Feb. 2, 1943. D. D. WAY 2,310,166

LIGHTING DEVICE FOR PORTABLE ELECTRIC TOOLS

Filed Jan. 24, 1941 2 Sheets-Sheet 1

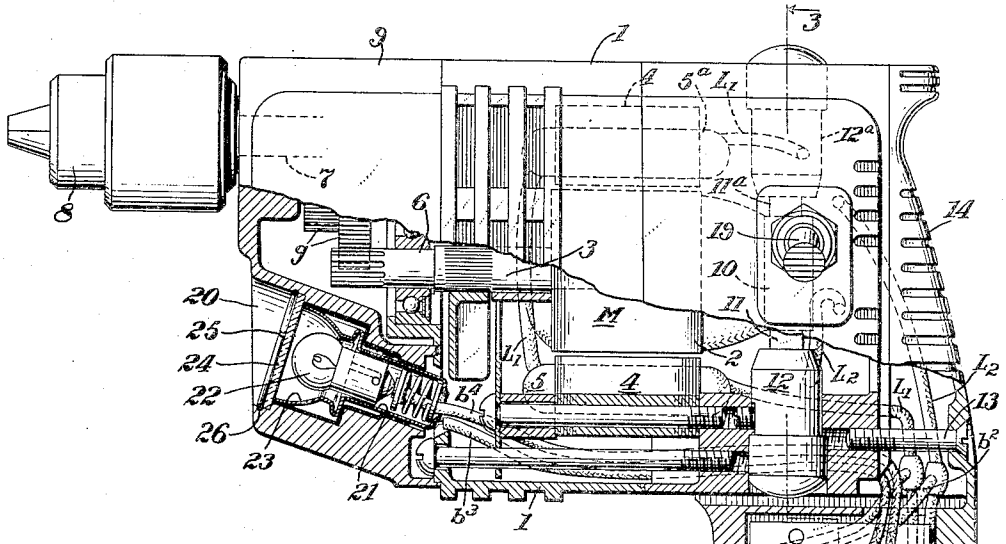


Fig. 1.

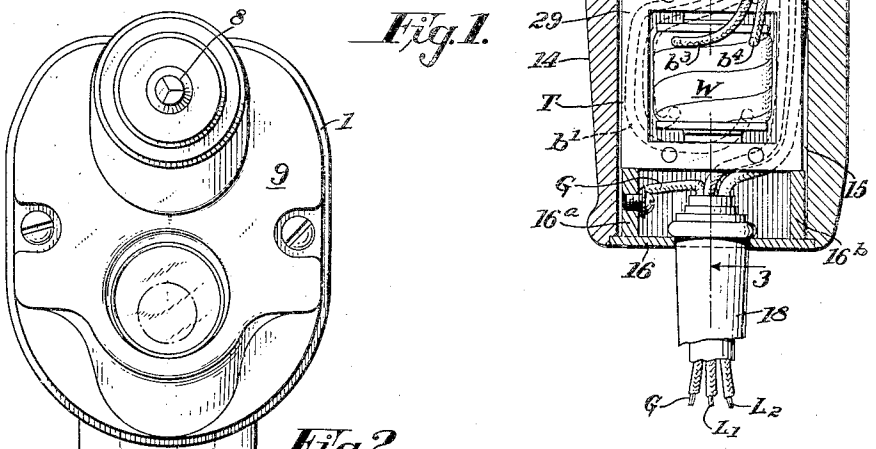


Fig. 2.

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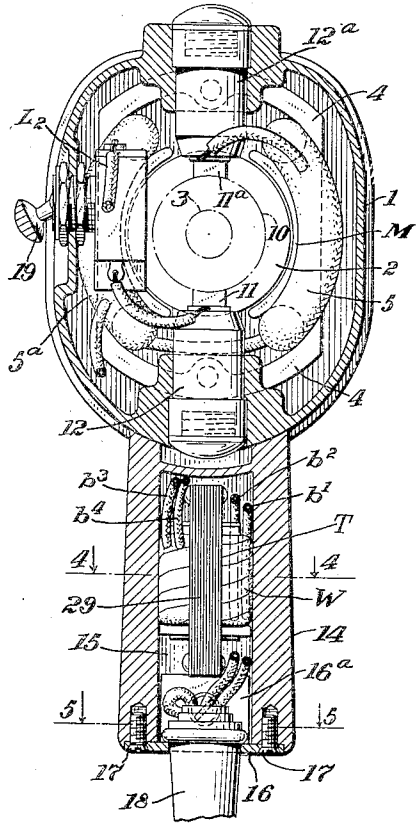


Fig. 3.

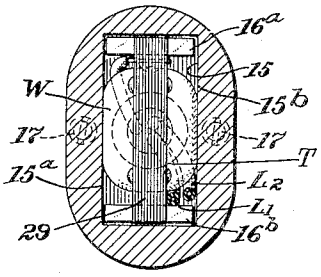


Fig. 4.

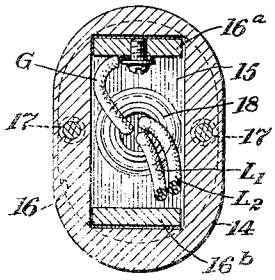


Fig. 5.

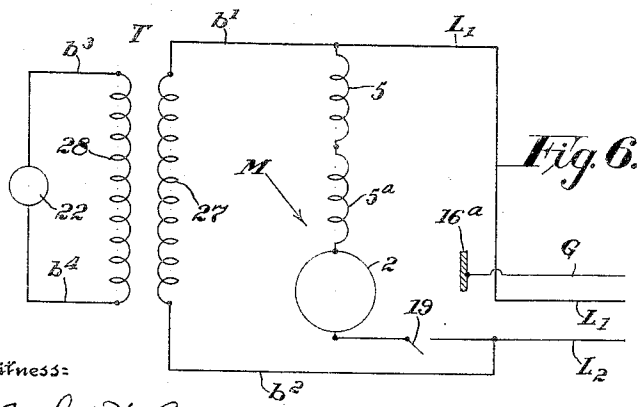


Fig. 6.

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2,310,166

UNITED STATES PATENT OFFICE

2,310,166

LIGHTING DEVICE FOR PORTABLE ELECTRIC TOOLS

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Application January 24, 1941, Serial No. 375,756

3 Claims. (Cl. 240—2)

This invention relates to portable electric tools and more particularly to such tools having embodied therein lighting systems adapted to illuminate the field of operation of the tools.

A portable electric drill is a good example of a tool in which the invention advantageously may be embodied and therefore, for convenience, the invention will be shown and described in connection with that specific type of portable electric tool.

It is not new to equip various forms of electrically operated tools with means to illuminate the work. Heretofore, however, it has been customary to connect the electric lamp directly to the electric circuit which is utilized to operate the tool, using the full voltage therein to light the lamp.

As is well understood, tools of this nature are frequently subjected to rough handling. Also it is well known that the filaments of lamps adapted to withstand a relatively high voltage, such as 110 or 220 volts, frequently utilized to operate electric tools, are relatively fragile and are not designed to withstand the rough usage to which such tools are subjected. The filaments of low voltage lamps, such for example as those adapted to be lighted from a 6–8 volt circuit, however, are strong and durable and are not easily broken by rough handling but they are not adapted to be operated directly from a high voltage circuit.

This invention has as an object to provide a portable electric tool adapted to be actuated from a relatively high voltage circuit (e. g. 110–220 volts) and so to embody therein a relatively low voltage lighting system (e. g. 6–8 volts) that it may be operated from the lines which supply current to operate the tool.

Another object of the invention is to provide a portable electric tool, as above described, in which the lighting system is wholly independent of the motor which operates the tool, or, in other words, in which the lamp may be lighted even when the motor is at rest.

Still another object of the invention is to provide a portable electric tool having therein a high voltage operating circuit and a low voltage lighting circuit (both receiving current from the same supply lines) and to incorporate in the tool casing, without enlargement of the casing and so as to be invisible, a miniature transformer designed to supply low voltage to the lighting circuit from the high voltage tool-operating circuit.

These and other objects have been attained in a pistol type portable electric drill which comprises a casing housing a spindle-driving motor, a rotary tool-spindle projecting longitudinally from one end of the casing and a handle or handgrip projecting radially from the opposite end of the casing. A low voltage electric lamp is fitted into the front end of the casing beneath and at an angle to the tool spindle so that the light rays therefrom are projected forwardly and toward the end of the tool held by the tool-spindle, thereby to illuminate the work on which the tool is to operate. The handle is formed with a cavity and a miniature transformer is fitted therein and serves to supply low voltage current to the lamp from the high voltage motor circuit. By locating the transformer in a cavity in the handle the transformer is entirely hidden from view and does not add to the over-all size of the tool.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations and arrangements of parts hereinafter set forth and illustrated in the accompanying drawings of a preferred embodiment of the invention, from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

Fig. 1 is a side elevation, partly in section of a portable electric drill embodying the present invention.

Fig. 2 is a front end view of the drill illustrated in Fig. 1.

Fig. 3 is a vertical section taken substantially along the line 3—3 of Fig. 1.

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 3.

Fig. 5 is a horizontal section taken on the line 5—5 of Fig. 3.

Fig. 6 is a diagrammatic view illustrating the high voltage electric circuit for operating the tool-spindle driving motor and the low voltage circuit for lighting the lamp.

Referring more specifically to the drawings, the invention is disclosed as embodied in a portable electric drill having a main casing 1 in which is mounted an electric motor M comprising an armature 2 fixed upon a shaft 3, a laminated field-frame 4 secured in the casing 1 and field coils 5 and 5a carried by said field frame. In Fig. 1, for the purpose of illustration, the field coils are shown as shifted out of their normal positions. Fig. 3 shows the coils in their proper positions. The shaft 3 is journaled in suitable bearings 6, of which only one is shown. That shaft 3 is connected by a train of speed-reduction gears, designated generally as *g*, to rotate a drill-spindle 7 which carries a drill-chuck 8. The gears *g* are lo-

cated within a gear-casing 9 which is secured to the forward end of the motor casing 1 and forms a part of the main casing of the machine.

The armature shaft 3 carries at its rear end, a commutator 10 which is engaged by brushes 11, 11a carried by brush tubes 12, 12a, respectively, supported by the motor casing 1.

Detachably secured to the rear end of the motor casing, as by screws 13, of which only one is shown, is a handle or hand-grip 14, a portion of which projects radially below the casing. This handle is formed with a cavity 15, later to be referred to, which is closed at its lower end by a cap-plate 16 held in place by screws 17 threaded into the hand-grip 14.

Relatively high voltage electric current (e. g. 110–220 volts) to operate the motor M is supplied by electric conductors L_1, L_2 which enter the casing through a protecting element 18, preferably of rubber, secured in an aperture formed in the cap-plate 16. The conductor L_1, is connected first to the field coil 5, thence to field coil 5a and finally to the supporting tube 12a of the brush 11a. The conductor L_2 is connected first with a line switch 19 and thence to the supporting tube 12 of the brush 11. The switch 19, which may be of the conventional toggle type, is adapted to make and break the circuit, thereby alternately to render the motor M effective and ineffective.

Mounted in a cavity 20 formed in the forward end of the main casing, and more specifically in the gear casing 9, is a lamp socket 21 into which is secured a low voltage lamp 22. The socket has a portion 23 which serves as a reflector for the light rays emitted by the lamp. The lamp is protected by a transparent disk or lens 24 located in the cavity 20 outwardly beyond the lamp and reflector and held in place by a split wire ring 25 fitted into an annular groove 26 in the wall of said cavity. The axes of the lamp and its reflector are arranged at an angle to the axis of the drill spindle 7 so that the light rays from the lamp will be projected in a direction such that they will illuminate the area adjacent the end of a drill carried by the chuck 8.

Relatively low voltage current (6–8 volts) to light the lamp 22 is supplied indirectly by the high voltage lines L_1, L_2 through the medium of a transformer T (see Fig. 6) the primary coil 27 of which is connected by conductors b^1 and b^2 to the conductors L_1, L_2, respectively. The secondary coil 28 of the transformer is connected to the lamp socket 21 by a conductor b^3 and to the lamp 22 therein by conductor b^4. It will be noted that the lamp 22 receives current from the lines L_1, L_2 entirely independently of the motor-controlling switch 19 and that therefore the lamp will burn whenever the lines L_1, L_2 are connected to a source of current, regardless of whether or not the motor M is running.

An important feature of this invention resides in the construction and proportions of the transformer and its location wholly within a portion of the tool where it is hidden from view and does not add to the over-all size of the tool.

As hereinbefore stated, the handle 14 has formed therein a cavity 15. This cavity is formed of such shape and size as to conveniently receive and hold the transformer T. As shown most clearly in Fig. 1 the cavity 15 is only slightly wider in one direction than the width of the transformer core 29, while Figs. 3 and 4 show that in a direction transverse to the plane of the core 29 the width of the cavity is such that the walls 15a and 15b thereof frictionally engage and compress the composite transformer winding, designated generally as W in those figures. The lower edge of the transformer core is engaged by the upper edges of two upstanding walls 16a and 16b carried by the cap-plate 16, whereby the transformer is forced into the cavity 15.

By reason of this construction and arrangement of the transformer in the handle the transformer is not only held in a portion of the machine frame which cannot be used for any other purpose and where it is out of sight and does not add to the size of the tool, but it also rigidly holds the transformer against movement in the casing without the employment of any additional fastening means. Were the transformer not held firmly against movement, vibration of the tool would likely effect relative movement between the casing and the transformer with the result that the insulation eventually would be damaged and the effectiveness of the transformer impaired.

To prevent the possibility of the user being subjected to electrical shocks caused by faulty insulation, or for any other reason, the casing is adapted to be grounded whenever the tool is in use. This is effected by connecting to any suitable portion of the tool, such for example as to the wall 16a of the cap-plate 16 which is in electrical contact with the casing, a ground wire G which extends parallel to the conductors L_1, L_2 and which is adapted to be grounded when those conductors are connected to a source of supply.

While the gear casing 9 and the handle 14 are shown and described as being removably secured to the main casing 1, they are, in effect, a portion of the casing and, if desired, may be formed integrally therewith.

From the foregoing it will be perceived that I have provided, in a portable electric tool adapted to be actuated by a relatively high voltage circuit, a low voltage lighting system in which the electric current for the lighting system is taken from the high voltage circuit through the medium of a miniature transformer located in a cavity in the tool casing where it is entirely hidden from view, where it does not add to the size of the tool and where it is maintained against movement relative to the casing merely by the shape, size and proportions of the transformer and its receiving cavity.

Having thus set forth the nature of the invention what I claim herein is:

1. A portable electric tool comprising a casing having a cavity in its forward end, a tool-spindle journaled lengthwise of said casing, an electric motor located within said casing and operatively connected to rotate said tool-spindle, a relatively high voltage electric circuit connected to said motor, an electric lamp located within said cavity with its longitudinal axis arranged at an angle to the axis of said tool-spindle so as to project its light toward a tool carried by said tool-spindle, a handle connected with said casing and having therein a cavity, a transformer located within the cavity in said handle, and electrical connections between said transformer and said high voltage circuit and between said transformer and said lamp to supply relatively low voltage current to said lamp from said high voltage circuit independently of said motor.

2. In a portable electric tool including a pistol-shaped casing having therein a tool-spindle, a spindle-driving electric motor, a relatively high

voltage electric circuit connected to said motor, and a work illuminating lamp located in the forward end of said casing beneath said spindle and directing its light toward a tool carried by the spindle, the improvement which comprises the provision of a transformer located wholly within a cavity formed in the handle portion of said casing and electrically connected to said high voltage circuit and to said lamp to supply relatively low voltage electric current to said lamp from said high voltage circuit, said transformer frictionally engaging the side walls of said cavity to hold the transformer against movement therein, and a cap-plate secured to the free end of said handle portion and closing said cavity, said cap-plate having laterally spaced upstanding walls engaging the underside of said transformer to hold it in the upper portion of the cavity in said handle.

3. A portable electric tool comprising a casing, a handle projecting from said casing and having therein an open cavity, an electric motor located in said casing, a tool-spindle journaled in said casing and rotated from said motor, a relatively high voltage electric circuit extending into said casing and connected to said motor, an electric lamp carried by said casing and arranged with its axis at an angle to the axis of said tool spindle so as to project its light toward a tool carried by said tool-spindle, a transformer located within said cavity and electrically connected with said high voltage circuit and with said lamp to supply low voltage current to said lamp from said high voltage circuit, and a cap-plate secured to said handle and substantially closing said cavity, said cap-plate having inwardly projecting portions engaging said transformer to force it into said cavity.

DONALD D. WAY.