

DECLARATION OF Mayumi K. Johnson

I, Mayumi K. Johnson, pursuant to 28 U.S.C. § 1746, hereby declare as follows:

1. I am a freelance translator at TransPerfect, Inc.
2. I submit this declaration to certify the accuracy of the English translation of

JP2005051085A.

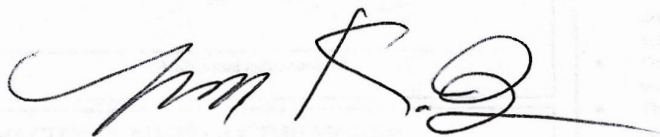
3. My statements are based on personal knowledge and my review of JP2005051085A and its Japanese into English translation.

4. JP2005051085A Translation is a true and accurate translation of JP2005051085A from Japanese into English.

5. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. Further, I am aware that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001. I declare under penalty of perjury that the foregoing is true and correct.

* * *

Executed on February 20, 2015 in the County of Monterey, State of California.



Mayumi K. Johnson

(19) **Japan Patent Office (J P)**

(12)Published Unexamined Patent Application (A)

(11) Patent Application
Publication Number

Unexamined Patent Application 2005-51085

(P2005-51085A)

(43) Date of Publication: **February 24, 2005 (2005.2.24)**

(51) Int.Cl. ⁷		F 1			Theme Code	(Reference)
HO5K	7/20	HO5K	7/20	H	5E322	
HO1L	23/467	HO1L	23/467	C	5F036	

Request for review: Not requested; Number of (37 pages in
claims: 5 OL total)

(21) Application Number	Patent Application 2003-282302 (P2003-282302)	(71) Applicant	000005223
(22) Date of Application	July 30, 2003 (7.30.2003)	(74) Agents	Fujitsu Co., Ltd. 4-1-1 Kamikodanaka, Nakahara-ku, Kawasaki-shi, Kanagawa-ken 100092152 Kiyoshi Hattori, Patent Attorney
		(72) Inventor	Yuji Hasegawa Fujitsu Co., Ltd., 4-1-1 Kamikodanaka, Nakahara-ku, Kawasaki-shi, Kanagawa-ken
		(72) Inventor	Akiyoshi Yamaguchi Fujitsu Co., Ltd., 4-1-1 Kamikodanaka, Nakahara-ku, Kawasaki-shi, Kanagawa-ken
		(72) Inventor	Kazuo Hirafuji Fujitsu Co., Ltd., 4-1-1 Uekodanaka, Nakahara-ku, Kawasaki-shi, Kanagawa-ken
Continue to the last page			

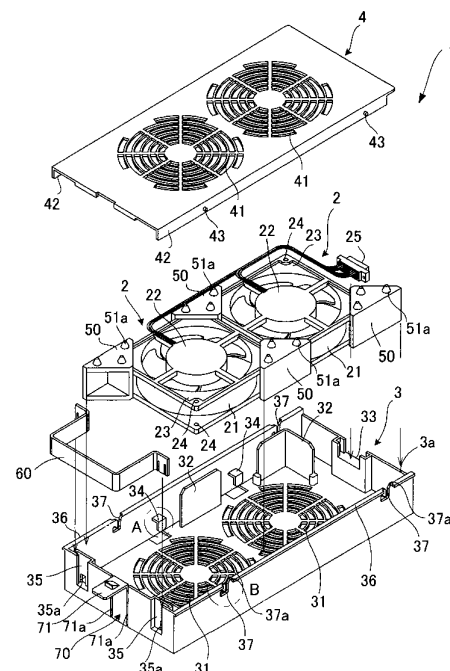
(54) **【Name of invention】** Air-cooling fan unit

(57)[Summary]

[Problem to be solved] This invention provides air-cooling fan units that are easy to handle and can improve maintainability and promote standardization of structures.

[Means to solve the problem] Air-cooling Fan Unit 1 comprises Locking Portion 70 that is oscillated by external forces. Locking Portion 70 is provided with Locking Means 72 and 73 corresponding to a position that abuts the opposing surface of Fan Unit Insertion Port 81 of Shelf 80, respectively. When Air-cooling Fan Unit 1 is removed from Shelf 80, only external force is applied to Collar Part 71 of Locking Portion 70 to shake it, and both of Locking Means 72 and 73 operate in the direction of leaving Shelf 80. Thus, this can be easily removed with a simple operation of pressing Collar Part 71, regardless of the side of the surfaces of Fan Unit Insertion Port 81 of Shelf 80, to which Air-cooling Fan Unit 1 is locked.

[Selection drawing] Figure 1



[Scope of Claims]

[Claim 1]

An air-cooling fan unit, wherein the air-cooling fan unit is mounted to a shelf containing electronics and forcing air through the shelf to cool the electronics;

wherein it is comprised of a fan that drives an internal rotor blade to produce a ventilating effect;

a casing supporting the aforementioned fan;

lattice-like finger guards, each of which is arranged to face the aforementioned rotor blades before and after an airflow path of the fan to face the aforementioned rotor blade;

a locking part consisting of a plate-like body resiliently provided to allow oscillation on a rear end side of the mounting direction to the shelf of the casing, having a collar portion for applying an external force in the oscillating direction to a portion of the plate-like body, and each of plural locking means provided in a position abutting an opposing surface of a fan unit insertion port of the shelf, the locking part being locked to the shelf via at least one of the locking means;

and

the aforementioned locking part is oscillated by the external force applied to the collar part, it is structured so that each of the aforementioned locking means is linked to this, leaving the aforementioned shelf.

10

[Claim 2]

An air-cooling fan unit, wherein it is mounted to a shelf containing an electronic device and forces air through the shelf to cool down the electronics;

it comprises a fan that drives an internal rotor blade to produce a ventilating effect;

a casing supporting the aforementioned fan;

lattice-like finger guards each of which is arranged to face the rotor blades before and after an airflow path of the aforementioned fan;

plural stud pins rotatably supporting, around an axis perpendicular to a longitudinal direction of the rotating pin, a rotating pin having a width narrower than a width of an axis-like body and a length greater than a width of the aforementioned body build in a slit portion provided at the tip end of the aforementioned body mounted within the casing; and

a lock bush having a through hole for inserting the tip end of the aforementioned stud pin including the aforementioned rotating pin; and a locking groove formed to transverse the through hole to lock the aforementioned through pin and be rotated through the through hole along its longitudinal direction; the lock bush being resiliently sandwiched between the fan and the finger guard by axially pressed and elastically deforming the stud pin toward its axis and

20

locking the aforementioned rotary pin in the locking groove.

30

[Claim 3]

An air-cooling fan unit mounted to a shelf containing electronics to force air through the shelf to cool the electronics;

wherein, the air-cooling fan unit is comprised of a fan that drives an internal rotor blade to produce a ventilating effect;

a pair of casings housed and supported to sandwich the aforementioned fan from a side; and

lattice-like finger guards each of which is arranged to face the rotor blades before and after an airflow path of the fan;

plural bushes circumferentially mounted on a side of the axial body with plural locking grooves locked to a portion of the finger guard and a through hole provided in the casing, respectively;

and

the air-cooling fan unit structured to secure the casing and the finger guards by locking each of the aforementioned bushes in a state a portion of the finger guards and a through hole in the casing are lined up.

40

[Claim 4]

An air-cooling fan unit mounted to a shelf containing electronics and forces air through the aforementioned shelf to cool down the electronics;

wherein the air-cooling fan unit is comprised of a fan that drives an internal rotor blade to create a ventilating effect;

50

casings that support the aforementioned fan and have lattice-like vents, each of which is arranged to face the rotor blades before and after a vent path of the fan; and
locking means each of which is provided in each casing in order to line up plural air-cooling fan units and secure them in parallel.

[Claim 5]

An air-cooling fan unit mounted to a shelf containing electronics and forces air through the shelf to cool down the electronics;

wherein the air-cooling fan unit is comprised of a fan that drives an internal rotor blade to produce a ventilating effect;

a casing having an opening for inserting the fan into the end face of a box-shaped body, containing and supporting the fan aforementioned and having a lattice-like vent arranged to face the rotor blade at a location for loading the fan; and

a cover arranged to cover an opening in the casing having a lattice-like vent arranged to face a rotor blade of the fan to open the opening by oscillating around an oscillating axis provided on one end side of the casing; and

an oscillating restraining means comprising a locking part provided between the cover and the casing, with the oscillating means prohibiting oscillating thereof

until the cover is raised to a certain level relative to the casing.

[Detailed description of the invention]

[Technical field]

[0001]

The present invention concerns the structure of an air-cooling fan unit mounted for cooling down electronics, more specifically, concerning an air-cooling fan unit for securing to a shelf an air-cooling fan forcing air through the shelf that contains electronic components.

[Background Technology]

[0002]

In recent years, power consumption has increased due to high-density mounting of communication equipment and other electronic devices, higher integration of LSI, etc., and higher output, and one of the measures to do so is to unitize air-cooling fans and implement them in electronic devices. Figure 37 is an exploded perspective view showing an example of such an air-cooling fan unit structure.

[0003]

As shown in the figure, Air-cooling Fan Unit 101 is unitized by surrounding Plural Fans 102 for air-cooling with plural materials. Specifically, after Fan 102 is coaxially mounted on a rectangular plate-shaped Base Material 103 having plural aperture holes of approximately the same diameter as the wing diameter of Fan 102, Front Panel 104 and Rear Panel 105 are mounted respectively, and a lattice-like Finger Guard 106 is mounted on each of Plural Fans 102. Then, Plural Screws 108 are inserted from above into the periphery of each Finger Guard 106, and the hole provided in the corner of each Fan 102 is inserted and threaded into the screw hole of the Base Material 103. As a result, Fan 2 is secured between the Finger Guard 106 and the Base Material 103 in an engaged state. In addition, Finger Guard 107 is threaded and secured via Screw 109 so as to cover the opening hole also on the lower surface of Base Material 103.

[0004]

Since the present invention was invented based on publicly known and publicly available technologies, literature on prior art may not be disclosed.

[Disclosure of the invention]

[Problems to solve by the invention]

[0005]

By the way, while there is a demand for manufacturing smaller and space-saving electronic equipment, high-cooling performance is sought after with the recent increase in high power consumption in recent years. Therefore, the percentage of cooling units containing the air-cooling fan units described above in the configuration of electronic equipment is about 10 to 20 %, resulting in the reduced mounting space for other units. This is a problem and is a major issue in the development of high-density mounting and weight reduction of electronic equipment.

[0006]

Under such circumstances, as the air-cooling fan mounting area is also be reduced due to high density mounting, etc., there are many cases in which maintainability is secured at the expense of replacing the air-cooling fan in the event of a failure, etc. However, in the case of high-heat heating devices in particular, a structure sought after is one that allows the replacement of the air-cooling fan that can be completed in a short amount of time in order to prevent temperature rise due to the failure of the air-cooling fan.

[0007]

Furthermore, in order to realize high-density mounting that comes with manufacturing smaller electronic equipment, manufacturing smaller air-cooling fan units is sought after. However, the position where the air-cooling fan unit is fixed is limited due to the small space in the conventional structures fixed by screws, and the structures need to be changed depending on the mounting conditions of the electronics. Thus, design changes have to be made each time, and it becomes necessary to manufacture multiple types of air-cooling fan units, creating problems such as increased manufacturing costs.

10

[0008]

The present invention is made taking these points into consideration, and is intended to provide air-cooling fan units that are easy to handle and capable of improving maintainability and promoting the standardization of structures.

[Means to solving the problems]

[0009]

In order to solve the above problems with the present invention, as shown in Figures 1 - 7, Air-cooling Fan Unit 1 is mounted on Shelf 80 containing electronic equipment to force air through Shelf 80 to cool down the electronic equipment; wherein the aforementioned Air-cooling Fan Unit 1 is comprised of Fan 2 that creates air by running the internal rotating blades; Casing 3 that supports the aforementioned Fan 2; lattice-like finger guards, each of which is arranged to face the rotor before and after the air path of Fan 2; Collar Part 71 for applying an oscillating external force to a portion of the plate-shaped body; plural Locking Means 72 and 73, and Locking Portion 70 that is locked to the aforementioned Shelf 80 with at least one of Locking Means 72 and 73; wherein the aforementioned Locking Means 72 and 73 are structured to break away from the aforementioned Shelf 80 when the aforementioned Locking Part 70 is oscillated by an external force applied to the Locked Part 70.

20

[0010]

“Finger guard” here is a concept that includes a finger guard actually having the shape of a finger guard as shown in Finger Guard 404 in Figure 20; and the portion of Air Vent 41, etc., provided as shown in Cover 4 in in Figure 1 having the function of a finger guard (hereinafter the same).

30

[0011]

In addition, Locking Means 72 and 73 of Locking Portion 70 may be of a shape that can fit into the locking part of the Shelf 80 side, regardless of its shape, whether it is convex or concave, etc. Also, either of these Locking Means 72 and 73 may be locked to the shelf or locked.

[0012]

In such Air-cooling Fan Unit 1, Locking Means 72 and 73 are respectively arranged corresponding to a position that abuts an opposing surface of the Fan Unit Inlet 81 when inserted into Fan Unit Inlet 81 of Shelf 80. Therefore, Air-cooling Fan Unit 1 can be locked, even if there is a locking part on either side of the opposite sides of Fan Unit Insertion Port 81 on the Shelf 80 side. In other words, Air-cooling Fan Unit 1 can be installed regardless of the shelf specifications.

40

[0013]

In addition, when removing Air-cooling Fan Unit 1 from Shelf 80, only external force is applied to Collar Part 71 of the Locking Portion 70 to shake, and both of Locking Means 72 and 73 operate in the direction of breaking away from Shelf 80. Thus, this can be easily removed with a simple operation of pressing Collar Part 71, regardless of which side of Fan Unit Insertion Port 81 of Shelf 80 the aforementioned Air-cooling Fan Unit 1 is locked.

[0014]

Again, the present invention provides air-cooling fan units comprised, in the air-cooling fan unit that is mounted on a shelf containing electronic devices and cooling down the electronic devices by forcing air through the aforementioned shelf, a fan to force air through the shelf by driving internal rotor blades; a casing that supports the aforementioned fan; lattice-like finger guards, each of which is arranged to face the rotor blades before and after the airflow path of the fan; and an axis-like body mounted inside the casing; plural stud pins that support rotating pins having a width that is narrower than the width of the body and a length that is greater than the width of the body in the slit portion provided at the tip portion of the body to support the rotator pins in the longitudinal direction and an axial direction perpendicular to the rotating pin; a through hole for inserting the tip of the stud pin including the rotating pin; a locking groove that is shaped to traverse the through hole to lock the rotating pin inserted through the through hole; and a lock bush resiliently sandwiching the fan and finger guard, in the space between the lock bush and the casing by locking the rotator pin to the locking groove, which is depressed toward the axis of the stud pin to be elastically deformed, and rotate around.

[0015]

Such an air-cooling fan unit can secure the casing, fan, and finger guard by pushing the rotator pin to lock it while rotating the lock bush toward the stud pin. They can also be separated by reversing the action. Therefore, tools used for assembly with screw, etc. are not required, and installation and removal can be made easily and quickly. In addition, due to the reaction force caused by the elasticity of the lock bush, these casings, fans, and finger guards can be secured stably.

[Effect of the invention]

[0016]

The air-cooling fan unit of the present invention provides locking means on both sides of the locking part abutting the opposite surface of the fan unit insertion port of the shelf, and the air-cooling fan unit can be installed regardless of the design of the shelf side, enabling the promotion of standardization.

[0017]

In addition, each locking means moves interlocked in the direction of breaking away using a simple operation of pressing the collar part of the locking part, and the air-cooling fan unit can be removed from the shelf with a single action, making its handling easier and maintenance easier.

[0018]

The air-cooling fan unit of the present invention can also be easily and quickly installed or removed from the casing, fan, and finger guard by working together with the stud pin and the lock bush. This improves the maintainability of the air-cooling fan unit.

[Best embodiment for implementing the invention]

[0019]

Embodiments of the present invention is described in detail below based on the drawings:

[1st embodiment]

An air-cooling fan unit according to the first embodiment is mounted to a shelf containing electronic device for forcing air through the shelf to cool down the electronics, and Figure 1 is an exploded perspective view showing a schematic configuration of the air-cooling fan unit.

[0020]

As shown in the figure, Air-cooling Fan Unit 1 is composed of two Fans 2 for ventilation, Casing 3 that houses and supports Fans 2, and Cover 4 that occludes Opening 3a of Casing 3.

[0021]

Fan 2 is configured with Motor 22 that drives the rotor blade in the center of both ends of the cylindrical Fan Casing 21 secured by plural beams. Fan Casing 21 has Flange Part 23 extending in four directions from the peripheral edges of both ends thereof and has a generally rectangular shape. The tip of each Flange Part 23 is provided with Securing Hole 24. The power cable extends from Motor 22 and connects to Connector 25 that is connected to the external power supply.

[0022]

As shown in Figure 2, Rubber Bush 50 for anti-vibration is mounted in the diagonal position of each Fan 2. Rubber Bush 50 is triangular, with a pair of Locking Recesses 51 locked with corners of Fan Casing 21 on two adjacent sides thereof. At the connection point of both Fans 2, one Rubber Bush 50 fits into both Fans 2. In addition, Conical Protrusion 51a is provided at three locations of the face opposite Cover 4 of Rubber Bush 50.

10

[0023]

Returning to Figure 1, Casing 3 has a box-shaped body, and a lattice-like Air Vent 31 is formed in the position where each Fan 2 on its bottom surface is mounted to face its rotor blade. Vent 31 serves as a vent and as a finger guard for preventing a jammed finger. In addition, plural Ribs 32 are provided on the bottom surface of Casing 3 to secure each Rubber Bush 50 attached to Fan 2 as described above, so that the contained Fan 2 can be secured stably.

[0024]

In addition, Connector Housing 33 is provided on the distal end side of Casing 3 in the direction of attachment to the shelf for securing Connector 25, and an inner wall of Casing 3 is provided with Guide Piece 34 for hooking and guiding a power cable leading to Connector 25, as shown in Figure 4 (a) in Section A of Figure 1.

20

[0025]

Also, the upper edge extending along the mounting direction of Casing 3 to the shelf is provided with a quantified extended Guide Portion 36 on the horizontally outward side and is guided to the guide rails of the shelf described below. Further, both ends of each upper edge of Casing 3 are provided with a J-shaped Slit 37 that locks Dowel 43 of Cover 4 as described below to secure Cover 4 to Casing 3.

[0026]

In addition, the rear end side of Casing 3 in the direction of mounting it to the shelf is fitted with Handle 60 that the operator grips when installing Air-cooling Fan Unit 1 to the shelf. Figure 3 (a) is a perspective view representing Handle 60, and Figure 3 (b) is a plan view showing the periphery of Handle 60.

30

[0027]

As shown in Figure 3 (a), Handle 60 has a U-shaped body formed by flexing the plate-like material at several locations, and its main body has Locking Claw 62 for mounting it to Casing 3 at Both Ends 61 of the body. Locking Claw 62 is composed of portions separated by Slits 61a provided longitudinally parallel at Both Ends 61 and is provided with Lock Protrusions 63 protruding inwardly of Casing 3.

[0028]

On the other hand, as shown in Figure 3 (b), a pair of Locking Recesses 35 are provided on the rear end side of Casing 3 in the direction of mounting it to the shelf to insert and secure End 61 of Handle 60. Locking Hole 35a is provided on the wall surface of the aforementioned Locking Recess 35, and by locking the Lock Protrusions 63 of Handle 60 thereto, Handle 60 is secured with respect to Casing 3 without falling off. When removing Handle 60 from Casing 3, Lock Protrusion 63 locked to Locking Hole 35a is pushed out from the inside to the outside of Casing 3 to release the locked state, and then Handle 60 is removed by pulling it upward.

40

[0029]

Also, on the rear end side of Casing 3 in the direction of mounting it to the shelf, Locking Portion 70 is provided so as to be surrounded by Handle 60, which constitutes the attachment mechanism between [Locking Portion 70] and the shelf. This will be discussed in more detail later.

[0030]

Returning to Figure 1, Cover 4 has a plate-shaped body, and lattice-like Air Vent 41 is formed to face the rotor blade of Fan 2. Vent 41 functions as a vent and also as a finger guard. In addition, both edges along the direction of mounting the body of Cover 4 to the shelf are folded downwardly to form Sidewalls 42, and there are outwardly protruding Cylindrical Dowels 43 in the vicinity of both ends of the sidewalls for securing Cover 4 to Casing 3, respectively. The diameter of Dowel 43 is slightly smaller than the width of Slit 37.

10

【0031】

Next, a method of assembling Air-cooling Fan Unit 1 will be explained.

First, as shown in Figure 1, Fans 2, 2 with Rubber Bush 50 attached is mounted along Rib 32 of Casing 3.

【0032】

Cover 4 is then placed over Opening 3a of Casing 3. Then, with Dowel 43 of Cover 4 and Opening 37a of Casing 3's Slit 37 aligned, Cover 4 is pressed from above against the reaction force of Rubber Bush 50. Cover 4 is moved so that Dowel 43 is pushed into Slit 37 in the direction of the solid line arrow to slide in Slit 37 to show the locking operation of Dowel 43 and Slit 37 in part B of Figure 1, and Cover 4 is fitted to the tip of Slit 37.

【0033】

At this time, Protruded Part 51a installed in Rubber Bush 50 follows the horizontal shift of Cover 4 to Casing 3. In other words, in the present embodiment, rather than directly abutting the flat surface of Rubber Bush 50 against Cover 4, the frictional force between Rubber Bush 50 and Cover 4 is reduced by dispersedly abutting the surface of Cover 4 at the position of Protruded Part 51a as described above. As a result, Cover 4 can be smoothly displaced relative to Casing 3 when Dowel 43 is fitted to Slit 37. Cover 4 and Casing 3 are secured stably without rattling due to the reaction force of Rubber Bush 50.

20

【0034】

When removing Cover 4 from Casing 3, with Cover 4 pressed upward and Dowel 43 pressed downward, it is slid in the direction of the dotted arrow in the figure opposite the above description. Then, when Dowel 43 is brought into the straight line leading to Opening 37a in Slit 37, Cover 4 naturally detaches from Casing 3 due to the elastic force of the Rubber Bush 50.

30

【0035】

In addition to the above structure, the key structure shown in Figure 4 (c) is also conceivable for the structure of Dowel 43 and Slit 37.

In other words, as shown in the same figure, Dowel 43' is formed in a key shape, while the shape of Slit 37' is also made in a key shape to match that. The width w of the straight portion of Slit 37' is wider than the width of Dowel 43', and the height h of the key portion of Slit 37' is formed greater than the height of the key portion of Dowel 43'.

【0036】

In such a configuration, when securing Cover 4 with respect to Casing 3, Cover 4 is pressed from above to push and slide Dowel 43' into Slit 37' to fit the key. Also, when removing Cover 4 from Casing 3, Press Cover 4 from above and slide it to the straight part of Slit 37' with Dowel 43' pushed in. At this time, Cover 4 naturally detaches from Casing 3 due to the elastic force of Rubber Bush 50.

40

【0037】

Next, the mounting mechanism between Air-cooling Fan Unit 1 and the shelf is explained. Figure 5 is a perspective view illustrating the mounting structure of Air-cooling Fan Unit 1 and Shelf 80 in the present embodiment, and Figure 6 is an oblique view of Shelf 80, looking diagonally from above when Air-cooling Fan Unit 1 is not present.

【0038】

As shown in Figure 5, plural Air-cooling Fan Units 1 are inserted from Fan Unit Inlet 81 of Shelf 80. Then, when Air-cooling Fan Unit 1 is inserted into the predetermined position, Locking Portion 70 provided on the rear end side of Casing 3 in the direction of mounting it to Shelf 80 is locked between the Upper and Lower Beams 82 and 83 provided parallel to each other above and below Fan Unit Insertion Port 81 of Shelf 80.

【0039】

As shown in Figure 6, Lower Beam 83 is a molded stainless steel plate material and is provided to extend in the parallel direction of Air-cooling Fan Unit 1, and Guide Rail Installation Part 84 extends perpendicularly at predetermined intervals corresponding to the width of Air-cooling Fan Unit 1 and extends in the depth direction of Shelf 80. Guide Rail 90 is then configured along Guide Rail Installation 84. 10

【0040】

As shown, in Figure 7 (a), a figure that corresponds to the C-directed arrow view of Figure 6, Guide Rail 90 is formed by injection-molding the resin material and has a long body having a protruded cross-section. In plural predetermined locations on the lower surface of the main body are provided with Lock Protrusions 91, and Lock Protrusions 91 are fitted to Locking Holes 84a provided in Guide Rail Installation Part 84 to secure Guide Rail 90 to Guide Rail Installation 84. In the intermediate position of the adjacent Guide Rail 90 of Lower Beam 83, Locking Hole 85 is provided to lock the Locking Portion 70 of Air-cooling Fan Unit 1.

【0041】

On the other hand, Locking Portion 70 is provided, as explained above, on the rear end side of the direction Casing 3 is mounted to Shelf 80 in Air-cooling Fan Unit 1. Figure 7 (b) shows a diagram corresponding to the D-D cross section of Figure 3 (b). 20

【0042】

As shown in the same figure, Locking Portion 70 comprises a plate-like body resiliently configured on Casing 3 for oscillation; and has Collar Part 71 for applying an external force in the direction of oscillation to part of the plate-like body; and Locking Claws 72 and 73 (Locking Means) configure in a location abutting the opposite surfaces of Upper Beam 82 and Lower Beam 83 of the Fan Unit Insertion Port 81 of Shelf 80, respectively. That is, Locking Portion 70 is formed partially separated from the body of the casing by inserting a pair of Slits 71a from the rear side of Casing 3 into a predetermined location on the bottom surface, as shown in Figure 1 and 3 (b). As shown in Figure 7 (b), the upper end of the aforementioned Locking Portion 70 comprises Collar Part 71 by extending its upper end toward the back on the same plane as the upper edge of Casing 3; and a lower end comprising a portion of the bottom surface of Casing 3. Then, the tip of the lower end, where Slit 71a is the disrupted leftover portion, is elastically deformed with respect to Casing 3 as a hinge, allowing it to oscillate. Locking Claw 72 is mounted to the upper surface of Collar Part 71 and Locking Claw 73 is mounted to the lower surface of the lower end portion. In addition, a pair of Ribs 74 extending toward the inside of Casing 3 are provided on both sides of the width direction of Locking Portion 70 to reinforce the aforementioned Locking Portion 70. 30

【0043】

When Air-cooling Fan Unit 1 is attached to Shelf 80, Air-cooling Fan Unit 1 is inserted into Shelf 80 along its left and right Guide Rails 90. Lower Locking Claw 73 is then fitted into the Locking Hole 85 of Lower Beam 83 to be locked and secured when Air-cooling Fan Unit 1 is in the predetermined installation position. 40

【0044】

On the other hand, when Air-cooling Fan Unit 1 is removed from Shelf 80, a finger other than the thumb is passed through Handle 60, for example, as shown in the same figure, and the upper end of Collar Part 71 is first pushed upward with the thumb to elastically deform Collar Part 71 relative to Casing 3 to allow oscillation. At this time, Lower Locking Claw 73 detaches from Locking Hole 85 of Lower Beam 83 in conjunction therewith. Air-cooling Fan Unit 1 can then be removed by pulling Handle 60 towards the front side (opposite of the direction the unit is inserted into Shelf 80).

【0045】

In the above, the mounting structure of the implementation form (lower lock type) that allows Air-cooling Fan Unit 1 to be placed in the opening Shelf 80 is explained. However, this embodiment can also be applied to the mounting structure of the implementation form (upper lock type) that hangs Air-cooling Fan Unit 1 in the opening of the shelf. Figure 8 shows a front view of Upper Locking-type Shelf 180, and Figure 9 shows a perspective view of Shelf 180 from below when Air-cooling Fan Unit 1 is not present.

【0046】

As shown in Figure 8, Shelf 180 is different from Shelf 80 described above, with its Guide Rail 90 installed on the upper side of the Fan Unit Insertion Port 181. Therefore, as shown in Figure 9, the shelf-side configuration of the portion where Air-cooling Fan Unit 1 is mounted is inverted from the configuration of Figure 6 explained above.

【0047】

In other words, Guide Rail Installation Part 184 is configured on the Upper Beam 182 side, and Guide Rail 90 is configured. Guide Portion 36 of Casing 3 described above is supported by this aforementioned Guide Rail 90. Also, in the intermediate position of the adjacent Guide Rail 90 of Upper Beam 182, Locking Hole 185 is configured to lock Locking Portion 70 of Air-cooling Fan Unit 1. Figure 10 (a) shows a cross-section view of the E-E arrow of Figure 9, and Figure 10 (b) shows a view of the F-direction arrow of Figure 10 (a).

【0048】

As shown in these figures, configuration of the mounting part between Air-cooling Fan Unit 1 and Shelf 180 is basically the same as the configuration shown in Figure 6 above except that the mounting structure is upside down. Therefore, the explanation is omitted.

【0049】

Figure 11 (a) shows a method of mounting Air-cooling Fan Unit 1 to Shelf 180.

As shown in the figure, when Air-cooling Fan Unit 1 is mounted to Shelf 180, the aforementioned Air-cooling Fan Unit 1 is inserted into Shelf 180 along its Left and Right Guide Rails 90. Then, when Air-cooling Fan Unit 1 is in the predetermined installation location, the Upper Locking Claw 72 fits into Locking Hole 185 of Upper Beam 182 to be locked and secured.

【0050】

On the other hand, when Air-cooling Fan Unit 1 is removed from Shelf 180, a finger other than the thumb is passed through Handle 60, for example, as shown in the same figure, and the upper end of Collar Part 71 is first pushed downward with the thumb to elastically deform Collar Part 71 relative to Casing 3 to enable oscillation. At this time, Upper Locking Claw 72 interlocks with this to disengage from Locking Hole 185 of Upper Beam 182. Air-cooling Fan Unit 1 can then be removed by pulling Handle 60 towards the front side (opposite of the direction the unit is inserted into Shelf 180).

【0051】

In the above, the top beam and bottom beam of Shelves 80 and 180 are shown in a cross-sectional L-shape, but this embodiment may be applied if the locking claw of Locking Portion 70 and lockable locking hole are formed, even in a cross-sectional U-shape or other shape as shown in Figure 11 (b).

【0052】

As described above, according to Air-cooling Fan Unit 1 of the present embodiment, Locking Means 72 and 73 are respectively configured corresponding to a position that abuts an opposing surface of Fan Unit Inlet 81 when inserted into Fan Unit Inlet 81 of Shelf 80. Thus, Air-cooling Fan Unit 1 can be locked even if there is a lock on either side of the opposing surface of Fan Unit Insertion Port 81 on the shelf side. In other words, Air-cooling Fan Unit 1 can be installed regardless of the design on the shelf side.

【0053】

In addition, when removing Air-cooling Fan Unit 1 from Shelf 80, only external force is applied to Collar Part 71 of Locking Portion 70 for oscillation, and both of Locking Means 72 and 73 operate in the direction of removal from Shelf 80. Thus, this can be easily removed with a simple one-touch operation of pressing Collar Part 71, regardless of which side of Fan Unit Insertion Port 81 of Shelf 80 is locked.

【0054】

In recent years, electronic devices have become smaller, and the installation environment has changed from a special location such as a machine room to an office near the user. Therefore, the fan's direct mounting to a casing made of conventional metal has generated a vibrating sound and resonance sound due to the vibration of a rotating fan. In addition, the adoption of large, high-capacity fans has made the noise extremely high. In this regard, in the present embodiment, the anti-vibration structure by Rubber Bush 50 can prevent or suppress the noise.

【0055】

Although the present embodiment has been explained above, it is also possible to apply the following variations, for example.

10

Figure 12 is an exploded view showing the structure of an air-cooling fan unit according to a first variant of the present embodiment, and Figure 13 is a perspective view showing the structure in the vicinity of the fan, which is a featured portion thereof; Furthermore, the present variant is the same as the embodiment explained above, except that the structure of the rubber bushing supporting the fan and its support structure are different. Thus, only the different component parts are described here.

【0056】

As shown in Figure 13, the anti-vibration Rubber Bush 150 in the air-cooling fan unit of the present variant has a triangular column, Fan Casing 21 and Locking Recess 151 are formed on 1 side. In the present variant, the Rubber Bush 150 are configured at two places located at a diagonal angle of each of the Fans 2. In addition, a conical Protruding Part 151a is configured at three places on the top surface of Rubber Bush 150.

20

【0057】

As shown in Figure 12, Plural Ribs 132 are configured on the bottom surface of Casing 3 to secure each Rubber Bush 150 attached to Fan 2 to allow for stable securing of the contained Fan 2.

【0058】

In this variant, Both Fans 2 are individually supported by Rubber Bush 150 and disposed within Casing 3.

Figure 14 is an exploded view showing the structure of an air-cooling fan unit according to the second variant of the present embodiment, and Figure 15 is a perspective view showing the structure in the vicinity of the fan, which is a featured portion thereof; Furthermore, the present variant is the same as the embodiment explained above, except that the structure of the rubber bush supporting the fan and its support structure are different. Thus, only the different component parts are described here.

30

【0059】

As shown in Figure 15, the anti-vibration Rubber Bush 250 in the air-cooling fan unit of the present variant has a square column shape, and the corner of Fan Casing 21 and lockable Locking Recess 251 are formed on four sides thereof. In addition, Conical Protrusion Part 251a is configured at four places on the top surface of Rubber Bush 250. In the present variant, both Fans 2 are parallel in a diagonal direction, and three Rubber Bushes 250 are disposed on the diagonal direction. In other words, the central Rubber Bush 250 prevents the opposite angles of both Fans 2 from directly contacting each other. Furthermore, Rubber Bush 250 are configured at each opposing angle located at both ends.

【0060】

As shown in Figure 14, plural Ribs 232 are configured on the bottom surface of Casing 3 to secure each Rubber Bush 250 attached to Fan 2 to allow for stable securing of the contained Fan 2.

40

【0061】

The present variant is effective in cases where, for convenience of spacing within Casing 3, it is necessary to vary the configuration of two Fans 2.

[Second embodiment]

The second embodiment of the present invention is explained here. The second embodiment is the same as the the first embodiment above, except for the configuration of the rear end side of the casing in the direction the casing is mounted to the shelf is different. Therefore, the explanation of the same configuration is omitted by indicating the same symbols as necessary. Figure 16 is a perspective view showing a schematic configuration of a featured portion of an air-cooling fan unit according to the present embodiment, and Figure 17 is a perspective view of a handle having that featured portion. Figure 18 is also an illustration showing the method of mounting the air-cooling fan unit, corresponding to the cross-sectional G-G arrow view shown in Figure 16.

50

【0062】

As shown in Figure 16, the trailing edge of Air-cooling Fan Unit 201 in the present embodiment is tapered, and Locking Portion 270 has a shape similar thereto.

In other words, as shown in Figures 16 and 18, Locking Portion 270 is formed partially separated from the body of Casing 203 by inserting a pair of Slits 271a from the rear side of Casing 203 into a predetermined location on the bottom surface. Locking Portion 270 extends inwardly on the same place as the upper edge of Casing 203 to form Flange Portion 271, and the lower end forms part of the bottom surface of Casing 203. Also, from the intermediate position between the Flange Portion 271 and the bottom surface of Locking Portion 270, Collar Part 272 extends outward (to the rear). This Locking Portion 270 is capable of elastically deforming with respect to Casing 203 using as a hinge at the bottom end tip where Slit 271a is interrupted by applying an external force to Collar Portion 272. Locking Claw 273 is configured on the upper surface of Flange Portion 271 and Locking Claw 274 is provided on the lower surface of the lower end portion.

10

【0063】

In addition, Slit 204a is configured at a location corresponding to Flange Portion 271 of Cover 204, which is fitted and mounted to Casing 203 to allow Flange Portion 271 to be inserted and exposed.

【0064】

On the other hand, Handle 260 has a structure of the top opening is closed in the configuration of Handle 60 in the first embodiment shown in Figure 3. In other words, as shown in Figure 17, Handle 260 is composed of a U-shaped Main Body 261 formed by flexing the plate-like member at several points, and Cover Material 262 that obstructs one edge of the upper opening formed between Casing 203 in Main Body 261. Thus, it is prohibited to insert a finder to Handle 260 from above. Handle 260 is mounted across Collar Part 272 on the rear end side of Casing 203 in the mounting direction to the shelf, as shown in Figure 16.

20

【0065】

When Air-cooling Fan Unit 201 is attached to the shelf, as shown in Figure 18(a), Air-cooling Fan Unit 201 is inserted into the shelf along its Left and Right Guide Rails 90. Lower Locking Claw 274 then fits into Locking Hole 285 of Lower Beam 283 to be locked and secured when Air-cooling Fan Unit 1 is in the predetermined installation location.

【0066】

On the other hand, when the air-cooling fan unit 201 is removed from the shelf, a finger is passed through the handle 260 as shown, for example, in the same figure. At this time, Handle 260 is occluded by Cover Material 262, so that the thumb is placed on Cover Material 262 without touching Collar Part 272. On the other hand, fingers other than the thumb are inserted from under the handle to hit the lower surface of Collar Part 272. Therefore, when the worker grasps Handle 260, Collar Part 272 is naturally pushed to the up, causing Collar Part 272 to elastically deform relative to Casing 203 and oscillate. At this time, Lower Locking Claw 274 interlocks with this to disengage from Locking Hole 285 of Lower Beam 283. Air-cooling Fan Unit 201 can then be removed by pulling Handle 260 towards the front side (opposite of the direction of insertion into the shelf).

30

【0067】

In the above, the lower lock-type mounting structure for placing Air-cooling Fan Unit 201 onto the opening of the shelf is explained, but this embodiment can be applied as is to the upper lock-type mounting structure for hanging Air-cooling Fan Unit 201 onto the opening of the shelf as shown in Figure (b).

40

【0068】

In this case, when Air-cooling Fan Unit 201 is attached to the shelf, Air-cooling Fan Unit 201 is inserted into the shelf along its Left and Right Guide Rails 90. Then, when Air-cooling Fan Unit 201 is in the predetermined installation location, Upper Locking Claw 273 fits into Locking Hole 285 of Upper Beam 282 to be locked and secured.

【0069】

On the other hand, when Air-cooling Fan Unit 1 is removed from the shelf, Handle 260 is held and pulled towards the front side (opposite of the direction of insertion into the shelf) as described above. At this time, Collar Part 272 is naturally pushed to the up as described above, causing Collar Part 272 to elastically deform with respect to Casing 203 and oscillate. At this time, Upper Locking Claw 273 can cooperate with this to detach Air-cooling Fan Unit 201 from Locking Hole 285 of Upper Beam 282.

【0070】

As explained above, in the present embodiment, Handle 260 is configured with a structure to prevent misoperation that prohibits insertion of a finger that energizes Collar Part 272 away from the shelf in the direction of removal. Thus, during the removal of Air-cooling Fan Unit 201, Locking Portion 270 can be accidentally locked in the opposite direction to avoid situations where Air-cooling Fan Unit 201 cannot be removed. As a result, this embodiment helps the users to work accurately and efficiently.

【0071】

[Third Form]

Next, a third embodiment of the invention is explained here. The present embodiment is the same as the first embodiment above, except that the configuration of the rear end of the casing in the direction of mounting to the shelf is different. Thus, only the different portions are explained here. Figure 19 is a perspective view showing a schematic configuration of a featured portion of an air-cooling fan unit according to the present embodiment, wherein (a) and (b) are views of the casing from above and (c) is a view from below.

【0072】

As shown in Figure (a), Locking Portion 370 comprises a plate-shaped body mounted flexibly for oscillation to Casing 303, and has Collar Part 371 for applying an external force in the direction of oscillation to a portion of the plate-shaped body, and Locking Claws 372 and 373 (Locking Means) configured in a position abutting opposite surfaces of the upper and lower beams of the openings of the shelf, respectively.

【0073】

In other words, Locking Portion 370 is formed partially separated from the body Casing 303 by inserting Slit 371a from the rear side of Casing 303 into a predetermined location on the bottom surface. Locking Portion 370 extends to the back on the same plane as with the upper edge of Casing 303 to form Collar Part 371, and the lower end forms part of the bottom surface of Casing 303. Then, the upper portion, which is the left portion of Slit 371a is used as a hinge, to elastically deform with respect to Casing 303 to enable oscillation. The first embodiment explained above differs in that the location of this hinge is at the top. Locking Claw 372 is mounted to the upper surface of Collar Part 371 and Locking Claw 273 is mounted to the lower surface of the lower end. In addition, a pair of Ribs 374 extending toward the inside of Casing 303 and a pair of Ribs 375 extending toward the outside of Casing 303 are configured, to reinforce Locking Portion 370, on both sides of the width direction of Locking Portion 370.

【0074】

This structure is also compatible with both upper and lower locking types, and the locking state can be easily released by pushing the collar down.

[Fourth embodiment]

A fourth embodiment of the present invention is explained here. It should be noted that in the present embodiment, the explanation is omitted by affixing the same symbols, etc., for the component parts similar to the first embodiment explained above. Figure 20 is a perspective view showing a schematic configuration of an air-cooling fan unit according to the present embodiment.

【0075】

As shown in the figure, Air-cooling Fan Unit 401 according to the present embodiment comprises two Fans 2 for ventilation, a Box-shaped Casing 403 that accommodates and supports Fan 2, two lattice-like Finger Guards 404 each of which is configured to face its rotor blade above the airflow path of each Fan 2, and Front Panel 460 that combines the handle and lock functions when attached to a shelf. Fan 2 and Finger Guard 404 are inserted into plural Stud Pins 410 configured on the bottom surface of Casing 403 and secured relative to Casing 403 by assembling Lock Bush 420 at each upper end thereof.

【0076】

Finger Guard 404 is configured by connecting a long U-shaped Crosslink 404b radially arranged with plural circular Ring Portion 404a configured in a concentric circle every 90 degrees and integrally formed by injection-molding the resin material. 10

【0077】

Stud Pin 410 comprises a Cylindrical Axial Body 411 as shown in Figure 21 in an exploded view thereof (corresponding to the enlarged view of the H portion in Figure 20). Gear-shaped Joint 412 configured at the lower end of Body 411 is then press-fitted into the same-shape joint Hole 403a provided in Casing 403 and is stably secured in a state rotation around its axis is prevented. Stud Pin 410 can also be integrally formed with respect to Casing 403.

【0078】

Also, Slit 413 is configured at the upper end (tip) of Body 411, and it is rotatably supported such that Rotator Pin 415 is sandwiched between Slit 413. Rotator Pin 415 has a width that is narrower than the diameter (width) of Body 411 and a length that is greater than the diameter of Body 411. More particularly, the location of Slit 413 of Body 411 is configured with Holes 411a that are larger than the diameter of Rotational Axis 414 going through at the right angle. On the other hand, the axial center portion of the Rotator Pin 415 has a collapsed shape, and the width of the collapsed portion is approximately consistent with the width of Slit 413. In its center, Holes 415a of approximately the same size as the diameter of Rotational Axis 414 are configured by going through at the right angle. When Rotator Pin 415 is assembled to Body 411, Rotator Pin 415 is placed in Slits 413 to align Holes 415a and 411a, and Rotational Axis 414 is inserted through these holes. At this time, Rotational Axis 414 is press fit and secured against Hole 415a on the side of Rotator Pin 415, while Body 411 side's Hole 411a is in an interstitial fit state, and Rotator Pin 415 is rotatably supported against Stud Pin 410. Also, because the width of Slit 413 is narrower than the diameter of Rotator Pin 415, the non-central portion of Rotator Pin 415 is caught in Slit 413 to prevent Rotator Pin 415 from rotating around Rotational Axis 414. Thus, Rotator Pin 415 is not rotated more easily when rotated to a predetermined location, but when a large external force is applied, it can be rotated such that a location other than the central portion of Rotator Pin 415 enters Slit 413 and pushes the slit wide. Even if Slit 413 of Stud Pin 410 is thus pushed out by Rotator Pin 415, the gap between Hole 411a on the side of Stud Pin 410 and Rotating Axis 414 can absorb some deformation of Slit 413. 30

【0079】

Lock Bush 420 is a two-piece molded integral product consisting of Lock Bush Body 421 having a structure capable of supporting Rotator Pin 415 explained above; Rubber Bush 422 configured to insert and wrap Lock Bush Body 421, and Washer 423 mounted on a bottom surface of Rubber Bush 422, as shown in Figure 22 (a). 40

【0080】

Lock Bush Body 421 comprises Through Hole 421a that is cylindrical and can horizontally insert Rotator Pin 415 in its self-axial direction; and Locking Groove 421b that transverses Through Hole 421a orthogonally and has a depth along which Rotator Pin 415 can lock.

【0081】

As Figure 22 (b) shows a perspective view of Lock Bush Body 421 from the bottom thereof, Through Hole 421a of Lock Bush Body 421 has a circular cross-section having an angular shape along the longitudinal direction of Rotator Pin 415 as a whole, with a central portion having a diameter slightly larger than the width of the angular shape.

【0082】

Rubber Bush 422 has a stepped cylindrical shape with Flange Portion 422a protruding inwardly in the lower half as shown in cross-sectional view thereof in Figure 22 (c). Then, Lock Brush Body 421 is inserted into the upper level, and Washer 423 is inserted into the lower level.

10

【0083】

The washer 423 has Hole 423a in the center of the disc-shaped body having a cross-section similar to Through Hole 421a of Lock Bush Body 421.

Front Panel 460 is an injection molded resin material, as shown in Figures 20 and 24 (a), and comprises Rectangular Plate-shaped Chassis 461 constituting a front wall of Casing 403, Handle 462 extending to the back from both ends of Chassis 461 to form a handle portion, and Lock 463 extending to the front and back from the center of the lower end of Chassis 461. Both sides of Chassis 461 are provided with Forward-extending Guides 464, and Lock Protrusion 464a is formed at the tip of Guide 464, with a pointed ramp shape formed at the tip of Guides 464. The outer width dimension between both Guides 464, except for Lock Protrusions 464a of Front Panel 460, matches the inner width dimension on both sides of Casing 403.

20

【0084】

On the other hand, Locking Recess 431 is configured at the rear end of the sidewall of Casing 403 to lock Guide 464 of Front Panel 460. Locking Recess 431 is configured to form Locking Hole 431a that locks Lock Protrusion 464a by providing a slit at the rear end of the sidewall of Casing 403, which is generally the same shape as Guide 464 and affixing a piece of board thereon.

【0085】

Handle 462 has a sloped surface at its top, bottom, left, and right and forms a handle that can be gripped by fingers.

Locking Portion 463 comprises Flange Portion 466 that first extends forward in the center of the bottom surface of Front Panel 460; and Collar Part 467 separated from Flange Portion 466 by a pair of Slits 466a formed in Flange Portion 466. Collar 467 extends further to the back but curves upwardly, and the bottom surface, which is on the same plane with Flange Portion 466, has Locking Claw 467a in a downward position with a sharp slope shape that with respect to the depth direction of the shelf.

30

【0086】

Thus, in the case of an implementation (PULL FAN) in which Air-cooling Fan Unit 401 can be mounted in the opening of the shelf, as shown in Figure 24 (b), when Air-cooling Fan Unit 401 is mounted to the shelf, Lower Locking Claw 467a is fitted and locked into the locking hole of the lower beam of the shelf when Air-cooling Fan Unit 401 is in the predetermined installation location.

【0087】

On the other hand, when Air-cooling Fan Unit 401 is removed from the shelf, Locking Claw 467a is released from the locking hole of the shelf by inserting fingers into Handle 462 and pushing Collar Part 467 upward, for example, as shown in the same figure. Air-cooling Fan Unit 401 can then be removed by pulling Handle 462 towards the front side (opposite of the direction of insertion into the shelf).

40

【0088】

As shown in Figure 25 (a), by mounting Front Panel 460 upside down to Casing 403 can also accommodate an implementation (PUSH FAN) that hangs Air-cooling Fan Unit 401 below the shelf.

【0089】

In this case, as shown in Figure (b), Upper Locking Claw 467a fits into the locking hole of the upper beam of the shelf and is locked when Air-cooling Fan Unit 401 is in the predetermined installation position.

【0090】

On the other hand, when Air-cooling Fan Unit 401 is removed from the shelf, Locking Claw 467a is released from the locking hole of the shelf by inserting a finger into Grip 462 and pushing Collar Part 467 downward, for example as shown in the same figure. Air-cooling Fan Unit 401 can then be removed by pulling Handle 462 towards the front side (opposite of the direction of insertion into the shelf).

【0091】

The method of assembling Air-cooling Fan Unit 401 is then explained based on Figures 20 and 23. Figure 23 (a) is a perspective view showing the locking portion of Stud Pin 410 and Lock Bush 420, wherein Figure 23 (b) is a cross-sectional view of its I-I, and Figure (c) shows cross-sectional views of J - J and K - K.

10

【0092】

With reference to Figure 20, when assembling each part of Air-cooling Fan Unit 401, each Stud Pin 410 is first inserted into Securing Hole 24 of each Fan 2, and Fan 2 is mounted on Casing 403. The tip of Crosslinking Portion 404b of each Finger Guard 404 is then mounted in line with Hole 24 configured at the tip of each Flange Portion 23 of Fan 2, and each Lock Bush 420 is locked against each Stud Pin 410.

【0093】

That is, after inserting Lock Bush 420 with Rotator Pin 415 at the tip of Stud Pin 410 approximately perpendicular, as shown in Figure 23 (a), with the center of Through Hole 421a aligned with the axis of Stud Pin 410, Rotator Pin 415 is rotated to level as shown in Figure 23 (b). At this time, as shown in the left view (J-J cross section) of Figure 23 (c), Rotator Pin 415 is housed inside the Through Hole 421a.

20

【0094】

Then, as shown in the central view (J-J cross section) of Figure 23 (c), Rotator Pin 415 of Stud Pin 410 is ejected to the top surface of Locking Bush 420 while pushing Locking Bush 420 downward, rotating Locking Bush 420 90 degrees, positioning Rotator Pin 415 against Locking Groove 421b, and releasing the hand. At this time, as shown in the right view (K-K cross section) of Figure 23 (c), Rotator Pin 415 is pushed into Locking Groove 421b by the elastic force of Rubber Bush 422 and locked, such that Lock Bush 420 is locked against Stud Pin 410. In this way, Fan 2 and Finger Guard 404 are resiliently sandwiched between Casing 403 and Lock Bush 420.

30

【0095】

Front Panel 460 is then fitted into the front surface of Casing 403.

Referring to Figures 20 and 24, first, Guide 464 on both sides of Front Panel 460 is inserted along the Locking Recess 431 of Chassis 461. At this time, due to the presence of Lock Protrusion 464a, Guide 464 is inserted along the inside of Locking Recess 431 in an inwardly curved state, but when Lock Protrusion 464a is in the location of Locking Hole 431a of Casing 403, Front Panel 460 is secured relative to Casing 403 by returning to the elastic force, and Lock Protrusion 464a is locked to Locking Hole 431a.

【0096】

When disassembling Air-cooling Fan Unit 401, each part is removed in the opposite manner. In particular, when Lock Bush 420 is removed from Stud Pin 410, the aforementioned Lock Bush 420 is pushed to protrude Rotator Pin 415 of Stud Pin 410 to the top surface of Lock Bush Body 421 to rotate Through Hole 421a. If Rotating Pin 415 is released when it reaches Through Hole 421a position, the elastic force of Rubber Bush 422 causes Lock Bush 420 to disengage from Stud Pin 410.

40

【0097】

Figure 26 is a perspective view showing a configuration of a lock bush according to a variant of the present embodiment. Figure 26 (a) is an exploded view of the rock bush of the present variant. Figure 26 (b) is its cross sectional view of L - L arrow, and Figure 26 (c) is a perspective view of a lock bush body constituting the lock bush from its bottom.

【0098】

In addition, since this example of a variant is the same as the embodiment explained above, except that the structure of the lock bush body that makes up the lock bush is different. Thus, explanation of the same configuration portion is omitted by affixing the same symbols, etc.

10

【0099】

Lock Bush Body 421', which constitutes Lock Bush 420' of the present variant, has Through Hole 421a that is cylindrical and capable of horizontally inserting Rotator Pin 415 in its self-axial direction; and Locking Groove 421b that transverses Through Hole 421a as if crossing at the right angle; and 421b having a depth at which Rotator Pin 415 can lock along its longitudinal direction, as shown in the cross sectional view of L - L in Figure 26 (a). Ramp 421c that spirally slopes from one edge of Locking Groove 421b to Through Hole 421a to guide Rotator Pin 415 along Ramp 421c to Locking Groove 421b Through Hole 421a. Ramp 421c is formed at a point-symmetrical location relative to the center of Lock Bush Body 421.

【0100】

In this case, when Air-cooling Fan Unit 401 is secured to the shelf, Lock Bush 420 is rotated 90 degrees while gently pushing downward. Rotator Pin 415 then travels up over Ramp 421c of Rubber Bush 422 and fits into Locking Groove 421b. At this time, Rotator Pin 415 is locked to Locking Groove 421b by the elastic force of Rubber Bush 422, so that Lock Bush 420 is locked against Stud Pin 410. In this way, Fan 2 and Finger Guard 404 are resiliently sandwiched between Casing 403 and Lock Bush 420.

20

【0101】

On the other hand, when disassembling Air-cooling Fan Unit 401, each part is removed using the method opposite from above. In particular, when Lock Bush 420 is removed from Stud Pin 410, a slight turn, while gently pushing in Lock Bush 420, causes Rotator Pin 415 to travel over Ramp 421c of Lock Bush Body 421 to naturally descend and exit through Through Hole 421a.

【0102】

30

As explained above, according to Air-cooling Fan Unit 401 of the present embodiment, Casing 403, Fan 2, Finger Guard 404 can be secured by pressing the rotating pin while rotating Lock bush 420 relative to Stud Pin 410. They can also be separated by performing the opposite action. Therefore, tools such as those used for assembly using screws are not required, and installation and removal can be performed easily and quickly. In addition, due to the elastic reaction force of Lock Bush 420, Casings 403, Fans 2, and Finger Guards 404 can be secured stably.

【0103】

Also, by forming Helically-inclined Ramp 421c between Locking Groove 421b and Through Hole 421a, securing of Rotator Pin 415 to the Locking Groove 421b can be performed more smoothly and easily with less force.

40

【0104】

[Fifth Embodiment]

The fifth embodiment of the present invention is explained next. In the present embodiment, explanation is omitted by affixing the same symbols, etc., with respect to the component parts similar to those used in each of the above embodiments. Figure 27 is an exploded view showing a schematic configuration of an air-cooling fan unit according to the present embodiment.

【0105】

As shown in the same figure, Air-cooling Fan Unit 501 according to the present embodiment comprises two Fans 2 for ventilation; a pair of Left and Right Casings 503 that accommodate and support Fans 2 from a lateral direction; four lattice-like Finger Guards 404, each of which is configured to face the rotor in front and back (up and down) of the airflow path of each Fan 2, Front Panel 460 that combines the functions of both the handle and the lock when secured to the shelf. Rear Panel 505 that has Connector 25 at the distal end of the insertion direction to the shelf. Fan 2 and Finger Guard 404 are secured by plural Securing Bush 520.

【0106】

Casing 503 is configured with a long plate-shaped material mounted in its width direction, with plural Ribs 504 on its side to accommodate and support surrounding the side of Fan 2 forming Fan Housing 504b. Upper and Lower Ribs 504 of plural Ribs 504 are formed with Fixing Hole 504a corresponding to Fixing Hole 24 of Fan 2. In addition, there are Locking Recesses 551 and 552 for locking and fitting Front Panel 460 and Rear Panel 505 in front and back of Casing 503. Because the configuration of these Locking Recesses 551 and 552 is similar to the configuration of Locking Recesses 431 in the fourth embodiment, explanation is omitted here.

【0107】

Rear Panel 505 is an injection molded resin material and consists of Rectangular Plate-shaped Chassis 561 that constitutes a wall in front of Casing 503 and Guide 562 extending to the back on both sides of Chassis 561. Connector Housing 33 is provided in the top center of Chassis 561 for securing Connector 25. The construction of Guide 562 and its mounting structure with Casing 503 are similar to the construction of Guide 464 and its mounting structure with Casing 403 in the fourth embodiment. Thus, explanation is omitted here.

【0108】

Fixing Bush 520 is composed of rubber and is configured with three Annular Ribs 521, 522, and 523 circumferentially spaced at predetermined intervals in the cylindrical body such that Figure 28 shows a cross-sectional mounting view to its Fan 2 and Finger Guard 404. Ribs 521 at front the tip are tapered, slightly expand toward the back (upper part in the figure), and Ribs 523 at the rear tip have an outer diameter that is slightly larger than the width of the slit of Finger Guard 404. Center Rib 522 is then flanged larger than Rear-end Rib 523. A locking groove is then formed between these ribs.

【0109】

Next, the method of assembling Air-cooling Fan Unit 501 is explained.

As shown in Figure 27, Casing 503 and each Fan 2 are first assembled with Fan Housing 504b accommodating the side surfaces of Fan 2. At this time, Fixing Holes 24 of Fan 2 and the Fixing Holes 504a of Casing 503 are matched.

【0110】

Then, each Finger Guard 404 is installed from this state. That is, as shown in Figure 28, Securing Bush 520 is first attached to the tip of Finger Guard 404 on the Rib 523 side. At this time, Securing Bush 520 is secured to Finger Guard 404 sandwiching the tip of Crosslink 404b between Center Rib 522 and Rear-end Rib 523.

【0111】

From this state, each Securing Bush 520 to which Finger Guard 404 is secured is then inserted from its tip into Hole 504a in Casing 503. At this time, if Tip Rib 521 goes through Hole 504a while being slightly elastically deformed, then the end is prevented from falling out in the opposite direction as a non-return structure. This secures Securing Bush 520 to Casing 503 sandwiching Ribs 504 by means of its Tip Ribs 521 and Center Rib 522. Also, Fan 2 and Casing 503 are indirectly secured via this Securing Bush 520 because the tip of Tip Rib 521 is inserted into Hole 24 of Fan 2. In this way, securing of the Fan 2, Casing 503 and Finger Guard 404 is completed.

【0112】

Assembly is then completed by locking and mounting Front Panel 460 and Rear Panel 505 from this state.

As explained above, according to Air-cooling Fan Unit 501 of the present embodiment, the attachment and detachment of Fan 2, Casing 503, and Finger Guard 404 can be performed easily using Securing Bush 520, also faster than when screws, etc. are used for securing,

【0113】

[Sixth embodiment]

The sixth embodiment of the present invention is explained next. In the present embodiment, explanation is omitted by affixing the same symbols, etc., with respect to the component parts similar to those of each of the above embodiments. Figure 29 is a perspective view showing a schematic configuration of an air-cooling fan unit according to the present embodiment, and Figure 30 is an exploded view thereof.

10

【0114】

As shown in Figures 29 and 30, Air-cooling Fan Unit 601 according to the present embodiment has a compact configuration in which one Casing 603 accommodates one Fan 2 for ventilation. Plural Air-cooling Fan Units 601 can then be coupled as needed to configure a large air-cooling fan unit.

【0115】

Air-cooling Fan Unit 601 of the present embodiment comprises Fan 2, Casing 603 that houses Fan 2 internally and supports it from above, and Cover 604 that occludes the lower opening of Casing 603.

【0116】

20

In other words, as shown in Figure 31 (a) in the cross sectional view of the M - M arrow of Figure 30, Casing 603 is configured with Upper Cover Portion 611 to cover the upper end of the cylindrical body, with Fan 2 assembled relative to Upper Cover Portion 611. Top Cover 611 has Lattice-like Vent 612 formed to face the rotor blade of Fan 2. This Vent 612 serves as a vent and also as a finger guard.

【0117】

In addition, Flange Portion 613 corresponding to the shape of Upper Cover Portion 611 is extended outwardly from the lower edge of Casing 603, and plural Locking Holes 613a are provided in Flange Portion 613.

【0118】

On the other hand, Cover 604 consists of a generally square-shaped plate material, as also shown in Figure 30, with Lattice-like Vent 621 formed in a position facing the rotor blade of Fan 2. This Vent 621 functions as a vent and also as a finger guard. Also, in the position corresponding to Locking Hole 613a in the four corners of Cover 604, Claw-shaped Lock Protrusion 604a is inserted, and by locking Lock Protrusion 604a Locking Hole 613a, Cover 604 is secured relative to Casing 603 and obstructs the lower opening of Casing 603.

30

【0119】

Also, as shown in Figure 31 (b), Power Cable 650 is wired to the motor of Fan 2 inside and outside Casing 603, and Connector 25 configure at the tip thereof is secured by Screws S before and after Casing 603.

【0120】

Also, as shown in Figures 29 and 30, a pair of Guides 616 are provided at the rear end of the sidewall of Casing 603, and a pair of Locking Recesses 617 are configured at the tip end. Since the configurations of these Guides 616 and Locking Recesses 617 are the same as those of Guides 464 and Locking Recesses 431 shown in Figure 24, respectively, the explanation of this is omitted. However, by locking and securing these, multiple Air-cooling Fan Units 601 can be continuously secured. In the present embodiment, Guide 616 and Locking Recess 617 constitute Locking Means.

40

【0121】

In addition, Air-cooling Fan Unit 601 is configured to allow Front Panel 660 to be mounted. Front Panel 660 has a structure in which Front Panel 460 shown in Figure 24 is configured with a side wall with Locking Recess 661 that allows Guide 616 to be connected. Plate 662 is connected to the tip of both walls to increase the strength of Front Panel 660. Window 662a that can insert Connector 25 is configured in the center of Plate 662.

【0122】

As described above, according to Air-cooling Fan Unit 601 of the present embodiment, Air-cooling Fan Unit 601 can be compactly formed and can also be configured as a large air-cooling fan unit by using multiple connections as needed. Therefore, it is highly versatile as an air-cooling fan unit.

10

【0123】

[Seventh embodiment]

The seventh embodiment of the invention is explained next. In the present embodiment, explanation is omitted by affixing the same symbols, etc., for the component parts similar to the above embodiments. Figure 32 is an exploded view showing a schematic configuration of an air-cooling fan unit according to the present embodiment.

【0124】

As shown in the figure, Air-cooling Fan Unit 701 according to the present embodiment comprises two Fans 2 for ventilation, Casing 703 that accommodates and supports Fans 2, and Cover 704 that occludes an opening in Casing 703.

【0125】

20

Casing 703 has a shape similar to that of Casing 3 shown in the first embodiment, with a cross-sectional Oblong Protrusion 711 extending longitudinally on the top rear end of both sides, Triangular Protrusion 712 on the top tip of both sides, and Cylindrical Recess 713 with Circular Recess Groove 713a in the center. In addition, at the bottom of both sides, Guide Portion 716 guided by the shelf side guide rail is extended from its tip end to its rear end.

【0126】

Also, in the center of the rear upper edge of Casing 703, Locking Portion 714 is configured that is locked to the beam on the shelf side, and on both sides thereof, Claw Portion 718 that pushes Cover 704 is formed, and slits are formed around the area to make it easier to deform the claws.

【0127】

30

Additionally, Lattice-like Vent 715 is formed on the bottom surface of Casing 703 to face the rotor blades of each Fan 2. This Vent 715 serves as a vent and also as a finger guard. In addition, around Vent 715 on the bottom surface, plural locations corresponding to Securing Hole 24 of Fan 2 are provided with Countersunk 755, and Hole 755a is formed that passes through Securing Bush 750 for securing Fan 2 to Countersunk 755. The head portion of Securing Bush 750 is accommodated in the aforementioned Counterbore 755.

【0128】

On the other hand, Cover 704, similar to Cover 4 shown in the first embodiment, has Lattice-like Vent 741 formed at a location that faces the rotor blades of each Fan 2 in a plate-shaped body. The aforementioned Vent 741 functions as a vent and also as a finger guard. Also, around Vent 741 of Cover 704, a seat 754 is provided in plural locations corresponding to Securing Hole 24 of Fan 2, and Hole 754a is formed that inserts Securing Bush 750 to secure Fan 2 in Countersunk 754. The head portion of Anchoring Bush 750 is accommodated in the aforementioned Countersunk 754.

40

【0129】

In addition, both edges along the mounting direction of the body of Cover 704 to the shelf are bent downwardly to form Side Wall 742, and Circular Cutout Hole 743 is configured in the proximity of the rear end of Side Wall 742 that fits into the above Protrusion 711. Also, in the vicinity of the tip of Side Wall 742, Elliptical Guide Hole 744 is formed to extend in a longitudinal direction that locks Cylindrical Protrusion 713 of Casing 703.

【0130】

Further, on the tip side of Cover 704, Press Cover 747 is configured, divided from Cover 4, and on the inside of both sides of Press Cover 747, Protrusion 747a that fits into the circular Recessed Groove 713a formed in Protrusion 713 of Casing 703, and Locking Hole 747b that fits into Triangular Protrusion 712.

【0131】

10

Next, a method of assembling Air-cooling Fan Unit 701 is explained.

First, each Fan 2 is configured within Casing 703 so that Hole 24 of Fan 2 matches Hole 755a of Countersunk 755. Plural Securing Bush 750 are then inserted from the bottom side of Casing 703 to secure each Fan 2 within Casing 703.

【0132】

Protrusions 711 and 713 of Casing 703 are then fitted with Cutout Holes 743, and Guide Holes 744 of Cover 704, respectively, to secure Cover 704 to Casing 703. At this time, Cover 704 is prevented from rotating around Protrusion 713 by Oblong Protrusion 711 of Casing 703.

【0133】

Cover 704 and Fan 2 are then secured by inserting Securing Bush 750 through Hole 754a of Cover 704 and locking its tip to Hole 24 of Fan 2.

20

Inner Protrusion 747a of Press Cover 747 is then aligned with Recessed Groove 713a of Casing 703 and fitted and secured over Cover 704 to Casing 703.

【0134】

On the other hand, when Cover 704 is opened relative to Casing 703, Cover 704 is lifted out of Protrusion 711 and then Cover 704 is rotated.

That is, even if Cover 704 is to be rotated as is from the closed state, it is difficult to rotate Cover 704 as Securing Bush 750 near the rotation axis fits into Securing Hole 24 of Fan 2. Forced rotation of this may deform or damage Securing Bush 750. Thus, in the present embodiment, Cover 704 is configured to be raised horizontally first. However, Oblong Protrusion 711 is configured to prevent this from rotating before Cover 704 is lifted. Cover 704 has an elliptical Cutout Hole 743 corresponding to Protrusion 711. As these Protrusions 711 and Cutout Holes 743 fit together, Cover 704 is structured such that it does not rotate until Cover 704 is lifted.

30

【0135】

Press Cover 747 is also intended to prevent the rotational axis of Cover 704 from moving upwards easily. In other words, the tip of Casing 703 has Protrusion 712 that is chamfered on one side of the tip angle of the triangular pyramid, and Press Cover 747 has Locking Hole 747b corresponding to the aforementioned Protrusion 712. Press Cover 747, which is divided relative to Cover 704, in its rotation, as shown in Figure 33, gradually expands its sides to the outside along Angle 712a in the chamfered surface of one tip angle of Triangular Protrusion 712 by applying an external force of a predetermined strength in the direction of rotation to unlock it.

【0136】

40

When closing Press Cover 747, by applying an external force in the opposite rotational direction of the predetermined strength, the sides of Press Cover 747 gradually bulge outwardly along the other chamfered Surfaces 712b of Protrusion 712, and Protrusion Holes 747b are finally fitted into Protrusion 712 to be locked.

【0137】

The procedure for opening Cover 704 of Air-cooling Fan Unit 701 is explained next, based on Figures 34 and 35.

First, from the closed state of Cover 704 and Press Cover 747 as shown in Figure 34 (a), Press Cover 747 is rotated and opened as shown in Figure 34 (b). This state is shown in Figure 35 (a).

【0138】

This is then lifted up with Cover 704 held horizontally, as shown in Figure 34 (c). This state is shown in Figure 35 (b).

Then, as shown in Figure 34 (d), Cover 704 is rotated to be opened. This state is shown in Figure 35 (c). Fan 2 can be replaced. 10

【0139】

As explained above, according to Air-cooling Fan Unit 701 of the present embodiment, Securing Bush 750 can be used to easily secure Fan 2, Cover 704, Casing 703, providing faster performed than using screws, etc. Cover 704 can also be easily released by lifting and oscillating Cover 704 relative to Casing 703. This is also convenient during maintenance.

【0140】

In the present embodiment, Protrusion 712 is configured in a triangular pyramid shape, which may be configured as Triangular Protrusion 712', as shown in the partial perspective view of Figure 36 (a). Although Protrusion 712 and Locking Holes 747b were formed parallel to Casing 703, the corresponding Protrusion 712' and Locking Holes 747b' may be formed at an angle relative to Casing 703, as shown in the partial side view in Figure 36 (b). 20

【Industrial Availability】

【0141】

The present invention can be attached to a shelf containing electronic devices and applied to devices that forcibly blow through the shelf to cool down the electronics.

(Additional Note 1)

Air-cooling Fan Unit mounted to a shelf containing electronic devices to force air through the shelf to cool down the electronics;

wherein it comprises a fan that drives an internal rotor blade to produce a ventilating effect; 30

a casing to support the aforementioned fan;

a lattice-like finger guard each of which is configured to face the rotor blades before and after an airflow path of the fan;

a locking portion consisting of a plate-shaped body resiliently provided for oscillation on a rear end side of the direction it is mounted to the shelf of the casing, having a collar part for applying an external force, in the direction of oscillation, to a portion of the plate-shaped body, and plural locking means each of which is configured at a location abutting an opposing surface of fan unit insertion port of the shelf, the locking portion being locked to the shelf via at least one of the locking means;

and

a structure in which the locking portion is oscillated by an external force applied to the collar part, such that each locking means is configured to detach the fan from the shelf in conjunction therewith. 40

【0142】

(Additional Note 2)

An air-cooling fan unit described in Additional Note 1, wherein the aforementioned casing is formed in the shape of a box;

the aforementioned locking portion is partially separated from the body of the casing by providing a slit on the side wall of the rear end of the casing and is configured for oscillation, with elastic deformation around a hinge part formed in the remainder thereof.

【0143】

50

(Additional Note 3)

An air-cooling fan unit described in Additional Note 1, wherein a handle is configured to span the collar on a rear end side in the direction of mounting it to the shelf of the casing; and
it is structured that prohibits insertion of fingers that energizes the collar part to an opposite side from the direction of detachment of the locking means.

【0144】

(Additional Note 4)

An air-cooled fan unit as described in Additional Note 3, wherein a structure is configured with a cover material occluding one end of an open portion formed between the main body of the handle and the casing.

10

【0145】

(Additional Note 5)

An air-cooling fan unit described in Additional Note 3, wherein the casing is detachably configured on a rear end side in the direction the casing is mounted; and comprises a front panel integrated with the handle and the locking portion.

【0146】

(Additional Note 6)

An air-cooling fan unit mounted to a shelf containing electronic devices, wherein it forces air through the shelf to cool down the electronics;

a fan that drives an internal rotor blade to produce a ventilating effect; and

20

a casing that supports the fan;

a lattice-like finger guard each of which is configured to face the rotor blades before and after an airflow path of the fan;

plural stud pins rotatably supporting a rotator pin having a width narrower than the width of the body and a length greater than the width of the body in a slit portion provided at the tip of the body mounted inside the casing around an axis perpendicular to a longitudinal direction of the rotator pin;

a lock bush having a through hole for inserting a tip end of the stud pin including the through hole and a locking groove formed to transverse the through hole and to lock the rotating pin inserted and rotate through the through hole along its longitudinal direction; the lock bush resiliently sandwiched between the fan and the finger guard by being axially depressed and elastically deformed toward the stud pin direction and rotating around its axis

30

and locking the rotatory pin in the locking groove.

【0147】

(Additional Note 7)

An air-cooling fan unit described in Additional Note 6, wherein although it comprises a through hole in the lock bush with a width wider than the length of the rotator pin, a slope that helically slopes from a leading edge of the locking groove to the through hole; and

when removing the lock bush from the stud pin, the rotator pin is configured to slide along the ramp to escape into the through hole by rotating the lock bush while axially pressing in the stud pin.

【0148】

(Additional Note 8)

An air-cooling fan unit as described in Additional Note 6, wherein it comprises the handle to grip when the air-cooling fan unit is mounted into the shelf; it is integrally configured with a locking portion that secures the air-cooling fan unit to the shelf by being locked to the fan unit insertion port of the shelf, and also it includes a front panel that is detachably configured on the rear end side in the direction of the to the shelf of the casing.

40

【0149】

(Additional Note 9)

An air-cooling fan unit mounted to a shelf containing electronic devices to force air through the shelf to cool down the electronics;

wherein it comprises a fan that drives an internal rotor blade to produce a ventilating effect;

a pair of casings housed and supporting the fan by sandwiching the fan from the sides;

a lattice-like finger guard each of which is configured to face the rotor blades before and after an airflow path of the fan;

plural bushings circumferentially mounted on a side of an axial main body with plural locking grooves to lock a portion of the finger guard and a through hole provided in the casing, respectively;

and

a structure in which the aforementioned casing and finger guard are secured by fitting part of the aforementioned finger guide and the a through hole in the casing.

【0150】

(Additional Note 10)

An air-cooling fan unit as described in Additional Note 9, wherein plural fixing holes are formed at the periphery of the fan, and the fan is secured relative to the casing by locking a tip of the bush to the securing hole.

【0151】

(Additional Note 11)

An air-cooling fan unit as described in Additional Note 9, wherein the handle gripped when inserting the air-cooling fan unit into the shelf is integrally configured with a locking portion that secures the air-cooling fan unit to the shelf by being locked to the fan unit insertion port of the shelf; and it further comprises a front panel that is detachably configured on the rear end side of the direction it is mounted to the shelf of the casing.

【0152】

(Additional Note 12)

An air-cooling fan unit mounted to a shelf containing electronic devices to force air through the shelf to cool down the electronics;

wherein it comprises a fan that drives an internal rotor blade to produce a ventilating effect;

a casing that supports the fan and has a lattice-like vent, each of the casings is configured to face the rotor blade before and after the fan vent path;

locking means configured in each casing such that

multiple air-cooling fan units can be connected and secured in parallel.

【0153】

(Additional Note 13)

An air-cooling fan unit described in Additional Note 12, wherein the handle gripped when inserting the air-cooling fan unit into the shelf is integrally configured with a locking portion to secure the air-cooling fan unit to the shelf by being locked to the fan unit insertion port of the shelf; and the front panel detachably configured on the rear end side of the direction it is mounted to the shelf of the casing.

【0154】

(Additional Note 14)

An air-cooling fan unit mounted to a shelf containing electronic devices to force air through the shelf to cool down the electronics;

wherein it comprises a fan that drives an internal rotor blade to produce a ventilating effect;

a casing having an opening for inserting the fan into an end face of a box-shaped body, a lattice-like vent configured to accommodate and support the fan and face the rotor blade in a location the fan is mounted;

a cover arranged to cover an opening in the casing; a lattice-like vent configured to face a rotor blade of the fan to open the opening by oscillating around a oscillating axis configured on one end side of the casing;

an oscillating restraint means comprising a locking portion provided between the cover and the casing; and the oscillating means inhibiting oscillating thereof

until the cover is lifted to a predetermined level relative to the casing.

【0155】

(Additional Note 15)

An air-cooling fan unit described in Additional Note 14, wherein it comprises plural securing bushes fitted to go through plural mounting holes configured in the cover, while plural securing holes are formed at the periphery of the fan, the fan is configured to be secured relative to the cover by locking a tip of the securing bush to the securing hole; and

the oscillating means inhibits oscillating the cover until the cover is lifted and a tip of the securing bush is removed from a securing hole of the fan.

【0156】

10

(Additional Note 16)

An air-cooling fan unit described in Additional Note 14, wherein it is configured to cover an end of the aforementioned cover and to be rotatable around a rotational axis configured in the casing; wherein it comprises a press cover that fits the casing at its rotational base point to inhibit lifting of the cover while releasing the lifting prohibition of the cover at its rotational end point.

【0157】

(Additional Note 17)

An air-cooling fan unit described in Additional Note 16, wherein by applying an external force in a rotational direction of a predetermined level to the press cover, the fit-release structure disengages the fit state of the press cover and the casing by elastically deforming the fit.

20

【0158】

(Additional Note 18)

An air-cooling fan unit described in Additional Note 14, wherein the handle gripped when inserting the air-cooling fan unit into the shelf is integrally configured with a locking portion that secures the air-cooling fan unit to the shelf by being locked to the fan unit insertion port of the shelf; and wherein it comprises a front panel that is detachably configured on the rear end side of the direction it is mounted to the shelf of the casing.

【Short description of drawings】**【0159】**

【Figure 1】 An exploded view showing a schematic configuration of an air-cooling fan unit according to the first embodiment of the present invention.

30

【Figure 2】 An exploded view showing the mounting structure of the fan and rubber bush that make up the air-cooling fan unit of the first embodiment.

【Fig. 3】 An illustration showing the peripheral structure of the handle that constitutes the air-cooling fan unit of the first embodiment.

【Figure 4】 An illustration showing the structure of the casing and cover that constitute the air-cooling fan unit of the first embodiment.

【Figure 5】 This is a perspective view showing the mounting structure of the air-cooling fan unit and the shelf in the first embodiment.

【Figure 6】 A perspective view of the shelf seen diagonally from above without the presence of the air cooling fan unit of the first embodiment.

40

【Figure 7】 A diagram corresponding to a view of the C - directed arrow vof Figure 6 and the cross section view of D - D of Figure 3 (b).

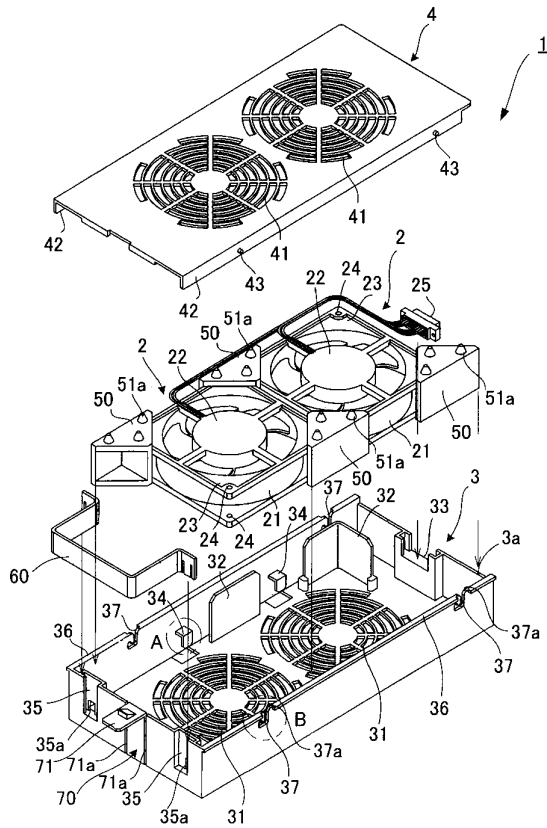
【Figure 8】 A front view of an upper lock-type shelf.

【Figure 9】 A perspective view of the upper lock-type shelf seen from below without the presence of the air cooling fan unit.

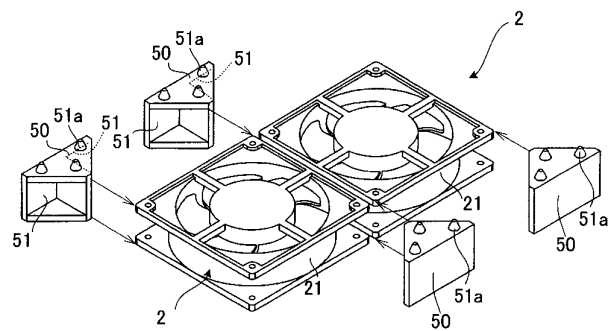
- 【Figure 10】 A view of E - E arrow in Figure 9 and a view of an arrow in the F direction.
- 【Figure 11】 An illustration showing the method of mounting the air-cooling fan unit to a shelf in the first embodiment.
- 【Figure 12】 An exploded view showing the structure of an air-cooling fan unit according to the first variant.
- 【Figure 13】 A perspective view showing the structure in the vicinity of the fan, which is a characteristic part of the first variant.
- 【Fig. 14】 An exploded view showing the structure of an air-cooling fan unit according to the second variant.
- 【Figure 15】 A perspective view showing the structure in the vicinity of the fan, which is a characteristic part of the second variant. 10
- 【Figure 16】 A perspective view showing a schematic configuration of a featured portion of an air-cooling fan unit according to the second embodiment.
- 【Fig. 17】 A perspective view of the handle having a featured portion of the second embodiment.
- 【Figure 18】 An illustration showing the method of mounting the air-cooling fan unit in the second embodiment.
- 【Figure 19】 A perspective view showing a schematic configuration of a featured portion of an air-cooling fan unit according to the third embodiment.
- 【Figure 20】 An exploded view showing a schematic configuration of an air-cooling fan unit according to the fourth embodiment.
- 【Figure 21】 An exploded view showing the configuration of a stud pin, which is a featured part of the fourth embodiment. 20
- 【Figure 22】 An illustration showing the configuration of a lock bush, which is a featured part of the fourth embodiment.
- 【Figure 23】 A perspective view, etc., showing the locking portion of the stud pin and the lock bush in the fourth embodiment.
- 【Fig. 24】 An illustration showing the structure of the front panel constituting the air-cooling fan unit of the fourth embodiment.
- 【Fig. 25】 An illustration showing the structure of the front panel constituting the air-cooling fan unit of the fourth embodiment.
- 【Fig. 26】 There is a perspective view showing the configuration of a rock bushing according to a variant of the fourth embodiment. 30
- 【Figure 27】 An exploded view showing a schematic configuration of an air-cooling fan unit according to the fifth embodiment.
- 【Fig. 28】 An illustration showing the assembled structure of the air-cooling fan unit in the fifth embodiment.
- 【Figure 29】 A perspective view showing a schematic configuration of an air-cooling fan unit according to the sixth embodiment.
- 【Figure 30】 An exploded view of an air-cooling fan unit in the sixth embodiment.
- 【Fig. 31】 An illustration showing the configuration of an air-cooling fan unit in the sixth embodiment.
- 【Figure 32】 An exploded view showing a schematic configuration of an air-cooling fan unit according to the seventh embodiment.
- 【Fig. 33】 An illustration showing the structure of the casing that constitutes the air-cooling fan unit of the seventh embodiment. 40
- 【Fig. 34】 An illustration illustrating the procedure of removing the cover from the casing in the air-cooling fan unit of the seventh embodiment.
- 【Fig. 35】 An illustration showing the procedure for removing a cover from a casing in an air-cooling fan unit of the seventh embodiment.
- 【Fig. 36】 An illustration showing the structure of the casing according to a variant of the seventh embodiment.
- 【Fig. 37】 An exploded view showing an example of the structure of a conventional air-cooling fan unit.
- 【Explanation of symbol/codes】
- 【0160】 50
- 1, 201, 401, 501, 601, and 701: Air-cooling Fan Units
- 2: Fan
- 3, 203, 303, 403, 503, 603, and 703: Casings
- 4, 204, 604 and 704: Covers
- 21: Fan Casing
- 31 and 41: Vents
- 50, 150, and 250: Rubber Bushes
- 60 and 260: Handle
- 70, 270, and 370: Locking Portion
- 71, 272, and 371: Flange Part
- 71a: Slit 60

72, 73, 372, and 373: Locking Claws	
80 and 180: Shelves	
81 and 181: Fan Unit Insertion Port	
82, 182 and 282: Upper Beam	
83 and 283: Lower Beam	
85, 185, and 285: Locking Holes	
90: Guide Rail	
262: Cover Material	
404: Finger Guard	
410: Stud Pin	10
413: Slit	
415: Rotator Pin	
420: Lock Bush	
421: Lock Bush Main Body	
421a: Through Hole	
421b: Locking Groove	
421c: Slope	
431: Locking recess	
460: Front Panel	
462: Handle	20
463: Locking Portion	
467: Collar Part	
504b: Fan Housing	
520: Securing Bush	
551: Locking Recess	
612 and 621: Vents	
616: Guide	
617: Locking Recess	
660: Front Panel	
714: Locking Portion	30
715 and 741: Vents	
747: Press Cover	
750: Securing Bush	

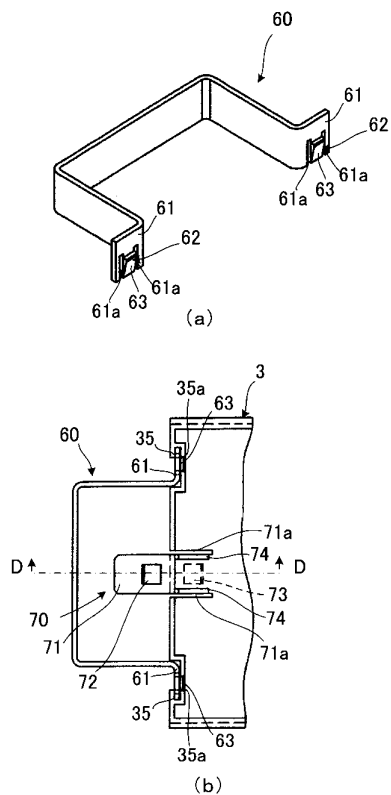
【Figure 1】



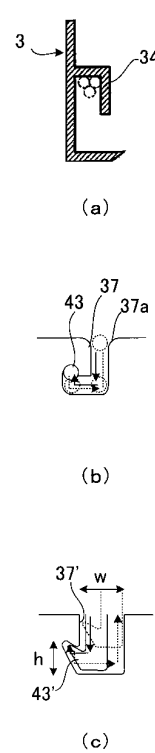
【Figure 2】



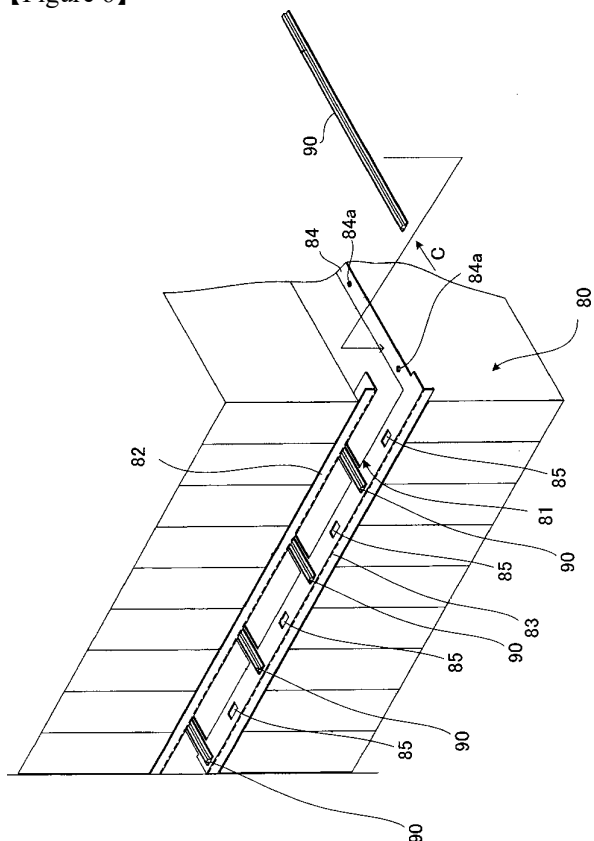
【Figure 3】



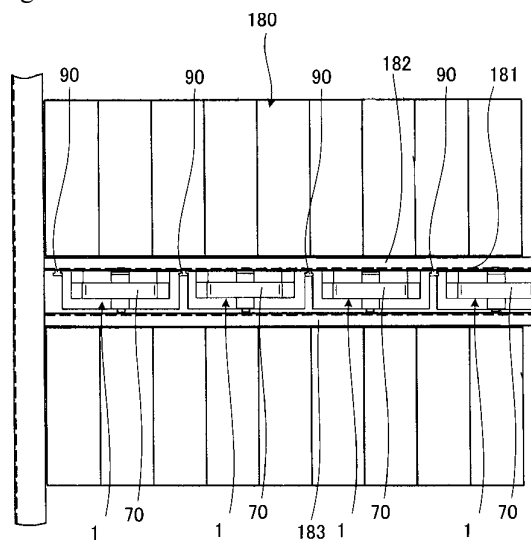
【Figure 4】



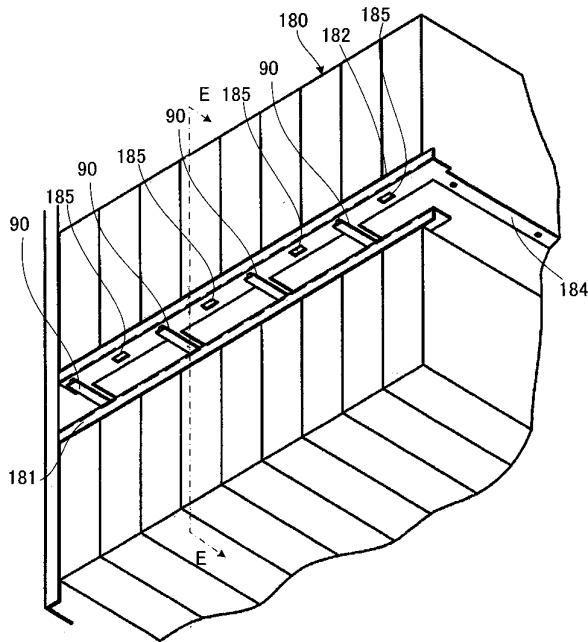
【Figure 6】



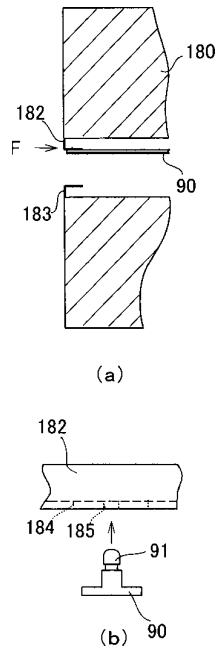
【Figure 8】



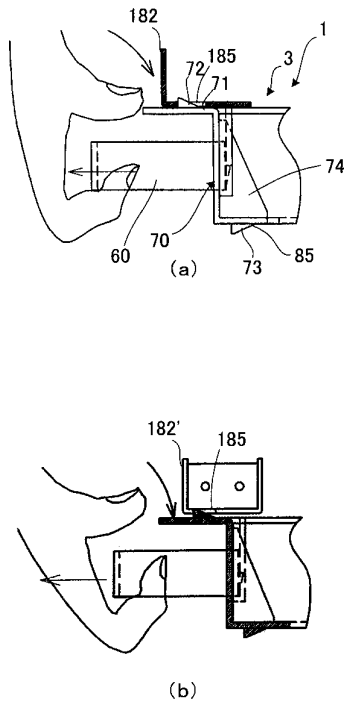
【Figure 9】



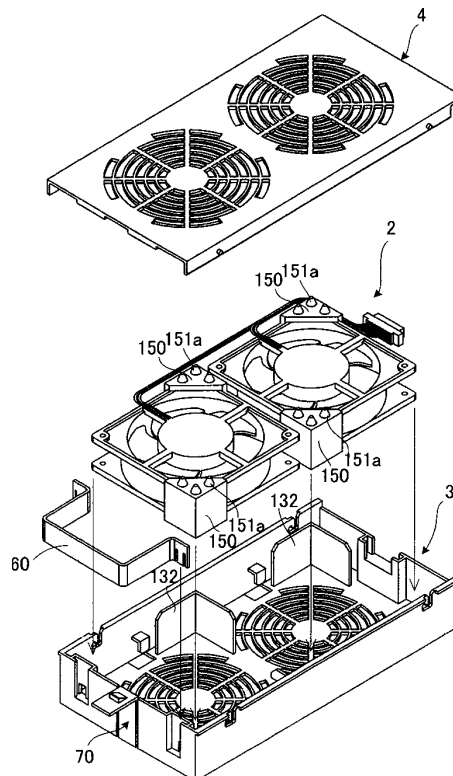
【Figure 10】



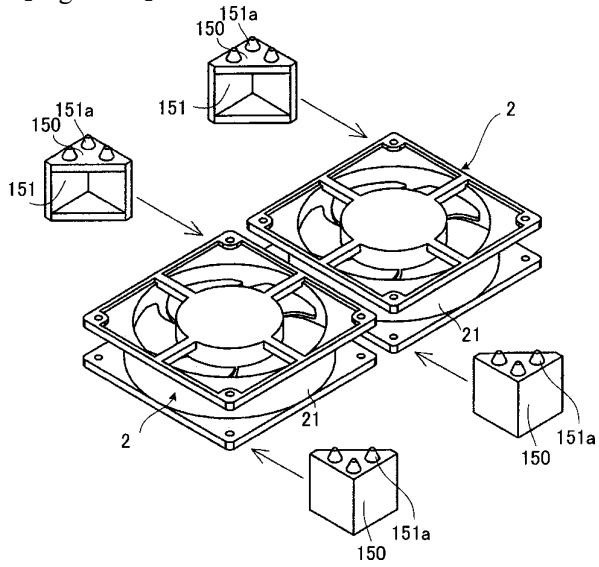
【Figure 11】



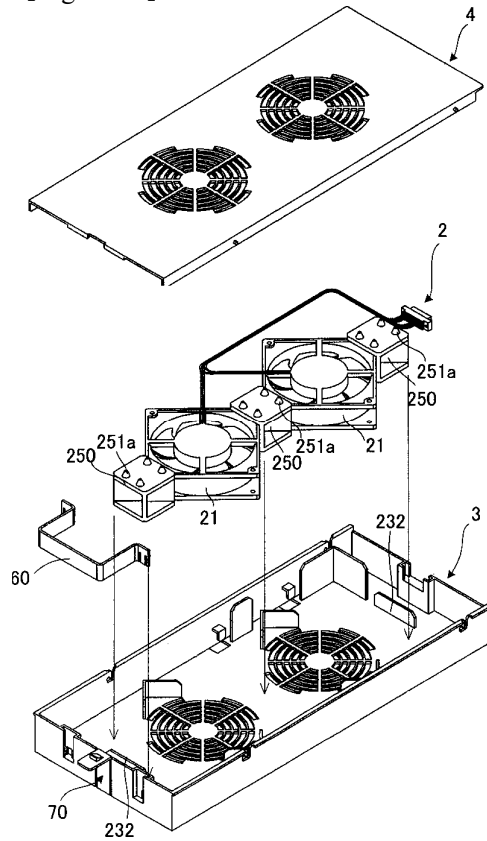
【Figure 12】



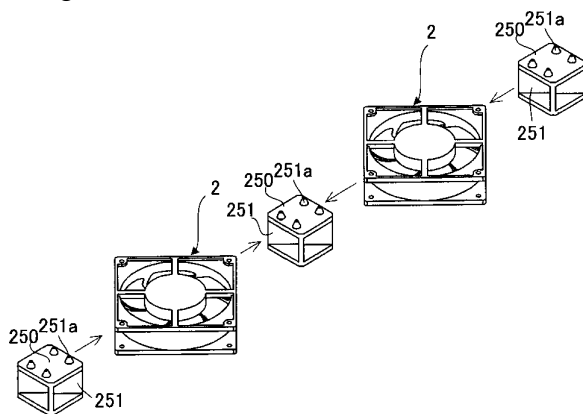
【Figure 13】



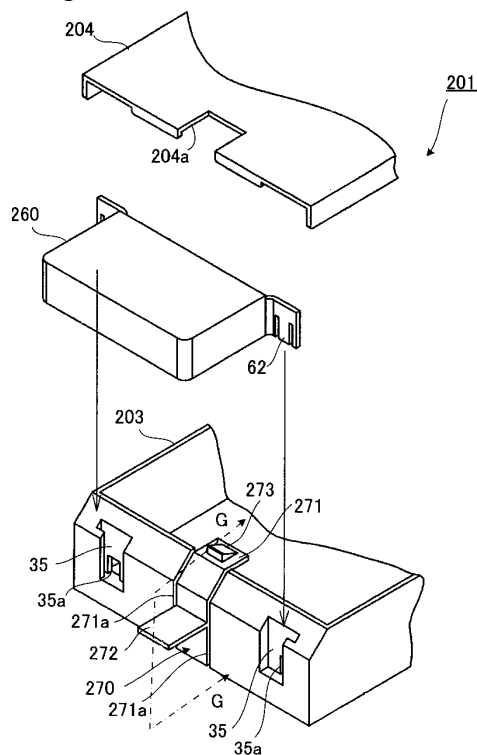
【Figure 14】



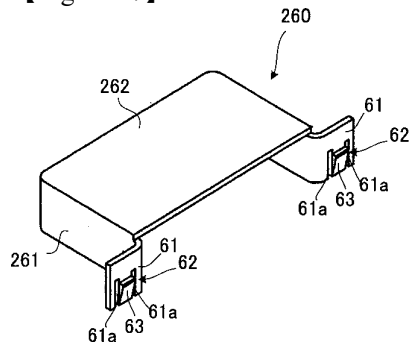
【Figure 15】



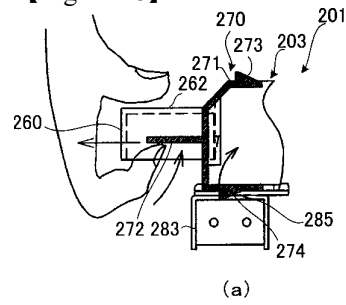
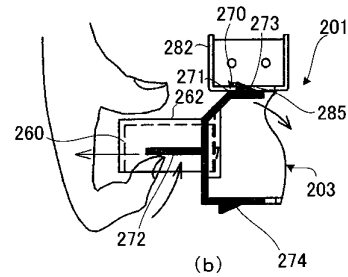
【Figure 16】



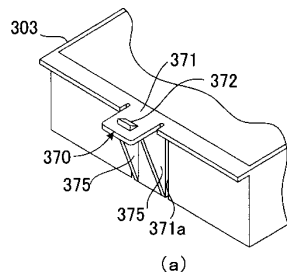
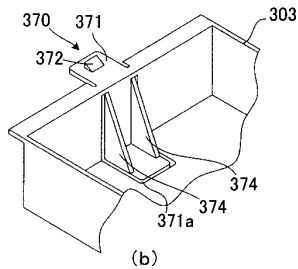
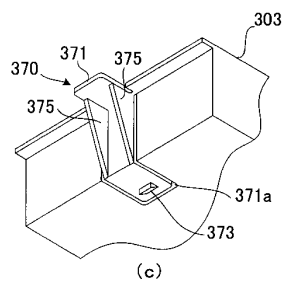
【Figure 17】



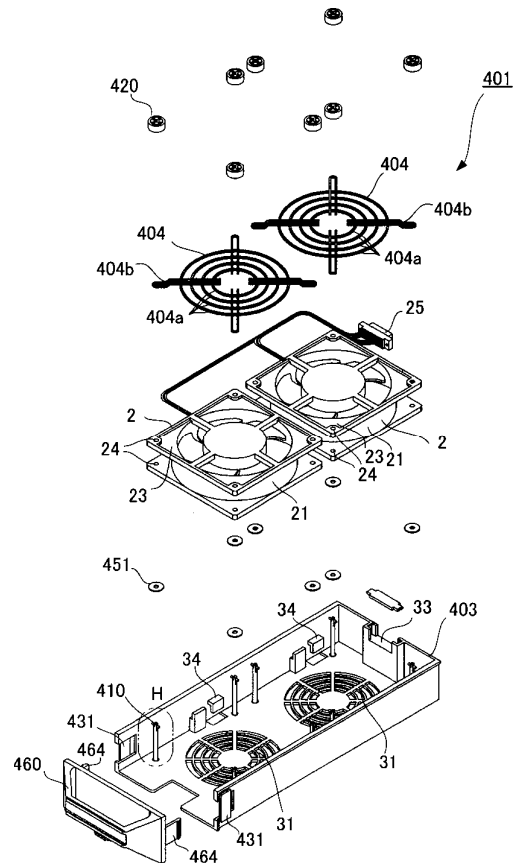
【Figure 18】



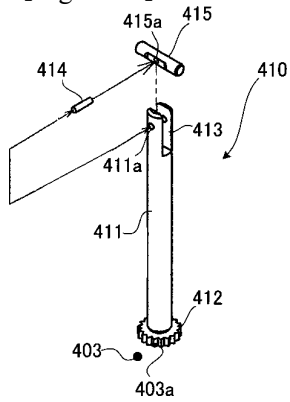
【Figure 19】



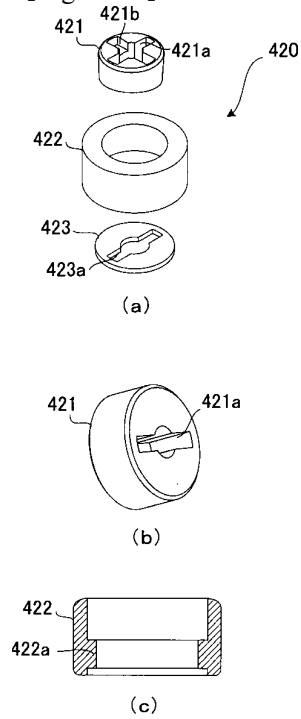
【Figure 20】



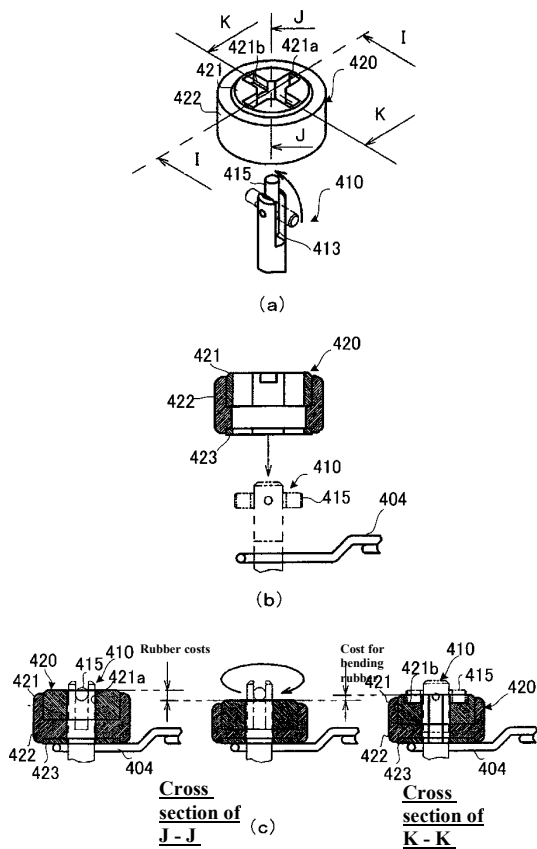
【Figure 21】



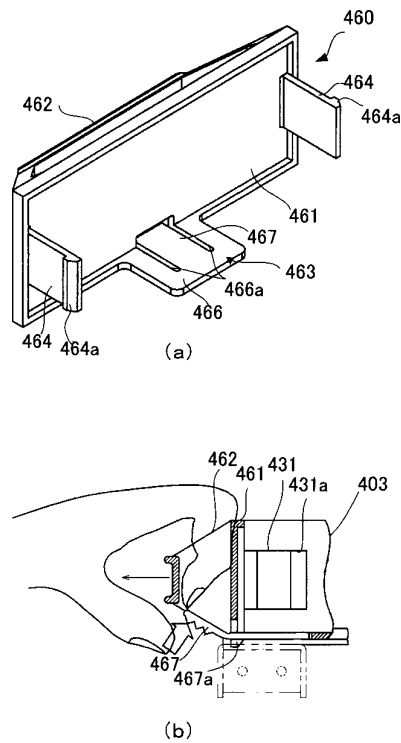
【Figure 22】



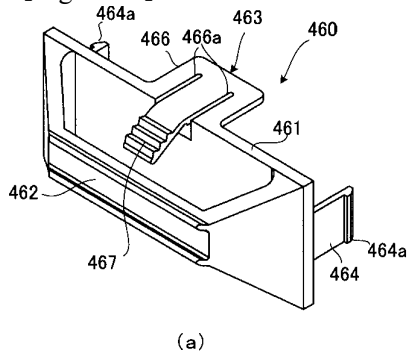
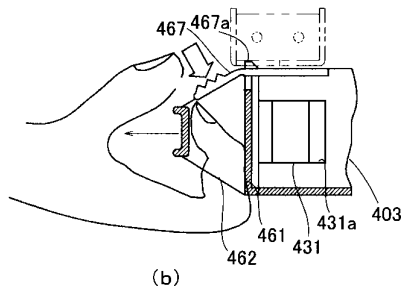
【Figure 23】



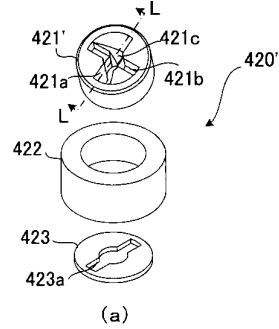
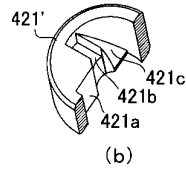
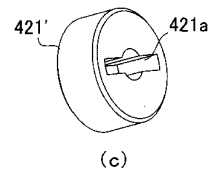
【Figure 24】



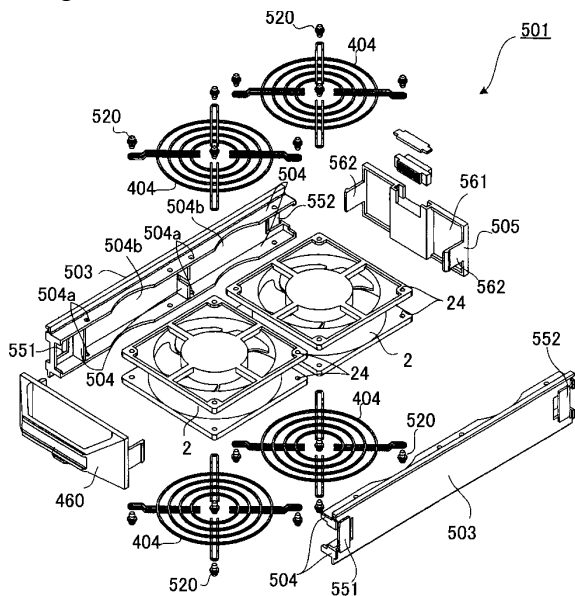
【Figure 25】



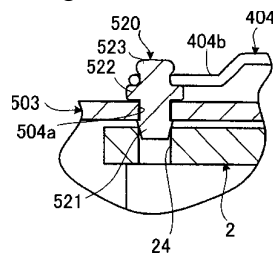
【Figure 26】



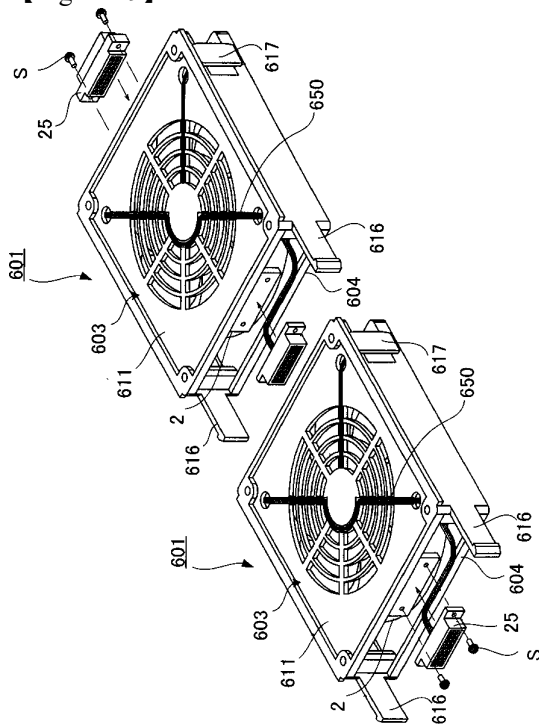
【Figure 27】



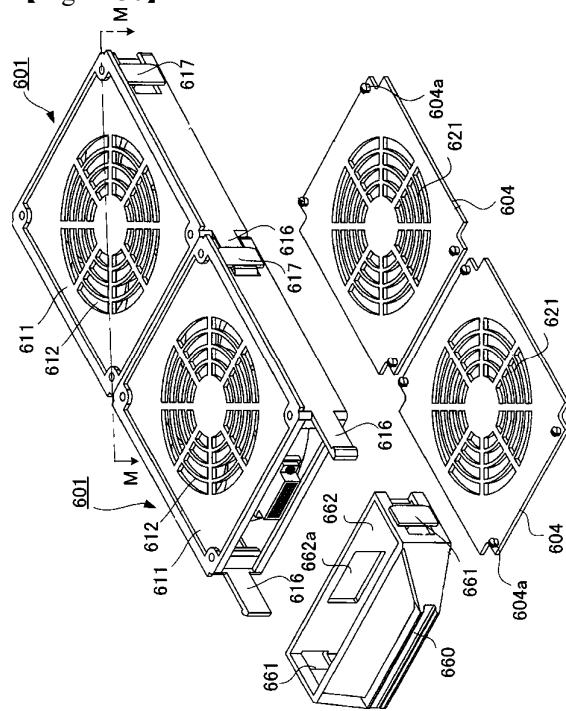
【Figure 28】



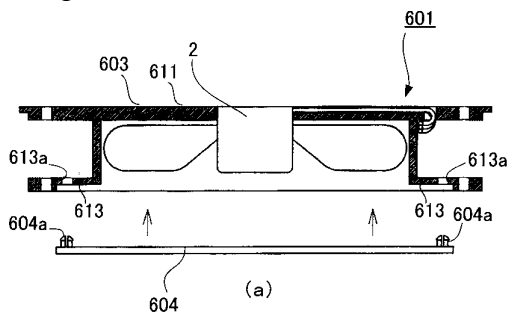
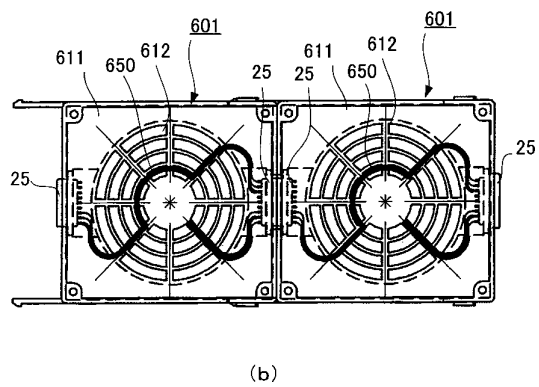
【Figure 29】



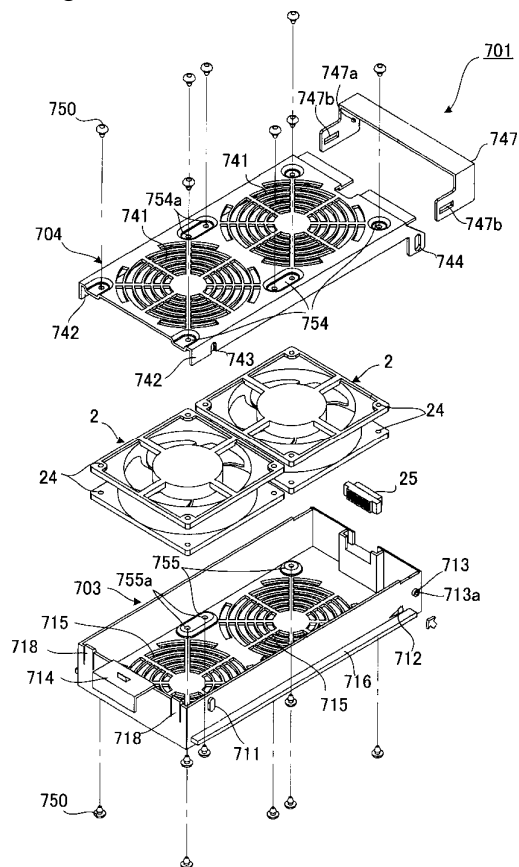
【Figure 30】



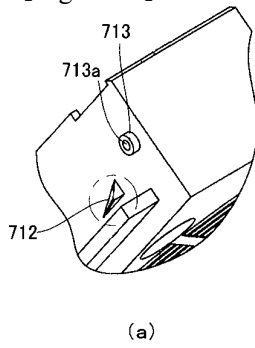
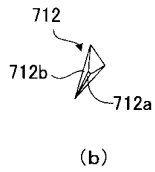
【Figure 31】



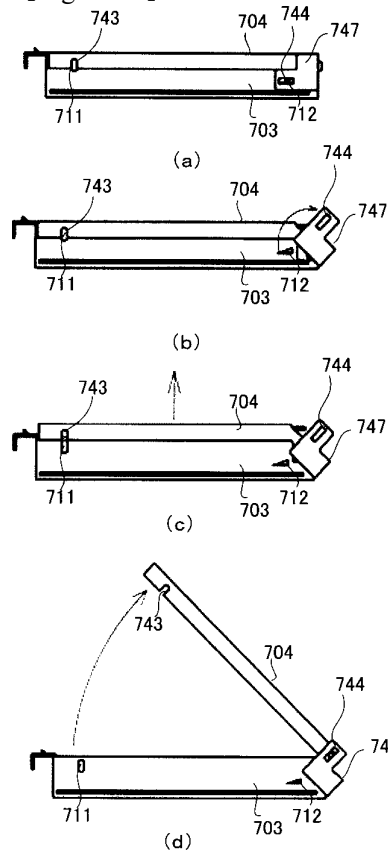
【Figure 32】



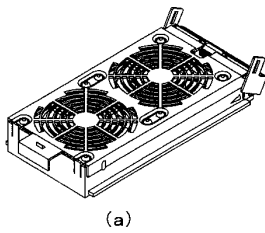
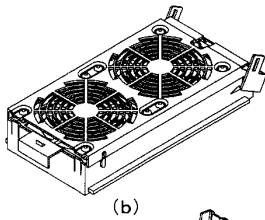
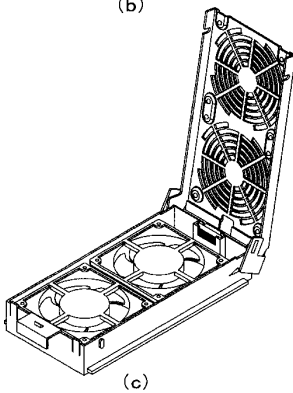
【Figure 33】



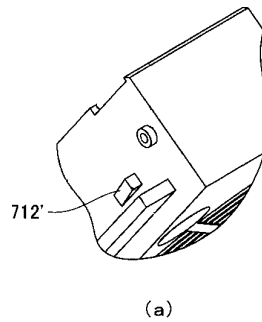
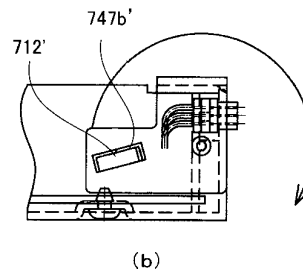
【Figure 34】



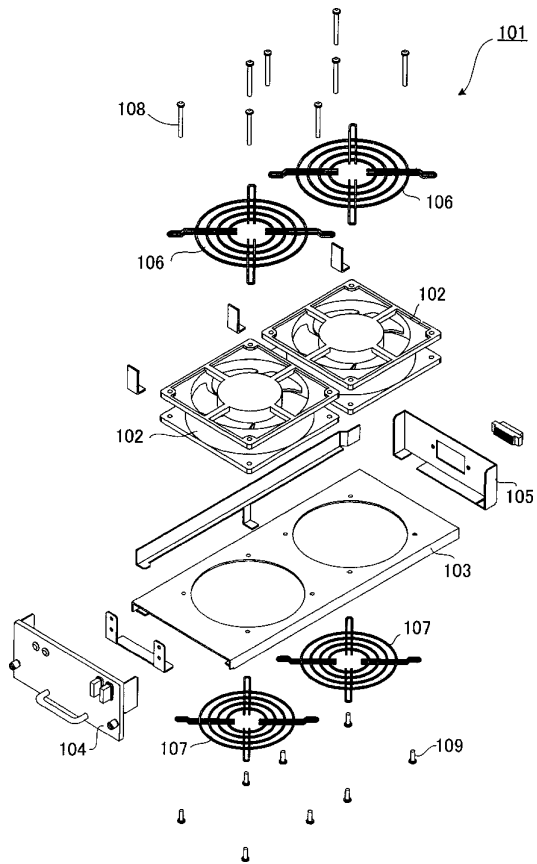
【Figure 35】



【Figure 36】



【Figure 37】



Continued from the front page

(72) Inventor Toshimitsu Kobayashi
Fujitsu Co., Ltd., 4-1-1 Kamikodanaka, Nakahara-ku, Kawasaki-shi, Kanagawa-ken

(72) Inventor Manabu Miyamoto
Fujitsu Co., Ltd., 4-1-1 Kamikodanaka, Nakahara-ku, Kawasaki-shi, Kanagawa-ken

(72) Inventor Yoshihisa Nakagawa
Fujitsu Co., Ltd., 4-1-1 Kamikodanaka, Nakahara-ku, Kawasaki-shi, Kanagawa-ken

F term (reference) 5E322 AB04 BB03
5F036 AA01 BA04 BB35