of the PC housing 5, the door member 82 of the HDD door 8 is opened. In other words, it goes into the state shown in Figure 3. The worker holds the grip of the opened door member 82 so as to load the HDD 4 into the HDD slot 6. Concretely, the door member 82 also has a grip member to be held when the HDD 4 is loaded into the HDD slot 6.

Figure 5 is a cross sectional view of the HDD slot 6. As shown in Figure 5, the HDD slot 6 is partitioned by the upper wall 51 and the lower wall 52 in the top-bottom direction. The lower wall 52 has a slope 54. Figure 6 is a top view of the HDD slot 6 of the PC housing 5. This top view indicates the HDD slot 6 from which the upper wall 52 is removed. As shown in Figure 6, the slope 54 is formed so as to come in contact with both side walls 53 around the loading hole 55 for loading the HDD 4. This slope 54 is inclined along the loading direction from the

loading hole 55, more concretely, the slope goes up along the loading direction from the loading hole 55.

Figures 7(A) through (C) show the order for loading the HDD 4 into the HDD slot 6.

Figure 7(A) shows how most of the HDD 4 is loaded in the HDD slot 6. Because a predetermined clearance is formed between the HDD 4 and the upper wall 51/lower wall 52, the HDD 4 can be loaded into the HDD slot 6 more easily. And, the door member 82 of the HDD door 8 is opened and the door member is held to load the HDD 4 into the HDD slot 6.

As loading of the HDD 4 into the HDD slot 6 is continued, the slope 83 of the HDD door 8 comes into contact with the slope 54 of the lower wall 52 of the HDD slot 6. The slopes 83 and 54 are both inclined along the rear end portion from the front end portion of the HDD 4. At this time, the screws 9 (not illustrated in Figure 7) set in the screw holes of the HDD door 8 go ahead through the screw holes 50 of the lower wall 52. When the screws 9 are fastened, fastening forces are generated in the right direction to the HDD door 8 in Figure 7, that is, in a direction parallel to the plane direction of the PC housing 5. Consequently, the HDD 4 united with the HDD door 8 is moved a little in proportion to the fastening degree of each screw 9 in the direction parallel to the PC housing 5. Because the slope 83 slides and goes up on the slope 54 at this time, the HDD 4 also goes a little in the upper direction shown in Figure 7. Concretely, in the first embodiment, the two slopes 54 and 83 are used as the conversion member for converting the displacement in the plane direction of the HDD 4 to the displacement in a direction vertical to the plane direction.

In this embodiment, the total height of the slopes 83 and 54 of the HDD door 8 and the lower wall 52 in the vertical direction is large enough to form the clearance between the HDD 4 and the upper wall 51 of the HDD slot 6. When the screw 9 is fastened up to a predetermined torque, therefore, the HDD 4 is stuck on

the upper wall 51 as shown in Figure 7(C). Because this sticking means pressing the HDD 4 against the upper wall 51 via the slopes 54 and 83 by means of the fastening force of the screw 9, the HDD 4 is fastened tightly. In this embodiment, in order not to hinder HDD 4 front being pressed against the upper wall 51, the hole of each screw 9 formed at the fixing member 81 of the HDD door 8 is almost ellipse in shape so as to enable the screw to move in the vertical direction.

On the other hand, the HDD 4 has a connector 42 at its rear end. This connector 42 is connected to the PC side connector 10 and both of the connectors 42 and 10 are disposed at the rear end of the HDD slot 6. The connection between the connector 42 at the HDD 4 side and the connector 10 at the PC side is done when the HDD 4 is loaded in the HDD slot 6 as shown in Figure 7(A) through (C). The PC side connector 10 allows a slight position change. And, because the rigidity of the connector 10 against the PC housing 5 is high, the rear end of the HDD 4 is fixed firmly to the PC housing 5.

As described above, in the first embodiment, the HDD 4 is fixed to the PC housing 5 with the screws 9 disposed horizontally to the PC housing 5. Consequently, unlike the conventional embodiment in which screws are disposed vertically to the PC housing 5, the first embodiment makes it possible to thin the PC body 2.

In addition, according to the first embodiment, when the screws 9 are fastened, the two slopes 54 and 83 are slid on each other and the HDD 4 goes up so as to press the HDD 4 strongly against the upper wall 51 of the PC housing 5. The HDD 4 is thus stuck on the wall 51 and fixed to the PC housing 5 strongly enough to stand received impacts.

#### <Second Embodiment>

Hereunder, the second embodiment of the present invention will be described with reference to Figures 8 through 10.

Figure 8 is a perspective inside view of the upper wall 151 of the HDD slot 160 of the PC housing 150 in the second embodiment. Figure 9 is a perspective view of the HDD 140 in the second embodiment and Figure 10 shows how the HDD 140 is loaded in the HDD slot 160 of the PC housing 150. Figure 8 omits the illustration of the lower wall 152.

As shown in Figure 8, the PC housing 150 includes the HDD slot 160 in which the HDD 140 is to be loaded. In the center of the width direction of the upper wall 151 that partitions the HDD slot 160 is provided with a slope member 154 having a slope 155 inclined in the direction for loading the HDD 140 into the slot 160. This slope 155 goes up in the loading direction from the loading hole (this side in Figure 8) of the HDD 140.

As shown in Figure 9, the HDD 140 has a hemispherical projection 141 thereon. In the second embodiment, this projection 141 slides down on the slope 155 formed in the HDD slot 160. This projection 141 may be formed unitarily with or separately from the housing of the HDD 140 so as to be fixed at a predetermined position of the HDD 140.

Figure 10(A) shows a state of the HDD 140, which is mostly loaded in the HDD slot 160. A predetermined clearance formed between the upper wall 151 and the lower wall 152 of the HDD 140 makes it possible to load the HDD 140 into the HDD slot 160 easily.

As the loading of the HDD 140 is continued, the projection 141 of the HDD 140 comes in contact with the slope 155 of the slope member 154 and the projection 141 slides down on the slope 155. Also in this second embodiment, the screws are disposed horizontally so as to fix the HDD 140 to the PC housing 150 just like in the first embodiment. When the screws (not illustrated) are fastened, therefore, the HDD 140 goes slightly in a direction parallel to the plane direction of the PC housing 150. At this time, the projection 141 slides on the slope 155, thereby the HDD 140 goes slightly in a direction

vertical to the plane direction of the PC housing 150.

When the screws are fastened up to a predetermined torque respectively, the HDD 140 sticks tightly to the lower wall 152 as shown in Figure 10(B). Because of the fastened screws, this close sticking between those items is very strong. And, just like in the first embodiment, because the screws are disposed in a direction parallel to the plane of the PC housing 150 so as to fix the HDD 140 to the PC housing 150, this embodiment makes it possible to thin the PC body.

In the second embodiment, the projection 141 is formed at the HDD 140. This means that the disposition of the projection 141 is comparatively free. Concretely, because the slope 83, which is equivalent to the projection 141, is formed at the HDD door 8 in the first embodiment, the position of the slope 83 is decided naturally. However, according to the second embodiment, the projection 141 can be formed at any position on the plane of the HDD 4. Consequently, the projection 141 can be formed at the optimized position according to the size, shape, etc. of the HDD 140.

And, in the first embodiment, two slopes 54 and 83 are used to stick the HDD 4 to the upper wall 51 tightly. However, as shown in the second embodiment, two slopes are not necessarily required. Forming a slope on one of the HDD 140 side and the PC housing 150 and providing a portion sliding over the slope on the other, can achieve the object of the present invention. Concretely, sliding of two slopes on each other may be used as a member for converting the displacement of the HDD 140 in the plane direction to the displacement in a vertical direction. And, sliding of one slope on the non-slope surface of another member may be used as such the conversion member. A slope is not limited only to a plane; it may be a curved surface.

In the above first and second embodiments, an HDD is employed as a disk drive unit, which is an electronic unit of the present invention. The electronic unit of the present

invention is not limited only to the HDD, however; it may be selected widely from various disk drive units such as a CD (Compact Disc) drive unit, a DVD (Digital Versatile Disc) drive unit, etc. usable as external storage units of computers, as well as other electronic units.

While a lap-top PC has been described as a portable electronic apparatus to which the HDD is to be connected in those first and second embodiments, the present invention may also apply to a desk-top PC, of course. And, it is also possible to apply the present invention to any of other electronic apparatuses than lap-top and desk-top PCs in case it incorporates a disk drive unit in itself.

[Advantages of the invention]

As described above, according to the present invention, when such an electronic unit as an HDD, etc. is to be connected to a portable electronic apparatus or a computer apparatus such as a lap-top PC, etc., it is possible to fix the electronic unit to the portable electronic apparatus firmly and enable the electronic unit to be reduced in thickness.

#### Brief Description of the Drawings:

Figure 1 is a sketch of a lap-top PC 1 in the first embodiment of the present invention;

Figure 2 shows a PC housing 5 of the lap-top PC 1 in the first embodiment of the present invention;

Figure 3 is a perspective view of an HDD 4 from which an HDD door 8 is removed in the first embodiment of the present invention;

Figure 4 is a side view of the HDD 4 to which the HDD door 8 is attached in the first embodiment of the present invention;

Figure 5 is a cross sectional view of an HDD slot 6 in the first embodiment of the present invention;

Figure 6 is a top view of the HDD slot 6 in the first embodiment of the present invention;

Figure 7 shows how the HDD 4 is loaded in the HDD slot 6 in the first embodiment of the present invention;

Figure 8 is a perspective inside view of an upper wall 151 of the HDD slot 160 in the second embodiment of the present invention;

Figure 9 is a perspective view of an HDD 140 in the second embodiment of the present invention;

Figure 10 illustrates a process for loading the HDD 140 into the HDD slot 160 in the second embodiment of the present invention;

Figure 11 illustrates the concept of the present invention; and

Figure 12 illustrates a structure for fixing a conventional HDD.

[Description of symbols]

- 1 ... Lap-top PC
- 2 ... PC Body
- 3 ... Liquid Crystal Display
- 4 ... HDD
- 5 ... PC Housing
- 6 ... HDD Slot
- 7 ... CD-ROM Drive Slot
- 8 ... HDD Door
- 9 ... Screw
- 10 ... Connector
- 50 ... Screw Hole

51 ... Upper Wall  
52 ... Lower Wall  
53 ... Side Wall  
54 ... Slope  
81 ... Fixing Member  
82 ... Door Member  
83 ... Slope  
140 ... HDD  
141 ... Projection  
150 ... PC Housing  
151 ... Upper Wall  
152 ... Lower Wall  
155 ... Slope Surface  
160 ... HDD Slot

Claims:

- (1) A portable electronic apparatus, comprising:

a housing having a slot in which an electronic unit is to be loaded and fixed, said electronic unit having a plane area and thickness that are predetermined;

an electronic unit to be loaded and fixed in said slot;

a fastening member enabled to generate a fastening force in a direction for loading said electronic unit in said slot, thereby fixing said electronic unit in said slot of said housing; and

a conversion member for converting a displacement in said direction for loading said electronic unit in said housing to a displacement in a direction vertical to said plane area.

- (2) The portable electronic apparatus according to Claim 1;

wherein said conversion member converts the displacement in the direction for loading said electronic unit to the displacement in the direction vertical to said plane area according to a fastening action of said fastening member.

- (3) The portable electronic apparatus according to Claim 1:

wherein said housing has an upper wall and/or a lower wall for partitioning said slot; and

said electronic unit is in close contact with said upper or lower wall.

- (4) The portable electronic apparatus according to Claim 1;

wherein said conversion member is configured by:

a first member moving by following said electronic unit;  
and

a second member disposed in said slot; and

said first member and/or said second member has a slope at a predetermined angle to said loading direction; and

another member goes up or down on said slope of said first or second member, thereby said electronic unit moves in a direction vertical to said plane area.

- (5) The portable electronic apparatus according to Claim 3;

wherein said fastening force of said fastening member presses said electronic unit against said upper or lower wall via said conversion member.

- (6) The portable electronic apparatus according to Claim 4;

wherein said apparatus further includes:

a loading member for loading said electronic unit in said slot; and

said loading member has a slope that functions as said first member and is fixed to said housing by said fastening member while it is fixed to said electronic unit.

- (7) A disk drive unit to be attached/removed to/from a computer apparatus, comprising:

a body having a front end and a rear end and being inserted in said computer apparatus from said rear end; and

a slope member having a slope along said front end side from said rear end side.

- (8) The disk drive unit according to Claim 7;

wherein said slope member is formed unitarily with said body.

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- (9) The disk drive unit according to Claim 7;  
wherein said unit further includes:  
a loading member for loading said disk drive unit in said computer apparatus; and  
said slope member is formed at said loading member.
- (10) The disk drive unit according to Claim 7;  
said disk drive unit is fixed to said computer by a fastening force of a screw; and  
said body or said loading member has a screw hole through which said screw goes  
in a direction parallel to said plane direction of said body.
- (11) A loading member for enabling a disk drive unit to be loaded in a slot formed in a  
housing of a computer apparatus, comprising:  
a fixing member to be fixed to said disk drive unit;  
a slope member having a slope inclined in one direction for loading said disk drive  
unit; and  
a gripping member to be gripped when said disk drive unit is being loaded in said  
slot.
- (12) A computer housing having a slot in which a disk drive unit is to be loaded,  
comprising:  
a loading hole formed at said slot;  
an upper wall and/or a lower wall for partitioning said slot; and  
a slope member disposed in said slot and having a slope inclined in a loading  
direction from said loading hole.