

DESCRIPTION

ELECTRONIC DEVICE

FIELD

[0001] An embodiment of the present invention relates generally to an electronic device.

BACKGROUND

[0002] Conventionally, electronic devices are known, which include a housing containing heat generating components such as a central processing unit and an auxiliary storage, a fan attached to the housing, and a louver (a guide member) contained in the housing to guide cooling air from the fan to the heat generating components.

CITATION LIST

Patent Literature

[0003] Patent Literature 1: JP 11-177265 A

SUMMARY OF THE INVENTION

Problem to be Solved by the Invention

[0004] It is beneficial to provide such a type of electronic device with a novel, improved configuration and less inconvenience.

Means for Solving Problem

[0005] An electronic device of an embodiment includes a housing, a fan, a central processing unit, a heatsink, auxiliary storage, and a guide member. The housing including a first outer wall provided with an air inlet. The fan which is attached to the first outer wall, and blows air into the housing from the air inlet. The central

processing unit which is contained in the housing and aligned with the fan in a first direction intersecting with the first outer wall. The heatsink attached to a first face of the central processing unit. The auxiliary storage which is contained in the housing and aligned with the central processing unit in a second direction intersecting with the first direction. The guide member which is contained in the housing and aligned with the fan in the first direction, the guide member includes a first guide and a second guide. The first guide including a first bottom wall and two first lateral walls, the first bottom wall which covers a side of the heatsink opposite the first face, the first lateral walls which protrude toward the first face from the first bottom wall, to cover both sides of the heatsink in the second direction, and define a first air passage that extends from a location facing the fan to a side of the heatsink opposite the fan. The second guide including two second lateral walls which face each other with spacing on a side of the first bottom wall opposite the first lateral walls, the second lateral walls extending in a direction intersecting with the first bottom wall, and defining a second air passage which crookedly extends from the location facing the fan to a location facing the auxiliary storage.

#### BRIEF DESCRIPTION OF DRAWINGS

[0006] FIG. 1 is an exemplary and schematic plan view of an electronic device of one embodiment.

FIG. 2 is an exemplary and schematic exploded perspective view of a guide member of the electronic device of one embodiment.

FIG. 3 is a YZ-sectional view of the guide member of the electronic device of one embodiment.

FIG. 4 is an XZ-sectional view of the guide member of the electronic device of one embodiment.

#### DETAILED DESCRIPTION

[0007] Hereinafter, an exemplary embodiment of the present invention will be disclosed. The configuration of the embodiment described below and actions and effects attained by the configuration are merely exemplary. In the specification, ordinal numbers are used to distinguish components and members alone and not intended to indicate order or priority.

[0008] FIG. 1 is an exemplary and schematic plan view of an electronic device 1. In the following drawings, three directions orthogonal to one another are defined for the sake of simplicity. An X direction is along the depth (length) of a housing 3 and a guide member 2, a Y direction is along the width (lateral) of the housing 3 and the guide member 2, and a Z direction is along the height (thickness) of the housing 3 and the guide member 2. The X direction is an example of a first direction, the Y direction is an example of a second direction. In the following description, positive sides (the tip end side of the arrow) in the X direction, the Y direction, and the Z direction will be referred to X direction, Y direction, and Z direction, and negative sides will be referred to as the other X direction, the other Y direction, and the other Z direction.

[0009] As illustrated in FIG. 1, the electronic device 1 includes the housing 3, the guide member 2, a fan unit 4, a substrate 5, an auxiliary storage 6, a power unit 7, a redundant arrays of inexpensive disks (RAID) module 11, an expansion module 15, and an external storage 16. The electronic device 1 represents a rack-mountable industrial

computer. The electronic device 1 is not limited to such an example, and can be configured as various electronic devices 1, such as a desktop personal computer, a video display device, a television receiver, a game machine, a video display control device, and an information storage device.

[0010] The housing 3 has a flat rectangular parallelepiped box shape in the Z direction. The housing 3 includes a plurality of walls such as a bottom wall 3a, a top wall 3b (see FIG. 3), a front wall 3c, a left wall 3d, a rear wall 3e, and a right wall 3f.

[0011] Both of the bottom wall 3a and the top wall 3b extend in a direction (XY plane) orthogonal to the Z direction, and are spaced apart from each other in parallel in the Z direction. The bottom wall 3a is provided with a support for supporting the housing 3 with spacing from a mount such as a shelf, a desk, and a table (not illustrated). The top wall 3b covers the inside of the housing 3 surrounded by the bottom wall 3a, the front wall 3c, the left wall 3d, the rear wall 3e, and the right wall 3f.

[0012] Both of the front wall 3c and the rear wall 3e extend in a direction (YZ plane) orthogonal to the X direction, and are spaced apart from each other in parallel in the X direction. The front wall 3c extends between the ends of the bottom wall 3a and the top wall 3b in the other X direction. The rear wall 3e extends between the ends of the bottom wall 3a and the top wall 3b in the X direction. The front wall 3c is provided with an air inlet 3r. The air inlet 3r is located in part of the front wall 3c in the other Y direction, that is, close to the left wall 3d, and penetrates through the front wall 3c in the X direction. The front wall 3c is an example of a first outer wall.

[0013] The front wall 3c is also provided, on a Y-directional side, that is, oppositely to the air inlet 3r, with a plurality of openings which exposes the ends of the auxiliary storage 6 and the external storage 16 in the other X direction. The openings are aligned in parallel with each other with spacing in the Z direction. The auxiliary storage 6 and the external storage 16 are fixed to the front wall 3c while inserted into the openings.

[0014] The rear wall 3e is provided with a plurality of air outlets 3k. The air outlets 3k are aligned with heat generating components including the RAID module 11, heatsinks 9 and 14 and a power-circuit component 10 mounted on the substrate 5, the expansion module 15, and the power unit 7 in the X direction. The air outlets 3k can discharge flows of air from the fan unit 4 after heat exchange with the heat generating components, as described below.

[0015] Both of the left wall 3d and the right wall 3f extend in a direction (XZ plane) orthogonal to the Y direction, and are spaced apart from each other in parallel in the Y direction. The left wall 3d extends between the ends of the bottom wall 3a and of the top wall 3b in the other Y direction. The right wall 3f extends between the ends of the bottom wall 3a and of the top wall 3b in the Y direction. The left wall 3d extends between the ends of the front wall 3c and of the rear wall 3e in the other Y direction. The right wall 3f extends between the ends of the front wall 3c and of the rear wall 3e in the Y direction. The left wall 3d is an example of a second outer wall.

[0016] The fan unit 4 is attached to the inside of the front wall 3c. The fan unit 4 is fixed to the front wall 3c while inserted into the air inlet 3r. The fan unit 4

includes a fan 41 which is rotatable around a rotational axis extending in the X direction. The fan 41 is a suction fan which sucks the air (ambient air) from outside to inside the housing 3. The fan unit 4 is not limited to such an example, and may be attached to the outside of the front wall 3c.

[0017] The substrate 5 is located on a side of the housing 3 in the other Y direction. The substrate 5 is aligned with the air inlet 3r and the fan 41 in the X direction. The substrate 5 extends in parallel to the bottom wall 3a and has a long rectangular plate shape in the X direction. The substrate 5 includes a top face 5a parallel to and opposite to the bottom wall 3a. The substrate 5 can be also referred to as a main substrate, a first substrate, a circuit substrate, or a control substrate.

[0018] Electronic components including a central processing unit 8, the power-circuit component 10, and a platform controller hub (PCH) 13 are mounted on the top face 5a of the substrate 5. The wiring in the substrate 5 and the electronic components constitute a control circuit of the electronic device 1.

[0019] The central processing unit 8 includes a top face 8a parallel to the top face 5a of the substrate 5, opposite to the substrate 5. The heatsink 9 is attached onto the top face 8a of the central processing unit 8. The central processing unit 8 and the heatsink 9 are aligned with the fan 41 in the X direction. In addition, the central processing unit 8 and the heatsink 9 are separated from the fan 41 in the X direction. The heatsink 9 includes a plurality of fins which is juxtaposed with a gap in the X direction and the Y direction. The top face 8a is an example of a first face.

[0020] The PCH 13 is also aligned with the fan 41 in the X direction. The PCH 13 is separated further from the fan 41 than the central processing unit 8 and the heatsink 9 in the X direction. The power-circuit component 10 is located close to the central processing unit 8 and the heatsink 9 in the Y direction.

[0021] The guide member 2 is fixed to the substrate 5 or the housing 3 to cover the heatsink 9 from the opposite side of the top face 8a of the central processing unit 8, that is, from the Z direction. The guide member 2 is aligned with the auxiliary storage 6 in the other Y direction. The guide member 2 is configured to be able to split cooling air from the fan 41 at least into a first airflow W1 to the heatsink 9, a second airflow W2 to the auxiliary storage 6, and a third airflow W3 to the power-circuit component 10 (see FIG. 3).

[0022] The auxiliary storage 6 is located on a side of the housing 3 in the Y direction and in the other X direction. The auxiliary storage 6 is aligned with the central processing unit 8 and the heatsink 9 in the Y direction. The auxiliary storage 6 represents a hard disk drive (HDD) or a solid state drive (SSD), for example. In this embodiment, two auxiliary storages 6 are stacked with spacing in the Z direction. At least part of the second airflow W2 is discharged through the gap between the two auxiliary storages 6 to the outside of the housing 3 from air outlets on flange-like exposed faces of the auxiliary storages 6. The exposed faces are exposed from the front wall 3c. In this embodiment, the auxiliary storages 6 are located close to the front wall 3c on the Y-directional side of the substrate 5, but may be located on the opposite side of the substrate 5 near the front wall 3c, on the Y-direction side close to the rear wall 3e, or on the other

Y-direction side near the rear wall 3e.

[0023] The external storage 16 is stacked over the auxiliary storage 6 with spacing in the Z direction. The external storage 16 represents an optical disk drive (ODD), for example. At least part of the second airflow W2 is discharged from the front wall 3c through the gap between the external storage 16 and the auxiliary storage 6.

[0024] The RAID module 11 is located on one side of the housing 3 in the other Y direction and in the X direction. The RAID module 11 is aligned with at least a part of the fan 41 (end in the other Y direction) in the X direction. The RAID module 11 includes a substrate 11a which is disposed in parallel to the left wall 3d with a gap. As obvious from FIG. 1, the substrate 11a partitions the space in the housing 3 between the bottom wall 3a and the top wall 3b in the Y direction.

[0025] The RAID module 11 includes a controller 11b on a face 11a1 of the substrate 11a, facing the left wall 3d. The RAID module 11 also includes a heatsink 11c on the opposite side of the substrate 11a relative to the controller 11b. The substrate 11a can be also referred to as a sub-substrate or a second substrate.

[0026] The power unit 7 is located on one side of the housing 3 in the Y direction and in the X direction. The power unit 7 is aligned with the auxiliary storages 6 in the X direction, and aligned with the substrate 5 in the Y direction. The power unit 7 includes a fan unit 71. In this embodiment, a fan 72 of the fan unit 71 suctions at least part of the second airflow W2 into the power unit 7 and produces an airflow to be discharged from a side of the power unit 7 in the X direction.

[0027] FIG. 2 is an exploded perspective view of the guide member 2. As illustrated in FIG. 2, the guide member

2 includes a bottom guide 21 and a top guide 22. The top guide 22 is located above the bottom guide 21 in the Z direction. The bottom guide 21 is provided with hook elements 21f that protrudes in the Z direction, while the top guide 22 is provided with openings 22r into which the hook elements 21f are inserted. The bottom guide 21 and the top guide 22 are detachably coupled to each other by snap fitting, that is, hooking between hooks 21f2 of the hook elements 21f and edges 22r1 of the openings 22r. The bottom guide 21 is an example of a first guide, and the top guide 22 is an example of a second guide.

[0028] The bottom guide 21 includes a bottom wall 21a, lateral walls 21b and 21c, wiring retainers 21d, the hook element 21f, and an attachment tab 21g. The bottom wall 21a covers one Z-direction side of the heatsink 9 (refer to FIG. 3), that is, opposite to the top face 8a of the central processing unit 8. The bottom wall 21a is approximately parallel to one Z-directional (XY plane) end face of the heatsink 9. The bottom wall 21a is an example of a first bottom wall, and will be also referred to as a top wall or a first cover.

[0029] The lateral walls 21b and 21c protrude from the bottom wall 21a in the other Z direction, that is, toward the top face 8a of the central processing unit 8, to cover both Y-directional sides of the heatsink 9 (see FIG. 3). The lateral walls 21b and 21c are approximately parallel to each other with spacing in the Y direction. In addition, the lateral walls 21b and 21c are approximately parallel to both Y-directional (XZ plane) end faces of the heatsink 9. The lateral walls 21b and 21c and the bottom wall 21a define a first passage P1 of the guide member 2. The lateral walls 21b and 21c are an example of first lateral walls, and will be also referred to as second covers. The

first passage P1 will be also referred to as a lower passage. The lateral walls 21b and 21c are gradually inclined away from each other in the Y direction while extending in the other Z direction. In this embodiment, due to such a structure (shape), the insertability of the heatsink 9 into the first passage P1 is enhanced.

[0030] As illustrated in FIG. 2, the bottom wall 21a is provided with a plurality of recesses 21r and 21s. Each of the recesses 21r and 21s is opened in the Z direction and is recessed in the other Z direction. The recess 21r is located at a center of the bottom wall 21a in the Y direction. The recess 21r extends from the other end toward one end of the bottom wall 21a in the X direction. The recess 21s is located next to the recess 21r in the X direction, extending between the lateral wall 21b and one X-directional end of the recess 21r. The recess 21s is deeper than the recess 21r.

[0031] The wiring retainers 21d are placed in two corners of the bottom wall 21a in the other X direction. Each of the wiring retainers 21d is rotatably supported through a rotational shaft 21e that extends from the bottom wall 21a in the Z direction. That is, the mounting angle of the wiring retainers 21d is adjustable around the rotation shafts 21e. The wiring retainers 21d can hold, in attitude to intersect the rotational shafts 21e, wiring via which the auxiliary storage 6 and the RAID module 11 are electrically connected together.

[0032] The hook elements 21f are located on both Y-direction sides of the bottom wall 21a, placing the recess 21r in-between them. Each of the hook elements 21f includes a protrusion 21f1 and a hook 21f2. The protrusion 21f1 protrudes from the bottom wall 21a in the Z direction. The hooks 21f2 protrude toward each other from an opposite

end of the protrusion 21f1 relative to the bottom wall 21a, that is, from a location away from the bottom wall 21a.

The hook elements 21f will be also referred to as first hooks, and the hooks 21f2 will be also referred to as tabs.

[0033] The attachment tabs 21g are placed in three of the four corners of the lateral walls 21b and 21c of the bottom guide 21, except for one corner in the Y direction and the other X direction. The attachment tabs 21g protrude from the lateral walls 21b and 21c. The attachment tabs 21g are each provided with bosses 21h into which fasteners such as screws are inserted. By inserting the fasteners through the three bosses 21h and coupling them to the substrate 5, the bottom guide 21 is attached to the housing 3. The attachment tabs 21g are not limited to such an example, and may be provided in the four corners or two diagonal ones of the four corners of the bottom guide 21.

[0034] The top guide 22 includes a bottom wall 22a, lateral walls 22b and 22c, a deflector 22g, and a protruding wall 22h. The bottom wall 22a is placed on one Z-direction side of the bottom wall 21a of the bottom guide 21, that is, opposite to the lateral walls 21b and 21c. The bottom wall 22a extends approximately in parallel to the bottom wall 21a (XY plane). The bottom wall 22a is bent in the Y direction to approach the auxiliary storage 6 from the other end to one end in the X direction. The bottom wall 22a is an example of a second bottom wall, and will be also referred to as a lower wall. The top guide 22 is not limited to such an example, and the bottom wall 22a may be placed on one or both of Z-directional sides of the lateral walls 22b and 22c, opposite to the bottom wall 21a.

[0035] In addition, the bottom wall 22a includes a contact region 22a1 and a separated region 22a2. Of the

bottom wall 22a, the contact region 22a1 is a region (part) in contact with the bottom wall 21a, and the separated region 22a2 is a region (part) with a gap 30 with the bottom wall 21a defined by the recesses 21r and 21s. The gap 30 forms a first section P31 being part of a third passage P3 of the guide member 2. The first section P31 is surrounded by the bottom wall 21a and the bottom wall 22a, and extends approximately in L-form between an inlet end 30a facing the fan 41 and an outlet end 30b facing the protruding wall 22h. The third passage P3 will be also referred to as an intermediate passage.

[0036] The contact region 22a1 of the bottom wall 22a is provided with two openings 22r through which the protrusions 21f1 of the hook elements 21f are inserted. The edges 22r1 of the openings 22r include steps slightly protruding from the bottom wall 22a in the Z direction. In this embodiment, the steps are elastically deformed and hooked by the hooks 21f2 to restrict the top guide 22 from relatively moving (such as a backlash) with respect to the bottom guide 21 due to vibration, for example.

[0037] The lateral walls 22b and 22c protrude from an end (side) of the bottom wall 22a in the Z direction, and face each other with spacing. The lateral walls 22b and 22c crookedly extend in the Y direction along the bottom wall 22a from an inlet end 22x facing the fan 41 to an outlet end 22y facing the auxiliary storages 6. The lateral walls 22b and 22c and the bottom wall 22a define a second passage P2 of the guide member 2. The lateral walls 22b and 22c are an example of second lateral walls. The second passage P2 will be also referred to as an upper passage.

[0038] The deflector 22g is located close to the outlet end 22y of the second passage P2. The deflector 22g

includes a plurality of fins which protrudes in the Z direction from the bottom wall 22a, and is juxtaposed with a gap in the X direction. In addition, the fins of the deflector 22g are inclined in the other X-direction from the opposite end to the outlet end 22y of the second passage P2. In this embodiment, due to such a configuration, the second airflow W2 ejected from the outlet end 22y is directed to a heat generating part of the auxiliary storages 6.

[0039] The protruding wall 22h protrudes from the bottom wall 22a in the other Z direction, that is, toward the power-circuit component 10 (see FIG. 3). The protruding wall 22h is located on the opposite side of the bottom wall 22a relative to the deflector 22g. The protruding wall 22h has an approximately U-shape with an XY-sectional face orthogonal to the Z direction opened toward the lateral wall 21b.

[0040] FIG. 3 is a YZ-sectional view of the guide member 2. As illustrated in FIG. 3, in this embodiment, the lateral wall 21b is covered with the protruding wall 22h with a gap 31 therebetween. The gap 31 faces the outlet end 30b of the first section P31. The gap 31 forms a second section P32 of the third passage P3. The second section P32 is communicated with the first section P31, and extends between an inlet end facing the outlet end 30b and an outlet end 22z facing the power-circuit component 10. According to this embodiment, thus, due to the third passage P3, the fan 41 can supply the cooling air (the third airflow W3) to the power-circuit component 10 by way of the first section P31 and the second section P32.

[0041] The guide member 2 is placed such that the lateral walls 21c and 22c of the lateral walls 21b, 21c, 22b, and 22c, the ones opposite the auxiliary storages 6,

or closer to the left wall 3d, are spaced apart from the left wall 3d. In this embodiment, with such a configuration, the left wall 3d and the lateral walls 21c and 22c define a fourth passage P4 in-between them. The fourth passage P4 extends in the X direction.

[0042] An inlet end of the fourth passage P4 (the lateral walls 21c and 22c) faces the fan 41 in the other Y direction. In other words, the guide member 2 is offset from the axis of the fan 41 in the Y direction. Because of this, the cooling air (fourth airflow) from the fan 41 flows into the fourth passage P4, cooling the heatsink 11c and the controller 11b of the RAID module 11 being heat generating components disposed in the fourth passage P4.

[0043] FIG. 4 is an XZ-sectional view of the guide member 2. As illustrated in FIG. 4, the heatsink 9 and the central processing unit 8 are contained in the first passage P1. The first passage P1 extends in the X direction between an inlet end 21x facing the fan 41 in the other Z direction and an outlet end 21y of the heatsink 9 opposite the fan 41. Thus, the first airflow W1 flows into the first passage P1 from the inlet end 21x and is discharged from the outlet end 21y by way of the heatsink 9 and the central processing unit 8, thereby cooling the heatsink 9 and the central processing unit 8.

[0044] While the guide member 2 is contained in the housing 3, the other Z- directional end of the first passage P1 is covered with the substrate 5 and the bottom wall 3a. Specifically, the first passage P1 is surrounded by the bottom wall 21a and the lateral walls 21b and 21c of the bottom guide 21, and the substrate 5. In this embodiment, such a configuration can prevent the first airflow W1 from leaking while flowing through the first passage P1, and enhance the cooling of the heatsink 9 and

the central processing unit 8 contained in the first passage P1.

[0045] In addition, the first passage P1 includes an inclined face 21k. The inclined face 21k is located on the opposite side of the bottom wall 21a relative to the recess 21s. The inclined face 21k is located closer to the fan 41 than a central position C of the heatsink 9 in the X direction. The inclined face 21k is inclined toward the heatsink 9 as being away from the fan 41 in the X direction. In this embodiment, such a configuration works to increase the flow rate of the first airflow W1 in the vicinity of the central position C of the heatsink 9. According to this embodiment, the cooling effect of the first airflow W1 can thus be improved in the vicinity of the central position C which most likely rises in temperature in the heatsink 9 and the central processing unit 8.

[0046] The second passage P2 crookedly extends from the inlet end 22x facing the fan 41 in the Z direction to the auxiliary storage 6. The Z-direction end of the second passage P2 is closed by the top wall 3b while the guide member 2 is contained in the housing 3. That is, the second passage P2 is surrounded by the bottom wall 22a and the lateral walls 22b and 22c of the top guide 22, and the top wall 3b. In this embodiment, such a configuration works to prevent the second airflow W2 from leaking while flowing through the second passage P2, and enhancing the cooling of the auxiliary storage 6 which is cooled by the fan 41 through the second passage P2. The top wall 3b is not limited to such an example, and may cover the second passage P2 with a gap with the lateral walls 22b and 22c.

[0047] As described above, in this embodiment, the guide member 2 includes the bottom guide 21 (first guide) including the bottom wall 21a (first bottom wall) that

covers a side of the heatsink 9 opposite the top face 8a (first face) of the central processing unit 8, and two lateral walls 21b and 21c (first lateral walls) which protrude from the bottom wall 21a toward the top face 8a to cover both sides of the heatsink 9 in the Y direction and define the first air passage P1 extending from a location facing the fan 41 to a side of the heatsink 9 opposite the fan 41; and the top guide 22 (second guide) including two lateral walls 22b and 22c (second lateral walls) which face each other with spacing on a side of the bottom wall 21a opposite the lateral walls 21b and 21c and extend in a direction intersecting with the bottom wall 21a, to define the second air passage P2 which crookedly extends from the location facing the fan 41 to a location facing the auxiliary storage 6. It is thus possible to attain the guide member 2 with such a configuration that can enhance the cooling of each of the heatsink 9 and the auxiliary storage 6 aligned with each other in the Y direction inside the housing 3. In addition, multiple electronic devices having different specifications such as the layout of each component can commonly use the bottom guide 21 or the top guide 22 of the guide member 2, which may result in reducing the time and cost required for manufacturing the electronic devices 1.

[0048] In this embodiment, the bottom guide 21 and the top guide 22 define the third air passage P3 that includes the first section P31 formed by the gap 30 between the bottom wall 21a and the separated region 22a2, and the second section P32 which is communicated with the first section P31 and formed by the gap 31 between the protruding wall 22h and the lateral wall 21b. The third air passage P3 extends from a location facing the fan 41 to a location facing the power-circuit component 10. Such a

configuration can ensure that the power-circuit component 10 is prevented from rising in temperature, compared with the one without the third passage P3. According to this embodiment, it is also possible to reduce the number of parts and components compared with the one including members which form passages in association with heat generators, leading to decreasing the manufacturing time and cost and downsizing the electronic device.

[0049] In addition, in this embodiment, the top guide 22 is provide with the openings 22r penetrating through the bottom wall 22a, while the bottom guide 21 includes the protrusions 21f1 which protrude from the bottom wall 21a and are inserted through the openings 22r, and the hooks 21f2 which are located on the protrusions 21f1 away from the bottom wall 21a and detachably catch the edges 22r1 of the openings 22r. According to such a configuration, the top guide 22 can be separated and detached from the bottom guide 21, which enables easier or smoother maintenance of the respective components of the housing 3. Specifically, while the heatsink 9 remains cooled by the cooling air from the fan 41 in the first passage P1 of the bottom guide 21, the maintenance of the other components can be conducted. Also, the operator can operate the snap fit from the opposite side of the bottom guide 21, to more easily detach the top guide 22 from the bottom guide 21.

[0050] In this embodiment, the bottom wall 21a includes the inclined face 21k which is located closer to the fan 41 than the central position C of the heatsink 9 in the X direction, and approaches the heatsink 9 as being away from the fan 41. With such a configuration, it is thus possible to increase the flow rate of the first airflow W1, flowing through the first passage P1, in the vicinity of the central position C of the heatsink 9. According to this

embodiment, thus, the cooling effect of the first airflow W1 can be enhanced in the vicinity of the central position C which most likely rises in temperature in the heatsink 9 and the central processing unit 8. In addition, guiding the cooling air, flowing along the bottom wall 21a in the first passage P1, to the heatsink 9 makes it possible to prevent the cooling air from passing through the first passage P1 without exchanging heat with the heatsink 9, resulting in more effectively cooling the heatsink 9 and the central processing unit 8.

[0051] In this embodiment, the guide member 2 is disposed such that the lateral wall 21c, closer to the left wall 3d (second outer wall), of the two lateral walls 21b and 21c is spaced apart from the left wall 3d, and the housing 3 is provided with the fourth air passage P4 which extends from the location facing the fan 41 in the X direction between the left wall 3d and the lateral wall 21c. Such a configuration can ensure prevention of a temperature rise of the RAID module 11 being a heat generating component placed in the fourth passage P4, compared with the one without the fourth passage P4. In addition, according to this embodiment, it is possible to reduce the number of parts and components compared with the one including members for forming passages in association with heat generators, which can lead to decreasing the manufacturing time and cost and downsizing the electronic device.

[0052] This embodiment has described the RAID module 11 as an exemplary object to be cooled in the fourth passage P4 but it is not limited to such an example, and the expansion module 15 may be cooled, for example. In addition, objects to be cooled in the second passage P2 may include the expansion module 15. Thus, objects to be

cooled in the first passage P1, the second passage P2, the third passage P3, and the fourth passage P4 of the guide member 2 are variously changeable according to the layout of the respective components.

[0053] 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, combinations, 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. The present invention can also be attained by a configuration other than the configuration disclosed in the embodiment described above, and can attain various effects (including derivative effects) obtained by a basic configuration (technical features). In addition, the specifications of each of the elements (structure, type, direction, shape, size, length, width, thickness, height, number, arrangement, position, material, and the like) can be suitably changed.

## CLAIMS

1. An electronic device, comprising:
  - a housing including a first outer wall provided with an air inlet;
  - a fan which is attached to the first outer wall, and blows air into the housing from the air inlet;
  - a central processing unit which is contained in the housing and aligned with the fan in a first direction intersecting with the first outer wall;
  - a heatsink attached to a first face of the central processing unit;
  - auxiliary storage which is contained in the housing and aligned with the central processing unit in a second direction intersecting with the first direction; and
  - a guide member which is contained in the housing and aligned with the fan in the first direction, wherein the guide member includes
    - a first guide including a first bottom wall and two first lateral walls, the first bottom wall which covers a side of the heatsink opposite the first face, the first lateral walls which protrude toward the first face from the first bottom wall, to cover both sides of the heatsink in the second direction, and define a first air passage that extends from a location facing the fan to a side of the heatsink opposite the fan, and
    - a second guide including two second lateral walls which face each other with spacing on a side of the first bottom wall opposite the first lateral walls, the second lateral walls extending in a direction intersecting with the first bottom wall, and defining a second air passage which crookedly extends from the location facing the fan to a location facing the auxiliary storage.

2. The electronic device according to claim 1, further comprising:

a power-circuit component which is contained in the housing and aligned with the central processing unit in the second direction, wherein

the second guide includes a second bottom wall and a protruding wall, the second bottom wall including a contact region and a separated region, the contact region which overlaps with the side of the first bottom wall opposite the first lateral walls and is in contact with the first bottom wall, the separated region located with a gap with the first bottom wall, the protruding wall which protrudes from the second bottom wall toward the power-circuit component, and

the first guide and the second guide form a third air passage which extends from the location facing the fan to a location facing the power-circuit component and which includes a first section and a second section, the first section being formed by a gap between the first bottom wall and the separated region, the second section which is communicated with the first section and is formed by a gap between the protruding wall and the first lateral walls.

3. The electronic device according to claim 2, wherein

the second guide is provided with an opening that penetrates through the second bottom wall, and

the first guide includes a protrusion and a hook, the protrusion which protrudes from the first bottom wall and is inserted through the opening, the hook which is located on the protrusion away from the first bottom wall and detachably catches an edge of the opening.

4. The electronic device according to any one of claims 1

to 3, wherein

the first bottom wall includes an inclined face, the inclined face which is located closer to the fan than a central position of the heatsink in the first direction, and approaches the heatsink as being away from the fan.

5. The electronic device according to any one of claims 1 to 4, wherein

the housing includes a second outer wall located on a side of the guide member opposite the auxiliary storage,

the guide member is disposed such that one of the two first lateral walls, the one closer to the second outer wall, is spaced apart from the second outer wall, and

the housing is provided with a fourth air passage between the second outer wall and the one of the first lateral walls, the fourth air passage extending from the location facing the fan in the first direction.