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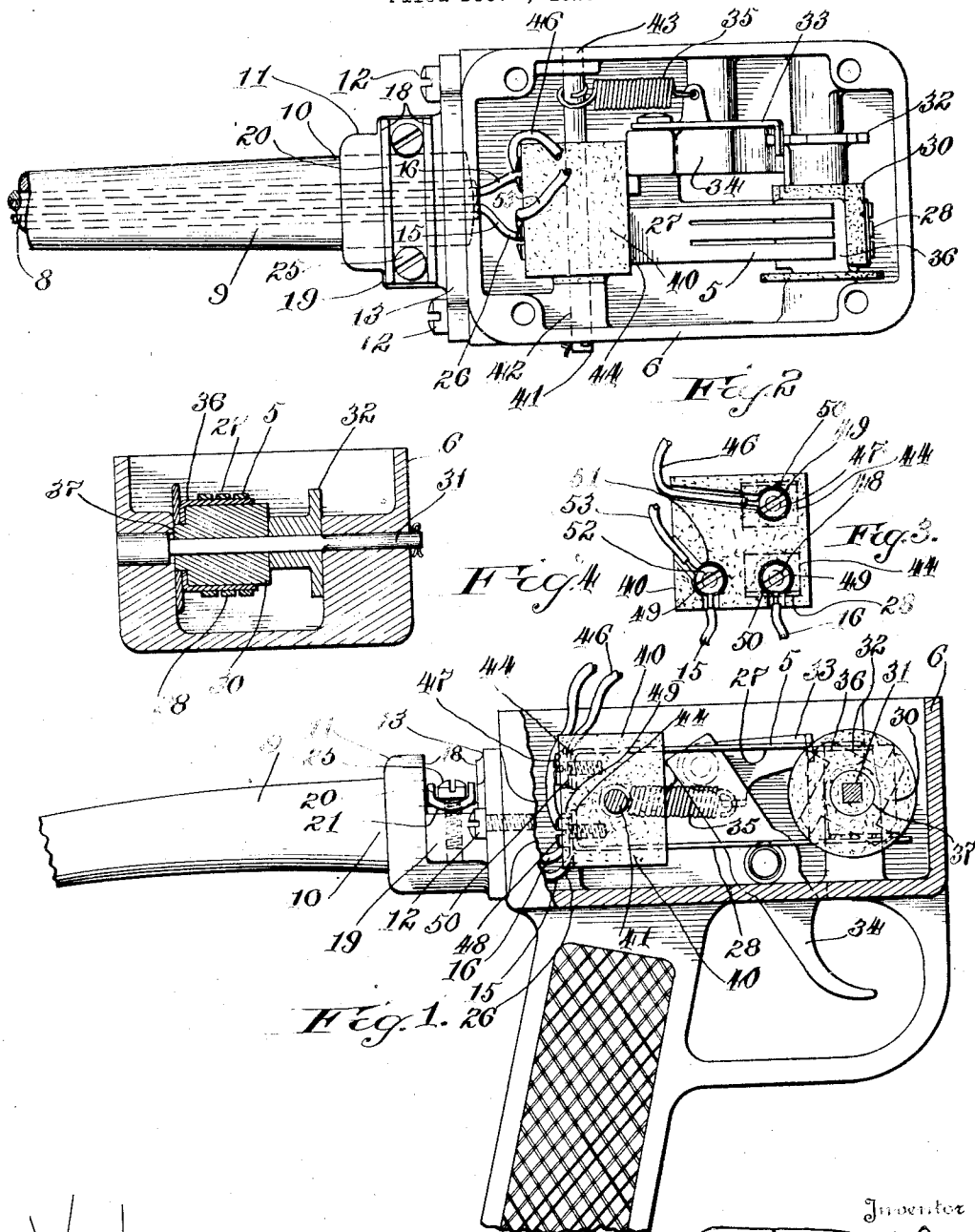
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S. D. BLACK ET AL

ELECTRICAL CONNECTION FOR PORTABLE ELECTRIC TOOLS

Filed Dec. 1, 1923

2 Sheets-Sheet 1



WITNESSES
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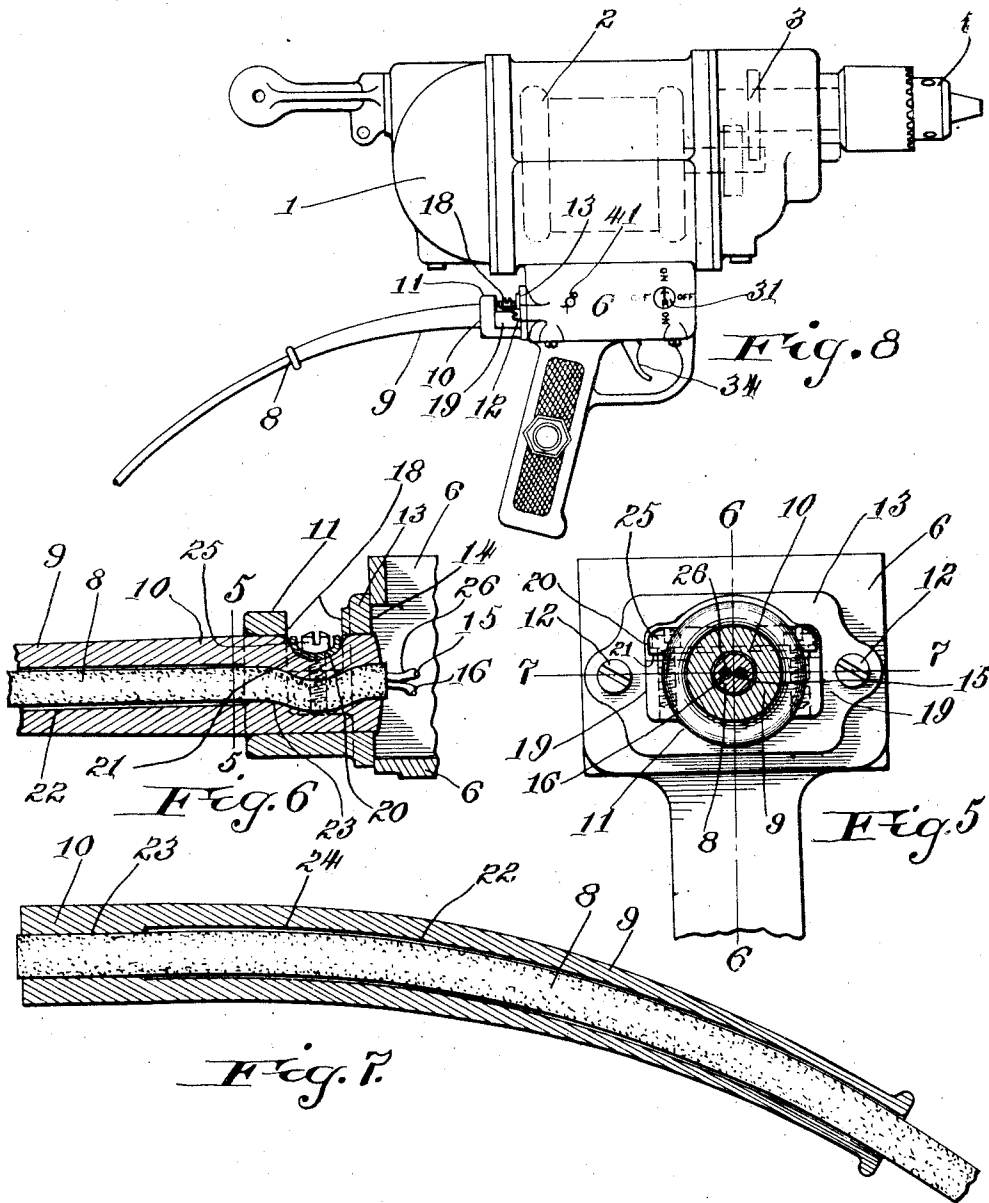
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UNITED STATES PATENT OFFICE.

SAMUEL DUNCAN BLACK AND ALONZO GALLOWAY DECKER, OF BALTIMORE COUNTY, MARYLAND, ASSIGNORS TO THE BLACK & DECKER MANUFACTURING COMPANY, OF TOWSON, MARYLAND, A CORPORATION OF MARYLAND.

ELECTRICAL CONNECTION FOR PORTABLE ELECTRIC TOOLS.

Application filed December 1, 1923. Serial No. 678,028.

In the use of electric tools the difficulties encountered incident to failure of the electrical connections both leading to and within the tool casing or switch box, the switch being sometimes within the casing and sometimes in a separate box secured to the tool casing, often result not only in disabling the tool by rupturing the connections but in some instances cause short circuits which burn fuses and result in other damage, with a more or less temporary cessation of work by the individual workman or by varying numbers of workmen.

Failures of this sort are so annoying and inconvenient, and in many instances happen so early in the period of use of the tool, that a remedy for these difficulties in the nature of a set of connections constituting the tool circuit or a part thereof, which is not subject to immediate failure in this way and which is to be depended upon to give a long period of absolutely satisfactory service, is of great importance from the point of view of salability, having more effect in making the tool attractive commercially than would a corresponding increase of the life of other parts of the tool.

The invention relates to an arrangement of electrical connections for an electric tool whereby the difficulties in operation incident to loose connections, broken connections, short circuits, etc. are greatly reduced and made a remote possibility for a long period after the tool is first placed in service. The device of the invention also possesses advantages as to the ease and convenience of connecting and disconnecting the cord to and from the tool circuit.

In the accompanying drawings we have illustrated an electric tool to which the features of our invention in the preferred form are applied. In the drawings—

Figure 1 is a side elevation of the switch box showing the pistol grip and cord connections, the box being broken away for the purpose of illustrating the portion of the circuit inside the box.

Figure 2 is a plan of the same, the switch box being removed from the tool frame so that the top is open and the parts within exposed.

Figure 3 is a rear elevation of the switch block with the connections; and

Figure 4 is a transverse section through the rotary contact block. 55

Figure 5 is a rear view of the switch casing and a portion of the pistol grip, showing a section through the cord on the line 5, 5 of Figure 6.

Figure 6 is a section on the line 6, 6 of Figure 5, the cord being shown in elevation. 60

Figure 7 is a section longitudinally of the cord on the line 7, 7 of Figure 5.

Figure 8 is an elevation of a complete tool equipped with the features of the invention, the same being on a reduced scale. 65

Referring to the drawings by numerals, each of which is used to indicate the same or similar parts in the different figures, the tool illustrated, which may be an electric drill, screw-driver, or grinder, or the like, comprises a casing 1, enclosing a motor 2 with suitable driving connections 3 for rotating the tool chuck 4, and a switch 5 within the switch-box 6, to which switch-box a cord 8 is suitably connected as hereinafter described, the cord being protected adjacent the switch-box by a tapered tubular protector of flexible material 9 as illustrated in our United States Patent No. 1,574,020. 80

Having more particular reference to the details of the apparatus, the butt or large end 10 of the tapered cord protector 9, which is preferably of flexible rubber or rubber and fabric, is passed through a sleeve or boss 11 which extends outward from the rear of the switch-box 6, being as shown secured thereto by screws 12, which pass through a flange 13 on the sleeve, and are seated in the box walls, the flange 13 covering an aperture 14 in the end of the box through which aperture easy and convenient access may be had to the parts within the neighboring end of the switch-box by removing the member 11. An important feature of the invention resides in the manner of securing the cord protector and cord within the sleeve or boss 12, i. e., in the manner of securing the cord protector and cord to the switchbox or casing in such a way as to take the stresses, due to pulling, jerking and bending the cord, entirely off of the wires 15 and 16 and the connections thereof. 100

To this end the boss 11 is slotted transversely at 18 down to or nearly to the center, and is preferably provided with ears 19 at 105

each side. Fitting this slot we have shown a clamping bar 20. This may to advantage be of channel-shaped cross-section, so that it can be stamped out of sheet metal, and is preferably rounded transversely as to the bottom surface at 21 to prevent injury to the cord or cord protector.

Preferably the cord protector is made with a central aperture 22 fitting closely the outside of the cord for a short distance at 23 near the butt or clamped end of the protector, see Figure 7, and of a larger diameter as at 24 for the remainder of the length of the cord protector beyond said portion 23, so that the cord is relatively free therein, and the butt or large end of the cord protector preferably fits closely within the aperture in the boss.

When the parts are thus arranged the clamping bar 20 may be placed in the slot 18, and the screws 25 being passed through the ends of the bar which are apertured therefor, are seated and turned down in suitably threaded apertures in the ears 19. By tightening the screws, the clamping bar is drawn down to the bottom of the slot or near the bottom of the slot, deflecting the corresponding side of the cord protector and in turn deflecting the cord itself and the more remote portion of the cord protector beneath the cord, the deflection taking place preferably on a transverse line near the center of the boss, the deflection of the cord protector and cord in this way within the boss having a gripping action in addition to the clamping effect due directly to the pressure of the bar and making it impossible to remove or partially remove or displace the cord protector and cord from the position which they occupy when clamped within the boss by any stress which can be applied to them by pulling or jerking the cord. This arrangement makes it impossible or practically impossible, by stresses applied to the cord, to displace or unseat the ends 15 and 16 of the cord wires from the connections to which they are applied within the switch-box. In this way an important difficulty incident to the operation of electric tools is overcome and disposed of.

This structure is also very efficient in preventing twisting of the cord wires within the casing incident to use of the tool, which effect results from the gripping of the cord within the protector and the locking of the protector immovably within the boss. With the arrangement of the parts outlined and described, the clamping bar being turned down tight against the protector, turning of the cord with consequent short circuits due to rupture of the wires and breaking down of the insulation 26, which ordinarily protects them, is practically impossible.

The invention further relates to the manner of connecting the cord wires 15, 16 to the

inside circuit, i. e., to one of the switch plates 27, 28, and to the motor, and to the manner of mounting and insulating the plates, and connecting the other switch plate 27 to the motor circuit, the switch aside from these elements, not being a feature of the invention.

The switch, as shown, consists of a contact block of non-conducting material 30 mounted on a pin or shaft 31, which shaft and block are given a step by step rotation as the circuit is opened and closed at the switch by means of a ratchet 32 on the shaft and a pawl 33 pivotally mounted on a trigger lever 34, the trigger and pawl being normally held in retracted position as shown in Figure 1, by means of a spring 35. The rotary block 30 carries a U-shaped strip of sheet metal 36, which is apertured to pass the hub 37 of the block and overlies two opposite sides of the block 30 which is preferably square, the non-conducting material of the block being exposed on the other two opposite sides.

The switch plates 27 and 28 which are ordinarily of plate spring brass, are placed substantially parallel to each other on each side of the contact block 30 and under a considerable degree of tension, so that they press against the block, giving the effect of a snap switch as the block is rotated by means of the trigger, the circuit being closed when the plates are in contact with the sheet metal 36 and opened when they are in contact with the surfaces of the block. These details of the switch are not regarded as essential to the invention but are described so that the illustration may be easily understood.

The switch plates 27 and 28 are rigidly secured at their opposite ends to and in a block 40 of non-conducting material as hard rubber or the like, which preferably rocks freely, being mounted on a shaft 41 therein, which as shown oscillates in bearings 42, 43 in the sides of the box. The manner of mounting and securing these contact plates 27, 28 in and to the block is of interest. The end portions of plates 27 and 28 being as shown cast or otherwise enclosed within the block 40, the extreme ends 44 being preferably as shown turned at right angles for added security and to provide a convenient point of attachment for the wires. The free ends are spaced apart by substantially the width of the rotary block 30. In accordance with this arrangement the plates are rigidly and permanently secured to the block and are conveniently separated by a considerable volume of the non-conducting material, and are thus completely insulated from each other, the arrangement having advantages over that whereby the plates are secured to each other by screws insulated from the plates by tubular insulation and non-conducting washers. Such manner of attaching the plates is less per-

manent and the insulation in some instances breaks down, permitting consequent short circuits and leakage. The sources of failure as to the connections are further reduced by connecting the wires 16 and 46, which lead to or to and from the switch plates directly to said plates. For this purpose the ends 44 of the plates which are turned at right angles and which have been referred to as enclosed within or covered by the insulating material of the rocking block 40, are provided with threaded apertures to receive screws 47, 48, the insulating material being preferably removed or omitted immediately around the screws, exposing the ends of the plates at the bottom of counter-sinks 49 thus formed, which receive eyes or loops 50 of conducting material formed on or secured to the ends of the wires, thus bringing the wires directly in contact and securing them to the corresponding ends of the switch plates to which they are intended to be connected.

In the arrangement shown the wire 46 connects the switch plate 27 to the motor and the wire 16, one of the wires within the cord is directly connected to the plate 28. The other cord wire 15 is provided with an eye 51 which is connected to the insulating block by a screw 52 seated in the hard rubber and not connected to either switch plate, thus providing a convenient point of attachment for this wire adjacent the point of attachment of the wire 16, and immediately opposite the opening 14 in the switch case or box. The wire 46 has been described as connecting one terminal of the motor to the switch. A wire 53 is connected to the other terminal of the motor and provided at its other end with a loop or eye, and the screw 52 referred to as seated in block 40 is passed through this eye, and the eye 51 on the end of cord wire 15 just referred to, connecting the wires 15 and 53 together and connecting the corresponding terminal of the motor to cord wire 15, making the circuit through the motor complete when the switch is closed. In this way soldering is avoided and both cord wires are easily and quickly connected and discon-

nected for replacement of the cord in case of failure of the cord.

The operation of the device is believed to have been fully disclosed in connection with the preamble and description.

What we claim and desire to secure by Letters Patent is:

1. The combination in a portable electric tool of a casing, a switch therein comprising switch contact members, a flexible electric conductor for connecting the electric device to a source of electricity, the casing being apertured to admit the conductor, means for connecting the conductor to the contact members opposite the opening, so that access to the connections can be had through the opening for the purpose of connecting and releasing the same, and a clamp for the conductor comprising a boss apertured to pass the conductor, the boss having a flange to close the opening and means for securing the flange to the casing whereby it serves as a cover for the opening which is removable to provide access to the connection.

2. The combination in a portable electric tool having a casing, a switch in the casing having terminals, a flexible conductor with means for electrically connecting the same to the end portions of the terminals, an elongated protecting tube covering the conductor in the vicinity of the casing, the casing being apertured directly opposite the switch connection to admit the conductor, connecting means for connecting the conductor to the contact members in the block, the aperture serving to give access to the connecting means to attach and release the conductor and a clamp for the conductor and tube, the same being apertured to admit the tube and conductor, and provided with clamping means to hold the tube and conductor, and means for removably securing the clamping means to the casing covering the opening.

Signed by us at Baltimore, Maryland, this 28th day of November, 1923.

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ALONZO GALLOWAY DECKER.