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(54) ELECTRIC MACHINE TOOL

ELEKTRISCHE WERKZEUGMASCHINE

OUTIL DE MACHINE ÉLECTRIQUE

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Description

FIELD OF THE INVENTION

[0001] The invention relates to an electric machine tool.

BACKGROUND OF THE INVENTION

[0002] A body of an electric machine tool such as a chain saw and a brush cutter has a motor receiving chamber, in which a motor has been disposed, and a battery receiving chamber, in which a battery is to be disposed. According to such electrical machine tool, a battery is disposed in a battery receiving chamber and the battery supplies electrical power to a motor to drive a work tool such as a saw chain and a rotating blade.

[0003] According to the conventional electric chain saw, a battery receiving chamber opens through an upper face of a body and may be configured to cool a motor in a motor receiving chamber and a control board by making air flow from a battery receiving chamber into the motor receiving chamber (e.g., US9138884).

DESCRIPTION OF THE RELATED ART

[0004] US9138884 discloses an electric machine tool of the type described above.

[0005] The Japanese patent application JP 2010058186 discloses a power tool according to the preamble of claim 1 with a cooling structure. The power tool includes a fan mounted on a rotating shaft of the motor to cool the motor. The housing of the power tool comprises a body portion for storing the motor, a handle extending downward from the body portion, and a battery retainer at a front end of the handle. An air inlet/outlet is provided in the battery retainer to cool the control circuit by generating air flows in the handle. The battery for the power tool is positioned outside of the housing. No filtering of the air flows takes place.

SUMMARY OF THE INVENTION

[0006] According to the conventional chain saw described above, chips and dust particles occurring when cutting are likely to enter into the motor receiving chamber from the battery receiving chamber. The remaining of the dust particles in the motor receiving chamber leads to reduction in the cooling efficiency of the motor as well as of the control board, and reduction in the driving efficiency of the motor. Thus, according to the conventional chain saw, the interior of a body must be cleaned frequently, which makes the maintenance of the conventional chain saw difficult.

[0007] It is an object of the invention to provide an electric machine tool which is capable of preventing dust particles from coming into a motor receiving chamber and reduce the frequency of the maintenance of the electric machine tool.

[0008] The electric machine tool of the invention includes: a body, to which a work tool is attached; a motor for driving the work tool; a battery for supplying electrical power to the motor; and, the body having a motor receiving chamber, in which the motor is disposed, an air discharging means to discharge the air in the motor receiving chamber, a battery receiving chamber opening through an outer surface of the body, and a communication path, through which the battery receiving chamber is in communication with the motor receiving chamber. A first air inlet opening is formed between the inner edge of an opening of the battery receiving chamber and the outer periphery of the battery disposed in the battery receiving chamber. An inflow port of the communication path opens to an inner side surface of the battery receiving chamber. An air filter is fitted over the inflow port.

[0009] According to the electric machine tool of the invention, when air flows through the air filter into the communication path, the dust particles in the air are filtered off by the air filter. In this way, dust particles are unlikely to enter into the motor receiving chamber. Thus, according to the electric machine tool of the invention, dust particles are unlikely to remain in the motor receiving chamber. This can extend time between the cleans of the interior of a body and can reduce the frequency of the maintenance of the electric machine tool. The air filter is disposed on an inner side surface of the battery receiving chamber according to the electric machine tool of the invention. Thus, the attachment/detachment of and the clean of the air filter can be simply conducted from the outside of the body by removing the battery from the battery receiving chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention will now be described with reference of the drawings wherein:

FIG. 1 is a perspective view of the electric machine tool of the embodiment of the invention when viewed from an upper rear right direction;

FIG. 2 is a perspective view of the electric machine tool of the embodiment of the invention when viewed from an upper rear right direction with a battery removed from a body;

FIG. 3 is a sectional view when the electric machine tool illustrated in FIG. 1 is cut along the III-III plane;

FIG. 4 is a schematic view for the cooling structure of the electric machine tool of the embodiment of the invention;

FIG. 5 is a perspective view of the electric machine tool of the embodiment of the invention when viewed from an upper rear left direction with an upper cover removed;

FIG. 6 is a sectional view of the electric machine tool of the embodiment of the invention during a detachment step of an air filter from a body housing; and

FIG. 7 is a sectional view of the electric machine tool of the embodiment of the invention during a detachment step subsequently to FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

[0011] Embodiments of the invention will be explained in detail appropriately referring to the drawings. The embodiments are explained with an example configuration of a chain saw cutting woods, boards, etc, to which the present invention is applied.

[0012] As FIG. 1 shows, a chain saw 1 has a body 10 and a cutter 20 attached to the body 10. As FIG. 4 shows, the chain saw 1 has a motor 30 for driving the cutter 20, a control board 40 for controlling operation of the motor 30, and a battery 50 for supplying electrical power to the motor 30.

[0013] As FIG. 1 shows, the body 10 has a box body housing 11 made of a resin and an upper cover 12 made of a resin covering a top portion of the body housing 11. As FIG. 4 shows, a motor receiving chamber 15 and a battery receiving chamber 16 are formed in the body housing 11.

[0014] The motor receiving chamber 15 is formed in a front area of the body housing 11 as FIG. 4 shows. The body housing 11 has an interior housing space in which the motor receiving chamber 15 is formed. Driving mechanism devices such as the motor 30, the control board 40, and a blower fan 33 are disposed in the motor receiving chamber 15.

[0015] The motor 30 may be any type of an electric motor which has been known has a hollow motor housing 31, into which a cylindrical yoke 30a is inserted, an output shaft 32 engaged with the yoke 30a, and a sensor board 30b for detecting the rotation of the yoke 30a.

[0016] An insertion hole 31a, through which the yoke 30a is inserted, is formed through the right side surface of the motor housing 31 as FIG. 4 shows. A gap is formed between the inner edge of the insertion hole 31a and the outer periphery of the yoke 30a.

[0017] An outflow port 31b opens through a bottom portion of the motor housing 31. A cylindrical air flow path 18, through which the outflow port 31b is in communication with an air outlet opening 11b, is formed at the bottom of the body housing 11. One end of the air flow path 18 communicates with the outflow port 31b and the other end communicates with the air outlet opening 11b, which opens through the right side surface of the body housing 11 as FIG. 4 shows.

[0018] A stator (not shown in the drawings) is disposed in the yoke 30a. When a coil of the stator is energized, the yoke rotates around the axis of the output shaft. A base end portion of the output shaft 32 engages with the yoke 30a and a leading end portion of the output shaft 32 projects outwardly through a right side wall 11a of the body housing 11 as FIG. 4 shows.

[0019] The sensor board 30b, which engages with the stator, is fixed relative to the motor 30. The sensor board 30b has a circular shape with a center hole. The yoke 30a is concentrically inserted through the center hole of the sensor board 30b.

[0020] The blower fan 33 is disposed in the motor housing 31. The blower fan 33 is secured to the yoke 30a. Thus, the blower fan 33 rotates in conjunction with the rotation of the yoke 30a. The blower fan 33, the outflow port 31b, the air flow path 18, and the air outlet opening 11b constitute air discharging means to discharge the air in the motor receiving chamber 15 to the outside of the body housing 11. The blower fan 33 blows the air in the motor housing 31 when rotating and then make the air flow via the outflow port 31b through the air flow path 18 via the air outlet opening 11b to the outside of the body housing 11. Meanwhile, the air in the motor receiving chamber 15 flows into the motor housing 31 through the insertion hole 31a. In this way, the air in the motor receiving chamber 15 is discharged through the motor housing 31 to the outside of the body housing 11.

[0021] A drive gear 34 engages with the leading end portion of the output shaft 32. The drive gear 34 is disposed adjacent to the right side wall 11a of the body housing 11 as FIG. 4 shows.

[0022] The control board 40 is an electrical circuit board attached onto a heat dissipation member made of metal. The control board 40 is electrically connected to the motor 30. The control board 40 is disposed in a rear area of the motor receiving chamber 15 as FIG. 4 shows.

[0023] The battery receiving chamber 16 is formed in a rear area of the body housing 11 as FIG. 4 shows. As FIG. 2 shows, the battery receiving chamber 16 is a substantially rectangular receptacle and opens through an upper face of the body housing 11.

[0024] The battery receiving chamber 16 receives the battery 50 (as referred to FIG. 3). The battery 50 may be any type of a battery which has been known and comprises a rectangular housing and a secondary battery (e.g., a lithium ion battery) disposed in the rectangular housing.

[0025] As FIG. 3 shows, a gap is formed between the inner edge of an opening 16a of the battery receiving chamber 16 and the outer periphery of an upper portion of the battery 50 disposed in the battery receiving chamber 16. Thus, this gap functions as a first air inlet opening 81. According to the embodiment, as FIG. 1 shows the first air inlet opening 81 has a circular shape and extends along the outer periphery of the upper portion of the battery 50.

[0026] A connection terminal (not shown in the drawings), which is electrically connected to the control board 40 shown in FIG. 4, is provided at the bottom of the motor receiving chamber 16. A connection terminal of the battery 50 is connected to the connection terminal at the bottom of the battery receiving chamber 16, whereby the battery 50 supplies electrical power to the control board 40 and the motor 30.

[0027] An ejecting mechanism (not shown in the drawings) is provided at the bottom of the battery receiving

chamber 16 to eject the battery 50 from the battery receiving chamber 16. With the battery 50 held in the battery receiving chamber 16 as shown in FIG. 1, the ejecting mechanism is actuated to push the battery 50 upward from the battery receiving chamber 16 by operating a lever 51 provided at the top of the battery 50.

[0028] As FIG. 3 shows, two right and left second air inlet openings 82 are formed through right and left bottom portions of the battery receiving chamber 16 and open through right and left lower portions in a rear area of the body housing 11. According to this embodiment, the total opening area of both of the second air inlet openings 82 is configured to be larger than that of the first air inlet opening 81.

[0029] Right and left bottom portions of the battery 50, which is disposed in the battery receiving chamber 50, are exposed to the outside through both of the second air inlet openings 82 (as referred to FIG.1).

[0030] As FIG. 1 shows, a top portion of the body housing 11 is covered by an upper cover 12. The upper cover 12 is fixed to the body housing 11 by one bolt B (as referred to FIG. 5). The upper cover 12 has an opening 12a formed to be in communication with the opening 16a of the battery receiving chamber 16.

[0031] The cutter 20 is attached to the right side of the body housing 11 as FIG. 4 shows. The cutter 20 configured as a work tool for cutting has a guide bar 21 and a saw chain 22. The guide bar 21 is a plate-like member extending longitudinally and a rear end portion of the guide bar 21 is attached to the right side of the body housing 11. The saw chain 22 is wound along the periphery of the guide bar 21. As FIG. 4 shows, a rear end portion of the saw chain 22 engages with the drive gear 34.

[0032] The saw chain 22 is driven along the outer periphery of the guide bar 21 when the motor 30 is driven to rotate the drive gear 34 (as referred to FIG. 1). A side cover 13 is attached to an outer surface of the right side wall 11a of the body housing 11 to cover the drive gear 34 and a rear end portion of the cutter 20.

[0033] As FIG. 1 shows, a front handle 61 as well as a rear handle 62 is attached to the body housing 11. The front handle 61, a gripping portion, extends around the body housing 11 and is formed by bending a cylindrical member. The rear handle 62 engages with a rear portion of the body housing 11 as FIG. 1 shows. A trigger lever 62a is disposed on the rear handle 62 and is capable of increasing/decreasing the speed of the rotation of the saw chain 22 when gripping the rear handle 62.

[0034] An operator typically grips the front handle 61 by one hand and the rear handle by the other hand when cutting an object such as woods and boards. Then the object can be cut by operating the trigger lever 62a disposed on the rear handle 62 to rotate the saw chain 22.

[0035] Because the cutter 20 is attached to the right side of the body 10 according to the chain saw 1 of this embodiment, an operator is at the left side of the body 10 when using the chain saw 1.

[0036] The cooling structure of the chain saw 1 of this embodiment will be explained. As FIG. 4 shows, a communication path 17, through which the battery receiving chamber 16 is in communication with the motor receiving chamber 15, is formed in the body housing 11. Air is drawn into the motor receiving chamber 15 from the battery receiving chamber 16 through the communication path 17.

[0037] As FIG. 4 shows, the communication path 17 is formed in a left area of the body housing 11, and extends longitudinally relative to the left edge of a partition wall 11c between the motor receiving chamber 15 and the battery receiving chamber 16. An inflow port 17a of the communication path 17 opens to a left side surface 16c of the battery receiving chamber 16 as FIG. 4 shows.

[0038] An air filter 70 is fitted over the inflow port 17a of the communication path 17. The air filter 70 comprises a tabular frame body 71 and a nonwoven fabric 72 held by the tabular frame body 71 (as referred to FIG. 2). The inflow port 17a is closed by the air filter 70.

[0039] A front edge portion of the frame body 71 of the air filter 70 is attached to an attachment groove 11d formed on an end portion of the partition wall 11c as FIG. 4 shows. A rear edge portion of the frame body 71 has a hook 73 projecting outwardly to the left as FIG. 4 shows. The hook 73 is inserted through an attachment hole 11f formed through a left wall 11e of the body housing 11. The leading end portion of the hook 73 engages with an outer surface of the left wall 11e as FIG. 4 shows. As FIG. 5 shows, the air filter 70 according to this embodiment has upper and lower hooks 73.

[0040] As FIG. 3 shows, a surface 70a of the air filter 70 extends in the direction of a predetermined angle θ relative to the vertical direction. The surface 70a of the air filter 70 comes inward as the surface 70a of the air filter 70 extends upward. The surface 70a of the air filter 70 thus extends downwardly obliquely. According to the embodiment, the predetermined angle θ of the surface 70a of the air filter 70 relative to the vertical direction is set to 5 degrees.

[0041] As FIG. 3 shows, the left second air inlet opening 82 is formed below the air filter 70. Thus, the air inlet opening 82 is formed below the surface 70a of the air filter 70.

[0042] As FIG. 4 shows, according to the chain saw 1 of this embodiment, the air in the motor receiving chamber 15 is discharged through the motor housing 31 to the outside of the body housing 11 when the motor 30 is driven to rotate the blower fan 33. The air in the motor receiving chamber 15 is discharged by the air discharging means (the blower fan 33, the outflow port 31b, the air flow path 18, and the air outlet opening 11b), whereby the air flows into the motor receiving chamber 15 through the communication path 17 from the battery receiving chamber 16.

[0043] As FIG. 3 shows, air flows into the battery receiving chamber 16 through the first air inlet opening 81 and the second air inlet openings 82 from the outside

of the chain saw 1, and then flows into the communication path 17. As FIG. 4 shows, when air flows into the communication path 17 through the air filter 70, the dust particles in the air are filtered off by the air filter 70. The control board 40 and the sensor board 30b are cooled by the air which flows into the motor receiving chamber 15 from the communication path 17. The interior of the motor 30 is then cooled by the air which flows into the motor housing 31 from the motor receiving chamber 15, which can improve the cooling efficiency of the motor 30.

[0044] The air in the motor receiving chamber 15 is discharged from a left area in the body housing 11 through the air flow path 18 to the outside (the right side) adjacent to the work tool 20 as FIG. 4 shows. The air in the motor receiving chamber 15 can be simply discharged because an operator is at the left side of the body housing 11 according to the chain saw 1 of this embodiment. The air in the motor receiving chamber 15 is discharged through a right side surface of the body housing 11, which also enables an operator at the left side of the body housing 11 to keep away from chips and dust particles occurring when cutting.

[0045] When the air filter 70 is to be removed from the body housing 11, the bolt B is unscrewed off from the body housing 11 after removing the battery 50 from the battery receiving chamber 16 as FIG. 5 shows. Next, when the upper cover 12 is removed from the body housing 11, leading end portions of the two hooks 73 are exposed adjacent to an outer surface of the left wall 11e of the body housing 11.

[0046] Subsequently, as FIG. 6 shows, the leading end portions of the hooks 73 are pushed through the attachment hole 11f. In this way, as FIG. 7 shows, the hooks can be detached from the left wall 11e of the body housing 11. Further, when a rear edge portion of the air filter 70 is moved inward in the battery receiving chamber 16 and the air filter 70 is then tilted relative to the left wall 11e, a front edge portion of the air filter 70 can be detached from the attachment groove 11d. In this way, the air filter 70, which has been detached from the attachment groove 11d, can be removed out of the battery receiving chamber 16 through the opening 16a as FIG. 5 shows.

[0047] The chain saw 1 (an electric machine tool) described above includes the body 10, to which the cutter 20 (a work tool) is attached, the motor 30 for driving the cutter 20, and the battery 50 for supplying electrical power to the motor 30. In the body 10, the motor receiving chamber 15, in which the motor 30 is disposed, the battery receiving chamber 16 opening through an outer surface of the body 10, and the communication path 17, through which the battery receiving chamber 16 is in communication with the motor receiving chamber 15, are formed. The first air inlet opening 81 is formed between the inner edge of the opening 16a of the battery receiving chamber 16 and the outer periphery of the battery 50 disposed in the battery receiving chamber 16. The inflow port 17a of the communication path 17 opens to the left side surface 16c of the battery receiving chamber 16. The air filter 70 is fitted over the inflow port 17a.

[0048] According to the chain saw 1 of this embodiment, when air flows into the communication path 17 through the air filter 70, the dust particles in the air are filtered off by the air filter 70. Thus, according to the chain saw 1 of this embodiment, dust particles are unlikely to enter into the motor receiving chamber 15. As a result, according to the chain saw 1 of this embodiment, dust particles are unlikely to remain in the motor receiving chamber 15. This can extend time between the cleans of the interior of the body 10 and can reduce the frequency of the maintenance of the chain saw 1.

[0049] According to the chain saw 1 of this embodiment, the air filter 70 is disposed on the left side surface 16c of the battery receiving chamber 16. Thus, the attachment/detachment and the clean of the air filter 70 can be simply conducted from the outside of the body 10 through the opening 16a of the battery receiving chamber 16 by removing the battery 50 from the battery receiving chamber 16.

[0050] According to the chain saw 1 of this embodiment, as FIG. 3 shows, the surface 70a of the air filter 70 extends in the direction of the predetermined angle θ relative to the vertical direction. Thus, dust particles are unlikely to settle on the surface 70a of the air filter 70. If the dust particles settle on the surface 70a of the air filter 70, the dust particles easily fall off by impact and vibration which are similar to those that occur when the chain saw 1 is placed on the ground. Thus, the air filter 70 is unlikely to become dirty and this can extend time between the cleans of the air filter 70 and time between the replacements of the air filter 70.

[0051] The body 10 of the chain saw 1 according to this embodiment has the second air inlet openings 82, which are formed through the right and left bottom portions of the battery receiving chamber 16 and open through an outer surface of the body 10. Because of this configuration, air flows into the battery receiving chamber 16 from the first air inlet opening 81 and the second air inlet openings 82. This ensures that a sufficient amount of air flows into the battery receiving chamber 16 to cool the motor 30 and the control board 40 as FIG. 4 shows.

[0052] According to the chain saw 1 of this embodiment, as FIG. 3 shows, both of the second air inlet openings 82 are formed and the total opening area of both of the second air inlet openings 82 is configured to be larger than that of the first air inlet opening 81.

[0053] Because of this configuration, an amount of the air which flows into the battery receiving chamber 16 from both of the second air inlet openings 82 is greater than that which flows into the battery receiving chamber 16 from the first air inlet opening 81. This can lead to a low flow speed of the air into the battery receiving chamber 16 from the first air inlet opening 81 so that the number of the dust particles which flow into the battery receiving chamber 16 through the first air inlet opening 81 can be

reduced. Because both of the second air inlet openings 82 are formed through the right and left bottom portions of the battery receiving chamber 16, dust particles are unlikely to enter into the battery receiving chamber 16 from under the body 10 through both of the second air inlet openings 82. Thus, according to the chain saw 1 of this embodiment, as FIG. 4 shows, dust particles can be unlikely to enter into the battery receiving chamber 16 and a necessary, sufficient amount of air can flow into the battery receiving chamber 16 to cool the motor 30 and the control board 40.

[0054] According to the chain saw 1 of this embodiment, as FIG. 3 shows, the dust particles which enter into the battery receiving chamber 16 are discharged to the outside through the second air inlet openings 82 formed through the right and left bottom portions of the battery receiving chamber 16. As a result, dust particles are unlikely to remain in the battery receiving chamber 16. As FIG. 3 shows, the left second air inlet opening 82 is formed below the air filter 70 and thus the dust particles which fall off from the air filter 70 are also discharged to the outside through the left second air inlet opening 82.

[0055] According to the chain saw 1 of this embodiment, when the battery 50 is disposed in the battery receiving chamber 16, the right and left bottom portions of the battery 50 are exposed through both of the second air inlet openings 82 formed through the right and left bottom portions of the battery receiving chamber 16. Thus, even if the ejecting mechanism for the battery 50 does not work, the battery can be removed out of the battery receiving chamber 16 by inserting a hand into the battery receiving chamber 16 from the second air inlet opening 82 and then pushing a bottom portion of the battery 50 upward.

[0056] According to the chain saw 1 of this embodiment, as FIG. 4 shows, the cutter 20 (a work tool) is attached to the right side (one side) of the body 10. In this configuration, an operator is typically at the left side of the body 10. As a result, dust particles become unlikely to enter into the battery receiving chamber 16 through a left area of the first air inlet opening 81 and the left second air inlet opening 82. According to the chain saw 1 of this embodiment, the inflow port 17a of the communication path 17 is formed inside the left side surface 16c (the opposite side) of the battery receiving chamber 16 of the body 10. As a result, dust particles are unlikely to settle on the air filter 70 fitted over the inflow port 17a.

[0057] Although the embodiments of this invention have been described above, the invention is not limited to the embodiments and changes as well as modifications can be appropriately made hereto without departing from the spirit and scope of the present disclosure. According to the chain saw 1 of this embodiment, as FIG. 4 shows, the communication path 17 is formed and the air filter 70 is disposed in a left area of the body 10, which is however not limited. The communication path 17 may be formed and the air filter 70 may be disposed in a front, a rear, or a right area of the body 10.

[0058] According to the chain saw 1 of this embodiment, as FIG. 3 shows, the surface 70a of the air filter 70 is disposed so as to extend downwardly obliquely relative to the vertical direction. The shape and the attachment state of the air filter 70 is however not limited to this and the surface 70a of the air filter 70 may, for example, extend in the horizontal direction.

[0059] According to the chain saw 1 of this embodiment, both of the second air inlet openings 82 are formed through the right and left bottom portions of the battery receiving chamber 16 but the number and the shapes of the second air inlet openings 82 are not limited to this. According to the chain saw 1 of this embodiment, as FIG. 1 shows, the first air inlet opening 81 has a circular shape and extends along the entire outer periphery of the upper portion of the battery 50. The first air inlet opening 81 may, however, extend along a part of the entire outer periphery of the upper portion of the battery 50.

[0060] According to this embodiment, the chain saw 1 to which this invention is applied has been described above but an electric machine tool to which the invention can be applied is not limited. Thus, this invention can apply to other electric machine tool such as a brush cutter, a hedge trimmer, and a blower.

Claims

1. An electric machine tool (1) comprising:

a body (10), which a work tool (20) is attached to and which has a body housing (11);
a motor (30) for driving the work tool (20);
a battery (50) for supplying electrical power to the motor (30);
a motor receiving chamber (15) of the body (10), in which the motor (30) is disposed and an air discharging means (33, 31b, 18, 11b) to discharge the air in the motor receiving chamber (15);
a battery receiving chamber (16) of the body (10); and
a communication path (17) of the body (10), through which the battery receiving chamber (16) is in communication with the motor receiving chamber (15);

characterized by:

the battery receiving chamber (16) of the body (10), which the battery (50) is disposed within and which has an opening (16a) extending through the body housing (11) to the outside;
an air outlet opening (11b) of the body (10), which is formed through the body housing (11);
a first air inlet opening (81) defined by an inner edge of the opening (16a) of the battery receiving chamber (16) and an outer periphery of the

battery (50) disposed in the battery receiving chamber (16);
an inflow port (17a) of the communication path (17) opens to an inner side surface (16c) of the battery receiving chamber (16), and
an air filter (70) is fitted over the inflow port (17a).

2. The electric machine tool (1) of claim 1, wherein:
a surface (70a) of the air filter (70) extends downwardly obliquely relative to the vertical direction.

3. The electric machine tool (1) of claim 2, wherein:
at least a second air inlet opening (82) which is formed through a bottom portion of the battery receiving chamber (16) and opens through the body housing (11) to the outside.

4. The electric machine tool (1) of claim 3, wherein:
the at least one second air inlet opening (82) is disposed below the air filter (70).

5. The electric machine tool (1) of claim 3 or claim 4, wherein:
the opening area of the at least one second air inlet opening (82) is larger than the opening area of the first air inlet opening (81).

6. The electric machine tool (1) of claim 1, wherein:
the work tool is attached to one side of the body (10) and the inflow port (17a) is formed in the battery receiving chamber (16) inside the other side of the body (10).

7. The electric machine tool (1) as claimed in any of the preceding claims, wherein the air filter (70) is removable from the battery receiving chamber (16) through the opening 16a of the battery receiving chamber (16).

8. The electric machine tool (1) of claim 7, comprising

hooks (73) of the air filter (70), cooperating with an attachment hole (11f) within a first partition wall (11e) of the body housing (11) near a first end portion of the air filter (70); and
an attachment groove (11d) formed on a second end portion of a second partition wall (11c) of the body housing (11), wherein the first end portion and the second end portion are opposite end portions of the air filter (70);
so that in the mounted state of the air filter (70), the air filter (70) is held between the hooks (73) and the attachment groove (11d) adjacent to an outer surface of the first partition wall (11e) of the body housing (11).

Patentansprüche

1. Eine elektrische Werkzeugmaschine (1) umfassend:

einen Körper (10), an dem ein Arbeitswerkzeug (20) befestigt ist und der ein Körpergehäuse (11) aufweist;
einen Motor (30) zum Antrieb des Arbeitswerkzeugs (20);
eine Batterie (50) zur Versorgung des Motors (30) mit elektrischer Energie;
eine Motoraufnahmekammer (15) des Körpers (10), in der der Motor (30) angeordnet ist, und
eine Luftauslasseinrichtung (33, 31b, 18, 11b) zum Auslassen der Luft in der Motoraufnahmekammer (15)
eine Batterieaufnahmekammer (16) des Körpers (10) ; und
einen Verbindungsweg (17) des Körpers (10), durch den die Batterieaufnahmekammer (16) mit Motoraufnahmekammer (15) in Verbindung steht;

gekennzeichnet durch:

die Batterieaufnahmekammer (16) des Körpers (10), in der die Batterie (50) angeordnet ist und die eine Öffnung (16a) aufweist, die sich durch das Körpergehäuse (11) nach außen erstreckt;
eine Luftaustrittsöffnung (11b) des Körpers (10), die durch das Körpergehäuse (11) hindurch ausgebildet ist;
eine erste Lufteinlassöffnung (81), die durch eine Innenkante der Öffnung (16a) der Batterieaufnahmekammer (16) und einen Außenumfang der in der Batterieaufnahmekammer (16) angeordneten Batterie (50) definiert ist;
eine Zuflussöffnung (17a) des Verbindungswegs (17), die sich zu einer inneren Seitenfläche (16c) der Batterieaufnahmekammer (16) öffnet, und
einen Luftfilter (70), der über der Zuflussöffnung (17a) angebracht ist.

2. Die elektrische Werkzeugmaschine (1) nach Anspruch 1, wobei sich eine Oberfläche (70a) des Luftfilters (70) schräg nach unten in Bezug auf die vertikale Richtung erstreckt.

3. Die elektrische Werkzeugmaschine (1) nach Anspruch 2, wobei mindestens eine zweite Lufteinlassöffnung (82) durch einen unteren Abschnitt der Batterieaufnahmekammer (16) ausgebildet ist und sich durch das Körpergehäuse (11) nach außen öffnet.

4. Die elektrische Werkzeugmaschine (1) nach Anspruch 3, wobei die mindestens eine zweite Lufteinlassöffnung (82) unterhalb des Luftfilters (70) an-

geordnet ist.

5. Die elektrische Werkzeugmaschine (1) nach Anspruch 3 oder Anspruch 4, wobei die Öffnungsfläche der mindestens einen zweiten Lufteinlassöffnung (82) größer ist als die Öffnungsfläche der ersten Lufteinlassöffnung (81).

6. Die elektrische Werkzeugmaschine (1) nach Anspruch 1, wobei das Arbeitswerkzeug (20) an einer Seite des Körpers (10) befestigt ist und die Zuflussöffnung (17a) in der Batterieaufnahmekammer (16) im Inneren der anderen Seite des Körpers (10) ausgebildet ist.

7. Die elektrische Werkzeugmaschine (1) nach einem der vorhergehenden Ansprüche, wobei der Luftfilter (70) durch die Öffnung (16a) der Batterieaufnahmekammer (16) aus der Batterieaufnahmekammer (16) herausnehmbar ist.

8. Die elektrische Werkzeugmaschine (1) nach Anspruch 7, umfassend

Haken (73) des Luftfilters (70), die mit einem Befestigungsloch (11f) in einer ersten Trennwand (11e) des Körpergehäuses (11) in der Nähe eines ersten Endabschnitts des Luftfilters (70) zusammenwirken; und
eine Befestigungsrille (11d), die an einem zweiten Endabschnitt einer zweiten Trennwand (11c) des Körpergehäuses (11) ausgebildet ist, wobei der erste Endabschnitt und der zweite Endabschnitt gegenüberliegende Endabschnitte des Luftfilters (70) sind;
so dass im montierten Zustand des Luftfilters (70) der Luftfilter (70) zwischen den Haken (73) und der Befestigungsrille (11d) benachbart zu einer Außenfläche der ersten Trennwand (11e) des Körpergehäuses (11) gehalten wird.

Revendications

1. Un outil de machine électrique (1) comprenant :

un corps (10), auquel est fixé un outil de travail (20) et qui comporte un boîtier de corps (11) ;
un moteur (30) pour entraîner l'outil de travail (20) ;
une batterie (50) pour alimenter le moteur (30) en énergie électrique ;
une chambre de réception du moteur (15) du corps (10), dans laquelle le moteur (30) est disposé et un moyen d'évacuation de l'air (33, 31b, 18, 11b) pour évacuer l'air dans la chambre de réception du moteur (15) ;
une chambre de réception de la batterie (16) du corps (10) ; et
une voie de communication (17) du corps (10), par laquelle la chambre de réception de la batterie (16) est en communication avec la chambre de réception du moteur (15) ;

caractérisé par :

la chambre de réception de la batterie (16) du corps (10), dans laquelle la batterie (50) est disposée et qui présente une ouverture (16a) s'étendant à travers le boîtier du corps (11) vers l'extérieur ;
une ouverture de sortie d'air (11b) du corps (10), qui est formée à travers le boîtier du corps (11) ;
une première ouverture d'entrée d'air (81) définie par un bord intérieur de l'ouverture (16a) de la chambre de réception de la batterie (16) et une périphérie extérieure de la batterie (50) disposée dans la chambre de réception de la batterie (16) ;
un port d'entrée (17a) de la voie de communication (17) s'ouvrant sur une surface latérale intérieure (16c) de la chambre de réception de la batterie (16), et
un filtre à air (70) monté sur le port d'entrée (17a).

2. L'outil de machine électrique (1) selon la revendication 1, dans lequel une surface (70a) du filtre à air (70) s'étend obliquement vers le bas par rapport à la direction verticale.

3. L'outil de machine électrique (1) selon la revendication 2, dans lequel au moins une deuxième ouverture d'entrée d'air (82) est formée à travers une partie inférieure de la chambre de réception de la batterie (16) et qui débouche à l'extérieur à travers le boîtier du corps (11).

4. L'outil de machine électrique (1) selon la revendication 3, dans lequel l'au moins une deuxième ouverture d'entrée d'air (82) est disposée en dessous du filtre à air (70).

5. L'outil de machine électrique (1) selon la revendication 3 ou la revendication 4, dans lequel la surface d'ouverture de l'au moins une deuxième ouverture d'entrée d'air (82) est plus grande que la surface d'ouverture de la première ouverture d'entrée d'air (81).

6. L'outil de machine électrique (1) selon la revendication 1, dans lequel l'outil de travail (20) est fixé à un côté du corps (10) et le port d'entrée (17a) est formé dans la chambre de réception de la batterie (16) à l'intérieur de l'autre côté du corps (10).

7. L'outil de machine électrique (1) selon l'une des revendications précédentes, dans lequel le filtre à air (70) peut être retiré de la chambre de réception de la batterie (16) par l'ouverture (16a) de la chambre de réception de la batterie (16).

8. L'outil de machine électrique (1) selon la revendication 7, comprenant

des crochets (73) du filtre à air (70), coopérant avec un trou de fixation (11f) à l'intérieur d'une première paroi de séparation (11e) du boîtier de corps (11) près d'une première partie d'extrémité du filtre à air (70) ; et
une rainure de fixation (11d) formée sur une deuxième partie d'extrémité d'une deuxième paroi de séparation (11c) du boîtier de corps (11), la première partie d'extrémité et la deuxième partie d'extrémité étant des parties d'extrémité opposées du filtre à air (70) ;
de sorte qu'à l'état monté du filtre à air (70), le filtre à air (70) est maintenu entre les crochets (73) et la rainure de fixation (11d) adjacente à une surface extérieure de la première paroi de séparation (11e) du boîtier de corps (11).

FIG. 1

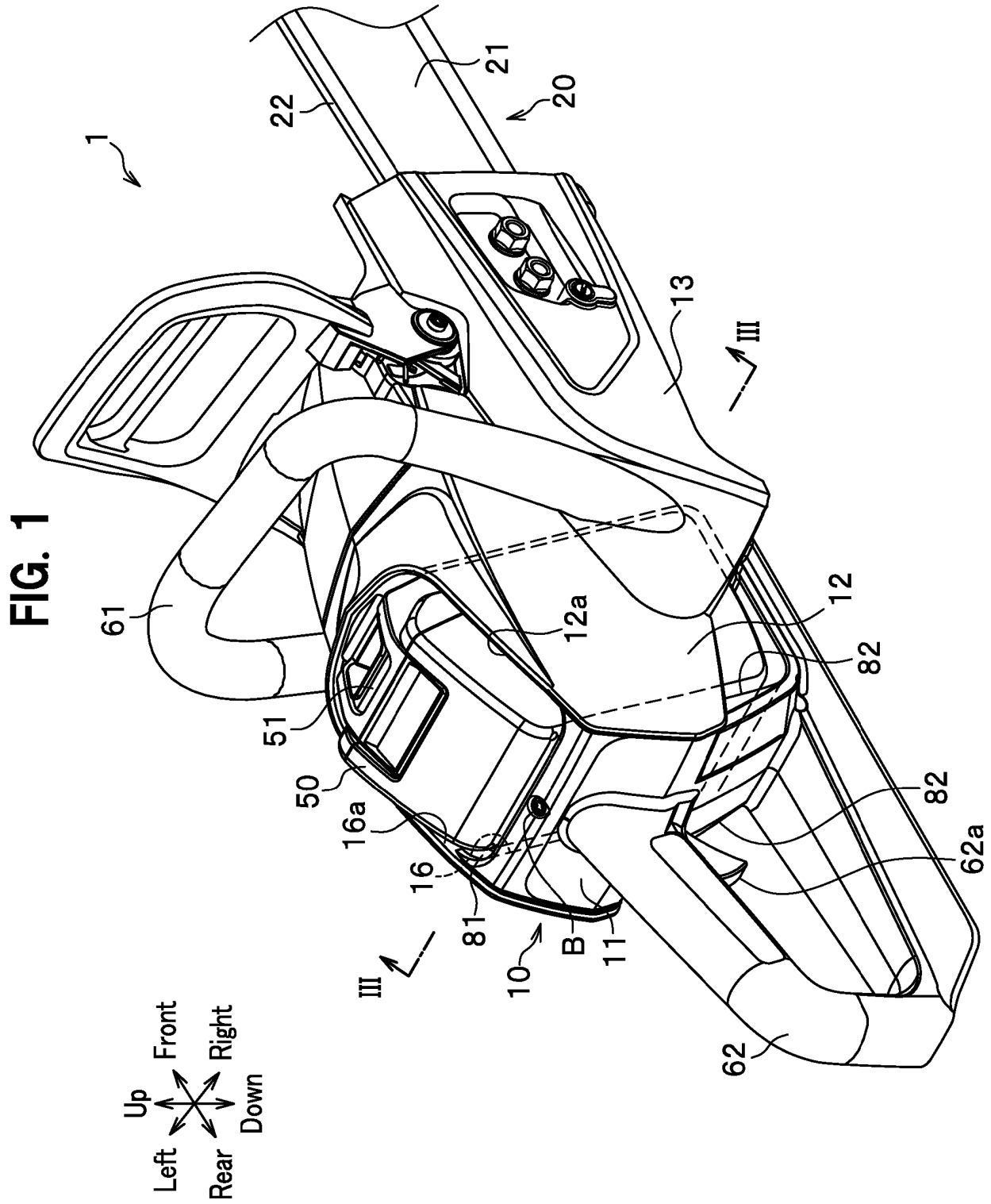
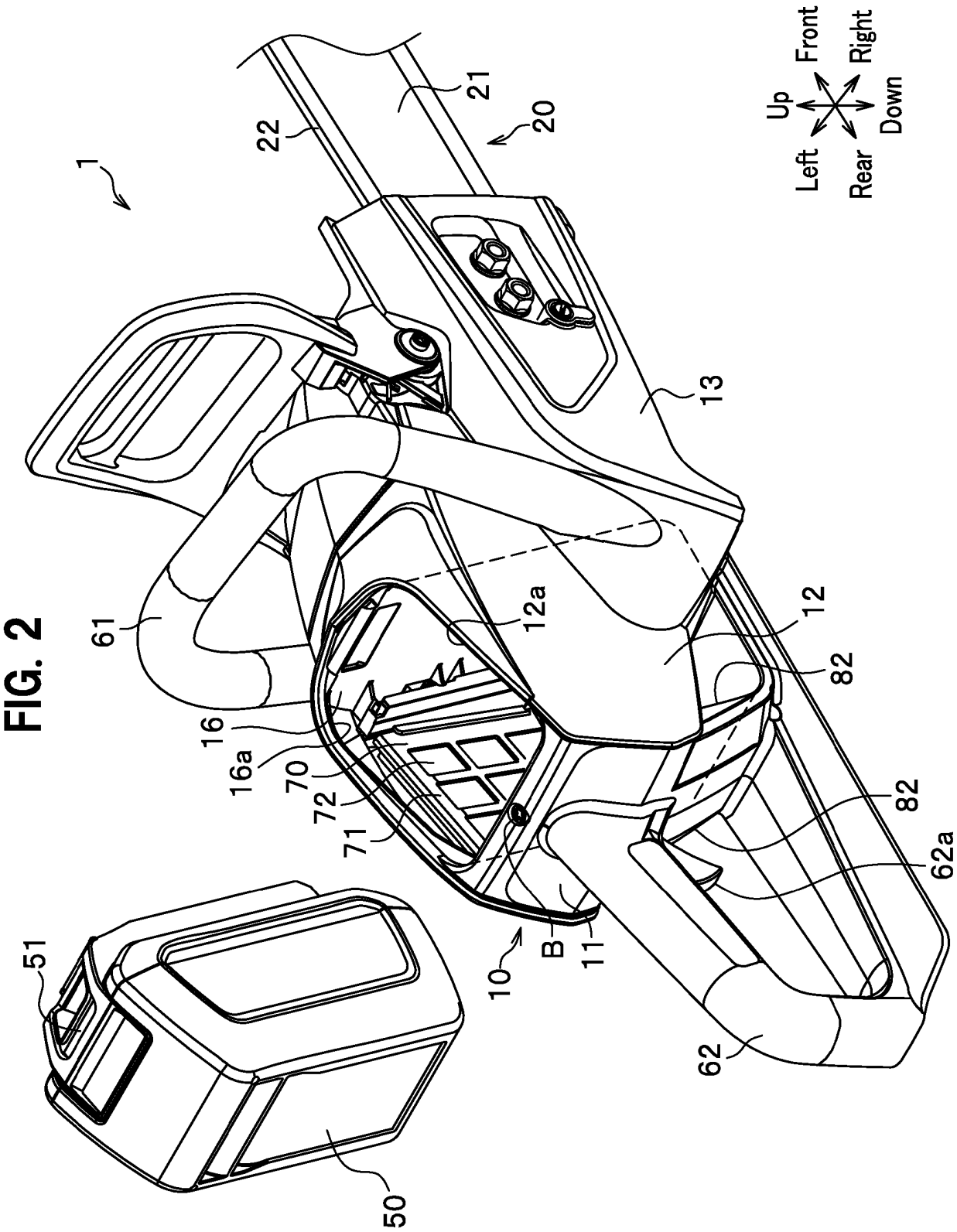

1
22
21
20
13
III
61
12a
12
82
51
50
16a
16
81
III
10
B
11
82
62a
62
Up
Front
Left
Rear
Right
Down

FIG. 2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20
21
22
13
12
12a
82
61
16
16a
70
72
71
82
62a
62
10
B
11
50
51
Up
Front
Left
Rear
Right
Down

FIG. 3

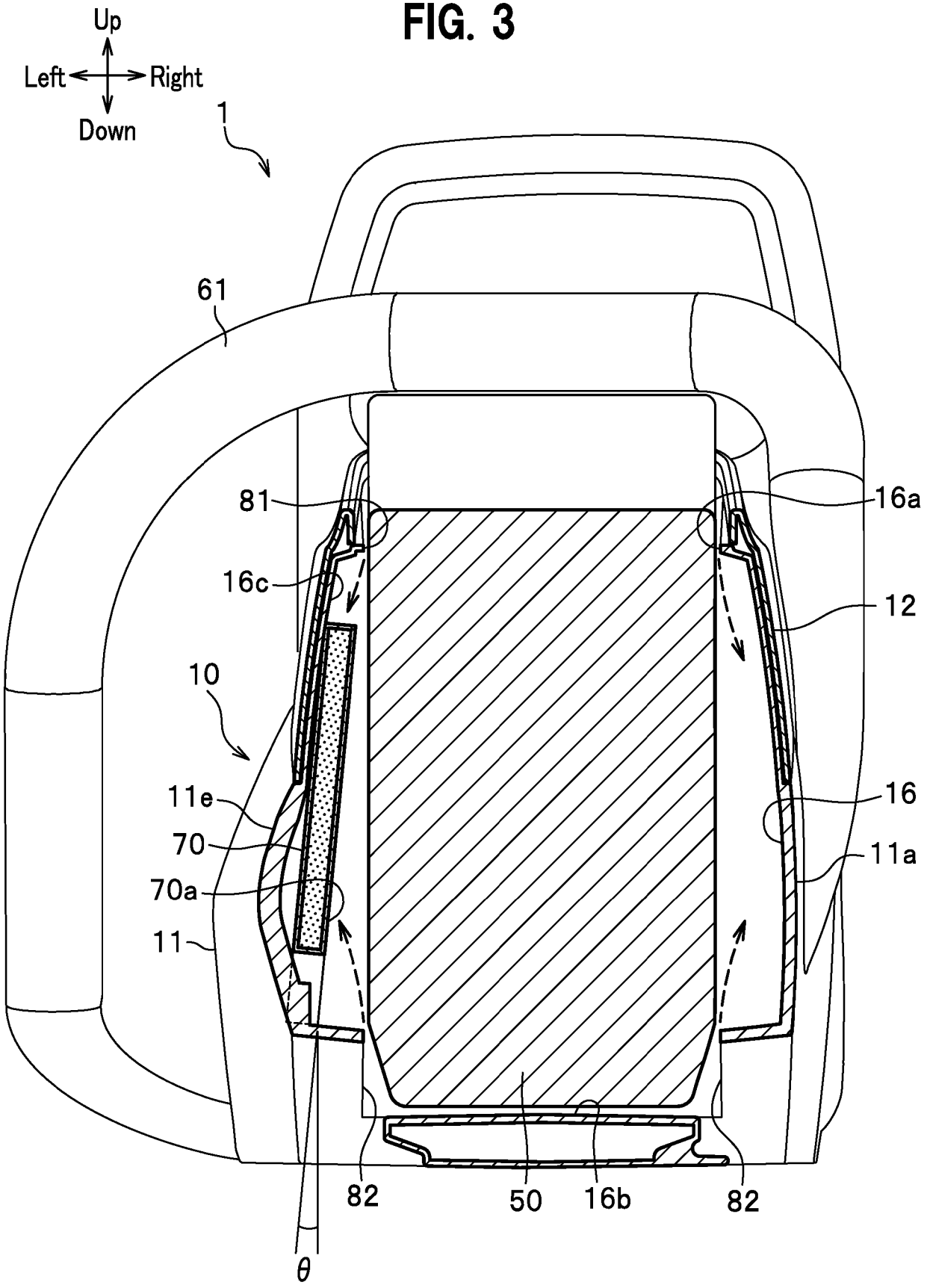
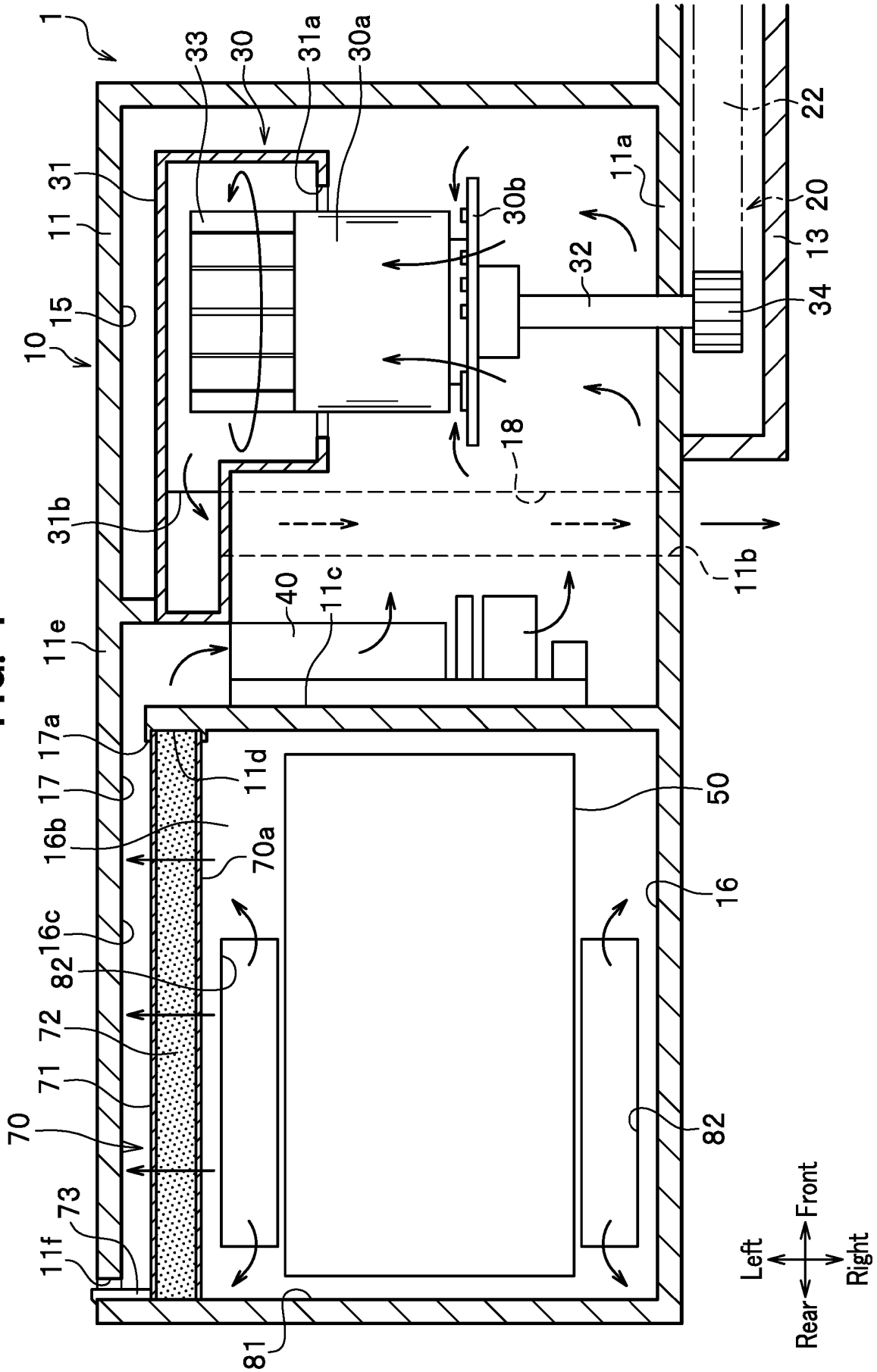

Up
Left
Right
Down
1
61
81
16a
16c
12
10
11e
16
70
11a
70a
11
82
50
16b
82
θ

FIG. 4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33
30
31a
30a
22
31
11
15
10
30b
11a
32
20
13
34
18
31b
11b
40
11c
11e
17a
17
16b
16c
82
72
71
70
73
11f
11d
70a
50
16
82
81
Left
Front
Rear
Right

FIG. 5

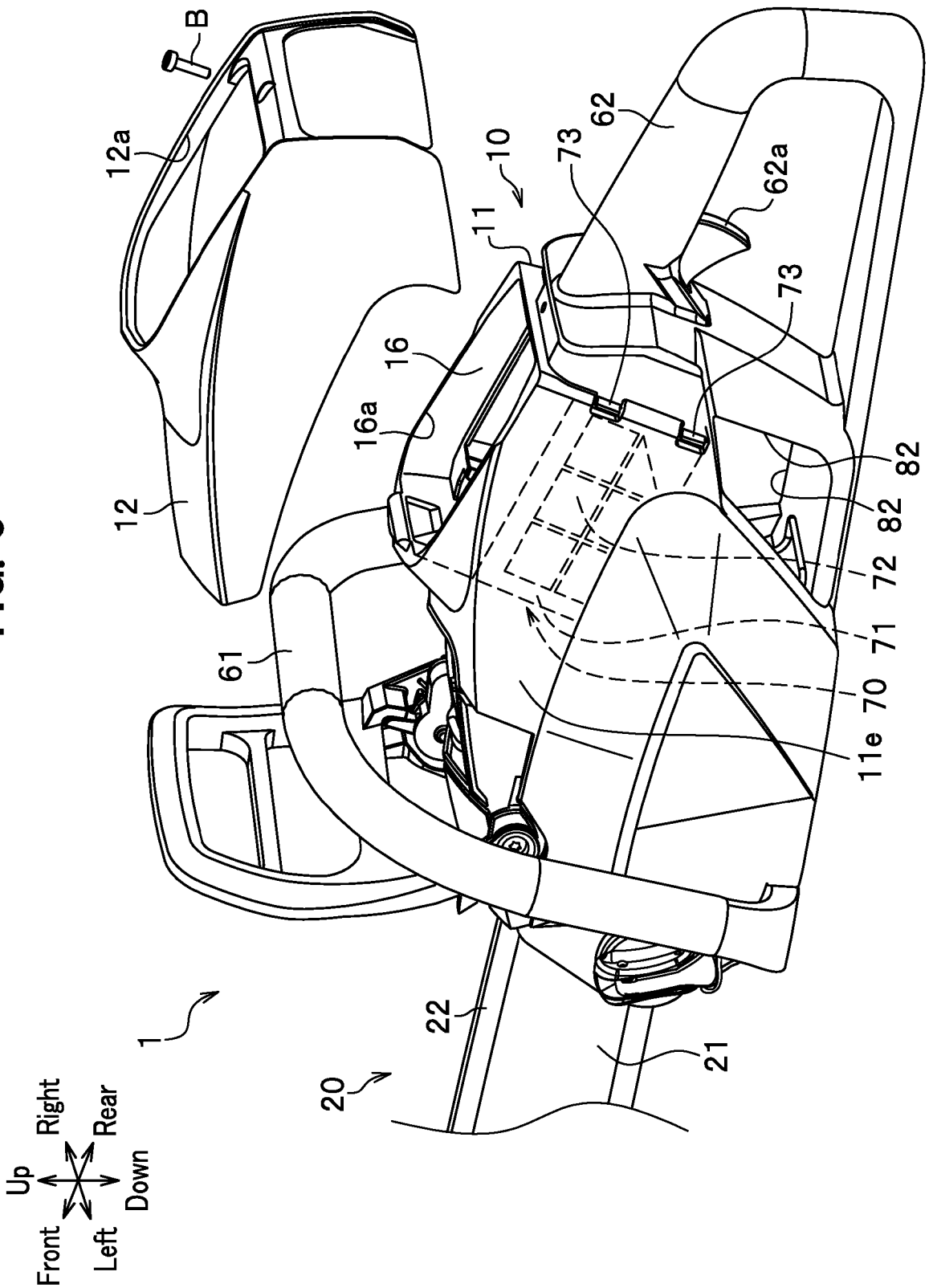

B
12a
10
11
73
62
62a
73
16
16a
12
82
82
72
71
70
11e
61
1
22
21
20
Up
Right
Front
Rear
Left
Down

FIG. 6

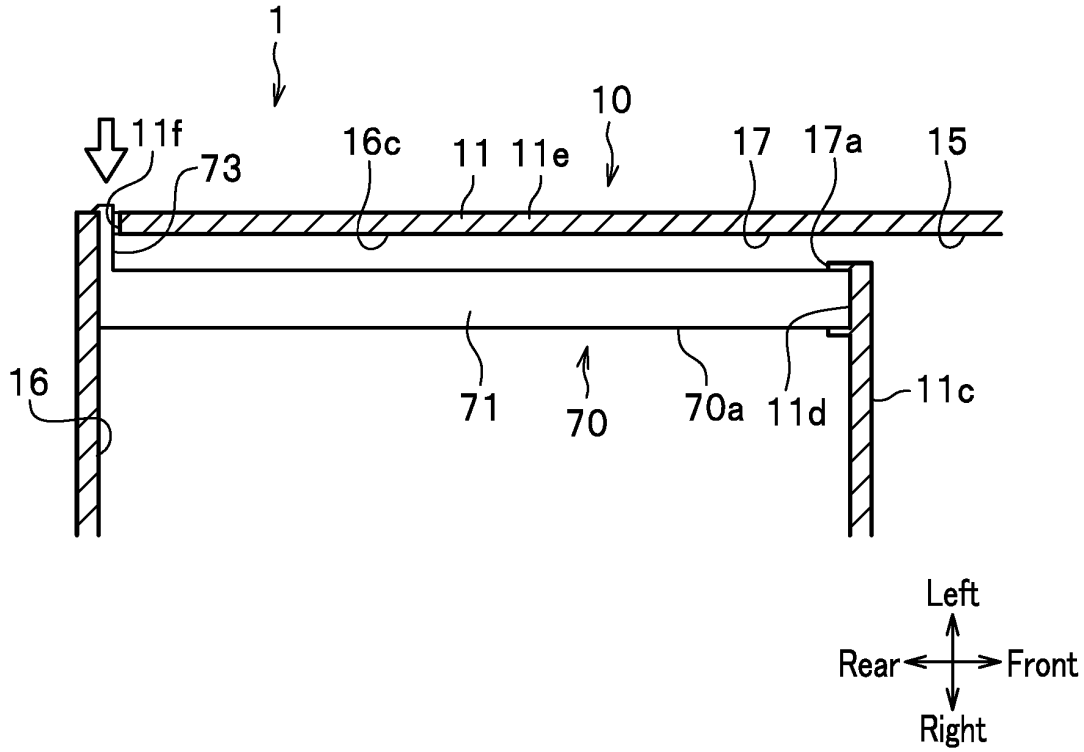
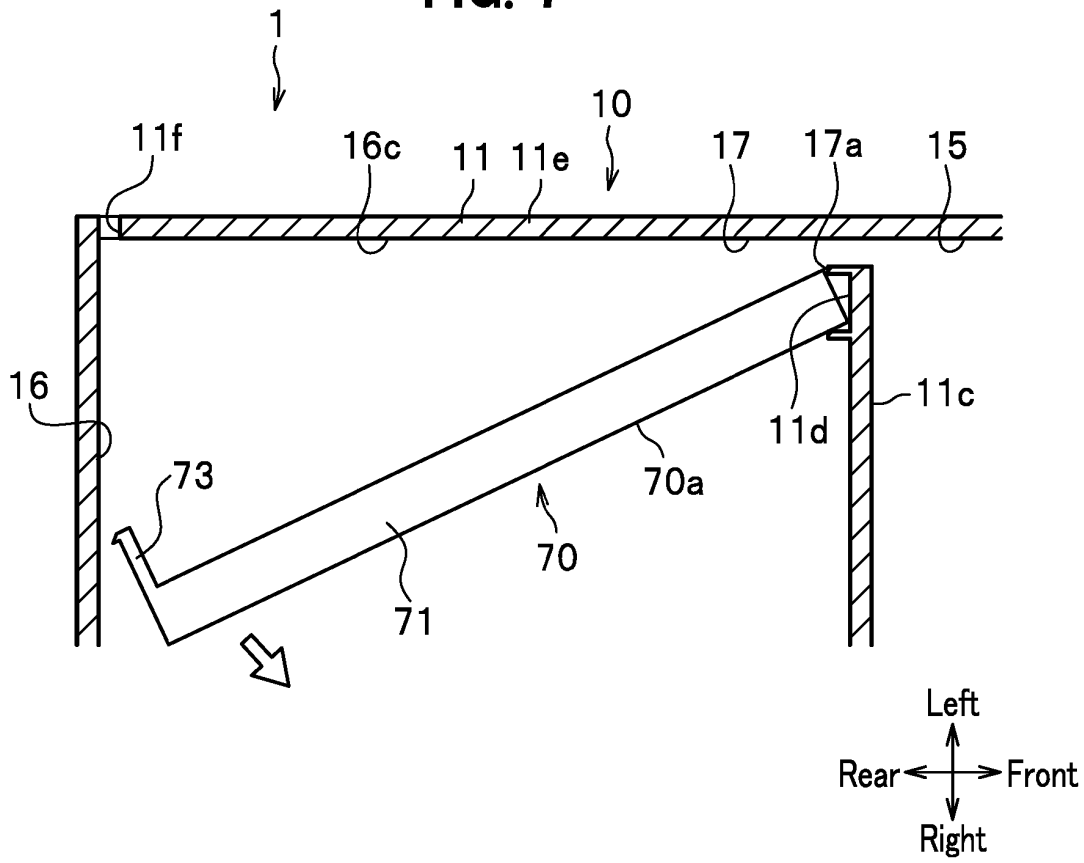

1
10
11f
73
16c
11
11e
17
17a
15
16
71
70
70a
11d
11c
Left
Rear
Front
Right

FIG. 7


1
10
11f
16c
11
11e
17
17a
15
16
11c
11d
73
70a
70
71
Left
Rear
Front
Right

REFERENCES CITED IN THE DESCRIPTION

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- JP 2010058186 B **[0005]**