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(54) **ELECTRIC GRINDING MACHINE TOOL**

(57) An electric grinding machine tool (10) comprises a grip body (11), a grinding disc (15) and a battery (16), the grip body (11) is arranged with a tool shaft (114) connected with the grinding disc (15), a driving component (115) capable of rotating the tool shaft (114), a circuit board (116) electrically connected with the driving component (115) and the battery (16), and the grip body (11) has a battery mount (121). The circuit board (116) is not perpendicular to the tool shaft (114), the circuit board (116) and the battery mount (121) are respectively positioned on opposite sides of the tool shaft (114), and a line (122) passes through the circuit board (116), the battery mount (121), and the tool shaft (114). By changing the position of the circuit board (116), the gravity center of the grip body (11) is reduced to improve stability of a grinding operation.

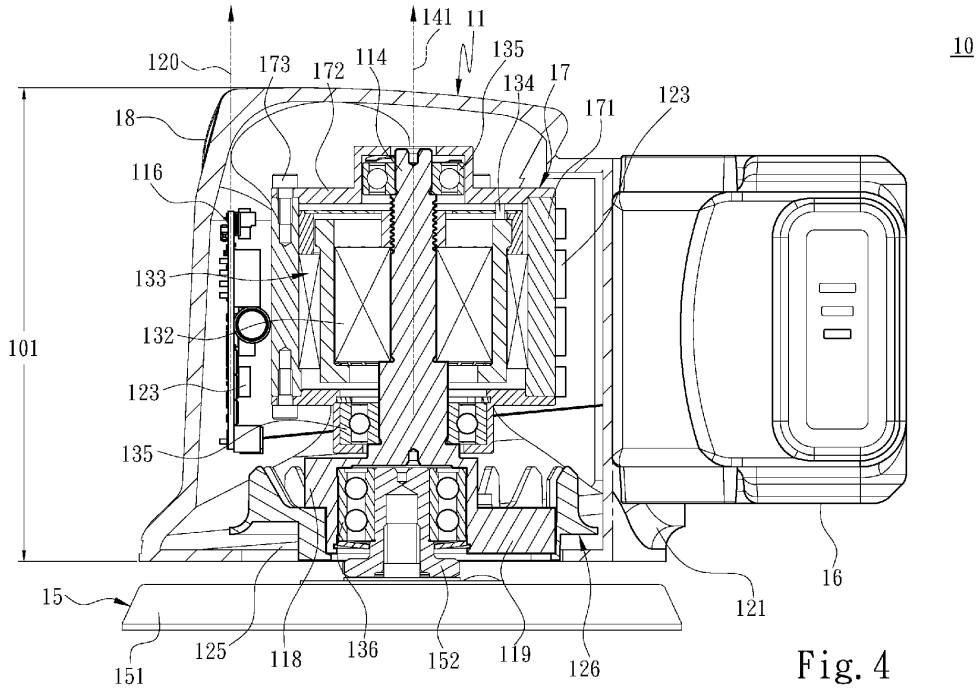

Fig. 4

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Description

FIELD OF THE INVENTION

[0001] The invention relates to an electric grinding machine tool, in particular to an electric grinding machine tool with a reduced gravity center of a grip body.

BACKGROUND OF THE INVENTION

[0002] It is found that US 2020230796A, US 2006068689A and US 2018056473A have disclosed configurations of internal components of an electric grinding machine tool. An internal structure of a conventional electric grinding machine tool 50, as depicted in Fig. 1 herein, comprises a grip body 51, and the grip body 51 includes a tool shaft 511 arranged in the grip body 51 and assembled with the grinding disc 52, a driving component 512 arranged in the grip body 51 and driving the tool shaft 511 when receiving power, and a circuit board 513 arranged in the grip body 51 to connect with the driving component 512 and the battery 53. Here, since the circuit board 513 is conventionally arranged at a top end 515 of the tool shaft 511, the internal components of the electric grinding machine tool 50 appear a modality of linear up-down configuration. That is, conventionally, a height 514 of the grip body 51 is equal to the sum of a height of the circuit board 513, a height of the tool shaft 511, and a height of the top of the grip body 51. However, the conventional configuration is deficient in that the gravity center of the grip body 51 cannot be lowered due to the high height 514 of the grip body 51, and the grip body 51 is liable to be unstable and topple over when a user operates and moves the electric grinding machine tool 50. The electric grinding machine tool 50 is more difficult to be stably controlled, especially when the user operates the electric grinding machine tool 50 to grind an upright plate surface.

[0003] On the other hand, since the circuit board 513 is conventionally arranged on the top end of the tool shaft 511, the circuit board 513 is arranged on a side of the grip body 51 close to the palm of the user. In operation of the electric grinding machine tool 50, the circuit board 513 receives power to generate heat energy, so that a temperature of the side of the grip body 51 close to the palm of the user is increased. When the electric grinding machine tool 50 is used for a long time, the circuit board 513 transfers a large amount of heat energy to the grip body 51, making it difficult for the user to hold the grip body 51, thereby affecting the grinding operation.

SUMMARY OF THE INVENTION

[0004] The invention mainly aims to solve the problem of a higher gravity center of a grip body caused by a circuit board of a conventional electric grinding machine tool arranged at a top end of a tool shaft.

[0005] Another object of the present invention is to solve the problem that the temperature of the grip body is raised after a conventional circuit board receives power to generate heat energy, thereby affecting the comfort level of a user for holding the grip body.

[0006] For the above purposes, the invention provides an electric grinding machine tool comprising a grip body, a grinding disc and a battery, wherein the grip body is arranged with a tool shaft connected with the grinding disc, a driving component capable of rotating the tool shaft when receiving power, and a circuit board electrically connected with the driving component and the battery, and the grip body has a battery mount exposed to an outer surface. Further, a board surface of the circuit board is not perpendicular to the tool shaft, the circuit board and the battery mount are respectively positioned on opposite sides of the tool shaft, and a line passes through the circuit board, the battery mount, and the tool shaft.

[0007] In an embodiment, the grip body is formed with a plurality of ventilation holes forming a air passage passing through the circuit board.

[0008] In an embodiment, the grip body is formed with a plurality of ventilation holes forming a first air passage passing through the circuit board and a second air passage flowing at a side of the driving component which does not face the circuit board.

[0009] In an embodiment, the driving component comprises a rotor connected to the tool shaft and a stator cooperating with the rotor.

[0010] In an embodiment, the electric grinding machine tool comprises an assembled shell arranged in the grip body and provided with the driving component arranged therein, and the assembled shell comprises a pipe body, and two covers respectively arranged at two sides of the pipe body.

[0011] In an embodiment, the tool shaft is arranged with a counterweight body, and a fan blade mounted on the counterweight body and rotating synchronously with the tool shaft.

[0012] In an embodiment, the counterweight body is provided with a first counterweight part and a second counterweight part which are configured up and down, the second counterweight part is relatively eccentric to the first counterweight part, and the fan blade is arranged on the second counterweight part.

[0013] In an embodiment, the grip body is formed with at least one opening respectively facing the counterweight body at an end of the grip body close to the grinding disc.

[0014] In an embodiment, the grip body defines a side on which the circuit board is arranged as a front side, and the electric grinding machine tool has an operation panel arranged on the front side of the grip body and electrically connected with the circuit board.

[0015] In an embodiment, the grip body has, on an inner wall surface, a receiving space facing the driving component and providing an arrangement for the circuit board.

[0016] In an embodiment, the grip body is formed with a protrusion with respect to an outer surface of the receiving space, the protrusion being provided with a commercial mark thereon.

[0017] In an embodiment, the battery mount has an insertion opening, and a insertion opening direction of the insertion opening is perpendicular to the tool shaft.

[0018] In an embodiment, the battery mount has an insertion opening, and an insertion opening direction of the insertion opening is parallel to the tool shaft.

[0019] According to above-mentioned disclosure of the invention, compared with a conventional use, the invention has the following characteristics. By changing the position of the circuit board, the circuit board is arranged on the other side of the tool shaft which does not face the battery mount, and the board surface of the circuit board is set not to be perpendicular to the tool shaft. Therefore, the height of the grip body is about the sum of the height of the tool shaft and the height of the upper portion of the grip body, and is lower than that of a conventional grip body, so that the gravity center of the grip body can be reduced, and a user can operate the grip body more stably. On the other hand, since the circuit board is no longer arranged on a side of the tool shaft which does not face the grinding disc, the operation of the user is not influenced due to the temperature rise of the circuit board when the user grabs the grip body.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

Fig. 1 is a schematic cross-sectional view of a conventional electric grinding machine tool.

Fig. 2 is a schematic perspective view of an embodiment of the present invention.

Fig. 3 is a schematic exploded view of an embodiment of the present invention.

Fig. 4 is a first schematic cross-sectional view of an embodiment of the present invention.

Fig. 5 is a second schematic cross-sectional view of an embodiment of the present invention.

Fig. 6 is a schematic unit view of an embodiment of the present invention.

Fig. 7 is a schematic perspective view of another embodiment of the present invention.

Fig. 8 is a schematic cross-sectional view of another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] The detailed description and technical contents of the present invention will now be described with reference to the drawings as follows.

[0022] Referring to Fig. 2, Fig. 3, Fig. 4 and Fig. 5, the present invention provides an electric grinding machine tool 10 comprising a grip body 11, a grinding disc 15, and a battery 16. In an embodiment, the grip body 11 comprises a head 111, a neck 112 and a shoulder 113, wherein the head 111 is provided for a user to grip so as to control the grip body 11. Further, the neck 112 extends from a side of the head 111, and the diameter of the neck 112 is smaller than the head 111 and the shoulder 113. In addition, the shoulder 113 is connected to the neck 112 and extends toward a direction where the neck 112 does not face the head 111, and the diameter of the shoulder 113 gradually increases from a side where the shoulder 113 next to the neck 112 toward a side of the shoulder 113 which is opposite to the neck 112, so that the shoulder 113 shows a trumpet shape. Also, the grinding disc 15 is arranged at a side of the shoulder 113 where is not connected to the neck 112.

[0023] Further, the grip body 11 further comprises a tool shaft 114, a driving component 115, and a circuit board 116. Specifically, the tool shaft 114 is arranged in the grip body 11, and an end of the tool shaft 114 is assembled with the grinding disc 15. In an embodiment, the grinding disc 15 comprises a body 151 and an assembly part 152 connected with the body 151, and the tool shaft 114 is connected with the assembly part 152. In addition, in an embodiment, the tool shaft 114 includes a counterweight body 117 to be configured to face at an end of the grinding disc 15, and the counterweight body 117 includes a first counterweight part 118 and a second counterweight part 119 which are configured up and down, the second counterweight part 119 is arranged below the first counterweight part 118, and the second counterweight part 119 is relatively eccentric to the first counterweight part 118. Accordingly, by the arrangement of the counterweight body 117, the tool shaft 114 drives the grinding disc 15 to produce an eccentric rotational route. On the other hand, the driving component 115 is assembled with the tool shaft 114 so as to be located in the grip body 11, the driving component 115 can be an electric motor, and the driving component 115 receives power to drive the tool shaft 114 to rotate. In addition, the circuit board 116 is electrically connected with the driving component 115 and the battery 16, and the circuit board 116 is used for controlling the operation of the driving component 115. In the embodiment, the circuit board 116 is fixed to an inner wall surface of the grip body 11, so that the circuit board 116 is arranged at the position of the neck 112 of the grip body 11. In more detail, the circuit board 116 includes an extension direction 120 along a board surface which is a plane that the circuit board 116 is laid with electronic components, the extension direction 120 of the circuit board 116 is not perpendicular to the tool shaft 114. In an embodiment, the extension direction 120 of the circuit board 116 is arranged parallel to the tool shaft 114 to reduce a grip body height 101 of the grip body 11. On the other hand, the grip body 11 includes a battery mount 121 which the surface is exposed for assembling the battery 16, so that the power of the battery 16 is transmitted to the circuit board 116 via the battery mount 121. Also, the battery mount 121

is arranged on a side of the tool shaft 114 that does not face the circuit board 116, i.e., the battery mount 121 and the circuit board 116 are located on opposite sides, respectively, so that a line 122 passes through the circuit board 116, the battery mount 121 and the tool shaft 114.

[0024] Accordingly, by changing the position of the circuit board 116, the present invention allows the grip body height 101 of the grip body 11 to be reduced by a height of the circuit board 116, which is approximately equal to the sum of a height of the tool shaft 114 and an upper height of the grip body 11, thereby reducing the grip body height 101 of the grip body 11 and achieving the purpose of reducing the gravity center of the grip body 11. According to the invention, when a user operates the electric grinding machine tool 10, due to the fact that a gravity center of the grip body 11 is lowered, the grip body 11 is not prone to toppling over and is more stably close to a grinding surface when being displaced by operation. In particular, when the user grinds a vertical plate surface, the user does not need to apply a large amount of force to control the grip body against action of gravity, so that the grip body 11 is brought close to the plate surface, and a grinding quality of the electric grinding machine tool 10 is improved so as for the user to operate conveniently. Furthermore, since the circuit board 116 of the invention is no longer arranged on the head 111 of the grip body 11, the user cannot be affected by a temperature of the circuit board 116 while griping the head 111, thereby facilitating the operation of the user.

[0025] Referring to Fig. 2, Fig. 3, Fig. 4 and Fig. 5, in an embodiment of the present invention, in order to enhance the heat dissipation effect of the circuit board 116, the grip body 11 is formed with a plurality of ventilation holes 123 which are located on a position between the driving component 115 and the circuit board 116, and the plurality of ventilation holes 123 form a first air passage 124 for heat exchange with the circuit board 116 when an air flow inside the electric grinding machine tool 10 changes. For example, the plurality of ventilation holes 123 are arranged on opposite sides of the grip body 11, and the plurality of ventilation holes 123 located on one side of the grip body 11 allow an external air entering the grip body 11, passing through the circuit board 116, and then being discharged through the plurality of ventilation holes 123 located on the other side of the grip body 11, thereby allowing the circuit board 116 to dissipate heat. In another embodiment, the plurality of ventilation holes 123 is located on a position between the driving component 115 and the battery mount 121, so that the plurality of ventilation holes 123 forms a second air passage 127 passing through the driving component 115. For example, the plurality of ventilation holes 123 are arranged on opposite sides of the grip body 11, respectively, the plurality of ventilation holes 123 located on one side of the grip body 11 allow the external air entering the grip body 11, and then the external air flows on a side of the driving component 115 that does not face the circuit board 116 and then be discharged through one of the plurality of ventilation holes 123 located on the other side of the grip body 11. Therefore, when the driving component 115 is driven to operate, the heat energy of the driving component 115 is dissipated by the air from the second air passage 127, so as to avoid a situation that the head 111 of the grip body 11 is too high in temperature to be held by the user, and the heat energy of the driving component 115 transmitted to the circuit board 116 is decreased as well, thereby reducing the problem that the circuit board 116 damages the life span and the use stability of the circuit board 116 due to accumulated heat. Also, in the present embodiment, when the battery 16 is inserted on the battery mount 121, an air of the second air passage 127 is provided for the driving component 115 to dissipate heat, and is also able to simultaneously exchange heat which is generated by the power supply of the battery 16. It should be noted that air flow directions of the first air passage 124 and the second air passage 127 described herein are examples only without intention to limit the present invention.

[0026] In addition, the tool shaft 114 includes a fan blade 126 mounted on the counterweight body 117, and the fan blade 126 is arranged on the second counterweight part 119 to be driven by the tool shaft 114, so that the fan blade 126 and the tool shaft 114 rotate synchronously. In another embodiment, the grip body 11 is formed with at least one opening 125 facing the counterweight body 117 at an end of the grip body 11 close to the grinding disc 15, and the at least one opening 125 allows the external air to enter the grip body 11.

[0027] On the other hand, referring to Fig. 2, Fig. 3, Fig. 4 and Fig. 5, in an embodiment, the driving component 115 comprises a rotor 132 and a stator 133, wherein the rotor 132 is connected with the tool shaft 114, and the rotor 132 rotates under the influence of magnetic force, thereby driving the tool shaft 114 to rotate therewith. In addition, the stator 133 is arranged at the periphery of the rotor 132 and cooperates with the rotor 132. The specific structure of the stator 133 and the manner that the stator 133 cooperating with the rotor 132 are well known to those skilled in the art and will not be described in detail herein.

[0028] Further, the electric grinding machine tool 10 comprises a assembled shell 17 which is provided for the driving component 115 to be disposed therein, the assembled shell 17 is located in the grip body 11, and the assembled shell 17 comprises a pipe body 171 and two covers 172 which are respectively arranged at two sides of the pipe body 171. More specifically, the pipe body 171 is provided for arranging the stator 133 and the rotor 132 therein, and in an embodiment, the pipe body 171 is provided for securing the stator 133 thereto. In another embodiment, the stator 133 is formed with at least one assembling columns 134 assembled to one of the covers 172, so that the stator 133 is secured in the pipe body 171. In addition, the two covers 172 are provided for shutting the pipe body 171, thereby preventing dust entering the driving component 115 when the elec-

tric grinding machine tool 10 grinds. In an embodiment, each of the covers 172 comprises at least one assembling column 173 that threadably secure the cover 172 and the pipe body 171. In another embodiment, the driving component 115 comprises at least one first bearing 135 arranged on the tool shaft 114. The first bearing 135 is arranged on a side of the tool shaft 114 facing one of the covers 172. The first bearing 135 is provided for reducing a frictional force generated by rotation of the tool shaft 114. On the other hand, in an embodiment, the tool shaft 114 is arranged with at least one second bearing 136 located on the counterweight body 117, wherein the at least one second bearing 136 assists the counterweight body 117 in reducing the frictional force when rotated by the tool shaft 114 under the action of the tool shaft 114.

[0029] On the other hand, referring to Fig. 3, Fig. 4, Fig. 5 and Fig. 6, in an embodiment, the grip body 11 defines a front side 137 located at a side of the circuit board 116, and the electric grinding machine tool 10 includes an operation panel 18 arranged on the front side 137 of the grip body 11. The operation panel 18 is electrically connected with the circuit board 116. The operation panel 18 generates a control signal 181 to the circuit board 116 after being operated, and the circuit board 116 controls the driving component 115 to start operation or stop operation according to the content of the control signal 181.

[0030] Further, the battery mount 121 of the present invention comprises an insertion opening 138 and two conductive terminals 139 arranged at the insertion opening 138, the battery 16 is formed with a boss 161 protruding toward the battery mount 121, and a plurality of conductive holes 162 arranged at the boss 161, and the two conductive terminals 139 are inserted into any two of the plurality of conductive holes 162. Further, the insertion opening 138 is defined by an assembling direction of the battery 16. As referred herein with respect to Fig. 3 and Fig. 4, a insertion opening direction 140 of the insertion opening 138 is perpendicular to an shaft rod extension direction 141 of the tool shaft 114, that is, the battery 16 is assembled with the battery mount 121 in a lateral plug-in manner.

[0031] Accordingly, in another embodiment, an insertion opening direction 142 of the insertion opening 138 may also be parallel to the shaft rod extension direction 141 of the tool shaft 114. Thus, the battery 16 is assembled on the battery mount 121 in a vertical plug-in manner, as shown in Fig. 7 herein. Also, referring to Fig. 8, in an embodiment, an inner wall surface of the grip body 11 of the present invention comprises a receiving space 143 facing the driving component 115, the receiving space 143 is provided at the front side 137 and at the position of the neck 112, and the receiving space 143 is provided for the circuit board 116 to be arranged therein. In an embodiment, the grip body 11 is formed with a protrusion 144 with respect to an outer surface of the receiving space 143, and the protrusion 144 is provided with a commercial mark (not shown), wherein the commercial mark described herein may be a trademark or a product model or the like.

Claims

1. An electric grinding machine tool (10), comprising a grip body (11), a grinding disc (15) and a battery (16), wherein the grip body (11) is arranged with a tool shaft (114) connected with the grinding disc (15), a driving component (115) capable of rotating the tool shaft (114) when receiving power, and a circuit board (116) electrically connected with the driving component (115) and the battery (16), the grip body (11) comprising a battery mount (121) exposed to an outer surface, and the electric grinding machine tool (10) is **characterized in that**:
a board surface of the circuit board (116) is not perpendicular to the tool shaft (114), the circuit board (116) and the battery mount (121) are respectively positioned on opposite sides of the tool shaft (114), and a line (122) passes through the circuit board (116), the battery mount (121) and the tool shaft (114).

2. The electric grinding machine tool (10) of claim 1, wherein the grip body (11) is formed with a plurality of ventilation holes (123) forming a air passage passing through the circuit board (116).

3. The electric grinding machine tool (10) of claim 1, wherein the grip body (11) is formed with a plurality of ventilation holes (123) forming a first air passage passing through the circuit board (116) and a second air passage (127) flowing at a side of the driving component (115) which does not face the circuit board (116).

4. The electric grinding machine tool (10) of claim 1, wherein the driving component (115) comprises a rotor (132) connected to the tool shaft (114) and a stator (133) cooperating with the rotor (132).

5. The electric grinding machine tool (10) of claim 4, wherein the electric grinding machine tool (10) comprises an assembled shell (17) arranged in the grip body (11) and provided with the driving component (115) arranged therein, and the assembled shell (17) comprises a pipe body (171), and two covers (172) respectively arranged at two sides of the pipe body (171).

6. The electric grinding machine tool (10) of claim 1, wherein the tool shaft (114) is arranged with a counterweight body (117), and a fan blade (126) mounted on the counterweight body (117) and rotating synchronously with the tool shaft (114).

7. The electric grinding machine tool (10) of claim 6, wherein the counterweight body (117) has a first counterweight part (118) and a second counterweight part (119) which are configured up and down, the second counterweight part (119) is relatively eccentric to the first counterweight part (118), and the fan blade (126) is arranged on the second counterweight part (119).

8. The electric grinding machine tool (10) of claim 7, wherein the grip body (11) is formed with at least one opening (125) respectively facing the counterweight body (117) at an end of the grip body (11) close to the grinding disc (15).

9. The electric grinding machine tool (10) of claim 6, wherein the grip body (11) is formed with at least one opening (125) respectively facing the counterweight body (117) at an end of the grip body (11) close to the grinding disc (15).

10. The electric grinding machine tool (10) of claim 9, wherein the grip body (11) defines a side on which the circuit board (116) is arranged as a front side (137), and the electric grinding machine tool (10) comprises an operation panel (18) arranged on the front side (137) of the grip body (11) and electrically connected with the circuit board (116).

11. The electric grinding machine tool (10) of claim 1, wherein the grip body (11) comprises, on an inner wall surface, a receiving space (143) facing the driving component (115) and providing an arrangement for the circuit board (116).

12. The electric grinding machine tool (10) of claim 11, wherein the grip body (11) is formed with a protrusion (144) with respect to an outer surface of the receiving space (143), the protrusion (144) being provided with a commercial mark thereon.

13. The electric grinding machine tool (10) of claim 1, wherein the battery mount (121) comprises an insertion opening (138), and a insertion opening direction (140) of the insertion opening (138) is perpendicular to the tool shaft (114).

14. The electric grinding machine tool (10) of claim 1, wherein the battery mount (121) comprises an insertion opening (138), and an insertion opening direction (142) of the insertion opening (138) is parallel to the tool shaft (114).

15. The electric grinding machine tool (10) of claim 1, wherein the grip body (11) defines a side on which the circuit board (116) is arranged as a front side (137), and the electric grinding machine tool (10) has an operation panel (18) arranged on the front side (137) of the grip body (11) and electrically connected with the circuit board (116).

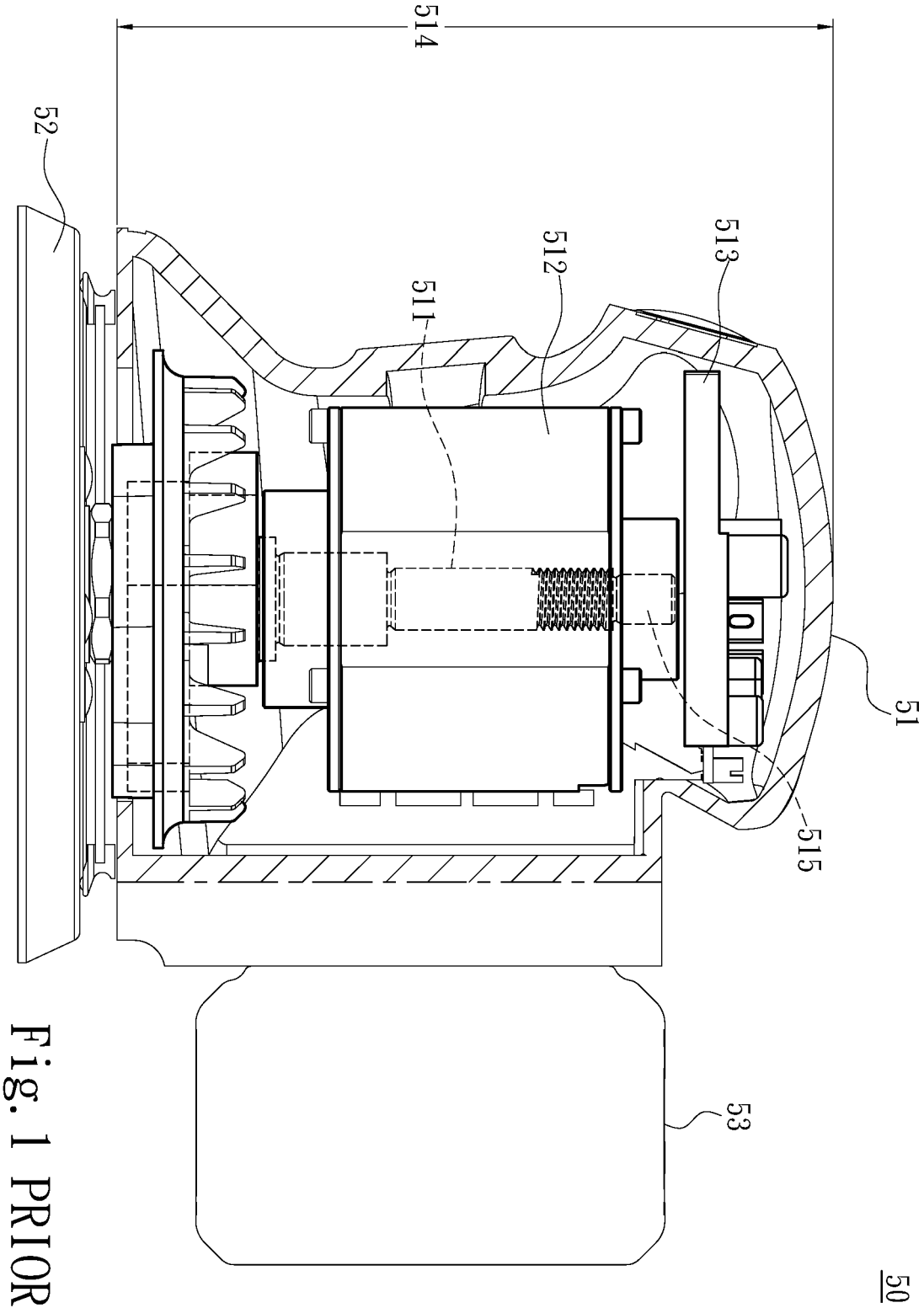

Fig. 1 PRIOR ART

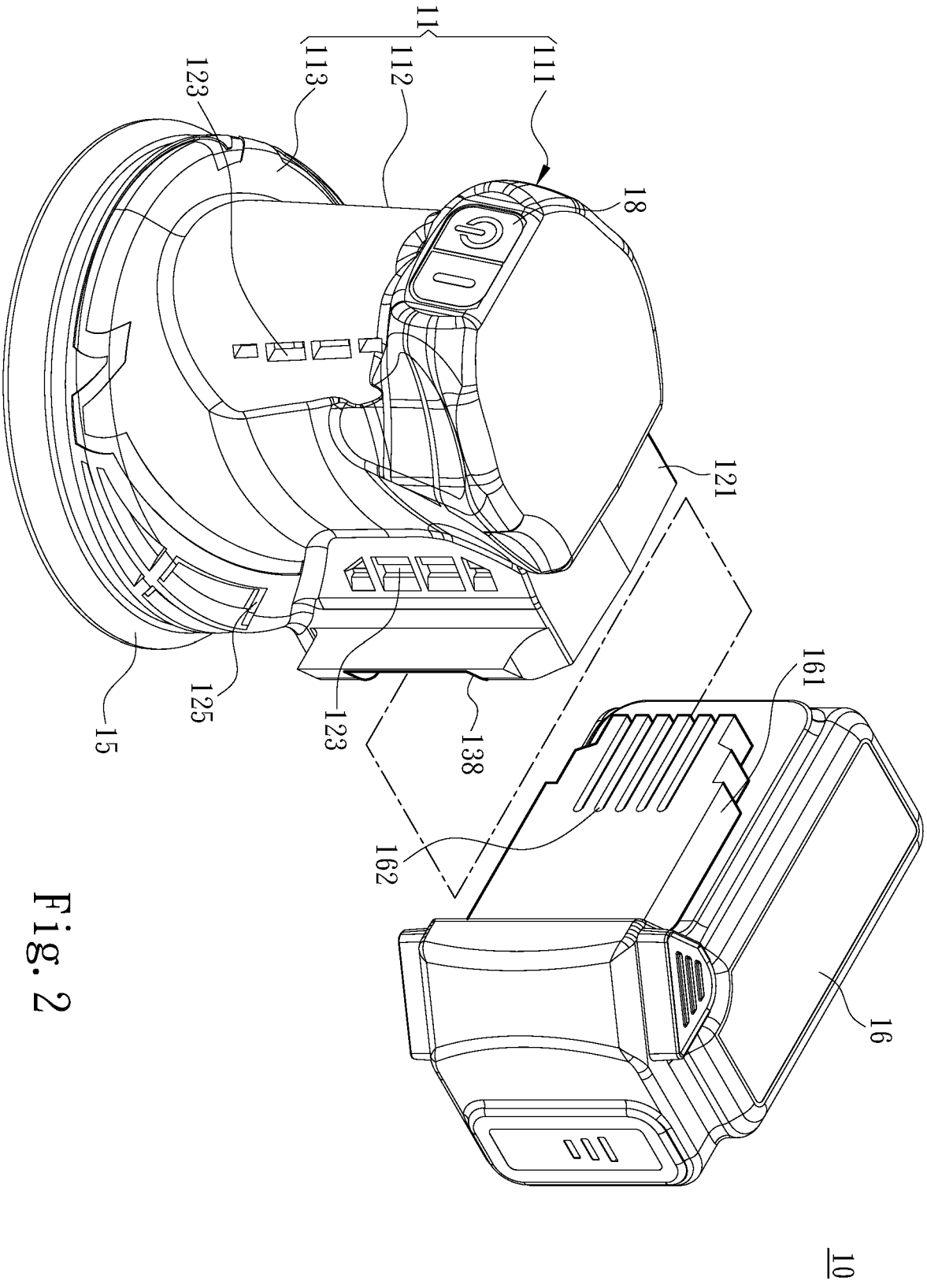

Fig. 2

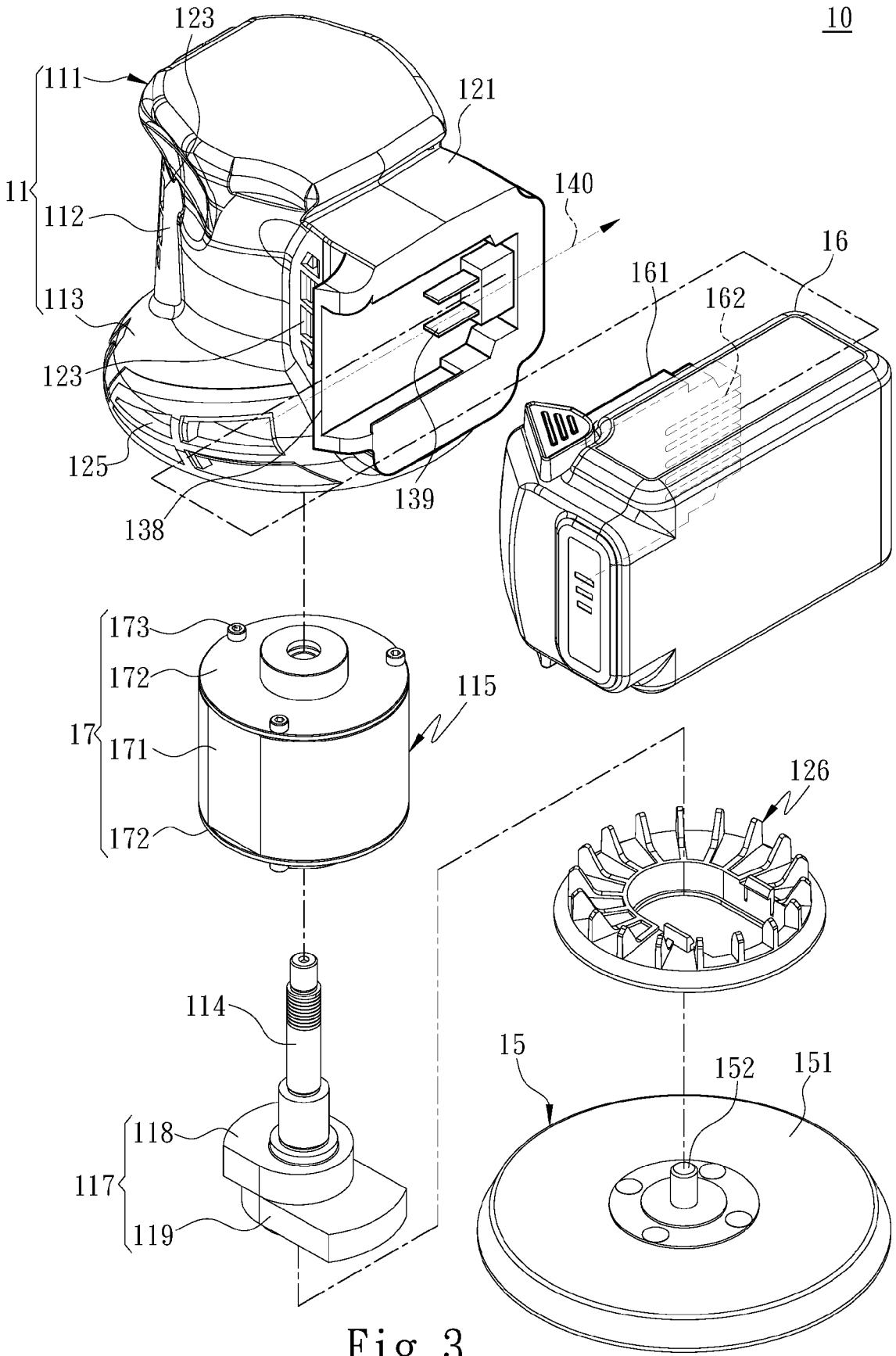
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Fig. 3

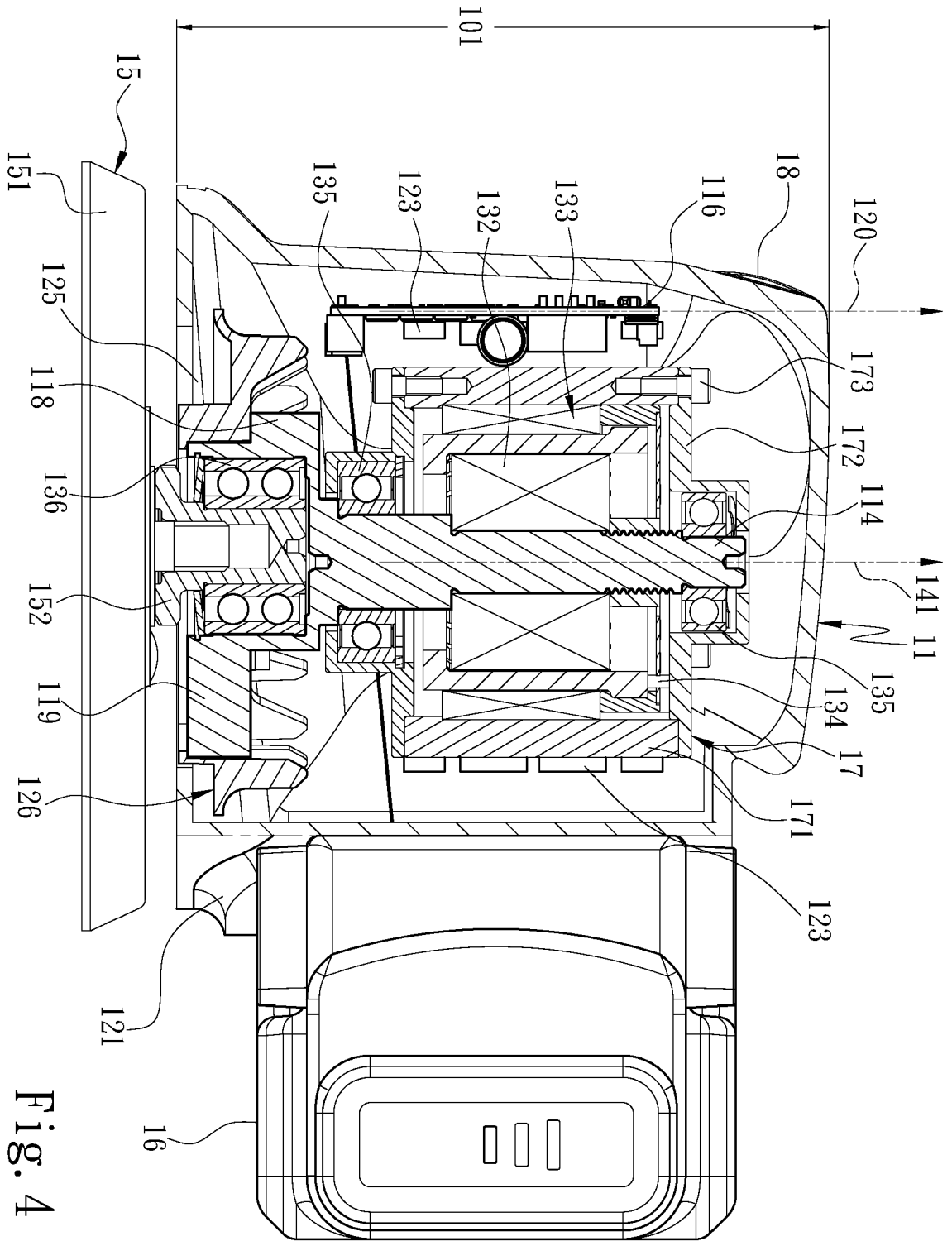
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Fig. 4

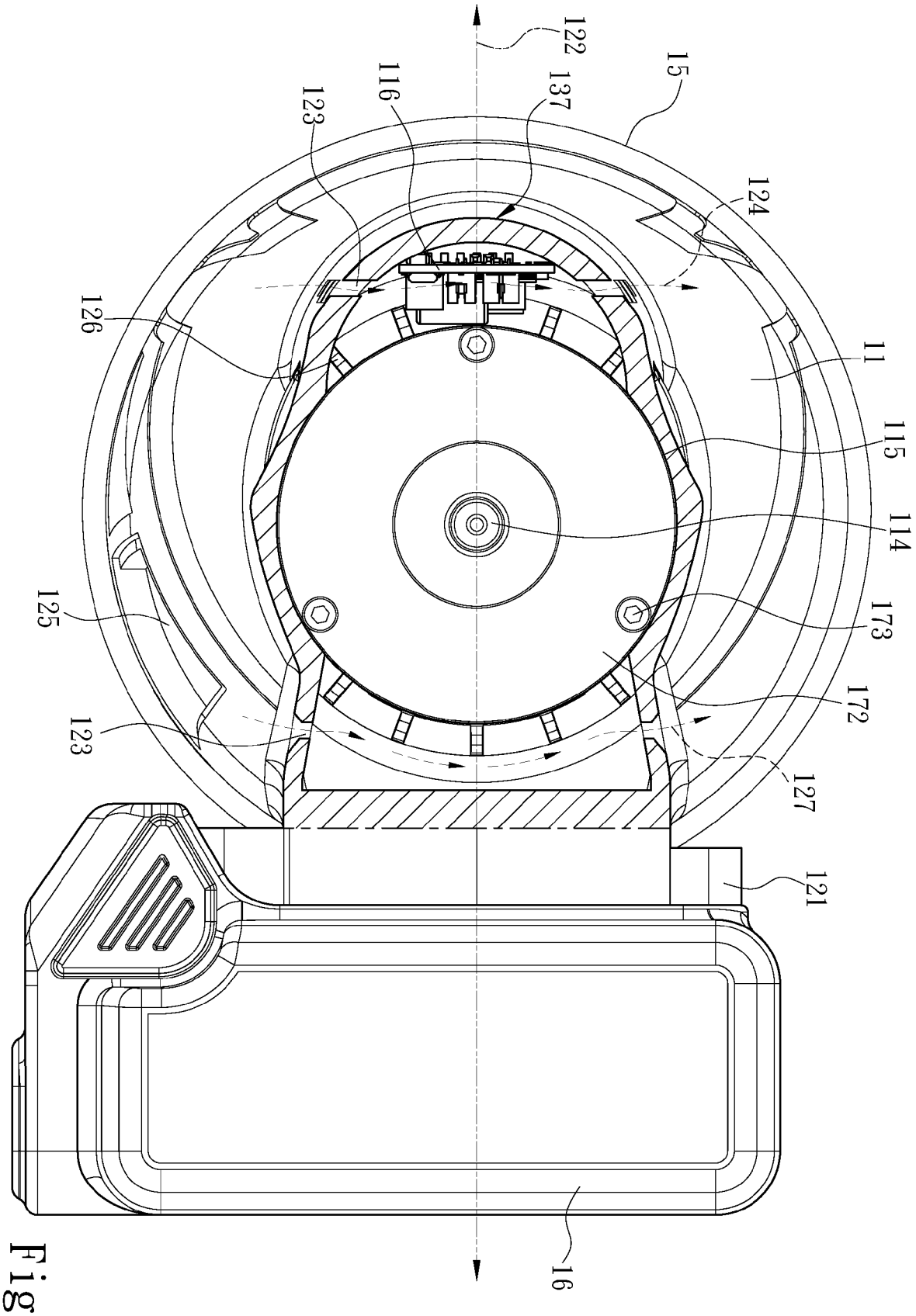

Fig. 5

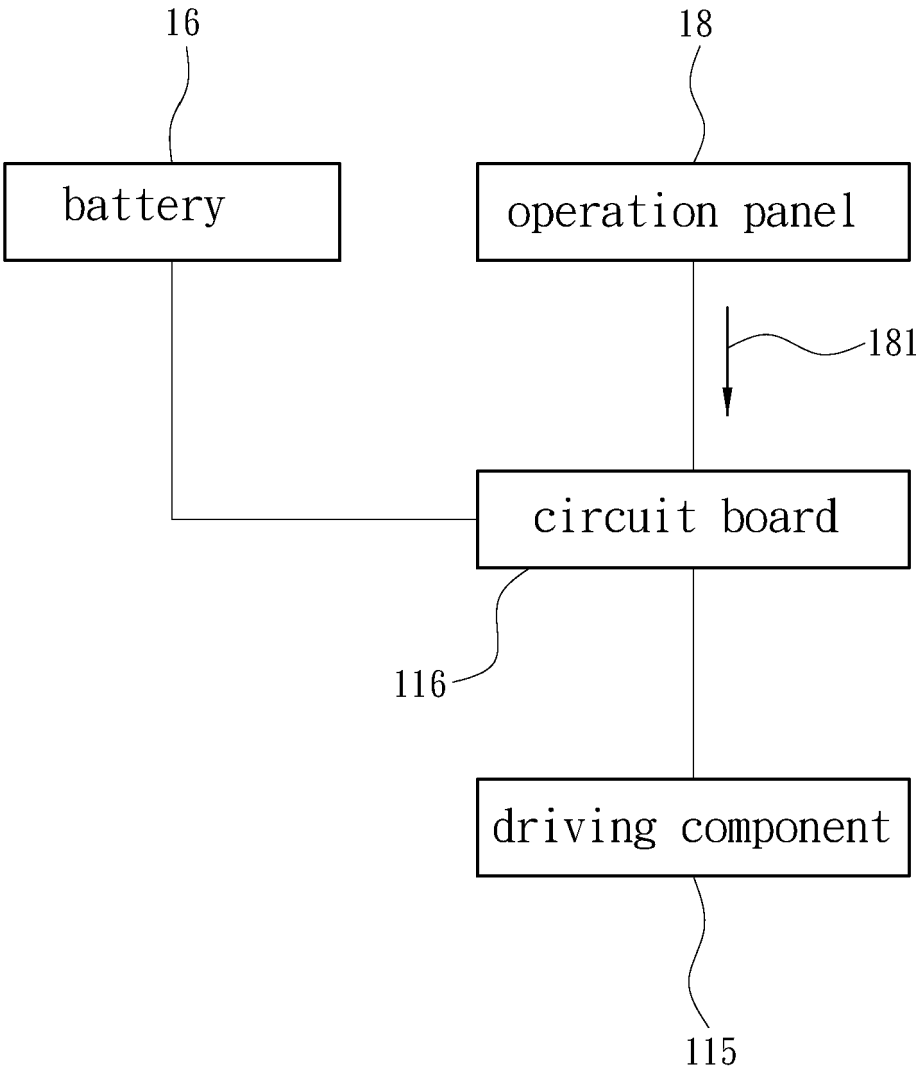
16
18
battery
operation panel
181
circuit board
116
driving component
115

Fig. 6

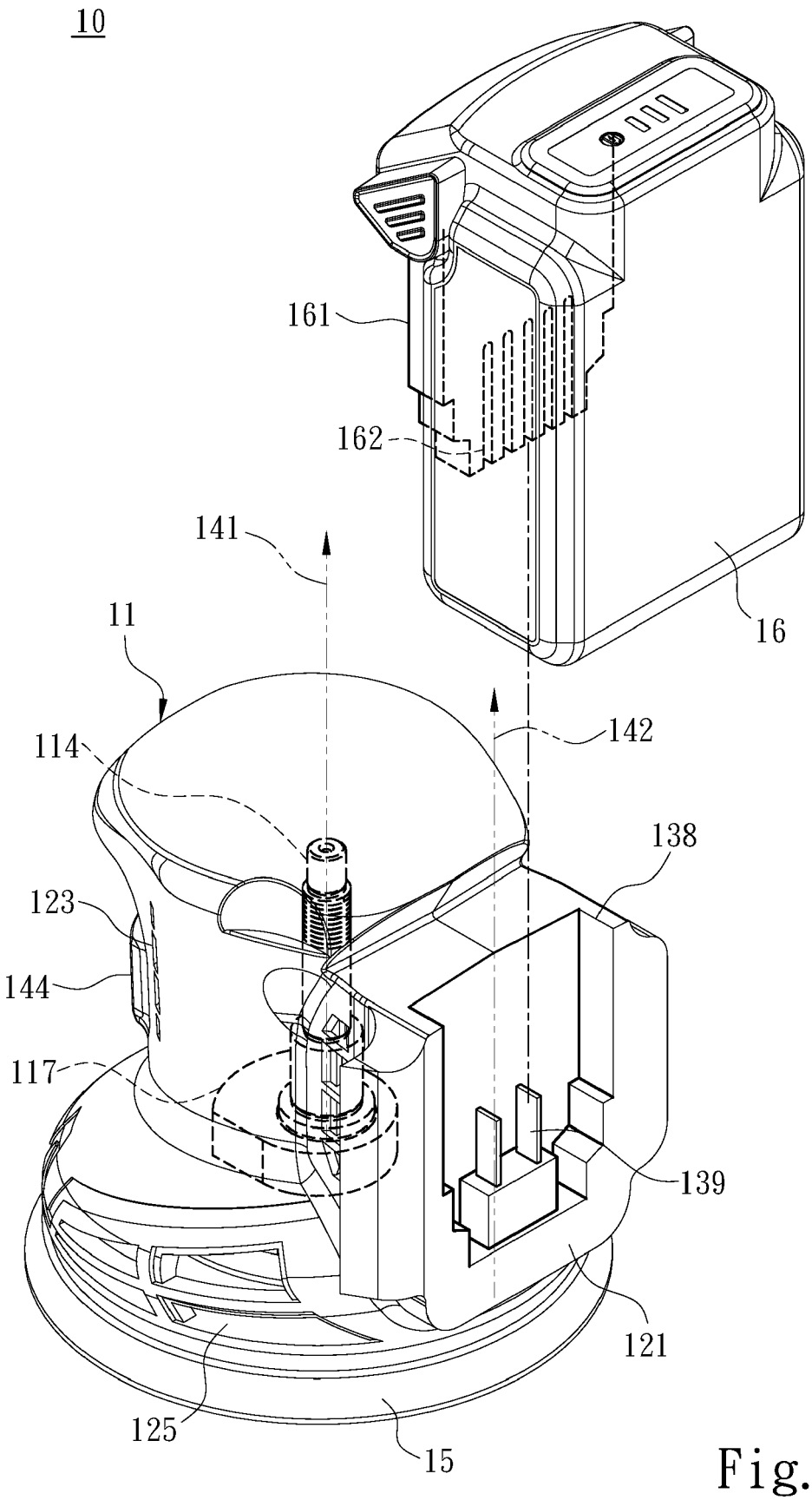

Fig. 7

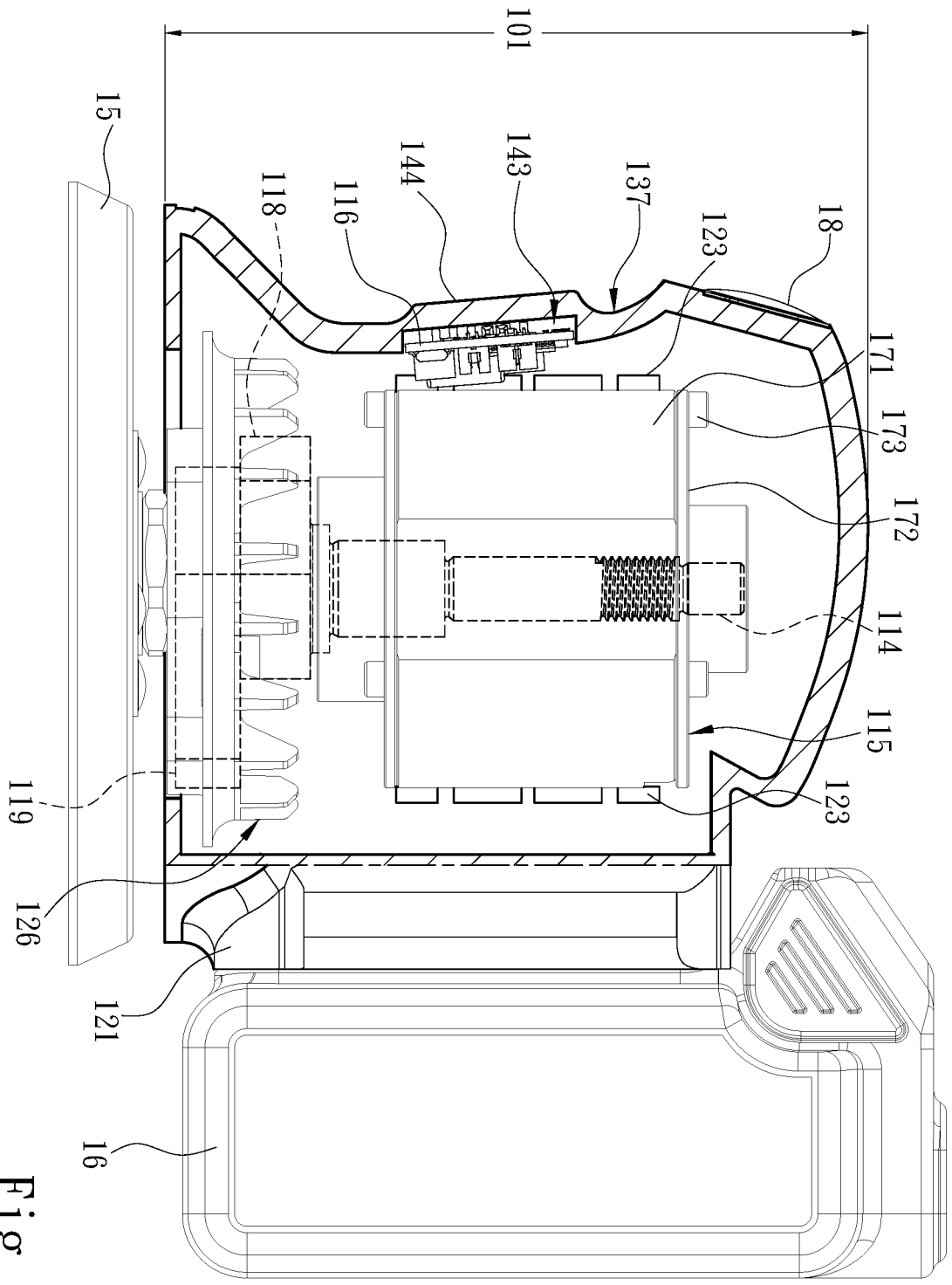
101
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Fig. 8

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 20 19 4533

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 Y	US 2019/047115 A1 (NAKAMURA SHIN [JP] ET AL) 14 February 2019 (2019-02-14) * paragraphs [0046], [0070], [0077]; figures 2, 15 * -----	1-4, 11-13 5-10,14, 15	INV. B24B23/04 B24B41/00 B24B55/02 B24B55/10
Y	DE 10 2010 042452 A1 (BOSCH GMBH ROBERT [DE]) 19 April 2012 (2012-04-19) * paragraph [0033]; figure 9 * -----	5	
Y	US 8 435 096 B2 (CHEN BACH PANGHO [US]; X POLE PREC TOOLS INC [TW]) 7 May 2013 (2013-05-07) * col. 3, l. 27-42; figure 1 * -----	6-9	
Y	US 2015/263592 A1 (KAWAKAMI TAKAHIRO [JP] ET AL) 17 September 2015 (2015-09-17) * paragraph [0061]; figures 2, 3 * -----	10,14,15	

TECHNICAL FIELDS SEARCHED (IPC)

B24B
B24D
B25F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 March 2021	Bonetti, Serena

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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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

EPO FORM 1503 03.82 (P04C01)

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