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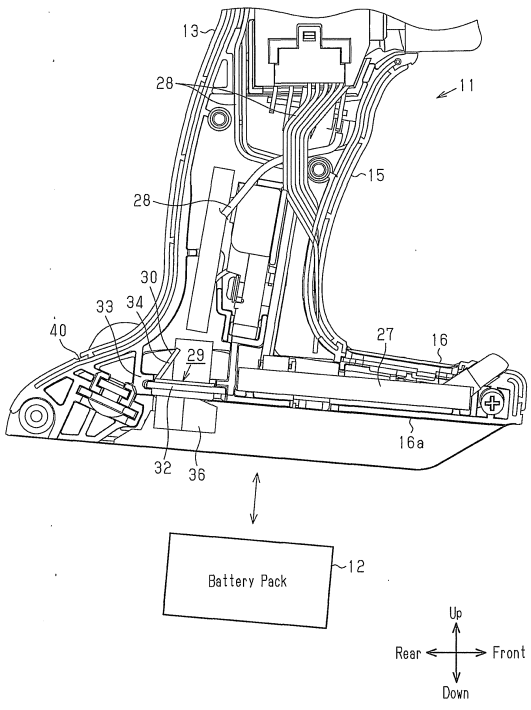
(54) Power tool

(57) A hand-held power tool (10) includes a grip (15), a battery pack mount (16) located below the grip (15), and a connection terminal (30, 31) coupled to the battery pack mount (16). The connection terminal (30, 31) includes outer and inner terminal portions (34 to 37). The outer terminal portion (36, 37) extends from a lower surface of the battery pack mount (16). The inner terminal portion (34, 35) extends into the grip (15) or the battery pack mount (16). The inner terminal portion is non-parallel to the outer terminal portion. When the outer terminal portion lies along a sagittal plane that extends in a front-to-rear direction and a vertical direction of the power tool (10), the inner terminal portion lies along a plane that differs from the sagittal plane.

Fig.2



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Description

[0001] The present invention relates to a power tool, and more particularly, to a hand-held power tool for use with a removable battery back.

[0002] Japanese Laid-Open Patent Publication No. 2006-263830 describes a hand-held power tool including a grip and a battery pack attached in a removable manner to the lower end of the grip. The battery pack includes a terminal that is electrically connected to a connection terminal extending from the lower end of the grip.

[0003] The connection terminal of the power tool has an outer end, or lower end, extending downward from a mounting surface at the lower end of the grip. The connection terminal has an inner end, or upper end, located in the grip and electrically connected to a lead wire.

[0004] The inventors of the present invention have noticed that changes in the shape of the connection terminal increases the degree of freedom for the location of the connection terminal and the shape of the grip.

[0005] It is an object of the present invention to provide a power tool that increases the degree of freedom for the shape of the grip.

[0006] One aspect of the present invention is a hand-held power tool including a grip, a battery pack mount located below the grip, and at least one connection terminal coupled to the battery pack mount. The at least one connection terminal includes an outer terminal portion and an inner terminal portion that are formed by bending a metal plate. The outer terminal portion includes a distal end extending from a lower surface of the battery pack mount to provide an electrical contact for a battery pack. The inner terminal portion includes a distal end extending into the grip or the battery pack mount to provide an electric contact for a conductive member located in the grip or the battery pack mount. The inner terminal portion is non-parallel to the outer terminal portion. The outer terminal portion lies along a sagittal plane that extends in a front-to-rear direction and a vertical direction of the power tool. The inner terminal portion lies along a plane that differs from the sagittal plane.

[0007] The power tool according to one aspect of the present invention increases the degree of freedom for the shape of the grip.

[0008] Other aspects and advantages of the present invention will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

[0009] The invention, together with objects and advantages thereof, may best be understood by reference to the following description of the presently preferred embodiments together with the accompanying drawings in which:

Fig. 1 is a partially cross-sectional view showing one embodiment of a power tool;

Fig. 2 is a cross-sectional view of a grip;

Fig. 3 is a perspective view showing connection terminals;

Fig. 4 is a perspective view showing a modified example of the connection terminals; and

Fig. 5 is a perspective view showing a further modified example of the connection terminals.

[0010] One embodiment of a power tool will now be described with reference to the drawings.

[0011] Fig. 1 shows a power tool 10 of the present embodiment used as, for example, a drill driver. The power tool 10 includes a main body 11 and a battery pack 12, which is connected in a removable manner to the main body 11. The main body 11 has a housing 13 including a barrel 14, a grip 15 extending downward from the barrel 14, and a battery pack mount 16 located at the lower side of the grip 15. The barrel 14 has the form of, for example, a tube that has a closed end. The battery pack 12 is attached to the battery pack mount 16.

[0012] The rear end (left end as viewed in Fig. 1) of the barrel 14 of the housing 13 accommodates, for example, an electric motor 17, which functions as a power source. A gear unit 18, which receives the rotation produced by the motor 17 and changes (reduces) the rotation speed, is arranged at the output shaft side (right side as viewed in Fig. 1) of the motor 17. The rotation, the speed of which is reduced by the gear unit 18, is transmitted via a power transmission mechanism 19 to a drive shaft 20. The drive shaft 20 is coupled to a rotation output unit 21, which is located at the distal end of the barrel. The rotation output unit 21 has a chuck function. A bit 22 is attached in a removable manner to the distal end of the rotation output unit 21. The bit 22 rotates together with the rotation output unit 21 at the rotation speed reduced by the gear unit 18.

[0013] A trigger switch 23 is arranged at the upper end of the grip 15. That is, the trigger switch 23 is located slightly below and toward the front of where the grip 15 is connected to the barrel 14. The trigger switch 23 includes a trigger lever 24 and a switch circuit 25. The trigger lever 24 is operated by the index finger or the like of a user when driving the power tool 10. The switch circuit 25 is located in the grip 15 (housing 13) and generates signals in accordance with the operation of the trigger lever 24. In addition to signals corresponding to activation and deactivation operations of the trigger lever 24, the switch circuit 25 outputs a signal that is in accordance with the operated amount (pulled amount) of the trigger lever 24 during an activation operation. Further, a rotation direction switch 26 is located near the trigger switch 23 to switch the rotation of the motor 17 between forward and reverse directions.

[0014] As shown in Figs. 1 and 2, a control circuit 27 that controls the power tool 10 is located in a front middle portion of the battery pack mount 16. The control circuit 27 is, for example, box-shaped and thin in the vertical direction. The control circuit 27, the motor 17, the trigger switch 23 (switch circuit 25), the rotation direction switch

26, and the like are electrically connected to one another by lead wires 28.

[0015] A connection terminal unit 29 is arranged near the control circuit 27 in the battery pack mount 16, more specifically, at the rear of the control circuit 27. The connection terminal unit 29 includes, for example, two connection terminals 30 and 31, which are shown in Fig. 3. The connection terminals 30 and 31 are integrated with each other in plastic (not shown in Fig. 3). Referring to Fig. 2, a plastic portion 32 of the connection terminal unit 29 is held by a holder 33 in the battery pack mount 16. The connection terminals 30 and 31 respectively include inner terminal portions 34 and 35, which extend from the upper side of the plastic portion 32, and outer terminals 36 and 37, which extend from the inner side of the plastic portion 32. One of the inner terminal portions 34 and 35 (e.g., inner terminal portion 34) may be branched into two sections (refer to Fig. 3).

[0016] The inner terminals portions 34 and 35 of the connection terminals 30 and 31 in the grip 15 (battery pack mount 16) are connected to corresponding conductive members such as the lead wires 28. The outer terminal portions 36 and 37 extending from the lower surface 16a of the battery pack mount 16 are connected to terminals of the battery pack 12, which is attached to the mount 16. That is, the connection terminals 30 and 31 electrically connect the battery pack 12 and the main body 11 to allow for the supply of power from the battery pack 12 to the main body 11.

[0017] The connection terminals 30 and 31 are each formed by bending a metal plate. In the example of Fig. 3, flat middle portions 38 and 39 are located between the inner terminal portions 34 and 35 and the outer terminal portions 36 and 37, respectively. Each of the outer terminal portions 36 and 37 is bent at a right angle at one side of the corresponding one of the middle portions 38 and 39 to extend downward. The inner terminal portions 34 and 35 are bent in a diagonally upward direction so that the angle is acute between the inner terminal portions 34 and 35 and the middle portions 38 and 39. Preferably, bending lines L1a and L1b, at which the outer terminal portions 36 and 37 are bent, are perpendicular to the bending lines L2a and L2b, at which the inner terminal portions 34 and 35 are bent, on a horizontal plane (plane of the middle portions 38 and 39).

[0018] When forming the connection terminal unit 29, the connection terminals 30 and 31 are arranged near each other so that the middle portions 38 and 39 of the connection terminals 30 and 31 are arranged on the same plane and the outer terminal portions 36 and 37 are parallel to each other. The bending lines L1 a and L1b of the outer terminal portions 36 and 37 are arranged to be parallel, and the bending lines l2a and L2b of the inner terminal portions 34 and 35 are aligned with each other along the same line. The middle portions 38 and 39 and the inner terminal portions 34 and 35 are located between the outer terminal portions 36 and 37. Molding is performed so that all of the middle portions 38 and 39, basal ends of the outer terminal portions 36 and 37, and basal ends of the inner terminal portions 34 and 35 are covered with plastic and integrated with one another. This forms the connection terminal unit 29.

[0019] When coupling the connection terminal unit 29 to the battery pack mount 16, the middle portions 38 and 39 of the connection terminals 30 and 31 lie along a transverse plane of the power tool 10 (main body 11), that is, a plane extending in the front-to-rear direction and the lateral direction (sideward direction). Further, the outer terminals 36 and 37 are arranged extending downward from the middle portions 38 and 39 so that the outer terminal portions 36 and 37 lie along a sagittal plane of the power tool 10 (main body 11), that is, a plane extending in the front-to-rear direction and the vertical direction. As a result, the bending lines L2a and L2b of the inner terminal portions 34 and 35 extend in the lateral direction (sideward direction). Further, the inner terminal portions 34 and 35 extend in a diagonally upward direction and are slightly sloped toward the front from the rear ends of the middle portions 38 and 39.

[0020] As shown in Fig. 1, the grip 15 has a small (narrow) profile so that the user can hold the grip 15 with a single hand. In contrast, the battery pack 12 has a profile that is much larger than the battery pack 12 so that the power tool 10 may be operated as long as possible. Thus, the battery pack mount 16 is shaped to become smaller in size from the lower end, which is attached to the large battery pack 12, toward the small grip 15.

[0021] The connection terminal unit 29 is incorporate in the rear side of the battery pack mount 16, the shape of which is gradually reduced in size from the battery pack mount 16 to the grip 15. In the portion between the grip 15 and the battery pack mount 16 where the inner terminal portions 34 and 35 of the connection terminal unit 29 are located, the battery pack mount 16 has a rear wall 40 that is inclined toward the front side. In the present embodiment, the inner terminal portions 34 and 35 are bent in the diagonally upward direction to extend as close as possible along the sloped form of the rear wall. This allows for the connection terminal unit 29 to be arranged at the rearmost portion of the battery pack mount 16 and allows for the connection terminal unit 29 to be shaped and arranged in an efficient manner without forming unnecessary space around the inner terminal portions 34 and 35.

[0022] A new tool may be designed based on the present power tool 10 when, for example, slightly changing the outer shape of the grip 15 or the battery pack mount 16 or slightly changing the shape of an internal component such as the control circuit 27. In such a case, restrictions are imposed on the location of the connection terminal unit 29 in the battery pack mount 16 due to the rear wall 40 of the battery pack mount 16. However, the connection terminal unit 29 may easily cope with changes in the shape of the grip 15 or the battery pack mount 16 by changing the inclined amount (bent amount) of the inner terminal portions 34 and 35 in the front-to-rear di-

rection and the vertical direction.

[0023] A comparative example uses connection terminals 30 and 31 that are bent in the usual crank-shaped manner. The bending lines L2a and L2b of the inner terminal portions 34 and 35 are set to be parallel to the bending lines L1a and L1b of the outer terminal portions 36 and 37. The inner terminal portions 34 and 35 are bent upward at a right angle at sides of the middle portions 38 and 39 opposite to the outer terminal portions 36 and 37 so that the outer terminals portions 36 and 37 are parallel to the inner terminal portions 34 and 35. The inner terminal portions 34 and 35 of the connection terminals 30 and 31 are projected upward over a long amount. Thus, the inner terminal portions 34 and 35 easily interfere with the rear wall 40 or the like of the battery pack mount 16 when adjusting the location of the connection terminal unit 29. Consequently, in the connection terminals 30 and 31 of the comparative example, the degree of layout freedom is low in the front-to-rear direction and the vertical direction, and the degree of design freedom is low for the shape of the grip 15 and the surrounding portions.

[0024] In this regard, the inclined amount of the inner terminal portions 34 and 35 in the front-to-rear direction and the vertical direction may be changed when adjusting the location of the connection terminal unit 29. Thus, the connection terminal unit 29 has a high degree of layout freedom. In other words, the degree of design freedom is high for the grip 15 and the surrounding portions.

[0025] The present embodiment has the advantages described below.

(1) In the connection terminals 30 and 31 (connection terminal unit 29) connecting the main body 11 and the battery pack 12, the inner terminal portions 34 and 35 are set so that the bending lines L2a and L2b extend in the sideward (lateral) direction of the power tool 10. When designing the power tool 10 (main body) and adjusting the location of the connection terminal unit 29, the inclined amount of the inner terminals 34 and 35 (bent amount at the bending lines L2a and L2b) may be changed in the front-to-rear direction and the vertical direction to easily adjust the location of the connection terminal unit 29. This increases the degree of layout freedom for the connection terminal unit 29 and increases the degree of design freedom for the grip 15 of the power tool 10 (main body 11) and the surrounding portions.

(2) In the present embodiment, the inner terminal portions 34 and 35 of the connection terminals 30 and 31 are bent at an acute angle at the bending lines L2a and L2b in conformance with the shapes of the rear wall 40 and the nearby walls of the battery pack mount 16. The connection terminal unit 29 is arranged at the rearmost portion of the battery pack mount 16 so that the inner terminal portions 34 and 35 extend as close as possible along the sloped form of the rear wall 40 or the like. This allows for the elimination of unnecessary space from around the inner terminal portions 34 and 35 (connection terminal unit 29). Thus, the connection terminal unit 29 is applicable to a situation in which the control circuit 27 is enlarged in the front-to-rear direction to increase functions.

[0026] It should be apparent to those skilled in the art that the present invention may be embodied in many other specific forms without departing from the spirit or scope of the invention. Particularly, it should be understood that the present invention may be embodied in the following forms.

[0027] The bending lines L2a and L2b of the inner terminal portions 34 and 35 do not have to extend in the sideward direction (lateral direction). Further, the inner terminal portions 34 and 35 do not have to be bent at an acute angle.

[0028] For example, as shown in Fig. 4, when there is enough space around the inner terminal portions 34 and 35, the inner terminal portions 34 and 35 may be bent upward at a right angle.

[0029] Alternatively, as shown in Fig. 5, the bent lines L2a and L2b of the inner terminal portions 34 and 35 may be set to be parallel to the bending lines L1a and L1b of the outer terminals 36 and 37. The inner terminal portions 34 and 35 are bent at obtuse angles so that the distal ends extend toward each other. This allows the grip 15 to be reduced in size.

[0030] As another option, the inner terminal portions 34 and 35 may be bent to be non-parallel to the outer terminal portions 36 and 37, and the inner terminal portions 34 and 35 and the outer terminal portions 36 and 37 (sagittal plane) may face different directions. This would also obtain the advantages described below.

[0031] The inner terminal portions 34 and 35 of the connection terminals 30 and 31 are bent at the same angle. Instead, the connection terminals 30 and 31 may be bent at different angles.

[0032] The inner terminal portion 34 of the connection terminal 30 does not have to be branched into two sections. For example, branched sections may be omitted from the inner terminal portion 34. Alternatively, the inner terminal portion 34 may include three or more branched sections. Further, each branched section may be bent at a different bending angle.

[0033] The power tool 10 may be a hand-held power tool other than a drill driver. For example, the power tool 10 may be an impact driver, an impact wrench, a hammer drill, a jigsaw, a sealing gun, or the like.

[0034] The distal ends of the inner terminal portions 34 and 35 may be located in the battery pack mount 16, in the grip 15, or in the bordering portion between the battery pack mount 16 and the grip 15.

[0035] The present disclosure includes the embodiments described below.

Embodiment 1

[0036] A hand-held power tool (10) including a grip (15), a battery pack mount (16) located below the grip (15), and at least one connection terminal (30, 31) coupled to the battery pack mount (16). The at least one connection terminal (30, 31) includes an outer terminal portion (36, 37) and an inner terminal portion (34, 35) that are formed by bending a metal plate. The outer terminal portion (36, 37) includes a distal end extending from a lower surface of the battery pack mount (16) to provide an electrical contact for a battery pack (12). The inner terminal portion (34, 35) includes a distal end extending into the grip (15) or the battery pack mount (16) to provide an electric contact for a conductive member located in the grip (15) or the battery pack mount (16). The inner terminal portion (34, 35) is non-parallel to the outer terminal portion (36, 37). When the outer terminal portion (36, 37) lies along a sagittal plane that extends in a front-to-rear direction and a vertical direction of the power tool (10), the inner terminal portion (34, 35) lies along a plane that differs from the sagittal plane.

Embodiment 2

[0037] The inner terminal portion (34, 35) is formed by bending the metal plate along a bending line (L2a, L2b). The at least one connection terminal (30, 31) is coupled to the battery pack mount (16) so that the bending line (L2a, L2b) extends in a sideward direction of the main body (11).

Embodiment 3

[0038] The inner terminal portion (34, 35) is bent at an acute angle along the bending line in conformance with a wall shape of a housing (13) of the power tool (10).

Embodiment 4

[0039] The inner terminal portion (34, 35) is located in a bordering portion of the battery pack mount (16) and the grip (15).

Embodiment 5

[0040] The at least one connection terminal is one of two connection terminals (30, 31) forming a connection terminal unit (29) arranged in a rear inner portion of the battery pack mount (16).

Embodiment 6

[0041] The inner terminal portion (34, 35) is bent upward at a right angle.

Embodiment 7

[0042] Each outer terminal portion (36, 37) is formed by bending the metal plate along a first bending line (L1a, L1b). Each inner terminal portion (34, 35) is formed by bending the metal plate at an obtuse angle along a second bending line (L2a, L2b) that is parallel to the first bending line so that the distal ends of the inner terminal portions (34, 35) approach each other.

Embodiment 8

[0043] The inner terminal portion (34, 35) is an upward sloping plate including a sloped upper surface and a sloped lower surface. The connection terminal (30, 31) is coupled to the battery pack mount (16) so that a distal end of the upward sloping plate is directed toward a front side of the power tool.

Embodiment 9

[0044] The inner terminal portion (34, 35) is an upright plate including a front surface and a rear surface. The connection terminal (30, 31) is coupled to the battery pack mount (16) so that a distal end of the upright plate is directed toward an upper side.

Embodiment 10

[0045] The inner terminal portion (34, 35) is an upward sloping plate including a sloped upper surface and a sloped lower surface. The connection terminal (30, 31) is coupled to the battery pack mount (16) so that the sloped upper surface of the upward sloping plate faces a side wall of the power tool.

[0046] The inner terminal portion (34, 35) is located at or near a lower end of the grip (15).

[0047] The invention is not limited to the foregoing embodiments and various changes and modifications of its components may be made without departing from the scope of the present invention. Also, the components disclosed in the embodiments may be assembled in any combination for embodying the present invention. For example, some of the components may be omitted from all components disclosed in the embodiments. Further, components in different embodiments may be appropriately combined.

Claims

1. A hand-held power tool (10) including a grip (15), a battery pack mount (16) located below the grip (15), and at least one connection terminal (30, 31) coupled to the battery pack mount (16), the power tool (10) being **characterized in that**:

   the at least one connection terminal (30, 31) in-

cludes an outer terminal portion (36, 37) and an inner terminal portion (34, 35) that are formed by bending a metal plate;
the outer terminal portion (36, 37) includes a distal end extending from a lower surface of the battery pack mount (16) to provide an electrical contact for a battery pack (12);
the inner terminal portion (34, 35) includes a distal end extending into the grip (15) or the battery pack mount (16) to provide an electric contact for a conductive member located in the grip (15) or the battery pack mount (16);
the inner terminal portion (34, 35) is non-parallel to the outer terminal portion (36, 37); and
when the outer terminal portion (36, 37) lies along a sagittal plane that extends in a front-to-rear direction and a vertical direction of the power tool (10), the inner terminal portion (34, 35) lies along a plane that differs from the sagittal plane.

2. The power tool according to claim 1, **characterized in that**:

the inner terminal portion (34, 35) is formed by bending the metal plate along a bending line (L2a, L2b); and
the at least one connection terminal (30, 31) is coupled to the battery pack mount (16) so that the bending line (L2a, L2b) extends in a sideward direction of the main body (11).

3. The power tool according to claim 2, **characterized in that**:

the inner terminal portion (34, 35) is bent at an acute angle along the bending line in conformance with a wall shape of a housing (13) of the power tool (10).

4. The power tool according to any one of claims 1 to 3, **characterized in that** the inner terminal portion (34, 35) is located in a bordering portion of the battery pack mount (16) and the grip (15).

5. The power tool according to any one of claims 1 to 3, **characterized in that** the at least one connection terminal is one of two connection terminals (30, 31) forming a connection terminal unit (29) arranged in a rear inner portion of the battery pack mount (16).

6. The power tool according to claim 1 or 2, **characterized in that** the inner terminal portion (34, 35) is bent upward at a right angle.

7. The power tool according to claim 5, **characterized in that**:

each outer terminal portion (36, 37) is formed by bending the metal plate along a first bending line (L1a, L1b); and
each inner terminal portion (34, 35) is formed by bending the metal plate at an obtuse angle along a second bending line (L2a, L2b) that is parallel to the first bending line so that the distal ends of the inner terminal portions (34, 35) approach each other.

8. The power tool according to claim 1, **characterized in that**:

the inner terminal portion (34, 35) is an upward sloping plate including a sloped upper surface and a sloped lower surface; and
the connection terminal (30, 31) is coupled to the battery pack mount (16) so that a distal end of the upward sloping plate is directed toward a front side of the power tool.

9. The power tool according to claim 1, **characterized in that**:

the inner terminal portion (34, 35) is an upright plate including a front surface and a rear surface; and
the connection terminal (30, 31) is coupled to the battery pack mount (16) so that a distal end of the upright plate is directed toward an upper side.

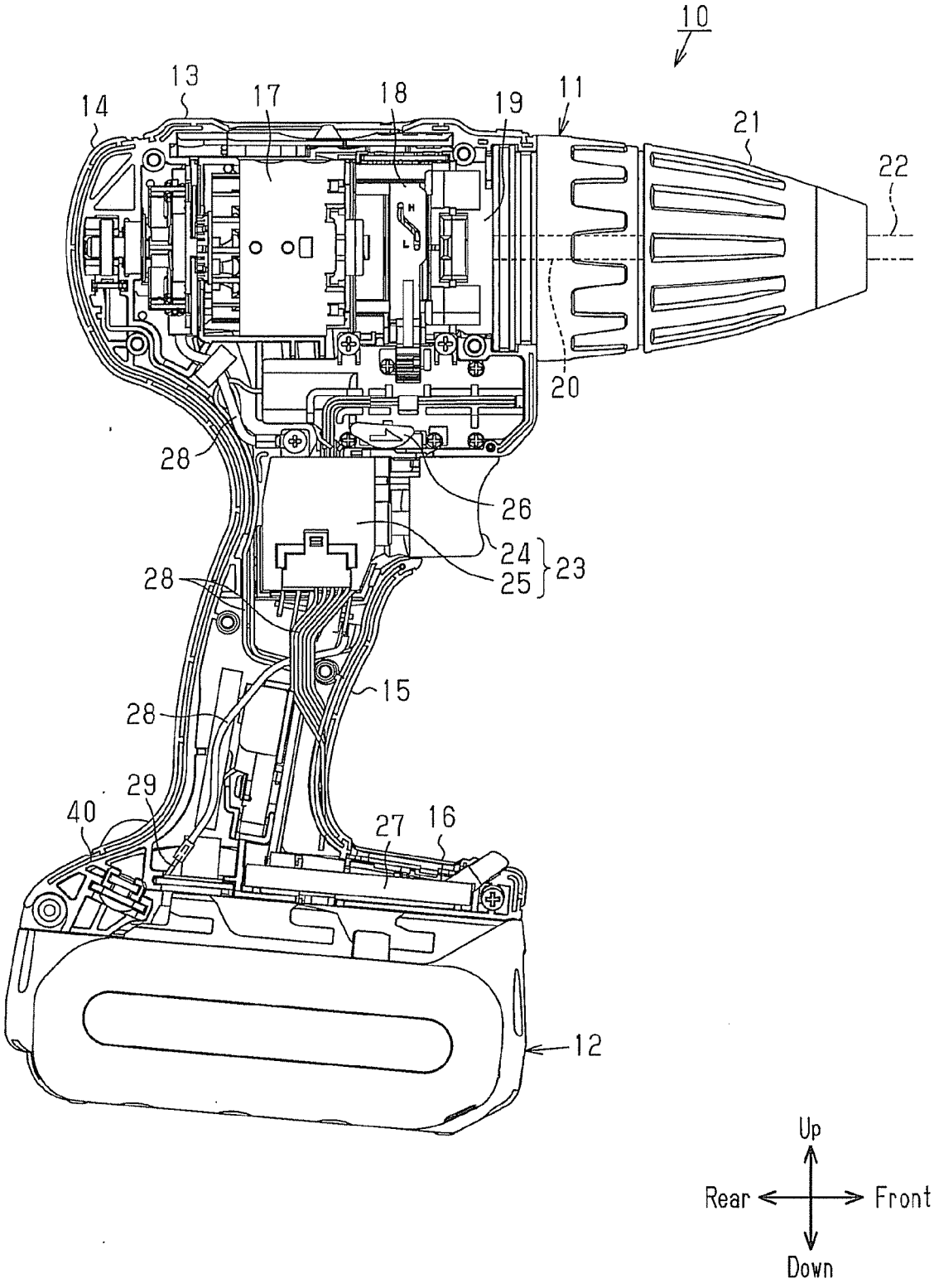
10. The power tool according to claim 1, **characterized in that**:

the inner terminal portion (34, 35) is an upward sloping plate including a sloped upper surface and a sloped lower surface; and
the connection terminal (30, 31) is coupled to the battery pack mount (16) so that the sloped upper surface of the upward sloping plate faces a side wall of the power tool.

11. The power tool according to any one of claims 8 to 10, **characterized in that**:

the inner terminal portion (34, 35) is located at or near a lower end of the grip (15).

Fig.1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Front
Down

Fig.2

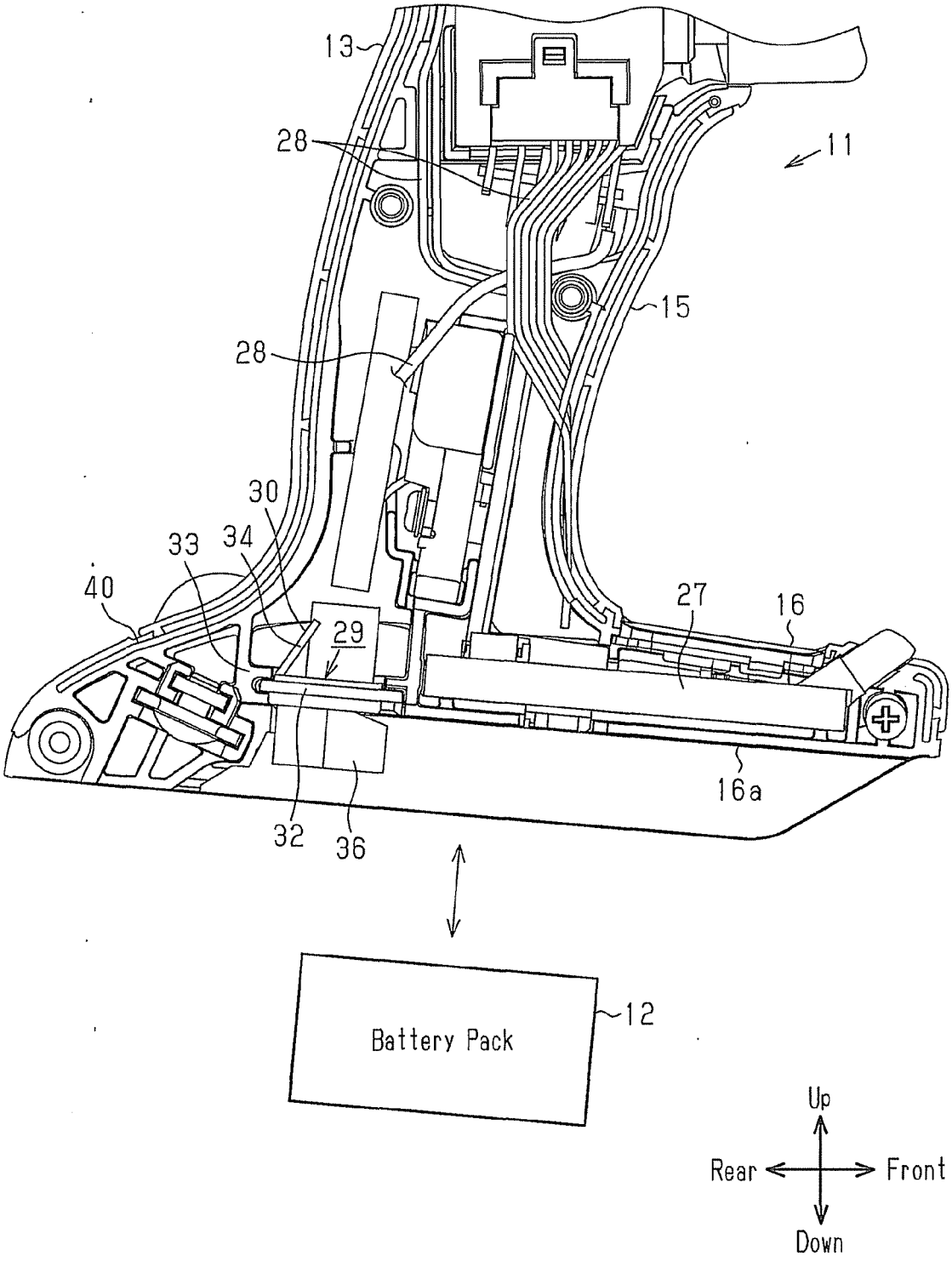
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Fig.3

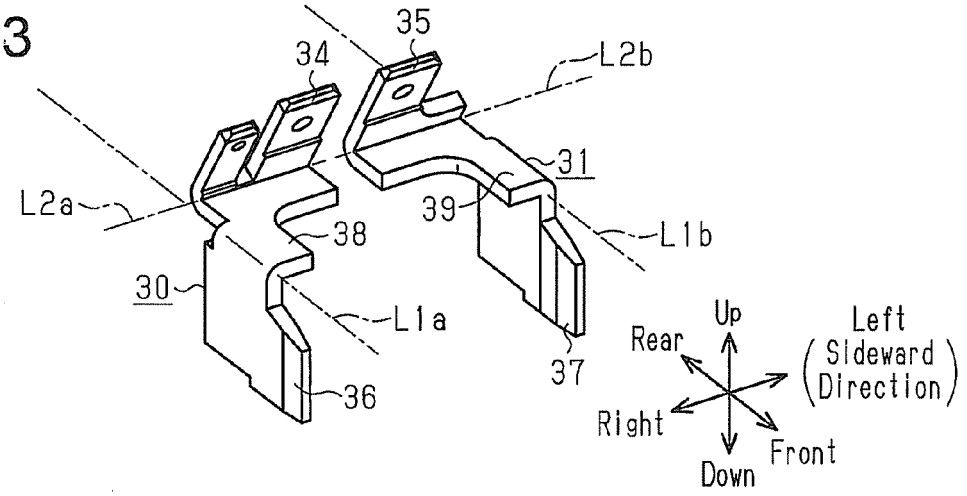


Fig.4

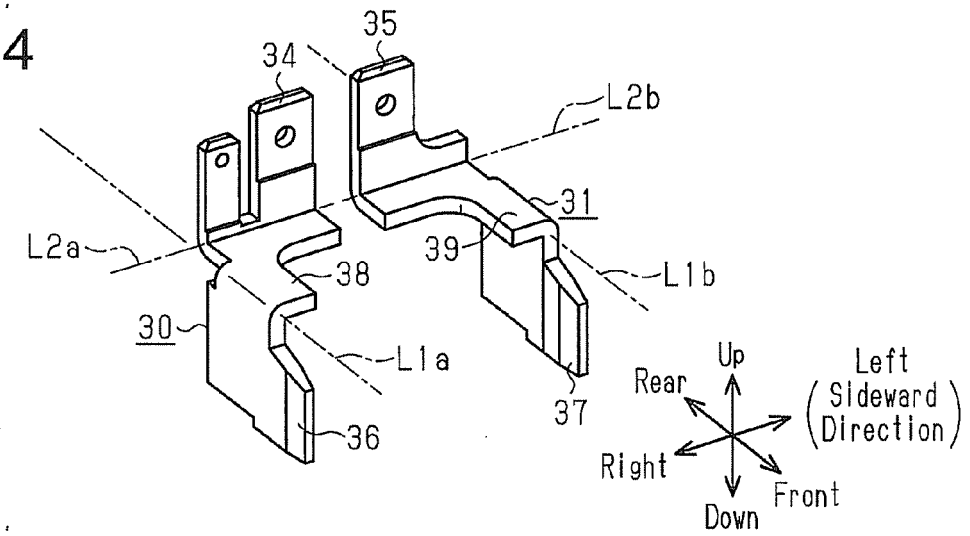
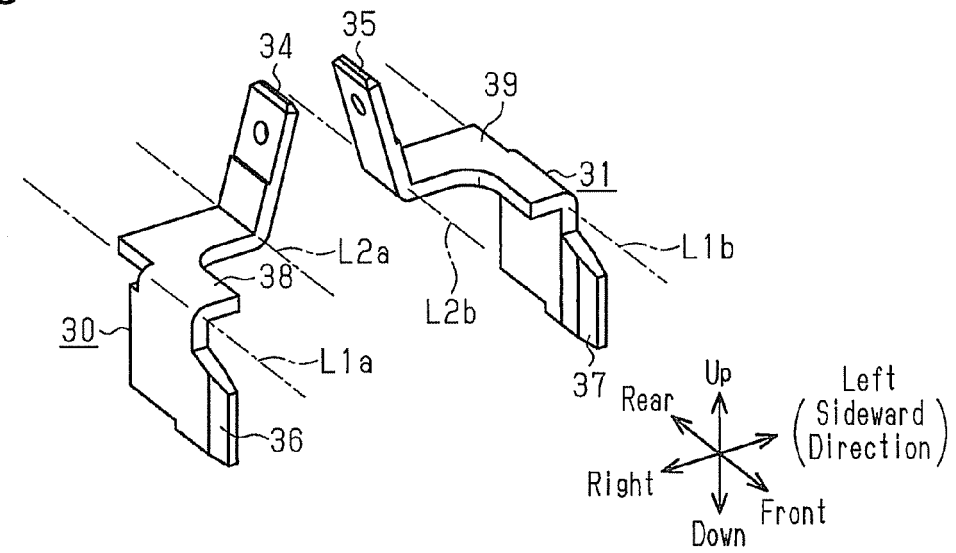


Fig.5



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EUROPEAN SEARCH REPORT

Application Number
EP 15 15 6851

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2011/247849 A1 (HEINZEN WILLIAM J [US] ET AL) 13 October 2011 (2011-10-13) * paragraph [0001] * * paragraph [0006] - paragraph [0008] * * paragraph [0015] - paragraph [0020] * * figures * -----	1-11	INV. B25F5/02
X	DE 93 19 361 U1 (ATLAS COPCO ELEKTROWERKZEUGE [DE]) 10 February 1994 (1994-02-10) * page 1, paragraph 1 * * page 4, paragraph 8 - page 7, paragraph 1 * * figures * -----	1,2,4,5, 9,11	
X	US 2008/101100 A1 (GRIFFIN PAUL W [US]) 1 May 2008 (2008-05-01) * paragraph [0001] * * paragraph [0011] - paragraph [0012] * * paragraph [0015] - paragraph [0024] * * figures * -----	1,2,4,5, 9,11	
			TECHNICAL FIELDS SEARCHED (IPC)
A	EP 0 734 083 A1 (MAKITA CORP [JP]) 25 September 1996 (1996-09-25) * the whole document * -----	1-11	B25F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	6 November 2015	van Woerden, N

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 15 6851

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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06-11-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011247849 A1	13-10-2011	CA 2794979 A1	13-10-2011
		EP 2556566 A1	13-02-2013
		TW 201212345 A	16-03-2012
		US 2011247849 A1	13-10-2011
		WO 2011126769 A1	13-10-2011
DE 9319361 U1	10-02-1994	NONE	
US 2008101100 A1	01-05-2008	NONE	
EP 0734083 A1	25-09-1996	DE 69605344 D1	05-01-2000
		DE 69605344 T2	30-03-2000
		EP 0734083 A1	25-09-1996
		US 5769657 A	23-06-1998

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006263830 A **[0002]**