

DESCRIPTION

STORAGE UNIT AND INFORMATION PROCESSING APPARATUS

5 TECHNICAL FIELD

[0001] Embodiments of the present invention relate generally to a storage unit and an information processing apparatus.

10 BACKGROUND ART

[0002] Traditionally, storage units are known, which include a tray of a form corresponding to an outer shape of an auxiliary storage device complying with a first standard, to be able to house, in the tray, an auxiliary
15 storage device complying with a second standard smaller in size than the first-standard auxiliary storage device for usage.

CITATION LIST

20 Patent Literature

[0003] Patent Document 1: JP 2014-21996 A

SUMMARY OF INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

25 [0004] It is beneficial to improve such a storage unit to provide a storage unit with a novel structure and less inconvenience.

MEANS FOR SOLVING PROBLEM

30 [0005] According to one embodiment, provided is a storage unit installable in a slot of an information processing apparatus open in a first direction. The storage unit includes a tray, an auxiliary storage device,

and a relay connector. The tray has a form corresponding to an outer shape of an auxiliary storage device complying with a first standard. The auxiliary storage device complying with the first standard includes a connector and
5 is housed in the tray in a lateral posture that the connector faces a second direction intersecting the first direction. The relay connector includes a first connector connectable to the connector of the auxiliary storage device, and a second connector connectable to a connector
10 of the information processing apparatus, the connector of the information processing apparatus facing the first direction.

BRIEF DESCRIPTION OF DRAWINGS

15 [0006] FIG. 1 is an exemplary exploded perspective view of an information processing apparatus according to an embodiment;

FIG. 2 is an exemplary enlarged view of slots included in the information processing apparatus in an embodiment;

20 FIG. 3 is an exemplary exploded perspective view of a storage unit incorporating an auxiliary storage device complying with a first standard in an embodiment;

FIG. 4 is an exemplary exploded perspective view of a storage unit incorporating an auxiliary storage device
25 complying with a second standard in an embodiment;

FIG. 5 is an exemplary front view of the information processing apparatus according to an embodiment, with a storage unit, incorporating the auxiliary storage device complying with the second standard, installed in a slot;
30 and

FIG. 6 is an exemplary front view of the information processing apparatus according to an embodiment, with a storage unit, incorporating the auxiliary storage device

complying with the first standard, installed in a slot.

DESCRIPTION OF EMBODIMENTS

[0007] Hereinafter, exemplary embodiments of the present
5 invention will be disclosed. The features of the
embodiments described below, and the functions and effects
brought about by the features are merely exemplary. The
present invention is also attainable by features other than
those disclosed in the following embodiments. In addition,
10 the present invention can provide at least one of various
effects (including derivative effects) attained by the
features.

[0008] Throughout this specification, ordinal numbers
are used solely to distinguish components, members, parts
15 or portions, positions or locations, directions, and else,
and are not intended to indicate any order or priority.

[0009] Embodiment

FIG. 1 is an exploded perspective view of an
information processing apparatus 1 according to an
20 embodiment. In each of the drawings as below, three
mutually orthogonal directions are defined for the sake of
convenience. An X direction is along the depth (front to
rear) of the information processing apparatus 1, a Y
direction is along the lateral width (right to left) of the
25 information processing apparatus 1, and a Z direction is
along the longitudinal width (top to bottom) of the
information processing apparatus 1. The X direction is an
exemplary first direction, and the Y direction is an
exemplary second direction.

30 [0010] As illustrated in FIG. 1, the information
processing apparatus 1 is formed as a rack-mount industrial
computer and includes a housing 2 and a plurality of
storage units 10 and 20 installable in slots 3 of the

housing 2. The information processing apparatus 1 is not limited to this example, and it may be a desktop personal computer, a video display device, a television receiver, a game machine, or an information storage device, for example.

[0011] The housing 2 has a rectangular parallelepiped box shape having a shorter length in the Z direction. The housing 2 includes a bottom wall 2a, a top wall 2b, a front wall 2c, a rear wall 2d, a left wall 2e, and a right wall 2f. The bottom wall 2a is also referred to as a lower wall, and the top wall 2b is also referred to as an upper wall, for example. The front wall 2c, the rear wall 2d, the left wall 2e, and the right wall 2f are also referred to as sidewalls or peripheral walls, for example.

[0012] Both the bottom wall 2a and the top wall 2b extend in a direction (XY plane) orthogonal to the Z direction and are in parallel to each other with spacing in the Z direction. The bottom wall 2a forms a lower end of the housing 2. The top wall 2b forms an upper end of the housing 2. The bottom wall 2a may be provided with a rubber leg or legs that supports or support the housing 2 away from an installation surface such as a shelf, a desk, or a table.

[0013] Both the left wall 2e and the right wall 2f extend in a direction (XZ plane) orthogonal to the Y direction and are in parallel to each other with spacing in the Y direction. The left wall 2e extends between the ends of the bottom wall 2a and the top wall 2b in the Y direction. The right wall 2f extends between the ends of the bottom wall 2a and the top wall 2b in a direction opposite to the Y direction. The left wall 2e forms a left end of the housing 2, and the right wall 2f forms a right end of the housing 2.

[0014] Both the front wall 2c and the rear wall 2d extend in a direction (YZ plane) orthogonal to the X direction and are in parallel to each other with spacing in the X direction. The front wall 2c extends between the
5 ends of the bottom wall 2a and the top wall 2b in the X direction, and the rear wall 2d extends between the ends of the bottom wall 2a and the top wall 2b in a direction opposite to the X direction. The front wall 2c forms a front end of the housing 2, and the rear wall 2d forms a
10 rear end of the housing 2.

[0015] The front wall 2c is provided with a plurality of slots 3 open in the X direction. In the present embodiment, in the Z direction of the front wall 2c, two slots 3 are arrayed closer to the left wall 2e and another
15 two slots 3 are arrayed closer to the right wall 2f with respect to the center in the Y direction. The storage units 10 and 20 are detachably installed in the slots 3 individually.

[0016] In the present embodiment the storage unit 10
20 incorporates a 3.5-inch hard disk drive (HDD) device 11 while the storage unit 20 incorporates two 2.5-inch solid state drive (SSD) devices 21. In the present embodiment, the two storage units 10 and 20 incorporating the HDD device 11 and the SSD devices 21 complying with different
25 standards can be selectively installed and used in the same slots 3.

[0017] That is, the slots 3 can be commonly used for the storage unit 10 and the storage unit 20. Further, in the present embodiment, owing to the slots 3 as configured
30 above, the information processing apparatus 1 can have a combination of the storage units 10 and 20 complying with different standards installed therein. The HDD device 11 is an exemplary auxiliary storage device complying with the

first standard. The SSD device 21 is an exemplary auxiliary storage device complying with the second standard. The slots 3 are also referred to as bays, inlets, or housing units, for example.

5 [0018] Hereinafter, the storage units 10 and 20 and the slots 3 that can exert the above effects will be described in more detail. FIG. 2 is an enlarged view of the slots 3. As illustrated in FIG. 2, the slots 3 include a slot holder 31, guide plates 32, and a backplane board 33.

10 [0019] The slot holder 31 has a substantially U-shape open in a direction opposite to the Z direction, when viewed from the X direction. The slot holder 31 covers (partitions) both Y-directional sides of the slots 3, and covers the slots 3 in the Z direction. The slot holder 31
15 is provided at the rear end with a pair of positioning protrusions 37 to be inserted into openings 33a in the backplane board 33.

[0020] The guide plates 32 extend in a direction (XY plane) orthogonal to the Z direction across the pair of
20 sidewalls of the slot holder 31. The guide plate 32 covers the slots 3 in a direction opposite to the Z direction, and partitions between the two slots 3 arrayed in the Z direction. The guide plates 32 are fixed to the slot holder 31 with a fastener such as screws or bolts.

25 [0021] The backplane board 33 extends in a direction (YZ plane) orthogonal to the X direction, and covers the slots 3 in a direction opposite to the X direction. A plurality of connectors 34 is mounted on the front surface of the backplane board 33. The connectors 34 are connectable to
30 connector 11a of the HDD device 11 or connectors 21a (see FIG. 1) of the SSD device 21 as described above. The connectors 34 are an exemplary connector facing the X direction in the information processing apparatus 1.

[0022] A plurality of LEDs 35 is mounted on the front surface of the backplane board 33. The LEDs 35 can display a communication state of the HDD device 11 connected to the connector 34 and a communication state of the SSD devices 21. With the openings 33a and the protrusions 37 correctly positioned to each other, the backplane board 33 becomes integrated with the slot holder 31 by fastening bolts penetrating through holes 33c and 38 with nuts, for example.

10 [0023] The backplane board 33 is further provided with a pair of openings 33b into which positioning pins 26 (see FIG. 4) of the storage unit 20 are inserted in the X direction, as described later. In the present embodiment the SSD devices 21 are inserted into the slots 28 of the storage unit 20 positioned with respect to the backplane board 33 in the Y direction and the Z direction. This results in preventing misalignment between the connectors 21a of the SSD devices 21 and the connectors 34 on the backplane board 33.

20 [0024] FIG. 3 is an exploded perspective view of the storage unit 10 incorporating the HDD device 11. As illustrated in FIG. 3, the storage unit 10 includes the HDD device 11, a tray 12, a substrate 13, relay connectors 14, an LED 15, an optical guide member 16, a holder 17, and attachment frames 18 and 19.

[0025] The tray 12 includes a bottom wall 12a, a pair of end walls 12b, and a pair of sidewalls 12c, and has a form corresponding to the outer shape of the HDD device 11. The tray 12 is provided with a housing part 12r open in the Z direction and surrounded by the bottom wall 12a, the end walls 12b, and the sidewalls 12c. The housing part 12r accommodates, for example, the HDD device 11 integrated with the substrate 13 and the attachment frames 18 and 19

as well as the holder 17 integrated with the optical guide member 16.

[0026] The bottom wall 12a has a rectangular plate shape corresponding to the bottom surface of the HDD device 11.

5 The pair of end walls 12b protrudes in the Z direction from both Y-directional sides of the bottom wall 12a. The pair of sidewalls 12c protrudes in the Z direction from both X-directional sides of the bottom wall 12a. In the present embodiment, the tray 12 is inserted into the slot 3 in a
10 lateral posture that the short side (end walls 12b) of the bottom wall 12a lies in the X direction and the long side (sidewalls 12c) of the bottom wall 12a lies in the Y direction.

[0027] The substrate 13 is located between the HDD
15 device 11 and the bottom wall 12a. The relay connectors 14, the LED 15, wiring patterns (not illustrated), and else are mounted on the substrate 13. The wiring patterns include a wiring pattern that electrically connects a first connector 14a and a second connector 14b of the relay
20 connectors 14 and a wiring pattern that electrically connects the LED 15 and the second connector 14b. The substrate 13 is also referred to as a wiring board, for example.

[0028] The relay connectors 14 include the first
25 connector 14a, the second connector 14b, and a third connector 14c. The first connector 14a is located at a Y-directional end of the substrate 13. The first connector 14a is electrically and mechanically connectable to the connector 11a of the HDD device 11 facing the Y direction
30 while housed in the tray 12.

[0029] The second connector 14b is located at an end of the substrate 13 in a direction opposite to the X direction. The second connector 14b is electrically and

mechanically connectable to the connector 34 facing the X direction on the backplane board 33 described above. In the present embodiment, such wiring patterns between the relay connectors 14 and the substrate 13 serve to
5 electrically connect the connector 11a of the HDD device 11 and the connector 34 on the backplane board 33 facing different directions.

[0030] The third connector 14c is located at an end of the substrate 13 in a direction opposite to the X
10 direction, and is aligned with the second connector 14b in the Y direction. The third connector 14c is only mechanically connectable to the connector 34 on the backplane board 33. The third connector 14c is an anti-rattling connector, and is also referred to as a dummy
15 connector.

[0031] The LED 15 is located at an X-directional end of the substrate 13. In the present embodiment, a control unit included in the information processing apparatus 1 is configured to switch a light emitter from the LED 35 to the
20 LED 15 while the HDD device 11 and the backplane board 33 are electrically connected to each other via the relay connectors 14. That is, the LED 15 can display a communication state of the HDD device 11 connected to the connector 34.

[0032] The optical guide member 16 includes an optical inlet 16a, optical outlets 16b, and an optical guide 16c. The optical guide 16c is located between the holder 17 and the attachment frame 18, extending in the Z direction. The optical inlet 16a is located at a lower end of the optical
30 guide 16c. The optical inlet 16a is disposed to face the LED 15. Light from the LED 15 enters into the optical guide 16 from the optical inlet 16a and propagates toward an upper end of the optical guide 16c while being

repeatedly reflected inside the optical guide 16c.

[0033] The optical outlets 16b are located at the upper end of the optical guide 16c. The optical outlets 16b are disposed to be exposed from openings 17c of the holder 17 in the X direction. The optical outlets 16b can become luminous by the light from the LED 15 propagated to the upper end of the optical guide 16c. The optical outlets 16b can display the communication state of the HDD device 11 on a front surface 12c1 (see FIG. 6) of the tray 12.

10 The optical outlet 16b is also referred to as a light emitter, for example.

[0034] The holder 17 includes a side plate 17a and a projection 17b. The side plate 17a is located between the sidewall 12c of the tray 12 and the attachment frame 18, to cover a side surface of the HDD device 11 in the X direction. The side plate 17a is provided with the above-described openings 17c for holding the optical guide member 16, a vent, and else.

[0035] The projection 17b projects from a lower end of the side plate 17a toward the attachment frame 18, that is, in a direction opposite to the X direction. The projection 17b is overlaid on a vibration-proof rubber 5 (to be described later) of the attachment frame 18 in the Z direction. The holder 17 integrated with the optical guide member 16 and the sidewall 12c of the tray 12 are fixed to the attachment frame 18 with a fastener S2, such as screws or bolts, penetrating the side plate 17a in the X direction.

[0036] The attachment frame 18 includes a side plate 18a and a projection 18b. The side plate 18a is located between the HDD device 11 and the holder 17, to cover a side surface of the HDD device 11 in the X direction. The attachment frame 18 is fixed to the HDD device 11 with a

fastener S1 penetrating the side plate 18a in the X direction.

[0037] The projection 18b protrudes from a lower end of the side plate 18a toward the holder 17, that is, in the X direction. In the present embodiment a pair of vibration-proof rubbers 4 and 5 is provided on both sides of the projection 18b in the Z direction. The vibration-proof rubbers 4 and 5 can absorb vibration in the Z direction when applied to the attachment frame 18 and the HDD device 11.

[0038] In the present embodiment, the attachment frame 18 becomes integrated with the holder 17 and the tray 12 with the fastener S2 while the projection 18b is held between the pair of vibration-proof rubbers 4 and 5 and the bottom wall 12a of the tray 12, and the projection 17b of the holder 17. This results in restricting vibration or impact applied to the tray 12 from being transferred to the HDD device 11.

[0039] The attachment frame 19 includes a side plate 19a and an attachment tab 19b. The side plate 19a is located between the HDD device 11 and the sidewall 12c of the tray 12, to cover a side surface of the HDD device 11 in a direction opposite to the X direction. The attachment tab 19b extends from a lower end of the side plate 19a in the direction opposite to the X direction. The attachment frame 19 is fixed to the HDD device 11 with a fastener S3 penetrating the side plate 19a in the X direction, and fixed to the bottom wall 12a of the tray 12 with a fastener S4 penetrating the attachment tab 19b in the Z direction.

[0040] FIG. 4 is an exploded perspective view of the storage unit 20 incorporating the SSD devices 21. As illustrated in FIG. 4, the storage unit 20 includes the SSD devices 21, a tray 22, a top cover 23, guide members 24,

optical guide members 25, and the positioning pins 26.

Note that FIG. 4 omits showing the SSD devices 21 for the sake of convenience.

[0041] The tray 22 includes a bottom wall 22a, a pair of
5 end walls 22b, and a pair of sidewalls 22c, and has a form
corresponding to the outer shape of the HDD device 11.

That is, the tray 22 has substantially the same size as the
tray 12. The bottom wall 22a has a rectangular plate shape
corresponding to the bottom surface of the HDD device 11.

10 The pair of end walls 22b protrudes in the Z direction from
both Y-direction sides of the bottom wall 22a. The pair of
sidewalls 22c protrudes in the Z direction from both X-
directional sides of the bottom wall 22a.

[0042] In the present embodiment, the tray 22 is
15 inserted into the slot 3 in a posture that the short side
(end wall 22b) of the bottom wall 22a lies in the X
direction and the long side (sidewall 22c) of the bottom
wall 22a lies in the Y direction. One of the sidewalls 22c
is provided with an opening end of the slots 28 open in the
20 X direction. The tray 22 is provided with two slots 28
juxtaposed in the Y direction. The SSD devices 21 are
individually inserted into the slots 28.

[0043] The guide members 24 are provided for the
corresponding slots 28. Each guide member 24 covers
25 (partition) both respective sides of the slot 28 in the Y
direction and in the Z direction. The guide member 24 is
fixed to the tray 22 with a fastener such as screws or
bolts. The guide member 24 slidably supports the SSD
device 21 inserted in the slot 28 in the X direction. The
30 guide member 24 is also referred to as a rail member, for
example.

[0044] Each optical guide member 25 includes optical
inlets 25a, optical outlets 25b, and optical guides 25c.

The optical guides 25c are located between the guide members 24 and the top cover 23, extending in the X direction. The optical inlets 25a are located at a rear end of the optical guides 25c. The optical inlets 25a are disposed to face the LED 35 of the backplane board 33 described above. Light from the LED 35 enters into the optical guides 25c from the optical inlets 25a and propagates toward the front end of the optical guides 25c while being repeatedly reflected inside the optical guides 25c.

[0045] The optical outlets 25b are located at the front end of the optical guides 25c. The optical outlets 25b are disposed to be exposed from the sidewall 22c of the tray 22 in the X direction. The optical outlets 25b can become luminous by the light from the LED 35 propagated to the front end of the optical guides 25c. The optical outlets 25b can display the communication state of the SSD devices 21 on a front surface 22c1 of the tray 22. The optical outlets 25b are also referred to as a light emitter, for example.

[0046] The top cover 23 is parallel to the bottom wall 22a of the tray 22, to cover a side of the optical guide members 25 opposite to the guide members 24, that is, from the Z direction. The top cover 23 is fixed to the guide members 24 with a fastener S7 such as screws or bolts.

[0047] The positioning pins 26 protrude from the sidewall 22c of the tray 22 in a direction opposite to the X direction. The sidewall 22c of the tray 22 is provided with the two positioning pins 26 aligned in the Y direction. The positioning pins 26 are inserted into the openings 33b of the above-described backplane board 33 and positioned with respect to the backplane board 33 in the Y direction and the Z direction.

[0048] FIG. 5 is a front view of the information processing apparatus 1, with the storage unit 20 incorporating the SSD devices 21 installed in the slot 3.

FIG. 6 is a front view of the information processing
5 apparatus 1, with the storage unit 10 incorporating the HDD device 11 installed in the slot 3.

[0049] As illustrated in FIG. 5, the storage unit 20 is fixed to the front wall 2c with a fastener S6 such as screws or bolts penetrating the sidewall 22c of the tray 22
10 in the X direction. As illustrated in FIG. 6, the storage unit 10 is fixed to the front wall 2c with a knurled screw S5 penetrating the sidewall 12c of the tray 12 in the X direction.

[0050] In the present embodiment, owing to the optical
15 guide members 25 described above, the storage unit 20 can display a light emission pattern of the LED 35 on the front surface 22c1 of the tray 22 located away from the LED 35. In addition, owing to the optical guide member 16 described above, the storage unit 10 can display a light emission
20 pattern of the LED 15 on the front surface 12c1 of the tray 12 located away from the LED 15.

[0051] In the present embodiment the optical guide members 25 and 16 are configured such that the positions of the optical outlets 25b and 16b are substantially the same,
25 when the storage unit 20 is fitted in the slot 3 and when the storage unit 10 is fitted in the slot 3. The positions refers to positions of the optical outlets 25b and 16b in the Z direction or in the Y direction.

[0052] Further, in the present embodiment the front wall
30 2c is provided with marks 7 for identifying the two storage units 10 and 20 fitted in the slots 3. The marks 7 are located on both sides of the storage units 10 and 20 in the Y direction. Specifically, the front wall 2c is provided

with the plurality of marks 7 arranged in the Y direction. The marks 7 are represented by numbers and characters, for example.

[0053] In the present embodiment, while the storage unit
5 20 is fitted in the slot 3 (see FIG. 5), the marks 7 are not hidden by the sidewall 22c of the tray 22 but exposed in the X direction. However, while the storage unit 10 is fitted in the slot 3 (see FIG. 6), one of the marks 7 is hidden by a cover 12d disposed on the sidewall 12c of the
10 tray 12.

[0054] Thus, according to the present embodiment the storage units 10 and 20 can be easily identified by the marks 7 one of which is hidden or not hidden depending on the storage unit 10 or 20 fitted in the slot 3. In
15 addition, the number of the marks 7 correspond to the number of the HDD devices 11 and/or the SSD devices 21, so that the number of the marks 7 can indicate the number of auxiliary storage devices (the HDD devices 11 and/or the SSD devices 21) installed in the information processing
20 apparatus 1.

[0055] In the present embodiment as described above, the storage unit 10 includes the tray 12 having a form corresponding to the outer shape of the HDD device 11 (auxiliary storage device) complying with the first
25 standard; the HDD device 11 complying with the first standard including the connector 11a and being housed in the tray 12 in a lateral posture that the connector 11a faces the Y direction (second direction) intersecting the X direction (first direction); and the relay connector 14
30 including the first connector 14a connectable to the connector 11a of the HDD device 11 and the second connector 14b connectable to the connector 34, facing the X direction, of the information processing apparatus 1.

[0056] With such a configuration, it is possible to provide the storage unit 10 which incorporates the HDD device 11 complying with the first standard in a lateral posture and is selectively installable in the slot 3 of the information processing apparatus 1.

[0057] In the present embodiment, the storage unit 20 includes the tray 22 having a form corresponding to the outer shape of the HDD device 11 (auxiliary storage device) complying with the first standard, and the plurality of SSD devices 21 (auxiliary storage devices) complying with the second standard smaller in size than the HDD device 11 complying with the first standard. The SSD devices are housed side by side in the tray 22 in the Y direction (second direction) intersecting the X direction (first direction), such that their respective connectors 21a are connectable to the connectors 34, facing the X direction, of the information processing apparatus 1.

[0058] With such a configuration, it is possible to provide the storage unit 20 which incorporates, side by side, the plurality of SSD devices 21 complying with the second standard and is selectively installable in the slot 3 of the information processing apparatus 1.

[0059] Furthermore, in the present embodiment the information processing apparatus 1 is provided with the slots 3 to be commonly used for the storage unit 10 and the storage unit 20.

[0060] With such a configuration, it is possible to provide the information processing apparatus 1 which can have multiple storage units 10 and 20 incorporating the HDD device 11 and the SSD devices 21 complying with different standards selectively installed and used in the same slots 3.

[0061] While certain embodiments of the present

invention have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. These embodiments may be embodied in a variety of other forms, and various

5 omissions, substitutions, combinations, and changes may be made without departing from the spirit of the inventions.

The accompanying claims and their equivalents are intended to cover these embodiments or modifications thereof as would fall within the scope and spirit of the inventions.

10 In addition, specifications (such as structure, type, direction, form, size, length, width, thickness, height, number, arrangement, position, material) of each element, shape, and the like can be changed for implementation, when appropriate.

15

CLAIMS

1. A storage unit installable in a slot of an information processing apparatus open in a first direction, the storage unit comprising:

5 a tray having a form corresponding to an outer shape of an auxiliary storage device complying with a first standard;

the auxiliary storage device complying with the first standard, including a connector and being housed in the
10 tray in a lateral posture that the connector faces the second direction intersecting the first direction; and

a relay connector including

a first connector connectable to the connector of the auxiliary storage device, and

15 a second connector connectable to a connector of the information processing apparatus, the connector of the information processing apparatus facing the first direction.

20 2. A storage unit installable to a slot of an information processing apparatus open in a first direction, the storage unit comprising:

a tray having a form corresponding to an outer shape of an auxiliary storage device complying with a first
25 standard; and

a plurality of auxiliary storage devices complying with a second standard, each of which includes a connector and is smaller in size than the auxiliary storage device complying with the first standard, the auxiliary storage
30 devices being housed side by side in the tray in a second direction intersecting the first direction such that the connectors are connectable to connectors, facing the first direction, of the information processing apparatus.

3. An information processing apparatus comprising:
the slot to be commonly used for the storage unit
according to claim 1 and the storage unit according to
5 claim 2.