(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 715 056 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
01.05.2024 Bulletin 2024/18

(21) Application number: **20165899.4**

(22) Date of filing: **26.03.2020**

(51) International Patent Classification (IPC):
B25F 5/02 *(2006.01)* ***B25B 21/00*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B25F 5/021; B25B 21/00

(54) ELECTRIC POWER TOOL

ELEKTRISCH BETRIEBENES WERKZEUG

OUTIL ÉLECTRIQUE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **29.03.2019 JP 2019068218**

(43) Date of publication of application:
30.09.2020 Bulletin 2020/40

(73) Proprietor: **Panasonic Intellectual Property Management Co., Ltd.**
Osaka-shi, Osaka 540-6207 (JP)

(72) Inventor: **MURAMATSU, Masari**
Osaka-shi, Osaka 540-6207 (JP)

(74) Representative: **Müller-Boré & Partner Patentanwälte PartG mbB**
Friedenheimer Brücke 21
80639 München (DE)

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Description

Technical Field

[0001] The present disclosure generally relates to an electric power tool, and more particularly relates to an electric power tool including a motor.

Background Art

[0002] JP 2017-209760 A discloses an electric power tool including: a motor; a motor housing in which the motor is arranged; a power transmission mechanism for transmitting the motive power of the motor to an output shaft; a case in which the power transmission mechanism is arranged; and a light for emitting irradiating light.

[0003] US 2017/326720 A1 relates to a power tool, such as an impact driver. This power tool includes a motor housing that houses a motor, and a battery-mount part to which a battery pack having a rated voltage of 18 V is mountable. A ratio of the maximum width of the motor housing to the maximum width of the battery pack is 0.75 or less. A forward/reverse-switching lever is slidable in a left-right direction to change the rotational direction of the motor and is disposed between the motor housing and the battery pack. A maximum-slide position of the forward/reverse-switching lever in the left-right direction is inward of a ground plane when the power tool is laid horizontally on its side on the ground plane.

[0004] EP 2 572 834 A1 describes an electric power tool, including: a lighting unit; a motor that drives a tool element; a setting switch that is turned ON/OFF to change an operation mode setting and a lighting mode setting; a setting switching unit that changes the operation mode setting and the lighting mode setting corresponding to a manner of operation provided to the setting switch; a motor control unit that controls the motor according to a control method for one of the operation modes currently set by the setting switching unit; and a lighting control unit that controls the lighting unit corresponding to one of the lighting modes currently set by the setting switching unit. When the setting switch is turned on, the setting switching unit changes one of the operation mode setting and the lighting mode setting corresponding to a duration time of an ON state of the setting switch.

[0005] EP 3 318 366 A1 discloses a power tool including a housing, a power output element for outputting power, a motor for driving the power output element to output power, and a surface light source device for providing illumination. The surface light source device is mounted on the housing and the surface light source device includes a light exit surface allowing the surface light source device to emit light.

[0006] US 2014/198486 A1 relates to a hand-power tool, which includes at least one tool spindle and a drive unit configured to drive the tool spindle at a rotational speed greater than 10,000 min-1. The hand-power tool further includes at least one lighting unit that has at least two lighting mechanisms that are configured to illuminate a work area. The lighting mechanisms are arranged on an axial plane of the tool spindle at an angle of less than 125 degrees relative to each other with respect to the tool spindle.

[0007] US 2006/262519 A1 describes a power tool, in particular a cordless power tool, having a housing from which a tool emerges, with which tool a lighting device for a work field is associated. The power tool is made convenient to use because an LED serves as a light source, downstream of which is an optical light guide system, particularly with curved end faces, that collects the light from the LED and conducts it and aims it at a work field, and the LED and the light guide system are located in a light tube on the housing.

[0008] DE 10 2014 226025 A1 relates an optical indicating device unit including at least one first housing, a mechanical interface, and a data interface. The at least one first housing includes at least one illumination device and/or at least one optical device, wherein the at least one illumination device and/or the at least one optical indicating device is configured to visually indicate information. The mechanical interface is configured to connect the at least one first housing to a second housing. The data interface is configured to transmit information to the at least one illumination device and/or the at least one optical indicating device.

[0009] US 2018/085901 A1 describes an induction-powered device for use in an alternating magnetic field, which comprises: a magnetically permeable core; an electrically conductive coil surrounding the core; and an electrical load electrically connected to the coil. The coil is configured to generate a voltage when exposed to the alternating magnetic field, to power the electrical load.

[0010] EP 2 199 024 A1 describes a hand-held power tool comprising an output shaft rotatable around a tool axis of rotation, a tool housing portion radially disposed relative to said output shaft, an illuminating element for illuminating a work area of the tool, a lens positioned adjacent said illuminating element, and a cover that secures said lens and said illuminating element to said tool housing portion, wherein at least a portion of said cover is closer to the axis of rotation than said lens is to the axis of rotation.

[0011] US 2008/074865 A1 describes a hand-held power tool which includes a housing with a tool fitting for receiving an insertion tool, and at least one illuminating element for illuminating the working area of the hand-held power tool; wherein the at least one illuminating element is located in the region of the tool fitting.

[0012] US 9 481 081 B2 relates to a machine tool having working field illumination disposed in a housing-having an illumination mechanism and a transparent element which allows the light from the illumination mechanism to be led out toward the working field. A light beam can be deflected between the illumination mechanism and the transparent element. The transparent element forms

a region of the housing.

Summary of Invention

[0013] In the electric power tool of JP 2017-209760 A, the light may be arranged around the middle of the case in the upward/downward direction, thus sometimes making it difficult for the user to control the spot of the irradiating light.

[0014] It is therefore an object of the present disclosure to provide an electric power tool which facilitates the user's control of the spot of the irradiating light. This object is achieved by the independent claim. Preferred embodiments are defined in the dependent claims.

[0015] An electric power tool according to an aspect of the present disclosure includes a motor, a bit mounting portion, a power transmission mechanism, a body, a handle, a trigger switch, and a plurality of light-emitting units. The bit mounting portion mounts a bit thereon. The power transmission mechanism is driven by the motor. The body houses the motor and the power transmission mechanism therein and includes the bit mounting portion at a tip thereof. The handle is extended downward from the body. The trigger switch is arranged in an upper front part of the handle. The plurality of light-emitting units are arranged between the trigger switch and the body.

[0016] The present disclosure achieves the advantage of facilitating the user's control of the spot of irradiating light.

Brief Description of Drawings

[0017]

FIG. 1 is a front view illustrating an exemplary embodiment of an electric power tool according to the present disclosure;

FIG. 2 is a side view illustrating the exemplary embodiment of the electric power tool according to the present disclosure;

FIG. 3 is a partially enlarged view illustrating the exemplary embodiment of the electric power tool according to the present disclosure;

FIG. 4 is a partial cross-sectional view illustrating the exemplary embodiment of the electric power tool according to the present disclosure;

FIG. 5A is a side view illustrating how the electric power tool according to the exemplary embodiment of the present disclosure may be used; and

FIG. 5B is a plan view illustrating how the electric power tool according to the exemplary embodiment of the present disclosure may be used.

Description of Embodiments

(Embodiment)

(Configuration for electric power tool)

[0018] An electric power tool 1 according to an exemplary embodiment is a handheld electric power tool. The electric power tool 1 includes a motor 11, a bit mounting portion 12, a power transmission mechanism 13, a body 14, a handle 15, a trigger switch 16, and a plurality of light-emitting units 17. That is to say, the motor 11, the power transmission mechanism 13, the body 14, the handle 15, the trigger switch 16, and the plurality of light-emitting units 17 are constituent elements of the electric power tool 1. The electric power tool 1 further includes a control unit for controlling the operation of the motor 11 and the power transmission mechanism 13.

[0019] The body 14 is formed in the shape of a cylinder extending in a forward/backward direction. The handle 15 is extended downward from the body 14. That is to say, the handle 15 is extended from a lower part of a peripheral surface of the body 14 to protrude in an upward/downward direction. The base 30 is formed in the shape of a box with a bottom opening. The base 30 is provided at the lower end of the handle 15. Inside the body 14, housed are the motor 11 and the power transmission mechanism 13. That is to say, the motor 11 and the power transmission mechanism 13, which are powered by battery cells in a battery pack 31, are housed in the body 14.

[0020] As used herein, the "forward/backward direction" defined for the electric power tool 1 refers to the direction in which the shaft 111 of the motor 11 extends. Also, the "upward/downward direction" refers herein to the direction perpendicular to the forward/backward direction and substantially aligned with the direction in which the handle 15 protrudes from the body 14. Furthermore, in the following description of embodiments, a direction defining the width of the electric power tool 1 perpendicularly to the forward/backward direction and the upward/downward direction will be hereinafter referred to as a "rightward/leftward direction."

[0021] The bit mounting portion 12 mounts a bit (tip tool) 18 thereon. The power transmission mechanism 13 is driven by the motor 11. The trigger switch 16 is arranged in an upper front part of the handle 15. The plurality of light-emitting units 17 are arranged between the trigger switch 16 and the body 14.

[0022] In the electric power tool 1 according to this embodiment, a rechargeable battery pack 31 is attached to the lower surface of the base 30 so as to be readily removable from the base 30. The electric power tool 1 is powered by the battery pack 31. In this embodiment, the battery pack 31 is not a constituent element of the electric power tool 1. However, this is only an example and should not be construed as limiting. Alternatively, the electric power tool 1 may include the battery pack 31 as a con-

stituent element. The battery pack 31 includes an assembled battery formed by connecting a plurality of secondary batteries (such as lithium-ion batteries) together in series, and a case that houses the assembled battery. The battery pack 31 includes a communications connector for transmitting battery information about the battery pack 31. Examples of the battery information include various pieces of information about the temperature, battery level, rated voltage, rated capacity, and number of times of use of the batteries.

[0023] The power transmission mechanism 13 is driven by the motor 11. That is to say, the power transmission mechanism 13 drives the bit 18 in rotation by using the rotation of the motor 11. In other words, the power transmission mechanism 13 is a mechanism for transmitting the rotational driving force of the motor 11 to an output shaft 131. In the electric power tool 1 according to this embodiment, the power transmission mechanism 13 may include a reducer mechanism, a clutch mechanism, or an impact mechanism, for example. The power transmission mechanism 13 is coupled to the shaft 111 of the motor 11. In addition, the power transmission mechanism 13 is also coupled to the output shaft 131. The output shaft 131 is coupled to the bit mounting portion 12, which is exposed at the front end of the body 14.

[0024] The bit 18 may be mounted onto the bit mounting portion 12. That is to say, the electric power tool 1 according to this embodiment includes the bit mounting portion 12 configured to mount the bit 18 thereon. Examples of the bits 18 that may be mounted onto the bit mounting portion 12 include a driver bit, a tap, and drill bit. As the shaft 111 of the motor 11 rotates, the power transmission mechanism 13 is driven, which in turn causes the output shaft 131 to rotate. Then, as the output shaft 131 rotates, the bit mounting portion 12 also turns, which causes the tip tool mounted onto the bit mounting portion 12 to rotate as well.

[0025] The trigger switch 16 is arranged in front of an upper part of the handle 15. That is to say, the trigger switch 16 is provided for an upper front part of the handle 15. The trigger switch 16 accepts a manual operation of partially depressing the trigger switch 16 into the handle 15. The trigger switch 16 may be configured as a mechanical switch, for example. The trigger switch 16 opens and closes in response to the manual operation.

[0026] The forward/reverse switching unit 51 includes a slide switch, which may be operated by the user to change the direction of rotation of the motor 11 from a forward direction to a reverse direction, and vice versa. That is to say, the user may change the direction of rotation of the motor 11 by operating the forward/reverse switching unit 51. The forward/reverse switching unit 51 is provided for a lower part of the body 14 and located behind the trigger switch 16. The forward/reverse switching unit 51 is a movable switch, which is slidable in the rightward/leftward direction. Specifically, when the electric power tool 1 is viewed from the front, the forward/reverse switching unit 51 slides from a position where the forward/reverse switching unit 51 protrudes from one of the right and left side surfaces of the body 14 to a position where the forward/reverse switching unit 51 protrudes from the other side surface of the body 14.

[0027] The plurality of light-emitting units 17 are arranged between the trigger switch 16 and the body 14. That is to say, the plurality of light-emitting units 17 are interposed between the trigger switch 16 and the body 14. The plurality of light-emitting units 17 are located right over the trigger switch 16 and right under the body 14. In the electric power tool 1 according to this embodiment, a protector portion 50 is provided at the front end of the body 14, and the plurality of light-emitting units 17 are located under the protector portion 50. The protector portion 50 is provided to protect the worker's hand from the heat generated when the power transmission mechanism 13 operates. Thus, arranging the light-emitting units 17 under the protector portion 50 reduces the effect of the heat generated by the power transmission mechanism 13 even when the light-emitting units 17 are arranged at the front end of the body 14.

[0028] As shown in FIG. 3, the plurality of light-emitting units 17 are arranged close enough for the user who grips the handle 15 to lift one of five fingers of his or hers that has been used to operate the trigger switch 16 from the trigger switch 16 and stretch the lifted finger to reach the plurality of light-emitting units 17 with the stretched finger. That is to say, the plurality of light-emitting units 17 are arranged over and adjacent to the trigger switch 16.

[0029] The electric power tool 1 according to this embodiment is designed to be held by the user with one of his or her hands to allow him or her to operate the trigger switch 16. That is to say, the user operates the electric power tool 1 with one of his or her fingers, used to pull the trigger switch 16, located right under the light-emitting units 17. Therefore, since the light-emitting units 17 are located near the user's finger used to operate the trigger switch 16, it is easy for him or her to lift his or her finger from the trigger switch 16 and stretch the lifted finger to reach the light-emitting units 17 with the stretched finger. For example, if the light emitted from the light-emitting units 17 happens to irradiate an unwanted region (such as a body part of a human), then the user may immediately lift his or her finger from the trigger switch 16 and stretch the finger to hide the front surface of the light-emitting units 17. This allows, even when the light emitted from the light-emitting units 17 irradiates an unwanted region, the user to lift his or her finger from the trigger switch 16 and stretch the lifted finger to cut off the light emitted from the light-emitting units 17.

[0030] In particular, it is recommended that all of those light-emitting units 17 be located close enough for the user to lift his or her finger used to operate the trigger switch 16 from the trigger switch 16 and stretch the lifted finger to reach all of those light-emitting units 17 with the stretched finger. This allows the user to more easily cut off, with his or her finger lifted from the trigger switch 16, the light emitted from all of those light-emitting units 17.

[0031] The plurality of light-emitting units 17 are located on both sides of a virtual line G that passes through the bit mounting portion 12 and the trigger switch 16. That is to say, in a front view of the electric power tool 1 (i.e., when the electric power tool 1 is viewed from the front), the plurality of light-emitting units 17 are arranged side by side in the rightward/leftward direction so as to interpose the virtual line G passing through the bit mounting portion 12 and the trigger switch 16 between themselves. The electric power tool 1 according to this embodiment includes two light-emitting units 17, one of which is arranged on one side (i.e., on the right or left) of the virtual line G and the other of which is arranged on the other side (i.e., on the left or right) of the virtual line G. If the virtual line G passes through the tip of the bit 18 mounted on the bit mounting portion 12, the two light-emitting units 17 are arranged symmetrically in the rightward/leftward direction with respect to the virtual line G. These two light-emitting units 17 are arranged at the same level in the upward/downward direction (at the same distance from the base 30).

[0032] In the electric power tool 1 according to this embodiment, the plurality of light-emitting units 17 are provided for a light-emitting part 19 formed separately from the body 14. That is to say, the light-emitting part 19 provided with the plurality of light-emitting units 17 is used as a part separable from the body 14. In other words, the light-emitting part 19 is implemented as a light-emitting module including the plurality of light-emitting units 17. This facilitates the user's change of specifications of the light-emitting units 17 even without replacing the rest of the electric power tool 1 other than the light-emitting part 19. That is to say, when the number of the light-emitting units 17 needs to be changed, just the light-emitting part 19 needs to be replaced with another one, thus requiring replacement of the body 14, the handle 15, the base 30, the motor 11, the power transmission mechanism 13, the trigger switch 16, and other parts much less often. As used herein, the "specifications of the light-emitting units 17" include the number of the light-emitting units 17 provided, the color of the light emitted from the light-emitting units 17, the ON period thereof, the lighting pattern, the arrangement, and other parameters. Also, cutting an opening through the outer surface of the body 14 such that the opening communicates with the inside of the body 14 and inserting the light-emitting part 19 into the opening allows the light-emitting part 19 to be attached to the body 14. As can be seen, the electric power tool 1 according to this embodiment allows the light-emitting part 19 to be attached to the body 14 more easily, thus facilitating the assembling process significantly compared to forming a plurality of light-emitting units 17 on the body 14.

[0033] As shown in FIG. 4, in electric power tool 1 according to this embodiment, the light-emitting part 19 includes a plurality of light-emitting elements 20 and a circuit board 21 on which the plurality of light-emitting elements 20 are mounted. That is to say, the plurality of light-emitting elements 20 and the circuit board 21 on which the plurality of light-emitting elements 20 are mounted are constituent elements of the light-emitting part 19. Each of the light-emitting elements 20 emits light when supplied with electricity and may be implemented as a light-emitting diode (LED), for example. The light-emitting elements 20 may be flat-plate LEDs, for example, but may also be bullet-shaped LEDs. The circuit board 21 includes a control circuit for controlling the ON/OFF and other states of the light-emitting elements 20. The circuit board 21 is arranged such that one surface and the other surface thereof, facing each other along the thickness thereof, are parallel to the upward/downward direction. One of the two surfaces, facing each other along the thickness, of the circuit board 21 is the front surface, which faces forward and on which the plurality of light-emitting elements 20 are mounted. The plurality of light-emitting elements 20 are mounted on the front surface of the circuit board 21 so as to be arranged side by side in the rightward/leftward direction.

[0034] The plurality of light-emitting elements 20 and the circuit board 21 are built in the housing 201. The housing 201 is a casing that forms the outer shell of the light-emitting part 19, and may be made of plastic as well as the body 14. The front surface of the housing 201 is a forwardly convex, curved surface, through which a plurality of holes 202 are opened. That is to say, each of those holes 202 runs through the front surface of the housing 201 along the thickness. The plurality of holes 202 are arranged side by side in the rightward/leftward direction. An optical member 203 is arranged inside the housing 201. The optical member 203 includes a plurality of lens portions 204, which are also arranged side by side in the rightward/leftward direction. The optical member 203 is placed such that each of those lens portions 204 is located behind an associated one of the holes 202. The circuit board 21 is arranged such that each light-emitting element 20 is located behind an associated one of the lens portions 204.

[0035] The electric power tool 1 according to this embodiment is able to irradiate, from below the bit 18 mounted on the bit mounting portion 12, the tip of the bit 18 with the light emitted from the plurality of light-emitting units 17. Therefore, as the tip of the bit 18 is brought closer toward the target such as a screw, the tip of the bit 18 and its surroundings may be automatically irradiated with the light emitted from the plurality of light-emitting units 17.

(How to use electric power tool)

[0036] The electric power tool 1 according to this embodiment is used with the bit 18 mounted on the bit mounting portion 12. Any appropriate type of bit 18 may be selected according to the purpose of the machining work. For example, when the workpiece needs to be screwed down, a driver bit may be used. On the other hand, when a hole needs to be cut through the workpiece, a drill bit

may be used.

[0037] The electric power tool 1 according to this embodiment allows the user to do the machining work with light emitted from the light-emitting units 17. In this case, either the tip of the bit 18 or the workpiece may be irradiated with the light emitted from the light-emitting units 17, thus making the tip of the bit 18 or the workpiece viewable more easily. This is effective particularly when the user needs to do the machining work in a dark place.

[0038] In the electric power tool 1 according to this embodiment, a switch, for example, may be used to emit light from the light-emitting units 17. The switch may be provided on the upper surface of the base 30, for example. A press button switch, a touchscreen sensor, or a pressure sensitive sensor may be used as the switch, for example. Optionally, the light-emitting units 17 may be activated by operating the trigger switch 16. In that case, the light-emitting units 17 emit light while the bit 18 is driven in rotation. This saves the trouble of activating the light-emitting units 17 on purpose, thus improving the work efficiency.

[0039] In the electric power tool 1 according to this embodiment, the plurality of light-emitting units 17 are provided below the body 14. This facilitates irradiation of the bit 18, mounted on the bit mounting portion 12 at the tip of the body 14, with the light coming from the light-emitting units 17 located obliquely below the bit 18.

[0040] FIGS. 5A and 5B illustrate how the electric power tool 1 according to this embodiment may be used. Specifically, FIGS. 5A and 5B illustrate a situation where the user is doing the machining work of driving a screw W2 into a wall W1. In this case, the screw W2 is driven into a wall area near the ceiling T (i.e., an upper part of the wall W1). Such a situation will arise when the user needs to do the work in a narrow space (such as the inside of a shelf). For example, the inside of a shelf provided over the sink of a kitchen is so narrow that the user who is doing the machining work using the electric power tool 1 often needs to cast his or her eyes M upward from under the electric power tool 1 as shown in FIG. 5A. Even so, in the electric power tool 1 according to this embodiment, the tip of the bit 18 is irradiated with light B1 emitted from the light-emitting units 17 located from below the bit 18, thus reducing the chances of casting the shadow of the bit 18 in front of the user (i.e., between the bit 18 and the user). The shadow, if any, will be cast beyond the bit 18. This allows the light to reach the tip of the bit 18 and its target (i.e., the screw W2 in the example illustrated in FIGS. 5A and 5B) more easily, thus making the tip of the bit 18 and its target more clearly viewable and improving the work efficiency as well.

[0041] Note that if the bit 18 is irradiated with light B2 coming from over the bit 18, then the shadow of the bit 18 is cast in front of the user (i.e., between the bit 18 and the user) as shown in FIG. 5A, thus darkening the area viewable with his or her eyes M to cause a decline in work efficiency.

[0042] In addition, in the electric power tool 1 according to this embodiment, the light-emitting units 17 are arranged near the handle 15 that the user grips with one of his or her hands, thus facilitating the user's control of the spot of the irradiating light. That is to say, the electric power tool 1 is used by the user who holds the handle 15 with one of his or her hands. Furthermore, when using this electric power tool 1, the user operates the trigger switch 16. Thus, while the electric power tool 1 is used by the user, an upper part of the handle 15 adjacent to the light-emitting units 17 is gripped with one of his or her hands. In other words, in the electric power tool 1 according to this embodiment, the location of the light-emitting units 17 is close to the location of that part gripped with one of the user's hands. Therefore, compared to a situation where the location of the light-emitting units 17 is distant from the location of that part gripped with one of the user's hands, the light-emitting units 17 move closer to his or her operating hand when he or she is going to change the direction of the irradiating light emitted from the light-emitting units 17. This makes it easier to synchronize the movement of the light-emitting units 17 with the movement of his or her hand, thus facilitating his or her control of the spot of the irradiating light.

[0043] Furthermore, in the electric power tool 1 according to this embodiment, light beams L1 and L2 are emitted from the plurality of light-emitting units 17, respectively, as shown in FIG. 5B. This produces an area where the light beams L1 and L2 overlap with each other around and in front of the bit 18. Thus, compared to a situation where only one light-emitting unit 17 is provided, the area around and in front of the bit 18 may be irradiated more brightly and the light irradiation range may be broadened.

(Variations)

[0044] Note that the embodiment described above is only an exemplary one of various embodiments of the present disclosure and should not be construed as limiting.

[0045] In the electric power tool 1 described above, the plurality of light-emitting units 17 may be arranged in any pattern without limitation. In the embodiment described above, the plurality of light-emitting units 17 are arranged side by side in the rightward/leftward direction (i.e., laterally). However, this is only an example and should not be construed as limiting. Alternatively, the plurality of light-emitting units 17 may also be arranged one on top of another in the upward/downward direction. Still alternatively, the plurality of light-emitting units 17 may also be arranged obliquely in a front view.

[0046] In the electric power tool 1 described above, the plurality of light-emitting units 17 are able to emit light beams with mutually different wavelengths. That is to say, light beams with mutually different wavelengths are suitably emitted from the respective light-emitting units 17. This allows light beams in various colors to be emitted from the respective light-emitting units 17 and also allows the target to be irradiated with such light beams in various

colors. For example, at least one of the plurality of light-emitting units 17 may emit a red light beam, and at least another one of the plurality of light-emitting units 17 may emit a blue light beam. In addition, this electric power tool 1 may be used effectively particularly when a special type of paint, which is invisible when irradiated with visible radiation but is visible only when irradiated with a light beam with a particular wavelength (such as a fluorescent paint), is used. Specifically, in that case, a light-emitting unit 17 that emits a light beam with a particular wavelength is provided, and a mark is made with a special type of paint that becomes visible when irradiated with such a light beam with the particular wavelength. The machining work is performed using the electric power tool 1 with the mark shining conspicuously with the light beam emitted from the light-emitting unit 17. Even after the machining work has been done, that mark is not erased but left as it is. Even so, the mark is invisible under visible radiation after the machining work is done, but is visible under the light beam emitted from the light-emitting unit 17 while the machining work is being performed. This reduces the chances of causing a significant decline in work efficiency.

[0047] Furthermore, in the electric power tool 1 described above, the plurality of light-emitting units 17 may emit light beams at respectively different irradiation angles. That is to say, light beams may be emitted from the light-emitting units 17 in respectively different directions. In that case, the irradiation angles of the light beams may be varied in any of the upward/downward direction or the rightward/leftward direction. For example, at least one of the plurality of light-emitting units 17 may emit a light beam obliquely upward and forward, and at least another one of the plurality of light-emitting units 17 may emit a light beam obliquely downward and forward.

[0048] Optionally, in the electric power tool 1 described above, the plurality of light-emitting units 17 do not have to emit light beams simultaneously but may emit light beams at respectively different timings or for mutually different durations. Also, any of the light-emitting units 17 may blink to send a sort of an error message, for example.

(Resume)

[0049] As can be seen from the foregoing description, an electric power tool (1) according to a first aspect includes a motor (11), a bit mounting portion (12), a power transmission mechanism (13), a body (14), a handle (15), a trigger switch (16), and a plurality of light-emitting units (17). The bit mounting portion (12) mounts a bit (18) thereon. The power transmission mechanism (13) is driven by the motor (11). The body (14) houses the motor (11) and the power transmission mechanism (13) therein and includes the bit mounting portion (12) at a tip thereof. The handle (15) is extended downward from the body (14). The trigger switch (16) is arranged in an upper front part of the handle (15). The plurality of light-emitting units (17) are arranged between the trigger switch (16) and the body (14).

[0050] This aspect facilitates the user's control of the spot of irradiating light because the plurality of light-emitting units (17) are arranged near a part of the handle (15) to be gripped with his or her hand.

[0051] In an electric power tool (1) according to a second aspect, which may be implemented in conjunction with the first aspect, the plurality of light-emitting units (17) are provided for a light-emitting part (19) formed separately from the body (14).

[0052] This aspect allows the user to replace only the light-emitting part (19) with another one without changing the body (14), thus facilitating a change of specifications of the light-emitting units (17).

[0053] In an electric power tool (1) according to a third aspect, which may be implemented in conjunction with the second aspect, the light-emitting part (19) includes a plurality of light-emitting elements (20) and a circuit board (21) on which the plurality of light-emitting elements (20) are mounted.

[0054] This aspect makes the light-emitting part (19) replaceable in its entirety when the types of the light-emitting elements (20) and the circuit board (21) are changed, thus facilitating a change of specifications of the light-emitting units (17).

[0055] In an electric power tool (1) according to a fourth aspect, which may be implemented in conjunction with any one of the first to third aspects, the plurality of light-emitting units (17) emit light beams with mutually different wavelengths.

[0056] This aspect allows the color or any other parameter of the light beams emitted from the light-emitting units (17) to be changed according to the situation, place, or purpose of use of the electric power tool (1), thus improving work efficiency.

[0057] In an electric power tool (1) according to a fifth aspect, which may be implemented in conjunction with any one of the first to fourth aspects, the plurality of light-emitting units (17) emit light beams at mutually different irradiation angles.

[0058] This aspect allows the user to more easily irradiate any desired range with the light emitted from the light-emitting units (17) by expanding or narrowing the irradiation range of the light.

[0059] In an electric power tool (1) according to a sixth aspect, which may be implemented in conjunction with any one of the first to fifth aspects, the plurality of light-emitting units (17) are arranged close enough for a user who grips the handle (15) to lift, from the trigger switch (16), one of five fingers of his or hers that has been used to operate the trigger switch (16) and stretch the lifted finger to reach the plurality of light-emitting units (17) with the stretched finger.

[0060] This aspect allows the user who is operating the trigger switch (16) with one of five fingers of his or hers to lift the finger from the trigger switch (16) and hide the plurality of light-emitting units (17) with the lifted fin-

ger, thus enabling him or her to cut off unwanted irradiating light from the light-emitting units (17) with the finger.

[0061] In an electric power tool (1) according to a seventh aspect, which may be implemented in conjunction with any one of the first to sixth aspects, the plurality of light-emitting units (17) are arranged on both sides of a virtual line (G) that passes through the bit mounting portion (12) and the trigger switch (16).

[0062] This aspect allows both sides of the virtual line (G) to be irradiated with the light emitted from the light-emitting units (17), thus expanding the irradiation range of the light.

Reference Signs List

[0063]

1	Electric Power Tool
11	Motor
12	Bit Mounting Portion
13	Power Transmission Mechanism
14	Body
15	Handle
16	Trigger Switch
17	Light-Emitting Unit
19	Light-Emitting Part
20	Light-Emitting Element
21	Circuit Board
G	Virtual Line

Claims

1. An electric power tool (1) comprising:

a motor (11);
a bit mounting portion (12) configured to mount a bit (18) thereon;
a power transmission mechanism (13) configured to be driven by the motor (11);
a body (14) housing the motor (11) and the power transmission mechanism (13) therein and including the bit mounting portion (12) at a tip thereof;
a handle (15) extended downward from the body (14);
a trigger switch (16) arranged in an upper front part of the handle (15); **characterized in that**
a plurality of light-emitting units (17) arranged between the trigger switch (16) and the body (14) so that the tip of the bit (18) is irradiated with the light emitted from the plurality of light-emitting units (17),
wherein in a front view of the electric power tool (1), the plurality of light-emitting units (17) are arranged side by side in the rightward/leftward direction so as to interpose the virtual line (G) passing through the bit mounting portion (12) and the trigger switch (16) between themselves

2. The electric power tool (1) of claim 1, wherein
the plurality of light-emitting units (17) are provided for a light-emitting part (19) formed separately from the body (14).

3. The electric power tool (1) of claim 2, wherein
the light-emitting part (19) comprises a plurality of light-emitting elements (20) and a circuit board (21) on which the plurality of light-emitting elements (20) are mounted.

4. The electric power tool (1) of any one of claims 1 to 3, wherein
the plurality of light-emitting units (17) are configured to emit light beams with mutually different wavelengths.

5. The electric power tool (1) of any one of claims 1 to 4, wherein
the plurality of light-emitting units (17) emits light beams at mutually different irradiation angles.

6. The electric power tool (1) of any one of claims 1 to 5, wherein
the plurality of light-emitting units (17) are arranged close enough for a user who grips the handle (15) to lift one of five fingers of his or hers that has been used to operate the trigger switch (16) from the trigger switch (16) and stretch the lifted finger to reach the plurality of light-emitting units (17) with the stretched finger.

7. The electric power tool (1) of any one of claims 1 to 6, wherein
the plurality of light-emitting units (17) are arranged on both sides of a virtual line (G) that passes through the bit mounting portion (12) and the trigger switch (16).

Patentansprüche

1. Elektrowerkzeug (1), aufweisend:

einen Motor (11);
einen Bit-Montageabschnitt (12), der eingerichtet ist, ein Bit (18) daran zu montieren;
einen Energieübertragungsmechanismus (13), der eingerichtet ist, durch den Motor (11) angetrieben zu werden;
einen Körper (14), der den Motor (11) und den Energieübertragungsmechanismus (13) in sich aufnimmt und den Bit-Montageabschnitt (12) an einer Spitze davon aufweist;
einen Griff (15), der sich von dem Körper (14) aus nach unten erstreckt;

einen Auslöseschalter (16), der in einem oberen vorderen Teil des Griffs (15) angeordnet ist;
dadurch gekennzeichnet, dass
eine Vielzahl von lichtemittierenden Einheiten (17) zwischen dem Auslöseschalter (16) und dem Körper (14) angeordnet sind, so dass die Spitze des Bits (18) mit dem Licht bestrahlt wird, das von der Vielzahl von lichtemittierenden Einheiten (17) emittiert wird,
wobei in einer Vorderansicht des Elektrowerkzeugs (1) die Vielzahl von lichtemittierenden Einheiten (17) in der Rechts-/Linksrichtung derart nebeneinander angeordnet sind, dass zwischen ihnen die virtuelle Linie (G) angeordnet ist, welche durch den Bit-Montageabschnitt (12) und den Auslöseschalter (16) verläuft.

2. Elektrowerkzeug (1) nach Anspruch 1, wobei die Vielzahl von lichtemittierenden Einheiten (17) für ein lichtemittierendes Teil (19) vorgesehen sind, das getrennt von dem Körper (14) ausgebildet ist.

3. Elektrowerkzeug (1) nach Anspruch 2, wobei das lichtemittierende Teil (19) eine Vielzahl von lichtemittierenden Elementen (20) sowie eine Leiterplatte (21) aufweist, auf der die Vielzahl von lichtemittierenden Elementen (20) montiert sind.

4. Elektrowerkzeug (1) nach einem der Ansprüche 1 bis 3, wobei die Vielzahl von lichtemittierenden Einheiten (17) derart eingerichtet sind, dass sie Lichtstrahlen mit voneinander verschiedenen Wellenlängen aussenden.

5. Elektrowerkzeug (1) nach einem der Ansprüche 1 bis 4, wobei die Vielzahl von lichtemittierenden Einheiten (17) Lichtstrahlen in voneinander verschiedenen Abstrahlwinkeln aussenden.

6. Elektrowerkzeug (1) nach einem der Ansprüche 1 bis 5, wobei die Vielzahl von lichtemittierenden Einheiten (17) ausrechend nahe beieinander angeordnet sind, dass ein Benutzer, der den Griff (15) ergreift, einen seiner fünf Finger, der zum Betätigen des Auslöseschalters (16) verwendet wurde, von dem Auslöseschalter (16) anhebt und den angehobenen Finger streckt, um die Vielzahl von lichtemittierenden Einheiten (17) mit dem gestreckten Finger zu erreichen.

7. Elektrowerkzeug (1) nach einem der Ansprüche 1 bis 6, wobei die Vielzahl von lichtemittierenden Einheiten (17) auf beiden Seiten einer virtuellen Linie (G) angeordnet sind, die durch den Bit-Montageabschnitt (12) und den Auslöseschalter (16) verläuft.

Revendications

1. Outil électrique (1), comprenant :

un moteur (11) ;
une partie (12) de montage de mèche, conçue pour monter sur elle une mèche (18) ;
un mécanisme (13) de transmission d'énergie, conçu pour être entraîné par le moteur (11) ;
un corps (14) logeant le moteur (11) et le mécanisme (13) de transmission d'énergie à son intérieur, et comprenant la partie (12) de montage de mèche au niveau de l'une de ses pointes ;
une poignée (15) s'étendant vers le bas à partir du corps (14) ;
un commutateur de déclenchement (16) agencé dans une partie avant supérieure de la poignée (15) ;
caractérisé en ce que
plusieurs unités (17) d'émission de lumière sont agencées entre le commutateur de déclenchement (16) et le corps (14), de sorte que la pointe de la mèche (18) soit irradiée à l'aide de la lumière émise par les plusieurs unités (17) d'émission de lumière,
dans lequel, dans une vue avant de l'outil électrique (1), les plusieurs unités (17) d'émission de lumière sont agencées côte à côte dans le sens vers la droite/vers la gauche afin d'interposer entre elles une ligne virtuelle (G) passant à travers la partie (12) de montage de mèche et le commutateur de déclenchement (16).

2. L'outil électrique (1) de la revendication 1, dans lequel
les plusieurs unités (17) d'émission de lumière sont prévues pour une partie (19) d'émission de lumière formée séparément du corps (14).

3. L'outil électrique (1) de la revendication 2, dans lequel
la partie (19) d'émission de lumière comprend plusieurs éléments (20) d'émission de lumière et une carte de circuit imprimé (21) sur laquelle les plusieurs éléments (20) d'émission de lumière sont montés.

4. L'outil électrique (1) de l'une quelconque des revendications 1 à 3, dans lequel
les plusieurs unités (17) d'émission de lumière sont conçues pour émettre des faisceaux lumineux dotés de longueurs d'onde différentes les unes des autres.

5. L'outil électrique (1) de l'une quelconque des revendications 1 à 4, dans lequel
les plusieurs unités (17) d'émission de lumière émettent des faisceaux lumineux selon des angles d'irradiation différents les uns des autres.

6. L'outil électrique (1) de l'une quelconque des revendications 1 à 5, dans lequel
les plusieurs unités (17) d'émission de lumière sont agencées suffisamment proches pour qu'un utilisateur, qui saisit la poignée (15), soulève l'un de ses cinq doigts, qui a été utilisé pour actionner le commutateur de déclenchement (16), à partir du commutateur de déclenchement (16) et étire le doigt soulevé afin d'atteindre les plusieurs unités (17) d'émission de lumière avec le doigt étiré.

7. L'outil électrique (1) de l'une quelconque des revendications 1 à 6, dans lequel
les plusieurs unités (17) d'émission de lumière sont agencées sur les deux côtés de la ligne virtuelle (G) qui passe à travers la partie (12) de montage de mèche et le commutateur de déclenchement (16).

FIG. 1

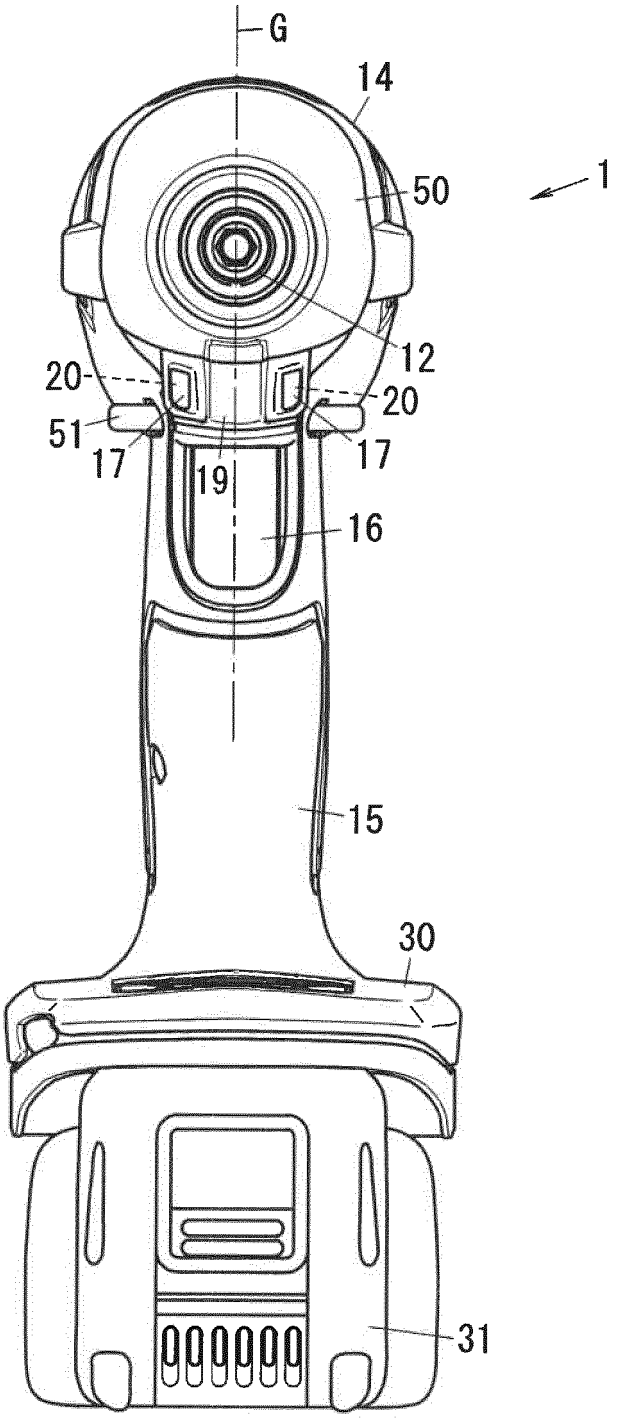


FIG. 2

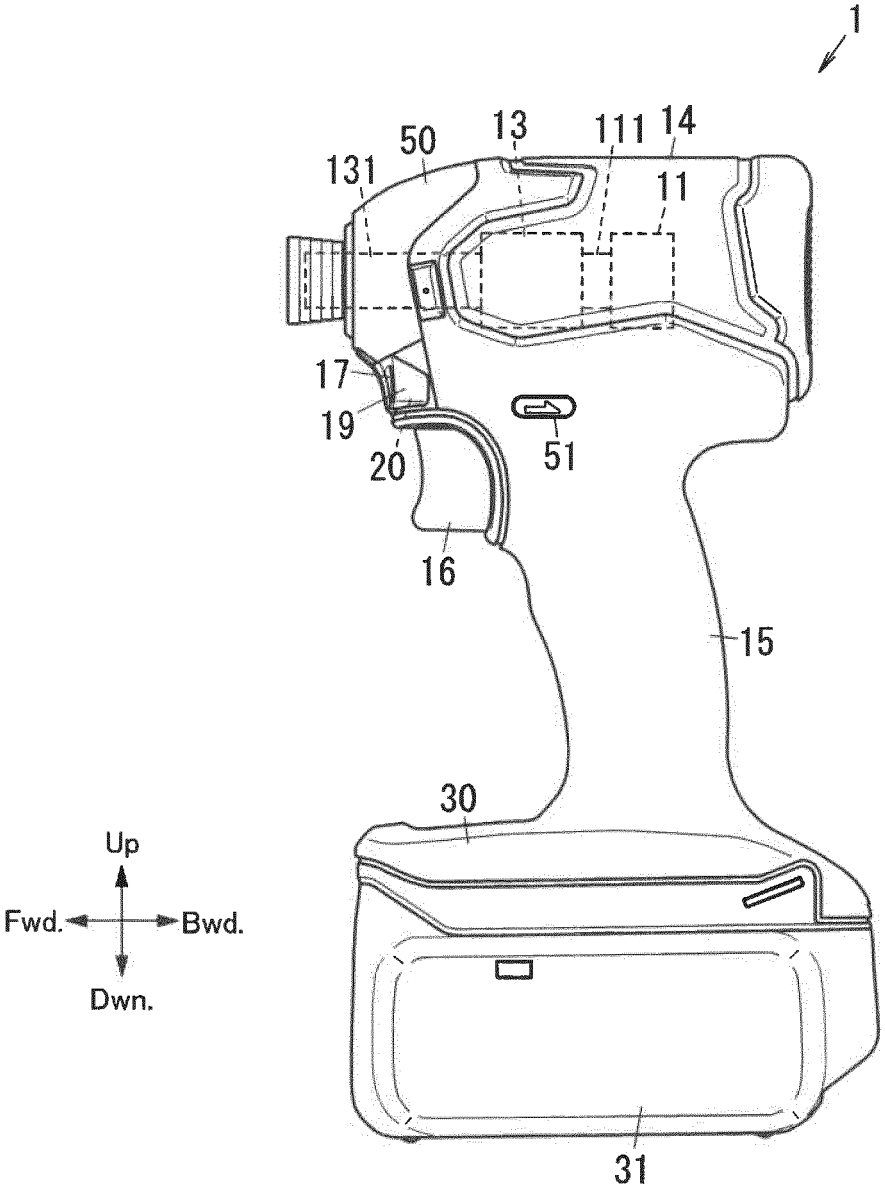


FIG. 3

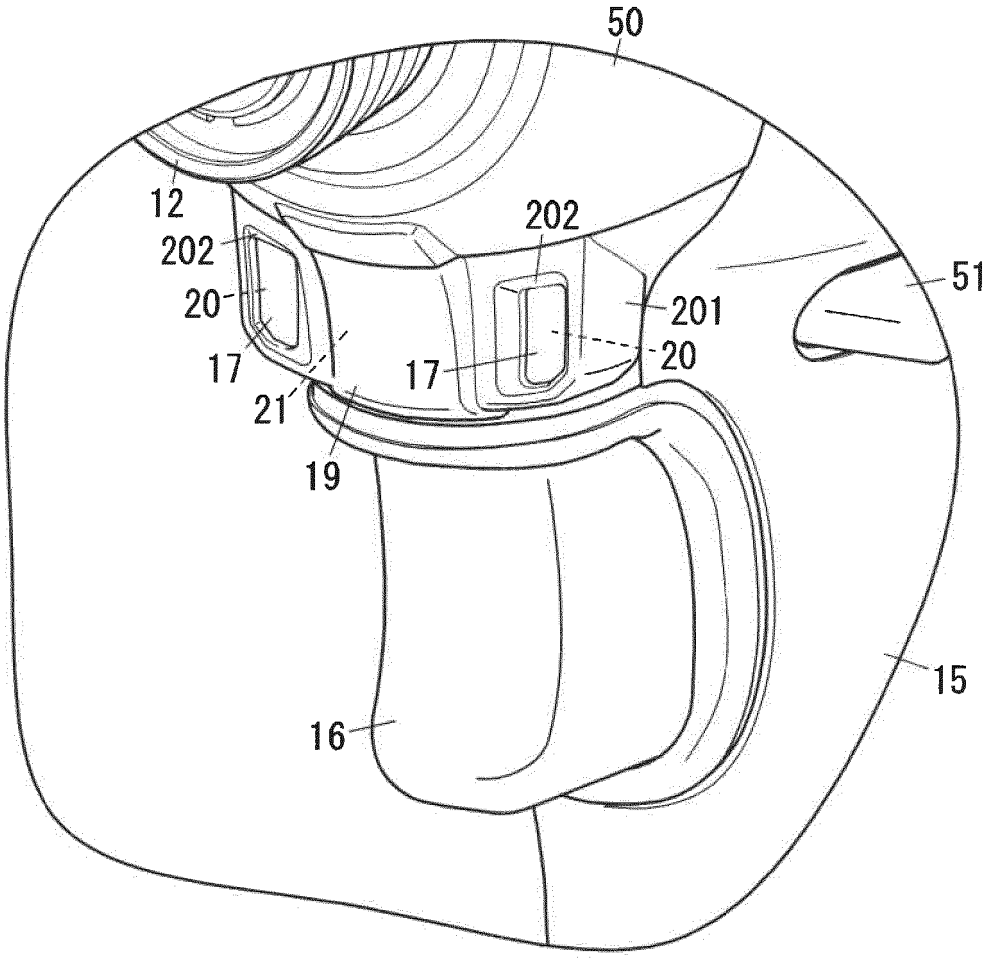


FIG. 4

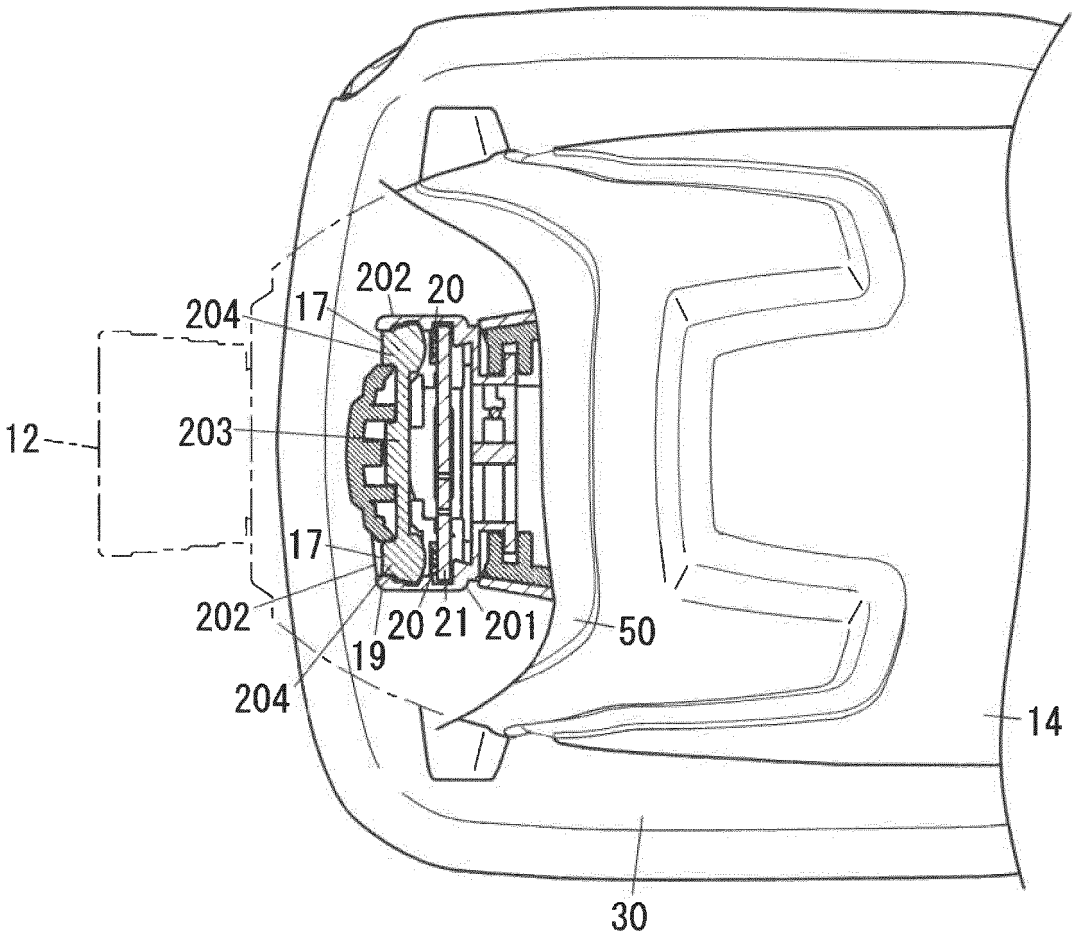
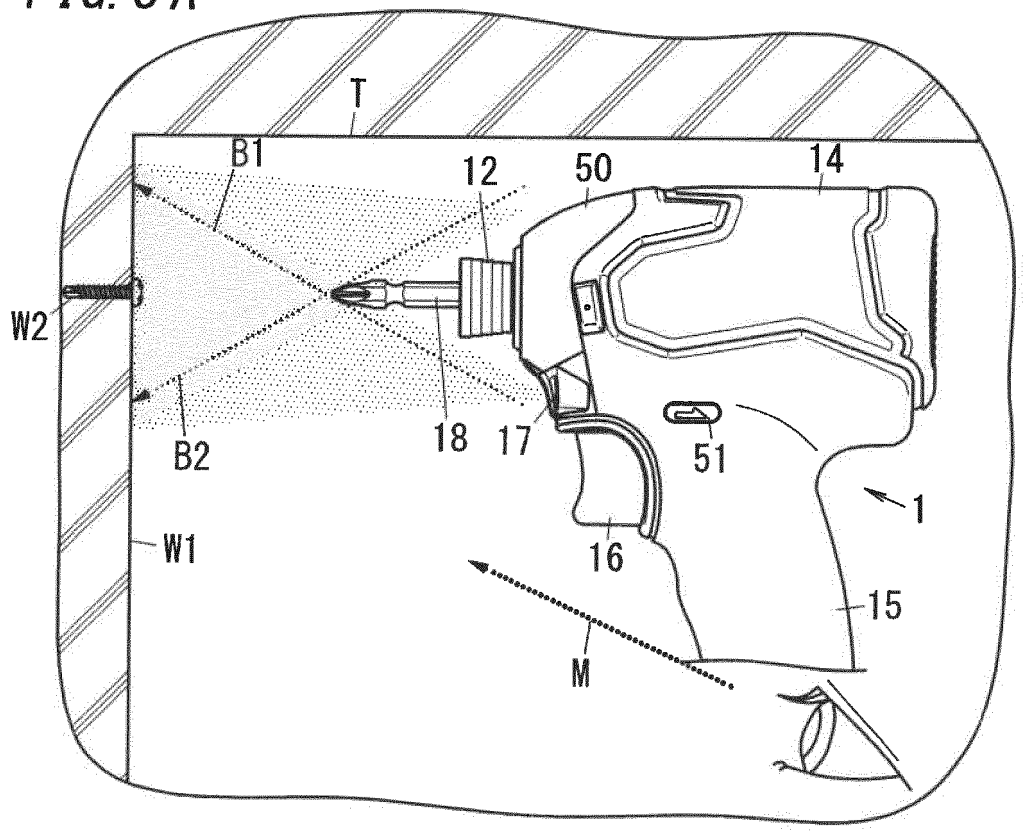


FIG. 5A


T
B1
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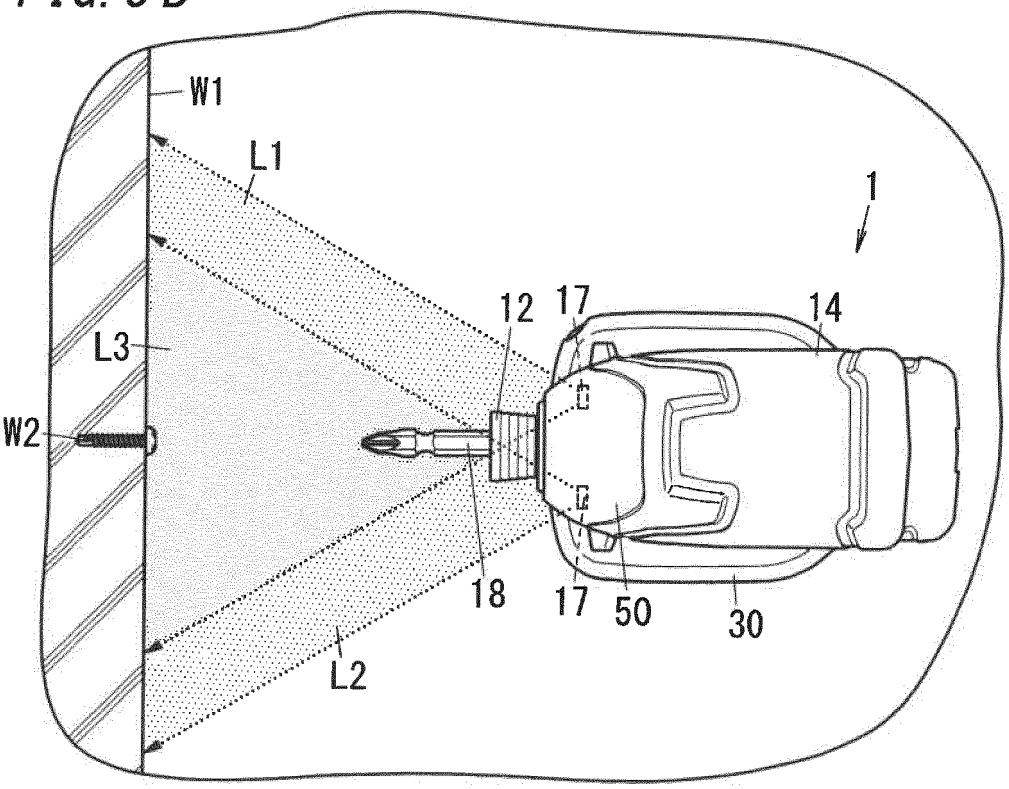
14
W2
B2
18
17
51
1
W1
16
15
M

FIG. 5B


W1
L1
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12
17
14
L3
W2
18
17
50
30
L2

REFERENCES CITED IN THE DESCRIPTION

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