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(54) Cutting devices

(57) A cutting device 1 includes a base 3 that is brought into contact with a material W to be cut and a cutting machine main body 2 that is positioned above an upper surface of the base 3. The cutting machine main body 2 includes an electric motor 22 that serves as a drive source, a battery mounting portion 23 to which a

rechargeable battery 7 serving as a power source can be mounted, a circular cutting blade 25 rotated by the electric motor 22, and a handle portion 24 held by a user. In addition, a cutting depth adjustment mechanism 5 that is used to adjust a cutting depth of the cutting blade 25 is positioned in front of the battery mounting portion 23.

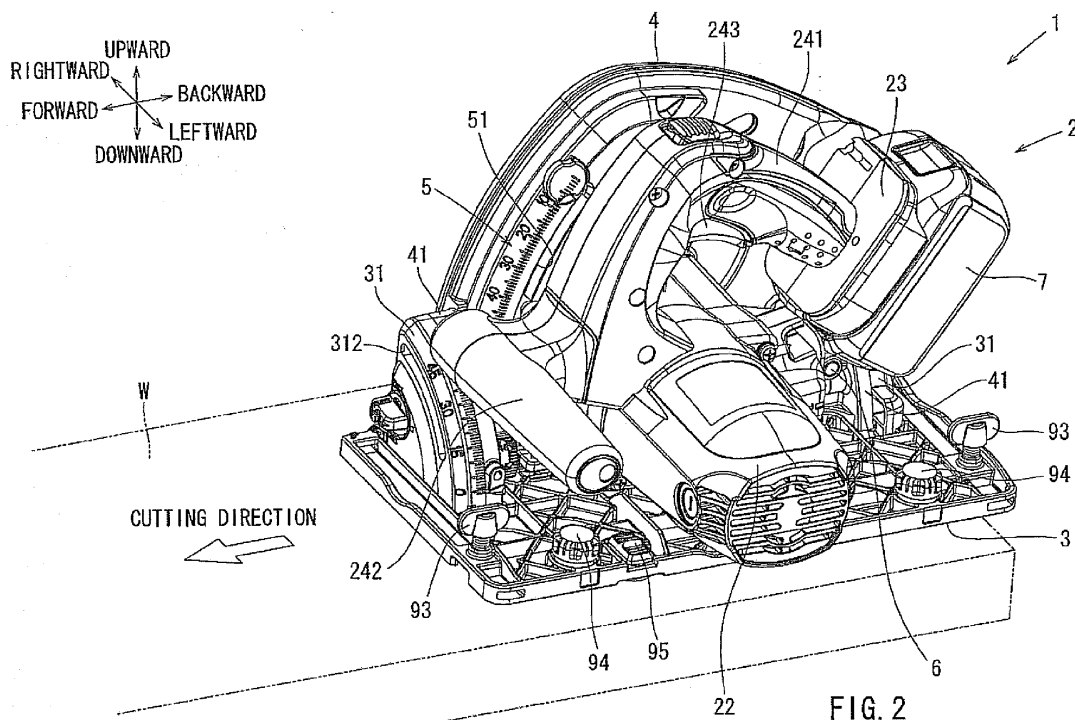


FIG. 2

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Description

[0001] This application claims priority to Japanese patent application serial numbers 2013-15514 and 2013-258991, the contents of which are incorporated herein by reference.

[0002] The present invention relates to a cutting device that is used in woodcutting etc., particularly to a handheld type cutting device.

[0003] Japanese Laid-Open Patent Publication No. 2010-201598 relates to a handheld type cutting device that uses a rechargeable battery serving as a power source. This kind of cutting device, which is referred to as a portable circular saw, includes a base that is brought into contact with an upper surface of a material to be cut, and a cutting machine main body that is supported at an upper surface side of the base. The cutting machine main body includes an electric motor served as a drive source, a rotating circular cutting blade, a case cover that covers at least a portion of the cutting blade, and a handle portion that is held by a user. Holding the handle portion, the user moves the cutting device in a cutting direction, and the material to be cut is cut by the cutting blade that protrudes from the lower surface side of the base. In this way, cutting is performed.

[0004] In these kind of cutting devices, in order to adjust a protrusion length (cutting depth) of the cutting blade from the base, a cutting depth adjustment mechanism called a depth guide may be provided.

[0005] The cutting device disclosed in Japanese Laid-Open Patent Publication No. 2010-201598 includes the cutting depth adjustment mechanism. In Japanese Laid-Open Patent Publication No. 2010-201598, the cutting depth adjustment mechanism is provided closer to the cutting blade side than the battery, and the cutting depth adjustment mechanism and the cutting blade are positioned adjacent to each other.

[0006] In the above cutting device, the cutting depth adjustment mechanism and the cutting blade are provided adjacent to each other. In order to position the cutting depth adjustment mechanism and a battery mounting portion adjacent to each other, the cutting depth adjustment mechanism has to be positioned between the cutting blade and the battery mounting portion. As a result, it is difficult to position the battery close to the cutting blade. Accordingly, the size of the entire cutting device may have to be increased. It is preferable that the cutting device be as compact as possible, particularly in the left and right width directions.

[0007] Thus, there is a need to provide a cutting device having a compact configuration, particularly in the right and left width directions.

[0008] One construction for a charging cutting device can include a base that is brought into contact with a material to be cut and a cutting machine main body that is positioned above an upper surface of the base. The cutting machine main body includes an electric motor that serves as a drive source, a battery mounting portion

to which a rechargeable battery that serves as a power source is mounted, a circular cutting blade that is rotated by the electric motor, and a handle portion that is held by a user. Further, a cutting depth adjustment mechanism that is used to adjust a cutting depth of the cutting blade is preferably located in front of the battery mounting portion.

[0009] For this reason, the battery can be positioned close to the cutting blade, and any broadening of the space between the battery and the cutting blade or a blade case in a right-left direction can be suppressed. Further, since the battery can be placed adjacent to the cutting blade, the handle portion can be placed close to the cutting blade. This is possible even when a center line of a handle and a center line of the battery mounting portion are configured to approximately coincide with each other in a right-left direction. Further, balance in weight can be improved while the broadening of the cutting device in the right-left direction can be suppressed.

[0010] According to another construction, the battery mounting portion is disposed on one end of the handle portion and the electric motor is disposed on the other end of the handle portion.

[0011] Due to the fact that the electric motor and the battery, which are both relatively heavy, are disposed on both ends of the main handle, a balance in weight on the ends of the main handle can be maintained. Thus, a sense of balance when the main handle 241 is held can be improved.

[0012] According to another construction, an elastic member that can bias the electric motor in an upward direction is disposed below the electric motor.

[0013] The cutting machine main body can be rotated downward from the position at its initial state. When an operation force for rotating the cutting machine main body is released, the cutting machine main body can be automatically restored to the initial state, or the force required for restoring to the initial state can be decreased.

[0014] According to another construction, the electric motor is rotated integrally with the battery mounting portion around a turning fulcrum. The electric motor and the battery mounting portion are positioned, respectively, in front of and behind the turning fulcrum.

[0015] For this reason, since the battery mounting portion is configured to rotate integrally with the electric motor and the bending of electric wires that connect the battery mounting portion to the electric motor is not performed repeatedly, disconnection due to the bending can be prevented. Further, since the electric motor and the battery mounting portion are disposed in front of and behind the turning fulcrum, respectively, force used in rotating the turning fulcrum toward the front side or the rear side can be suppressed.

[0016] According to another construction, when the cutting blade is positioned orthogonal to the base, the battery is set at an incline such that an opposite side of the battery mounting portion with respect to the cutter blade is positioned above a cutter blade side of the bat-

tery mounting portion facing the cutter blade.

[0017] For this reason, when the base is placed orthogonal to the cutting blade, a user can easily insert a hand below the battery mounting portion 23 or the battery 7 from the side opposite the blade case 4. This can improve the productivity of the device. Further, in comparison to the situation where the battery is not set at an incline, compactness in the width direction can be improved.

[0018] According to another construction, the battery is mounted to the battery mounting portion by sliding the battery along the battery mounting portion from the side opposite the cutter blade to the cutter blade side.

[0019] For this reason, a user can easily find the battery mounting surface of the battery mounting portion when mounting the battery.

[0020] According to another construction, the cutting device further includes an inclination mechanism that can set the cutting machine main body at an incline such that the cutting blade is set at an incline with respect to the base in a right and left direction. An angle between a mounting direction or a removal direction of the battery and a direction orthogonal to the base can be set to be 45° or less by setting the cutting machine main body at an incline with respect to the base.

[0021] As the angle between the mounting direction or the removal direction of the battery and the direction orthogonal to the base can be 45° or less, the battery can be mounted or removed while the battery is moved downward or upward. Thus, the mounting and removal of the battery can be easily performed.

[0022] According to the above, the entire cutting device becomes compact, especially in the right and left width directions.

[0023] Additional objects, features, and advantages, of embodiments of the present invention will be readily understood after reading the following detailed description together with the claims and the accompanying drawings, in which:

FIG. 1 is a perspective view of an embodiment of a cutting device in which a cutting device main body is placed at a top center position;

FIG. 2 is a perspective view of an embodiment of a cutting device in which the cutting device main body is rotated downward from the top center position;

FIG. 3 is a side view of an embodiment of a cutting device in which the cutting device main body is placed at the top center position, as viewed from a left side in a cutting direction;

FIG. 4 is a side view of an embodiment of a cutting device in which the cutting device main body is rotated downward from the top center position, as viewed from the left side in the cutting direction;

FIG. 5 is a side view of a handle portion and a battery mounting portion (in a state where the battery is mounted) of an embodiment, as viewed from the rear side to the front side;

FIG. 6 is a perspective view of a cutting device of

another embodiment in which a cutting device main body is rotated downward from the top center portion;

FIG. 7 is a side view of the cutting device of an embodiment in which the cutting device main body is placed at the top center portion, as viewed from the left side in the cutting direction;

FIG. 8 is a side view of the cutting device of the example in which the cutting device main body is rotated downward from the top center portion, as viewed from the left side in the cutting direction;

FIG. 9 is a side view of the cutting device of an embodiment in which the cutting device main body is placed at the top center portion, as viewed from the rear side to the front side; and

FIG. 10 is a side view of an embodiment of a cutting device in which the cutting device main body is rotated downward from the top center portion, as viewed from the rear side to the front side.

[0024] Each of the additional features and teachings disclosed above and below may be utilized separately or in conjunction with other features and teachings to provide an improved cutting device. Representative examples of the present teaching, which examples utilize many of these additional features and teachings both separately and in conjunction with one another, will now be described in detail with reference to the attached drawings. This detailed description is merely intended to teach a person of skill in the art further details for practicing preferred aspects of the present teachings and is not intended to limit the scope of the invention. Only the claims define the scope of the claimed invention. Therefore, combinations of features and steps disclosed in the following detailed description may not be necessary to practice the invention in the broadest sense, and are instead taught merely to particularly describe representative examples of the invention. Moreover, various features of the representative examples and the dependent claims may be combined in ways that are not specifically enumerated in order to provide additional useful examples of the present teachings.

[0025] A cutting device according to an example will be described with reference to FIG. 1 to FIG. 10.

[0026] First, a cutting device 1 of one example will be described with reference to FIG. 1 to FIG. 5.

[0027] In this explanation, the front side, the rear side, the left side, the right side, the upper side, and the lower side are shown. As shown in FIG. 1, based on a base 3, a side on which the base 3 is brought into contact with a material W to be cut corresponds to the lower side. Conversely, a side on which a cutting machine main body 2 is disposed corresponds to the upper side. Further, a side to which cutting of a cutting device advances (cutting direction) corresponds to the front side, and the side opposite the front side is the rear side. Also, the left side and the right side are determined as viewed from the rear side.

[0028] In a normal condition of the cutting device 1, the cutting machine main body 2, which includes a cutting blade 25, is placed at a top center position at which a lower end part of the cutting blade 25 is above the base 3 (refer to FIG. 1 and FIG. 3). The top center position corresponds to an initial position. The cutting machine main body 2 is moved from the initial position to a lower position at which the lower end part of the cutting blade 25 protrudes below the base 3, and a processing operation of the material W to be cut can be performed by the cutting blade 25 (refer to FIG. 2 and FIG. 4). In general, this kind of a cutting device 1 is called a plunge cut saw.

[0029] As shown in FIG. 1, the cutting device 1 of the example includes a flat rectangular plate shaped base 3 that is brought into contact with the material W to be cut, a blade case 4 that covers at least a portion of the cutting blade 25 above the base 3, and the cutting machine main body 2 that is rotated with respect to the blade case 4.

[0030] The cutting machine main body 2 includes an electric motor 22 that is served as a drive source, a battery mounting portion 23 on which a rechargeable battery 7 that serves as a power source can be mounted, the circular cutting blade 25 that is rotated by the electric motor 22, a handle portion 24 that is held by a user, and a support arm 21 that supports both the handle portion 24 and the electric motor 22. Further, the support arm 21 is rotatably supported by the blade case 4 via a rotating shaft 6.

[0031] A cutting depth adjustment mechanism 5 (depth guide) that is used to adjust a cutting depth of the cutting blade 25 is provided on the front left side of the blade case 4. In the cutting depth adjustment mechanism 5, a stopper 52, which is positioned along a long arcuate-shaped hole 51 provided in the blade case 4, is provided so as to protrude from the blade case 4 with respect to the long hole 51. The stopper 52 can be fixed at an appropriate position along the long hole 51. Further, the stopper 52 is configured to engage an engaging protrusion 26 that protrudes from the cutting machine main body 2. Accordingly, a bottom center position, which is obtained when the cutting machine main body 2 is rotated upward, can be adjusted by changing a fixed position of the stopper 52. In this way, the cutting depth adjustment mechanism 5 can adjust a length of the cutting blade 25 that protrudes from the base 3, that is, the cutting depth. Thus, the material W to be cut can be easily cut while a desired cutting depth is maintained.

[0032] Meanwhile, a user can rotate the cutting machine main body 2 from the top center position to the bottom center position.

[0033] In the example, the cutting depth adjustment mechanism 5 is provided on the left surface of the blade case 4 at the front side of a rotating shaft (not shown) of the cutting blade 25. The battery mounting portion 23 is provided at one end side of the handle portion 24 that is positioned at the rear side of the rotating shaft of the cutting blade 25. In this way, the cutting depth adjustment mechanism 5 is positioned in front of the battery 7, and

as a whole, a compact configuration in a width direction can be achieved. As the battery 7 can be disposed adjacent to the blade case 4, compactness in a right-left direction can be obtained.

[0034] In addition, according to this configuration, a surface BC corresponding to the center in the right-left direction of the battery 7 can substantially coincide with a surface HC corresponding to the center in the right-left direction of a main handle 241 (refer to FIG. 5). In other words, the main handle 241 and the battery mounting portion 23 that are integrated with the main handle 241 can be formed to be approximately bilaterally symmetrical. Accordingly, the left and right balance in terms of weight of the battery 7 can be prevented from biasing towards one side, while compactness of the cutting device 1 is maintained. Unlike the present example, if the cutting depth adjustment mechanism 5 shown in FIG. 1 is forced to a position to the rear of the rotating shaft of the cutting blade 25 and the cutting depth adjustment mechanism 5 and the battery 7 are disposed adjacent to each other the right-left direction, problems may occur. The main handle 241 is forced to further protrude to the left side than in FIG. 1, and thus, it is difficult to make the entire cutting device 1 to be compact. In contrast, the example of the present invention can avoid the above-described problem.

[0035] The handle portion 24 in the cutting machine main body 2 includes the main handle 241 which is usually held by a user. The inside of the main handle 241 typically includes an operation member 243. The handle portion 24 also includes a front grip 242 that extends in the right-left direction from the main handle 241.

[0036] The operation member 243 is a trigger that can be pulled. By pulling the trigger, the electric motor 22 is activated and the cutting blade 25 rotates.

[0037] The main handle 241 is formed in an approximately U shape, and the battery mounting portion 23 is disposed on one end side of the main handle 241. Also, the electric motor 22 is disposed on the other end side of the main handle 241. Since the electric motor 22 and the battery 7, which are relatively heavy, are disposed on both ends of the main handle 241, the balance with respect to the weight in the front and rear of the main handle 241 can be maintained. Thus, a sense of balance when the main handle 241 is held can be improved.

[0038] Also, the front grip 242 is positioned extending in a longitudinal direction from the support arm 21. Accordingly, a force that rotates the cutting machine main body 2 can be easily transmitted.

[0039] Further, in the cutting device 1 of the example, in order to adjust the cutting depth, the cutting machine main body 2 and the blade case 4 are connected to each other via the rotating shaft 6 that is provided to be approximately perpendicular to a plane of the blade case 4.

[0040] In the cutting machine main body 2, the support arm 21 has an approximately fan-shaped configuration in a side view when viewed from the direction shown in FIG. 3. The side of the narrowed width part is connected

to the blade case 4. In the support arm 21, the electric motor 22 and the handle portion 24 are connected to the opposite side in the longitudinal direction with regard to the side connected to the rotating shaft 6. Also, a part from the support arm 21 to the battery mounting portion 23 has an approximately U-shaped configuration in a side view, as shown in FIG. 3. This configuration enables the end of the mounted battery 7 to be positioned close to the rotating shaft 6. By adopting this configuration, the coupling form of the support arm 21, the handle portion 24, and the battery 7 has an approximately fan-shaped configuration in a side view, as shown in FIG. 3.

[0041] According to this configuration, relatively heavy loads such as the electric motor 22 and the battery 7 can be positioned adjacent the rotating shaft 6. Thus, when rotating the cutting machine main body 2, a user does not need to apply an excessive force to the cutting device 1, which is easy to handle for the user. Further, according to the configuration, electric wiring can be efficiently performed inside a case of the handle portion 24, and wiring paths can be efficiently and easily obtained.

[0042] The battery mounting portion 23 is configured to rotate integrally with the electric motor 22 with respect to a turning fulcrum at which the rotating shaft 6 is formed. Accordingly, bending of electric wires connecting the battery mounting portion 23 and the electric motor 22 is not performed repeatedly, and thus disconnection due to the bending can be prevented. In contrast, unlike the present example, in a case where the battery mounting portion 23 and the electric motor 22 rotate independently with each other, at least a part of the electric wires connected between the battery mounting portion 23 and the electric motor 22 has to be configured to be bendable enough not to cause disconnection. However, due to repeated bending, there is a high possibility that disconnection may occur. According to the configuration of the example of the present invention, since bending of the electric wires are not performed repeatedly, it is ensured that disconnection does not occur.

[0043] In addition, as shown in FIG. 3, the battery mounting portion 23 and the electric motor 22 are disposed on opposite sides in a front-rear direction with respect to the rotating shaft 6 (the turning fulcrum). That is, the electric motor 22 is positioned at the front side on the basis of a dashed line V shown in FIG. 3, and the battery mounting portion 23 is positioned at the rear side. Due to the positional relationship, the electric motor 22 having a relatively heavy load is disposed at the front side with respect to the rotating shaft 6 (the turning fulcrum), and the battery 7 having a relatively heavy load is disposed at the rear side with respect to the rotating shaft 6 (the turning fulcrum). Accordingly, compared to a case where the electric motor 22 and the battery 7 are mounted on either the front side or the rear side with respect to the rotating shaft 6 (the turning fulcrum), a force that is applied to rotate can be preventing from being biased to either the front side or the rear side. Therefore, even when the cutting device is rotated to either the

front side or the rear side, a user's burden in operating the cutting device can be suppressed. It is ideal that the condition that the battery mounting portion 23 and the electric motor 22 have the relationship positioned on opposite sides in the front-rear direction with respect to the rotating shaft 6 is always satisfied. It is preferred even when the cutting machine main body 2 is rotated in any direction. However, it is not necessary to satisfy this condition. In the present specification, the description that the battery mounting portion 23 and the electric motor 22 can be disposed on opposite sides in the front-rear direction with respect to the turning fulcrum means that any configuration is available if the battery mounting portion 23 and the electric motor 22 are disposed on opposite sides in the front-rear direction with respect to the turning fulcrum.

[0044] Further, a compression spring that is an elastic member 8 is disposed below the electric motor 22, and the electric motor 22 can be biased upward. According to this configuration, the cutting machine main body 2 can be rotated downward from the position of the initial state. When an operation force for rotating the cutting machine main body is released, the cutting machine main body can be automatically restored to the initial state. Alternatively, the force required for restoring to the initial state can be decreased.

[0045] Further, in the cutting device 1 of the example, the blade case 4 is positioned at one end in the right-left direction. Though not shown, the cutting blade 25 protrudes below the base 3 along the vicinity of the right end of the base 3. Accordingly, even when a floor surface is cut, a cutting operation in the vicinity of a wall (a so-called edge cutting) can be performed. Further, since the blade case 4 is formed on one end in the right-left direction, the width in the right-left direction can be narrowed, as compared to the situation where the base 3 is formed on one end in the right-left direction.

[0046] Further, when the cutting machine main body 2 is placed at the top center position, the entire cutting blade 25 is positioned above the base 3. Further, by rotation of the cutting machine main body 2, the cutting blade 25 protrudes downward from the base 3. Thus, the cutting operation with respect to the material W to be cut can be easily and conveniently performed.

[0047] The battery 7 of the example is a lithium ion battery of 18 V, and a plurality of battery cells are housed in a case of the battery 7. The battery 7 can be removed from the cutting device 1, and can be charged by a charger that is separately prepared. Thus, the battery 7 can be repeatedly used as a power source. The battery 7 includes a pair of right and left rail portions 71 and 72 on the upper surface. Positive and negative connection terminals 73 and 74 are provided in the terminal grooves 77 and 78 between the right and left rail portions 71 and 72. A connector 75 for transmitting and receiving a control signal is provided between the positive and negative connection terminals 73 and 74.

[0048] Further, on an end of the upper surface of the

battery 7 in the removal direction, a lock claw 76 for locking the battery 7 with respect to the battery mounting portion 23 is provided. It can be moved vertically.

[0049] The battery mounting portion 23 of the example is provided to form a surface approximately perpendicular to the longitudinal direction of a grip portion of the main handle 241 and at the lower end of the main handle 241. The battery 7 can be mounted and removed by sliding it in the front-rear direction as shown in FIG. 1. According to this configuration, a user can easily mount the battery 7 with one hand, while lightly holding the main handle 241 with another hand. This is because the user can firmly hold the main handle 241 in order to slidably mount the battery 7 to the battery mounting portion 23.

[0050] The battery 7 can be easily mounted from the direction approximately perpendicular to the longitudinal direction of the grip portion of the main handle 241.

[0051] Due to the fact that the battery mounting portion 23 is provided on the lower end of the main handle 241 and the battery 7 can be mounted with the right and left hands positioned close together. In this way, the battery 7 can be easily mounted to the battery mounting portion 23.

[0052] Further, as shown in FIG. 5, a center in the right-left direction of the main handle 241 approximately coincides with a center in the right-left direction of the battery mounting portion 23. Thus, the mounting of the battery 7 to the battery mounting portion 23 can be easily performed. This is because at the time of the mounting, one hand with which the main handle 241 is supported can be positioned 7 in the up-down direction in parallel with another hand with which the battery 7 is mounted.

[0053] With respect to the cutting device 1 of the example, matters other than the above-described matters will be described below.

[0054] The cutting device 1 includes an inclination mechanism that can set the cutting machine main body 2 and the blade case 4 at an incline with respect to the base 3. Accordingly, in the cutting device 1 of the example having the inclination mechanism, by raising the cutting machine main body 2 connected to the blade case 4 to the right side, the blade case 4 can be set at an incline with respect to the base 3. As shown in FIG. 2, in the inclination mechanism, oblique-cutting support plates 31 and 31 are provided at two locations of the front side and the rear side of the base 3. In addition, oblique-cutting pieces 41 and 41 are provided at both front and rear ends of the blade case 4. The oblique-cutting support plates 31 and 31 are rotatably supported, with the oblique-cutting pieces 41 and 41 interposed therebetween. By adopting this configuration, the blade case 4 and the cutting machine main body 2 can be raised to the inner side of the drawing. More specifically, this refers to the right side in FIG. 1. The blade case 4 and the cutting machine main body 2 can be largely raised to the right side, but they may be slightly raised to the front side of the drawing. More specifically, this refers to the left side in FIG. 1.

[0055] An approximately arc-shaped hole 312 that is

used for limiting an inclination range of the blade case 4 is provided in the oblique-cutting support plate 31. Further, a protrusion (not shown) that is fitted to and protrudes from the hole 312 is provided in the oblique-cutting piece 41. An operation portion 412, which can rotate around the protrusion, can be mounted on the tip of the protrusion (refer to FIG. 6 to FIG. 10). When the operation portion 412 is rotated clockwise around the protrusion, the oblique-cutting support plate 31 and the oblique-cutting piece 41 can be closely fitted to each other, and thus, they are forced to be relatively immovable to each other. Accordingly, the blade case 4 etc. is forced to be relatively immovable with respect to the base 3. By contrast, when the operation portion 412 is rotated counterclockwise, the fitting condition between the oblique-cutting support plate 31 and the oblique-cutting piece 41 is loosened, and they can be moved relatively to each other. Accordingly, the blade case 4 etc. can be moved with respect to the base 3.

[0056] Further, the cutting device 1 of the example includes a positive locking mechanism by which a highly-used inclination angle such as 22.5°, 45°, etc. can be set. Since this positive locking mechanism is well-known, detailed explanations are omitted.

[0057] Further, the cutting device 1 of the example can be configured to be placed on a rail member (not shown) such that the base 3 of the cutting device 1 can be slidably moved on the rail member.

[0058] Next, a second example will be described with reference to FIG. 6 to FIG. 10.

[0059] Similar to the first example, the cutting depth adjustment mechanism 5 is disposed at the front side of the cutting device 1 and the battery mounting portion 23 is disposed at the rear side in the second example (refer to FIG. 6). Also, similar to the first example, the cutting machine main body 2 can be rotated about the rotating shaft 6 that serves as the turning fulcrum. In some embodiments, the cutting blade 25 does not protrude below the base 3 (refer to FIG. 7 and FIG. 9), while in others, the cutting blade 25 protrudes below the base 3 (refer to FIG. 8 and FIG. 10). These embodiments can be selected in the second embodiment. Further, the cutting depth adjustment mechanism 5 is provided such that the cutting depth of the material W to be cut can be easily set to a specific depth. Main differences between the first example and the second example relate to a positional relationship between the handle portion 24 and the battery mounting portion 23. The differences will be described below.

[0060] In the second example, the battery mounting portion 23 is formed at an incline with respect to the surface HC in the right-left direction of a main handle 241. Further, the battery mounting portion 23 is formed at an incline such that an opposite side (left side) of the battery mounting portion 23 with respect to the blade case 4 is relatively positioned above a side facing the blade case 4 (right side). More specifically, when the circular-shaped cutting blade 25 is positioned orthogonal to the base 3

(that is, when the rotating shaft (not shown) of the cutting blade 25 is positioned to be parallel to the base 3), the left end side of the battery mounting portion 23 is inclined to be relatively positioned above the right end side. The battery 7 is mounted on the lower side of the battery mounting portion 23, and the battery 7 has an approximately rectangular parallelepiped shape. Thus, the battery 7 is disposed such that a left side of a bottom part of the battery 7 is positioned above a right side of the bottom part of the battery 7 (refer to FIG. 9 and FIG. 10).

[0061] In addition, the cutting machine main body 2 rotates about the rotating shaft 6 and can be inclined in the right-left direction. Accordingly, the positional relationship between the cutting machine main body 2 and the base 3 can be changed. A gap exists between the battery mounting portion 24 (or the battery 7) and the base 3. When the circular-shaped cutting blade 25 is positioned orthogonal to the base 3 the gap of the side opposite the blade case 4 (left side) is relatively larger than that of the gap on the side facing the blade case 4 (right side). Meanwhile, a user uses the cutting device 1 very often in which the circular-shaped cutting blade 25 is positioned orthogonal to the base 3. Therefore, according to the second example, the user can easily insert a hand below the battery mounting portion 23 or the battery 7 from the side opposite the blade case 4.

[0062] There are disposed various operating members operated by the user such as a fixing screw 93 that is used to fix the upper surface of the base 3 to a rail member (not shown), an adjustment screw 94 that can adjust the backlash between the upper surface and the rail member (not shown), or a slide lever 95 that can prevent the cutting device 1 from being derailed from the rail member (not shown). Even when the operating members are disposed immediately below the battery 7 or the battery mounting portion 23, the user can relatively easily operate these operating members.

[0063] Further, in the second example, the battery 7 is displaced to the blade case 4 side (right side) such that the battery 7 can be mounted to the battery mounting portion 23 (refer to FIG. 10). The mounting surface positioned below the battery mounting portion 23 can be easily viewed, and thus, the mounting of the battery 7 can be easily performed. Also, the battery 7 is displaced to the side (left side) opposite to the blade case 4 in order to remove the battery 7 from the battery mounting portion 23.

[0064] The battery mounting portion 23 is described in detail below. When the cutting blade 25 is positioned orthogonal to the base 3, the left end side of the battery mounting portion 23 is inclined to be positioned above the right end side. Referring to FIG. 10, an angle θ between the mounting surface of the battery mounting portion 23 (inclination surface AI along the battery 7) and the surface HC (vertical line relative to the bottom surface of the base 3) is formed to be more than 0° and less than 90° . In FIG. 10, the angle θ is formed to be 60° . It is preferable that the angle θ be selected from a range from

5° to 85° such as 45° , 55° , or 60° . When the cutting blade 25 is positioned orthogonal to the base 3 and the height of the mounting surface of the battery mounting portion 23 is approximately the same in the front-rear direction (refer to FIG. 10), it is preferable that the opposite side (left side) of the battery mounting portion 23 with regard to the blade case 4 is positioned above the side (right side) facing the blade case 4 side.

[0065] In the present example, the attaching and detaching directions of the battery can be adjusted by use of the inclination mechanism. This will be briefly described below.

[0066] First, by rotating the operation portion 412, the blade case 4 and the cutting machine main body 2 are maintained such that they may be set at an incline with regard to the base 3. When the angle θ between the mounting surface of the battery mounting portion 23 and the surface HC is 60° , moving the top part of the blade case 4 in a direction shown by a white arrow in FIG. 10 and setting the cutting machine main body 2 at an incline angle of 60° , the mounting and removal directions of the battery 7 can be set orthogonal to the base 3. When the angle θ is 45° , by setting the cutting machine main body 2 at an incline angle of 45° , the mounting and removal directions of the battery 7 can be orthogonal to the base 3. In this way, the mounting or the removal of the battery can be easily performed. In addition, when the angle θ is approximately the same as the angle of the positive lock, the user can more easily use the cutting device 1.

[0067] Further, the angle between the mounting direction or the removal direction of the battery 7 and the direction orthogonal to the base 3 may have an angle of less than 45° . When the angle is 45° , 15° , or the like, the battery 7 can be mounted on the battery mounting portion 23 in a state where the battery is slightly inclined with respect to the direction orthogonal to the base 3.

[0068] Further, the maximum angle by which the cutting machine main body 2 is inclined by the inclination mechanism can be determined according to the kind of cutting device 1, and the maximum angle may be 45° , 55° , 60° , or the like. When the cutting machine main body 2 is set at an incline having the maximum angle, it is preferable that the angle between the mounting direction or the removal direction of the battery 7 and the direction orthogonal to the base 3 be set to have an angle of 45° or less. Further, when the cutting machine main body 2 is raised by the angle of the positive lock, it is preferable that the angle between the mounting direction or the removal direction of the battery 7 and the direction orthogonal to the base 3 be set to have an angle of 45° or less.

[0069] Further, though not shown in the figures, the battery 7 may intersect the surface HC corresponding to the centerline in the right-left direction of the main handle 241. In this case, the battery mounting portion 23 or the battery 7 may be positioned to protrude at both right and left sides from both the right and left end parts of the main handle 241. As the typical example, the surface HC corresponding to the center in the right-left direction of the

main handle 241 may approximately coincide with the center in the right-left direction of the battery mounting surface. The battery mounting portion 23 may be provided on one end of the main handle 241.

[0070] The two examples are described above, but the present invention may include various modifications in addition to the above-described examples.

[0071] For example, the cutting device is not necessarily the plunge cut saw, and may be a cutting device in which the cutting blade is always positioned across the base.

[0072] In addition, the cutting machine main body may linearly move in the up-down direction.

[0073] In addition, the battery is not limited to 18 V output, and may include various outputs such as 10.8 V, 14.4 V, or 36 V.

[0074] Further, a plurality of batteries may be used together.

[0075] Further, in the above examples, the battery is slidably mounted to the battery mounting portion. However, the battery may be attached to the battery mounting portion by engaging the former with the latter in an up-down direction.

[0076] Further, the battery is not limited to the battery having an approximately rectangular parallelepiped shape, and may include a battery having a cylindrical shape, a square-pole shape, or the like.

[0077] It is explicitly stated that all features disclosed in the description and/or the claims are intended to be disclosed separately and independently from each other for the purpose of original disclosure as well as for the purpose of restricting the claimed invention independent of the composition of the features in the embodiments and/or the claims. It is explicitly stated that all value ranges or indications of groups of entities disclose every possible intermediate value or intermediate entity for the purpose of original disclosure as well as for the purpose of restricting the claimed invention, in particular as limits of value ranges.

Claims

1. A cutting device (1) having a base (3) that is brought into contact with a material (W) to be cut and also having a cutting machine main body (2) that is positioned above an upper surface of the base (3), wherein the cutting machine main body (2) has an electric motor (22) that serves as a drive source, a battery mounting portion (23) to which a rechargeable battery (7) that serves as a power source is mounted, a circular cutting blade (25) that is adapted to be rotated by the electric motor (22), and a handle portion (24) that is held by a user, **characterized in that** a cutting depth adjustment mechanism (5) that is used to adjust a cutting depth of the cutting blade (25) is located in front of the battery mounting portion

(23).

2. The cutting device (1) according to claim 1, wherein the battery mounting portion (23) is located on one end of the handle portion (24) and the electric motor (22) is located on an opposite end of the handle portion (24).
3. The cutting device (1) according to claim 1 or 2, wherein an elastic member (8) that can bias the electric motor (22) in an upward direction is located below the electric motor (22).
4. The cutting device (1) according to any one of claims 1 to 3, wherein the electric motor (22) is adapted to be rotated integrally with the battery mounting portion (23) around a turning fulcrum (6); and the electric motor (22) is located in front of the turning fulcrum (6) and the battery mounting portion (23) is located behind the turning fulcrum (6).
5. The cutting device (1) according to any one of claims 1 to 4, wherein when the cutting blade (25) is positioned orthogonal to the base (3), the battery (7) is positioned at an incline such that an opposite side of the battery mounting portion (23) with respect to the cutter blade (25) is positioned above a cutter blade side of the battery mounting portion (23) facing the cutter blade (25).
6. The cutting device (1) according to claim 5, wherein the battery (7) is mounted to the battery mounting portion (23) by sliding the battery (7) along the battery mounting portion (23) from the side opposite the cutter blade (25) towards the cutter blade side.
7. The cutting device (1) according to claim 5 or 6, wherein the battery (7) is mounted to the battery mounting portion (23) in a cutting direction of the material (W) to be cut when viewed from above.
8. The cutting device (1) according to claim 5 or 6, wherein the battery (7) is mounted to the battery mounting portion (23) in a direction orthogonal to the cutting direction of the material (W) to be cut when viewed from above.
9. The cutting device (1) according to any one of claims 1 to 8, further comprising: an inclination mechanism (31, 41) that can set the cutting machine main body (2) at an incline such that the cutting blade (25) is inclined with respect to the base (3) in a right and left direction, **characterized in that**

an angle between a mounting direction or a removal direction of the battery (7) and a direction orthogonal to the base (3) can be set to be 45° or less by setting the cutting machine main body (2) at an incline with respect to the base (3). 5

10. The cutting device (1) according to claim 9, wherein a maximum inclination angle that can be set by the inclination mechanism (31, 41) is 45°, 55°, or 60°. 10

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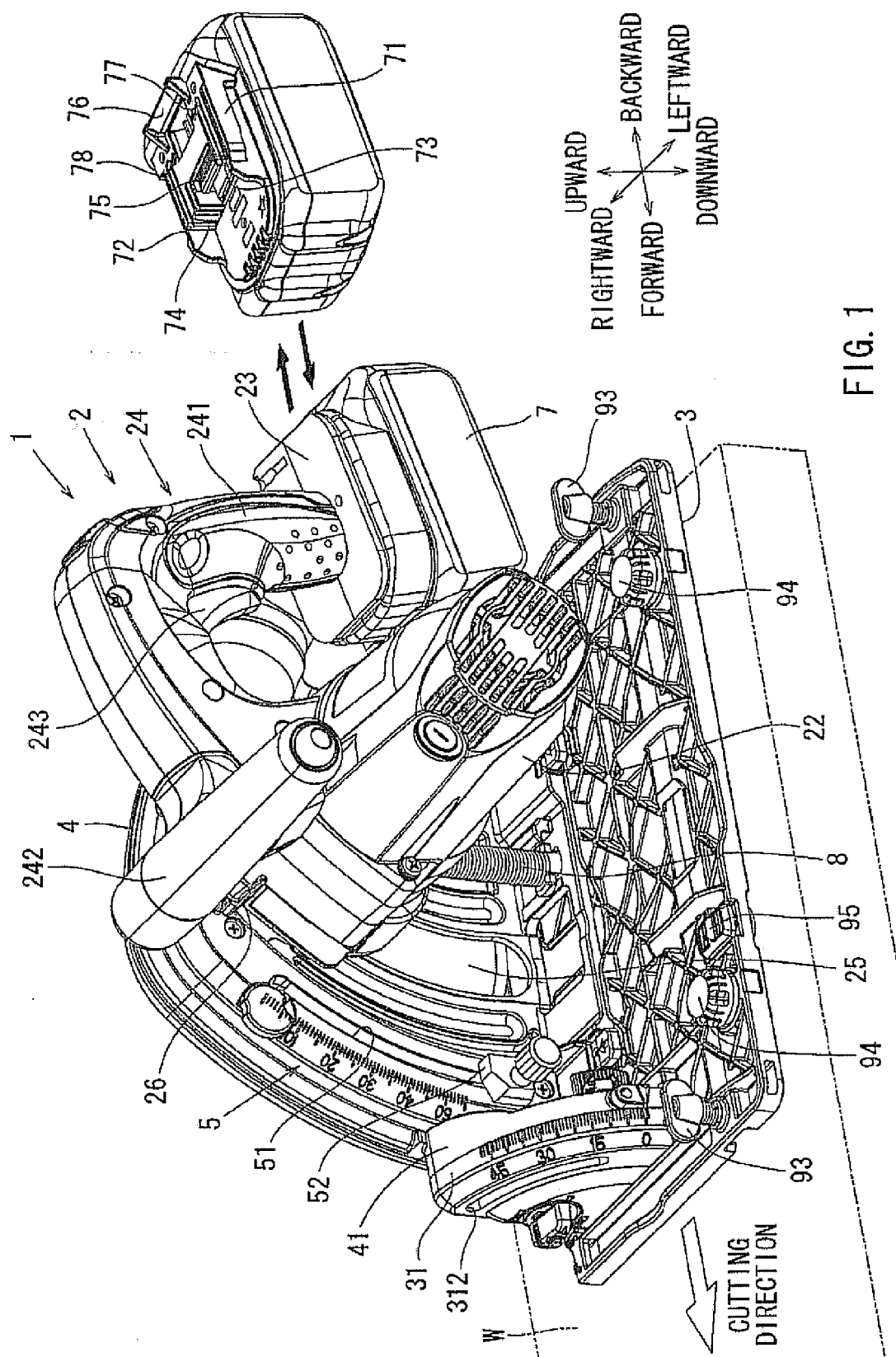
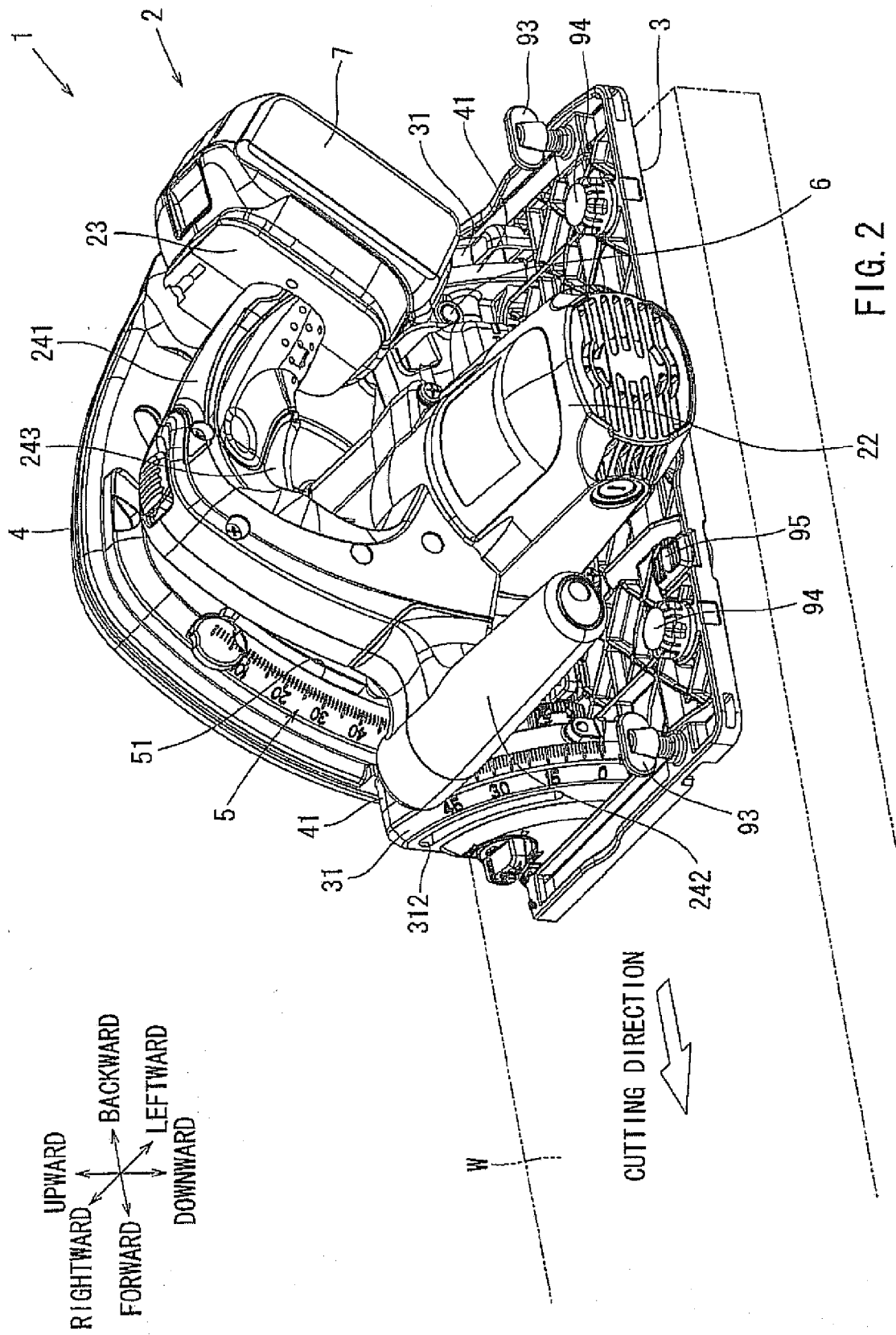
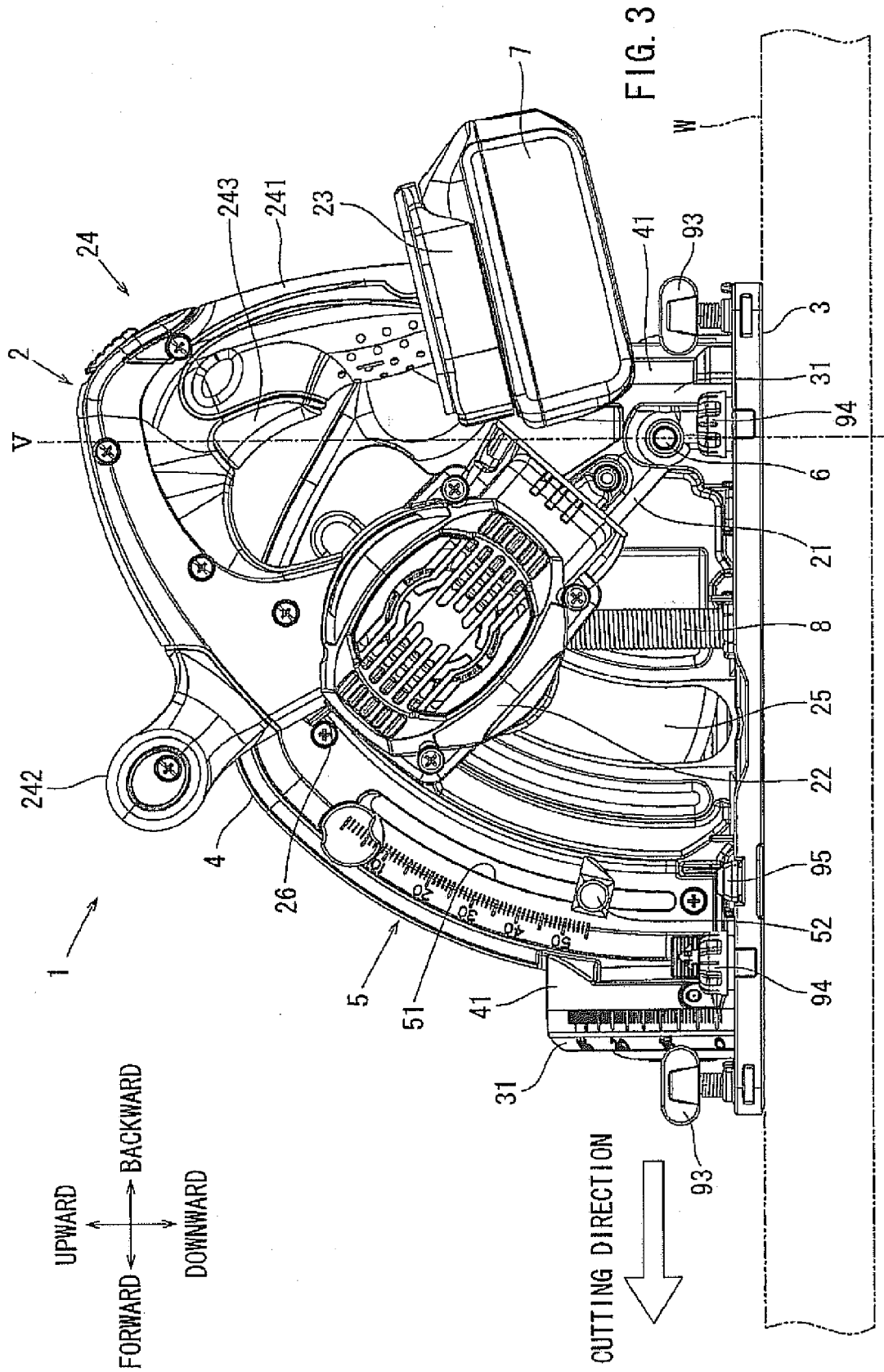


FIG. 1





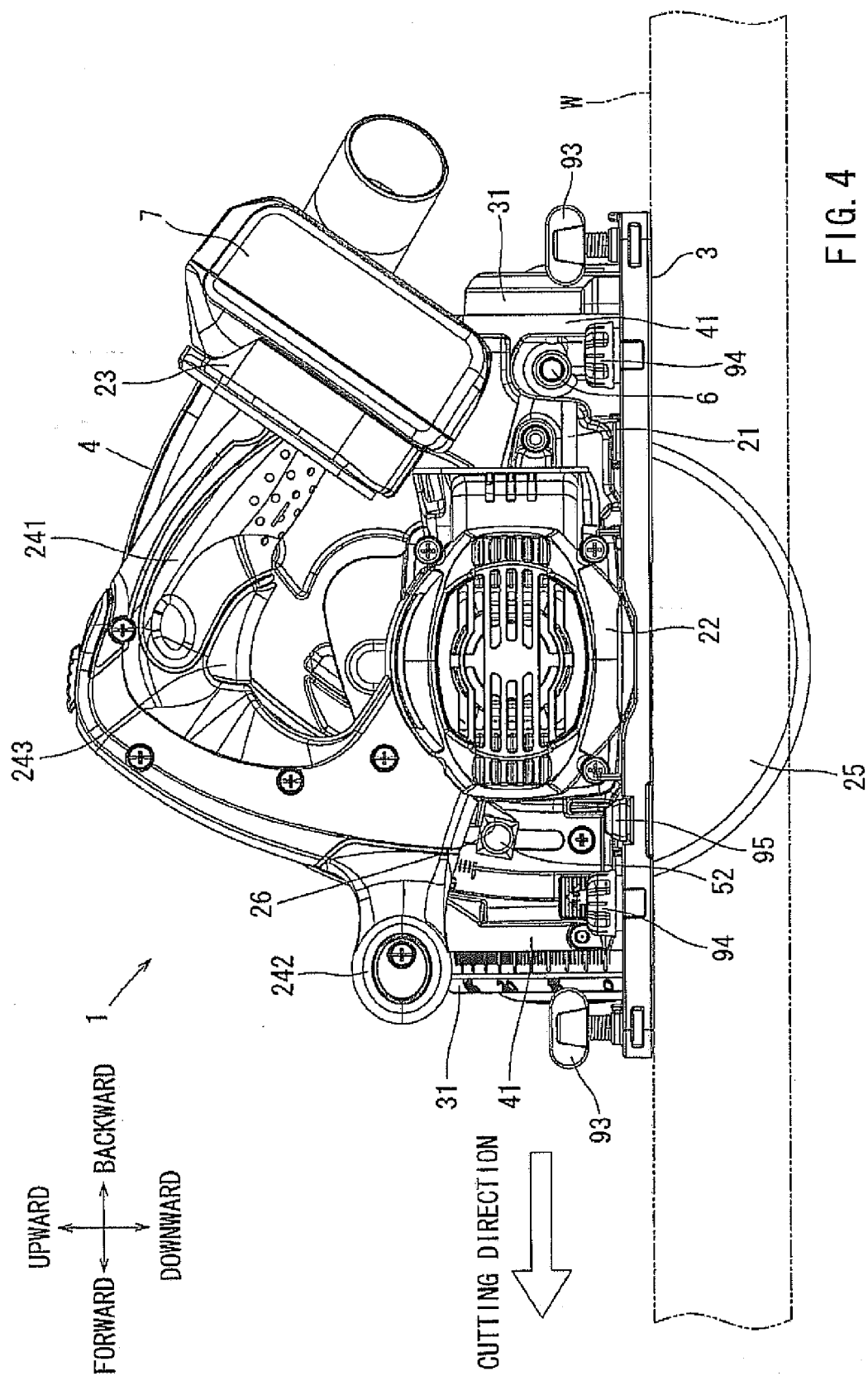


FIG. 4

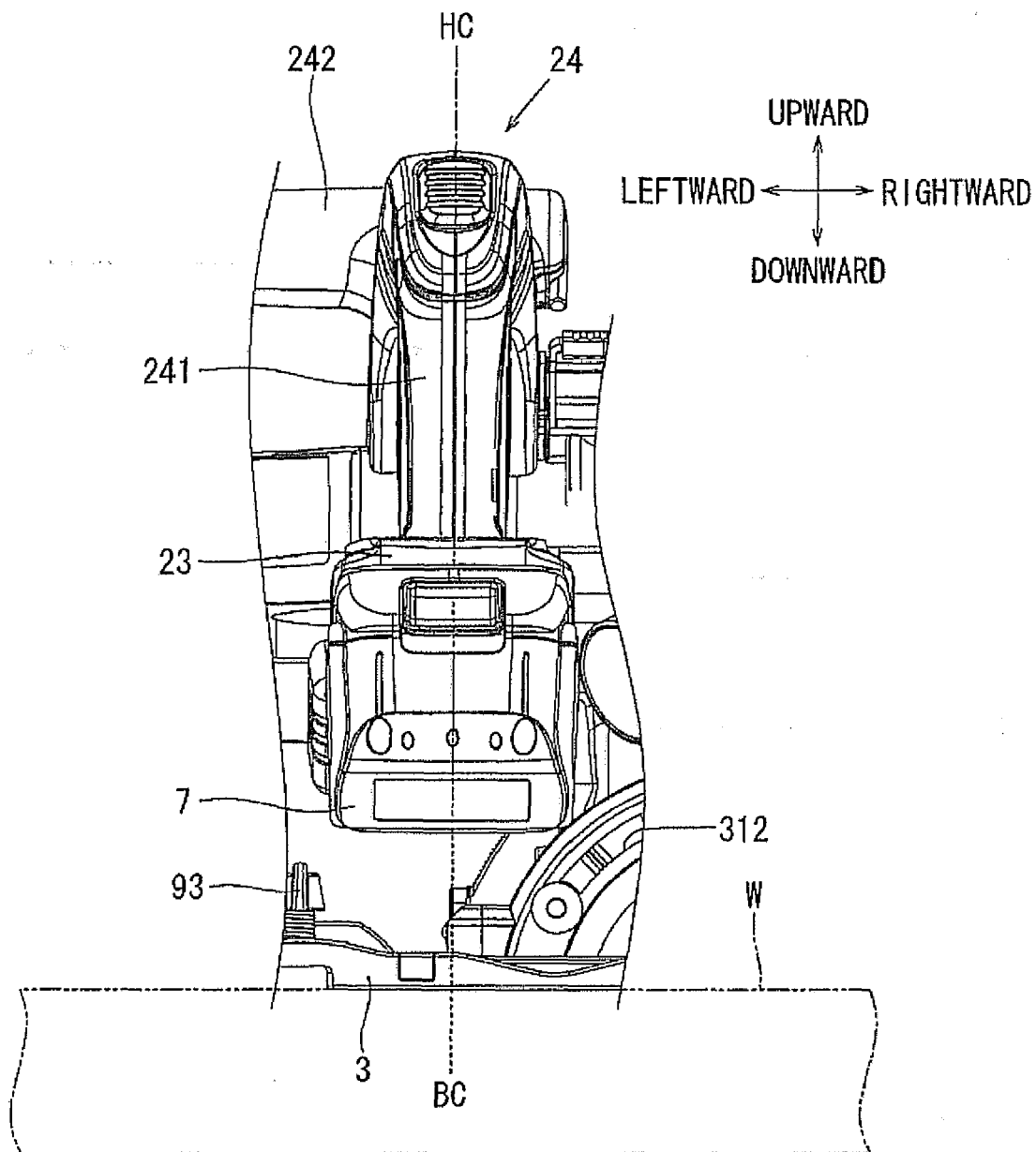
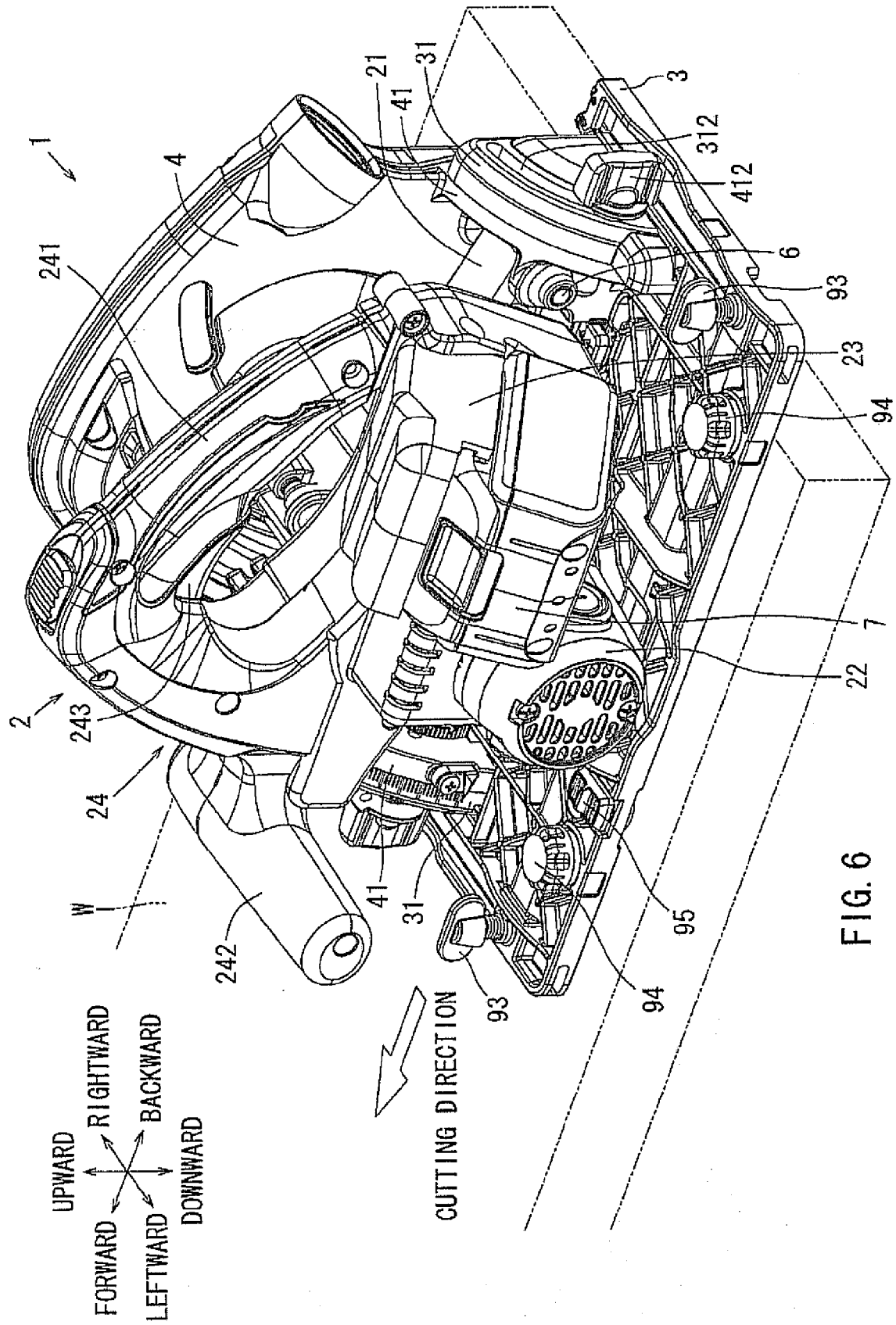
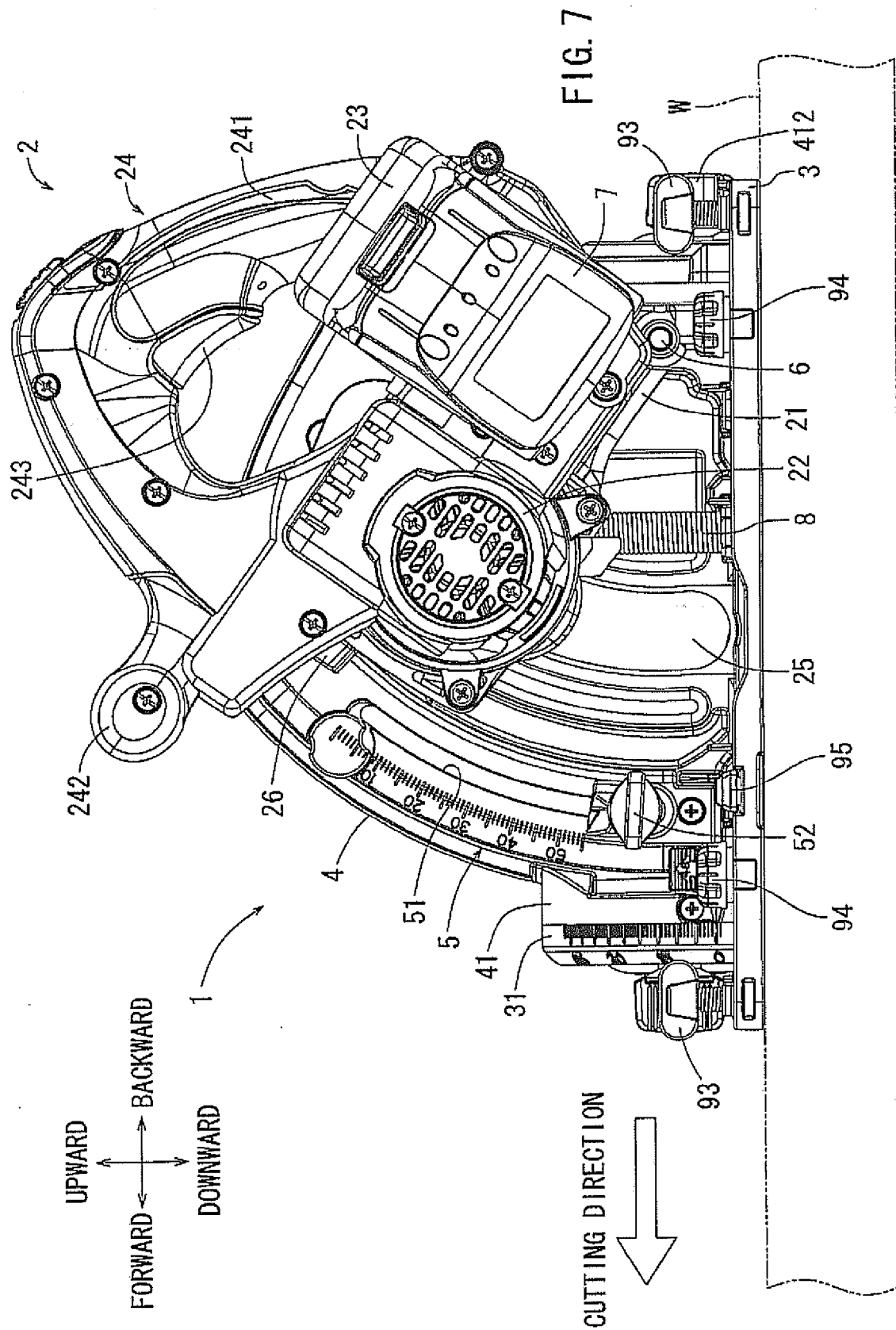


FIG. 5





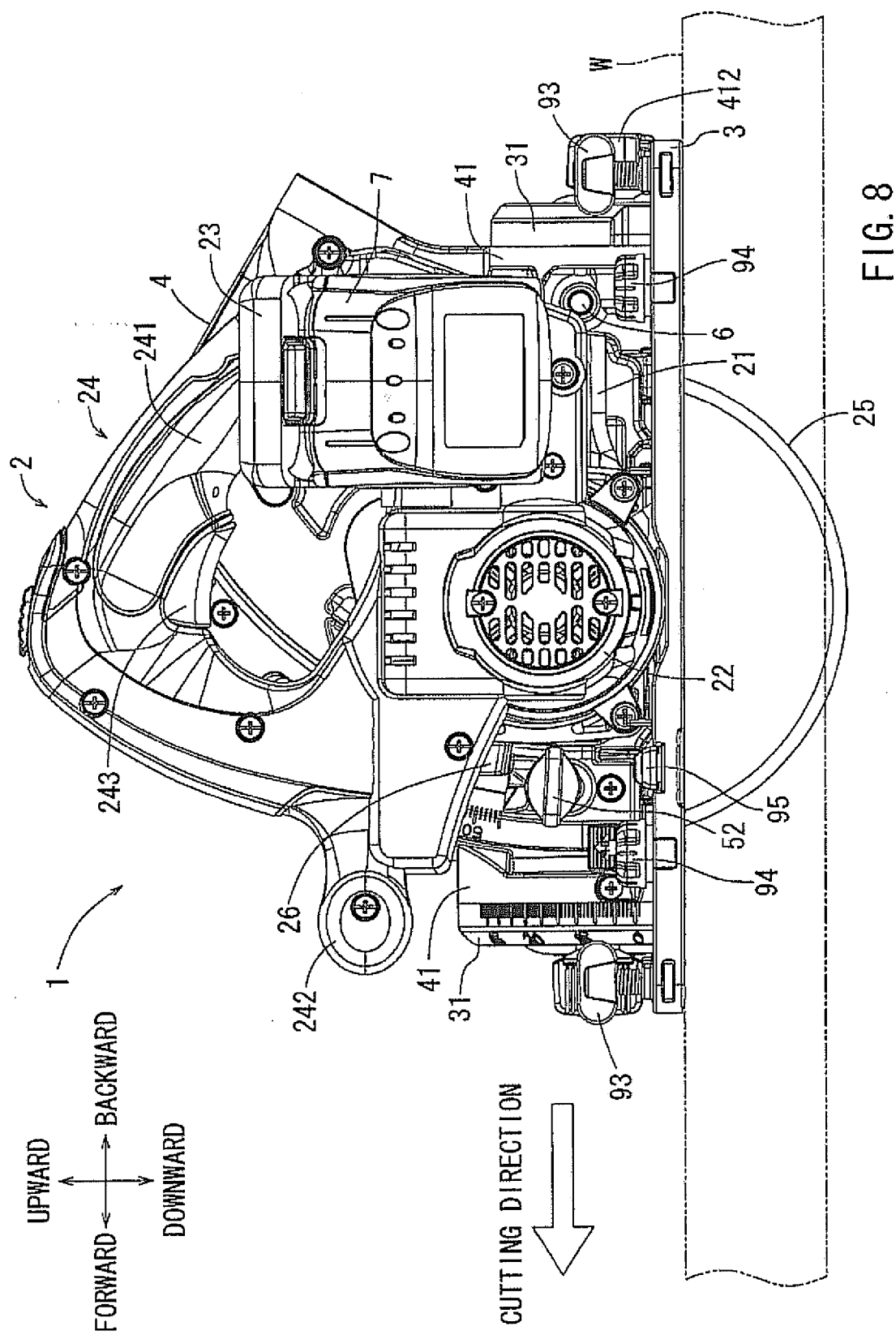


FIG. 8

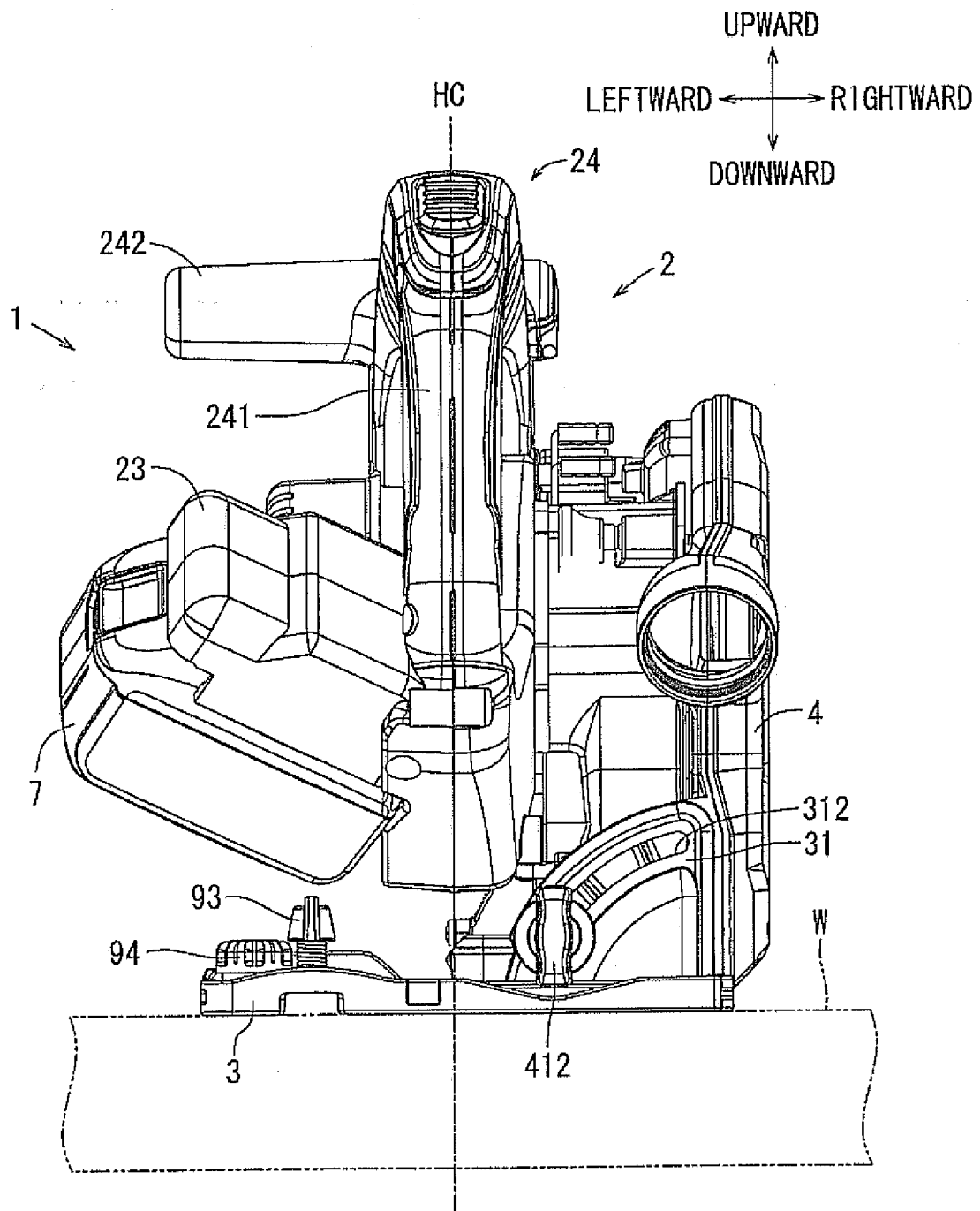


FIG. 9

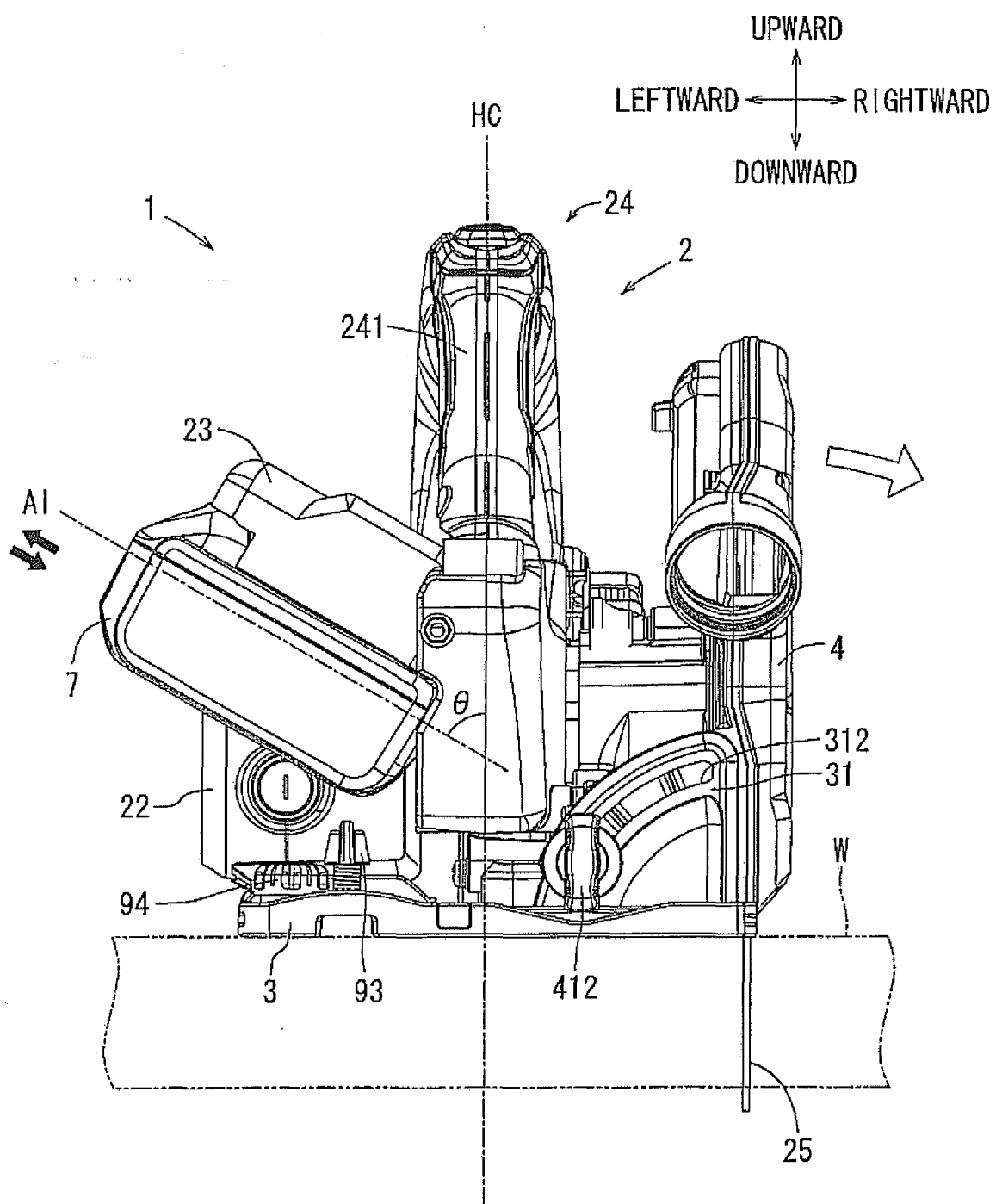


FIG. 10



EUROPEAN SEARCH REPORT

Application Number
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Y	* paragraphs [0004], [0019], [0020], [0021] *	4	
A	* figures 1-4,7,13 *	3,5,9	
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Place of search The Hague		Date of completion of the search 15 May 2014	Examiner Chariot, David
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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