Oct. 1, 1946. A. A. WRITZMANN 2,408,502

WATERPROOF COMBINED ELECTRIC SWITCH AND PISTOL-GRIP

Filed Sept. 21, 1944

Fig. 1

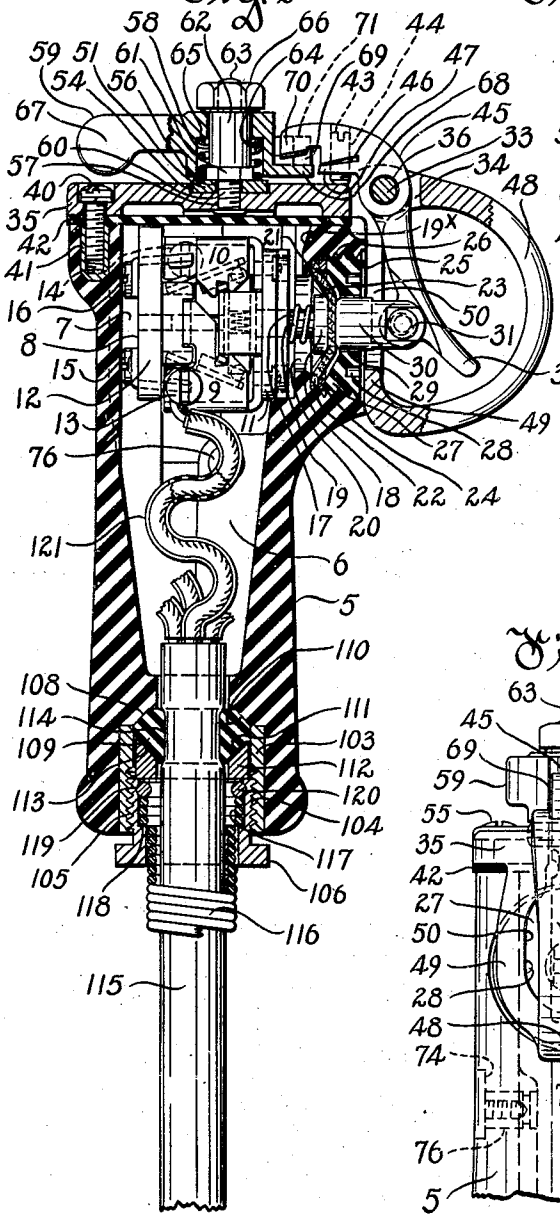


Fig. 2

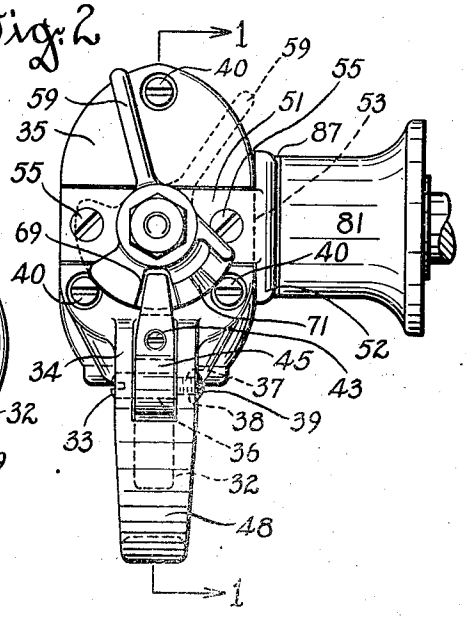
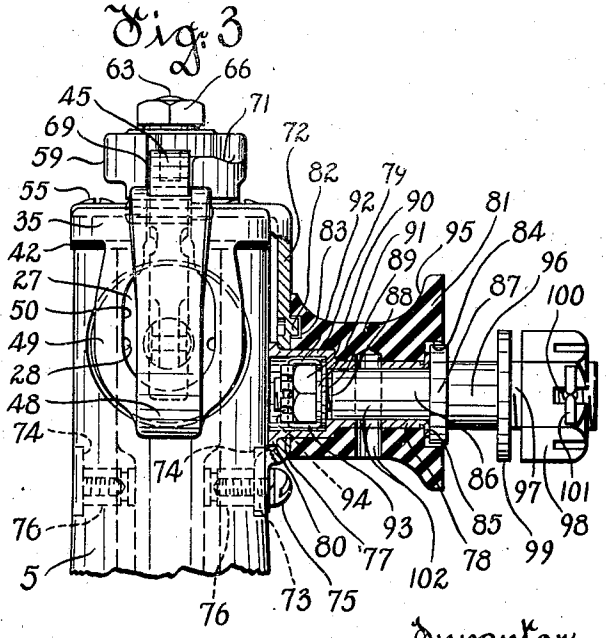


Fig. 3



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Patented Oct. 1, 1946

2,408,502

UNITED STATES PATENT OFFICE

2,408,502

WATERPROOF COMBINED ELECTRIC SWITCH AND PISTOL GRIP

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Application September 21, 1944, Serial No. 555,124

4 Claims. (Cl. 200—157)

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This invention relates to a waterproof combined electric switch and pistol-grip.

A primary object of the invention is to provide a combined electric switch and pistol-grip having novel and simple means for rendering the combination waterproof or water-tight.

Another object is to provide novel means at one end of the pistol-grip to render the same water-tight, and to simultaneously act as a highly efficient strain relief for a water-tight conductor cord to be associated therewith.

Another object is to provide a novel form of one-piece molded insulating pistol-grip to effect attainment of the foregoing objects.

Another object is to provide a novel form of double-pole snap switch for use in the aforementioned combination.

Another object is to provide a pistol-grip so formed as to accommodate the aforementioned double-pole switch, or alternatively to accommodate a known form of single-pole switch of similar contour.

Another object is to provide a combination device of the aforementioned character including a trigger-type operating lever.

Another object is to provide a manually operable latch whereby the trigger lever may be retained at will in circuit completing position.

Another object is to provide novel means for oscillatably supporting the device.

Another object is to provide for omission of the latch and/or supporting means without affecting the other functional or operating characteristics of the device.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawing illustrates an embodiment of the invention which will now be described, it being understood that the embodiment illustrated is susceptible of modification in respect of various structural details thereof within the scope of the appended claims.

In the drawing, Figure 1 is a longitudinal sectional view, on the line 1—1 of Fig. 2, of a waterproof combined electric switch and pistol-grip constructed in accordance with my invention; the switch unit being shown in elevation.

Fig. 2 is a top plan view of the device shown in Fig. 1, and

Fig. 3 is an elevational view of the right nand side of the device shown in Figs. 1 and 2; certain parts for oscillatably supporting the device being shown in section.

The combination device herein illustrated is particularly well adapted for use as a gun firing

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key; but it is obvious that the device is likewise adapted for various ordinary uses, and especially for rough usage out of doors where damage to the switch and other electrical elements must be guarded against.

In the drawing the numeral 5 designates a one-piece molded insulating pistol-grip, the insulating material employed preferably consisting of a phenol formaldehyde condensation product having a relatively large percentage of cord filler material. I prefer to provide said pistol-grip with a dull matt, or non-lustrous, exterior finish to substantially avoid reflection of light. Pistol-grip 5 is provided, by the molding operation, with a passage 6 extending longitudinally therethrough; said passage being enlarged and shaped at the upper end thereof, as indicated at 7, to receive and properly position, in a substantially flush relation to the flat upper end of said pistol-grip, a switch unit of corresponding contour, as shown in general at 8. Switch 8 may be of the single-pole, snap-action type disclosed and claimed in Patent No. 2,326,232, granted August 10, 1943, to A. W. Krieger, for Electric switch (see particularly Figs. 7 and 8 of said patent). However, I have herein illustrated a switch of the contour and general character shown in said Patent No. 2,326,232, but modified to provide a switch of the double-pole type. Thus in Fig. 1 hereof I have shown switch 8 as provided with a two-part metal frame, as indicated by numerals 9 and 10; the frame parts being each independently attached to the pair of insulating base members or blocks 11 and 12 and spaced from each other. Said frame members are respectively provided with wiring terminal screws designated by numerals 13 and 14. Upon engagement of the two contactors of the switch with the respective stationary contacts circuit will be completed between terminal screws 13 and 15 and between terminal screws 14 and 16. It is to be understood that all of the terminal screws are of like form and size and that the frame parts 9 and 10 are of identical form, but oppositely positioned with respect to each other.

Switch 8 has attached to the outer end of its operating plunger 17 an inverted cup-shaped metal cap 18; a coiled compression spring 19 being interposed between insulating block 11 and cap 18 to bias plunger 17 to its outer extreme position to normally effect disengagement of the switch contactors from the stationary contacts. It will thus be apparent that a predetermined degree of temporary depression of plunger 17 is required to provide for insertion of switch 8 into

portion 7 of the through passage 6; a beveled surface 19x (Fig. 1) being provided to facilitate such insertion.

An opening 20 is formed by the molding operation in a wall of the enlarged portion 7 of passage 6, said opening being adapted to accommodate and provide reciprocating clearance for the plunger 17 and cap 18 when switch 8 is fully inserted. Opening 20 is provided with an outwardly facing annular shoulder 21 against which the peripheral annular portion 22 of a flexible, watertight diaphragm 23 is adapted to seat. Overlying the outer surface of portion 22 is a flat metal ring 24. The central portion of diaphragm 23 is preferably initially of frusto-conical form as illustrated, whereby the same is adapted in its normal condition to accommodate cap 18 in its outer extreme position without stretching of said diaphragm. Opening 20 is provided with an enlarged outer cylindrical portion 25 which is provided with a thread 26 for cooperation with the externally threaded molded insulating member 27, the inner end of which engages ring 24 to clamp the periphery of diaphragm 23 in position. Member 27 is provided with a multiplicity of symmetrically and annularly arranged recesses 28 to accommodate the prongs or studs of a known form of wrench for tightening member 27.

Member 27 is also provided with a central circular opening 29 with which the button 18 is adapted to be alined; said opening being adapted to accommodate and guide the cylindrical end portion 30 of a metal member which is pivotally attached by pin 31 (with a predetermined degree of lost motion) to the intermediate portion of a trigger-type lever 32 which is in turn pivotally attached by pin 33 to the perforated extension 34 of a cast metal cover member 35. As best illustrated in Fig. 2 pin 32 is provided with a relatively long portion of relatively large diameter which is freely insertable into an opening in one side of extension 34 and a bearing opening 36 in lever 32, and a reduced and threaded portion 37 which takes into a threaded opening 38 in the other side of extension 34. The large end of pin 32 is kerfed as shown, and the end of threaded portion 37 is staked or upset, as indicated at 39 to retain said pin in assembled position.

Member 35 is attached to the upper end of pistol-grip 5 as by means of three screws 40 (Figs. 1 and 2), the shanks of which take into tapped inserts 41 (Fig. 1) in said pistol-grip. Interposed between cover member 35 and piston-grip 5 is a flat diaphragm 42 formed of rubber, or a rubber-like material such as the synthetic material sold commercially under the trade name of "neoprene;" diaphragm 42 having openings to provide clearance for the shanks of screws 40 and being otherwise imperforate, whereby the upper end of passage 6 is rendered water-tight.

Although the aforementioned diaphragm 23 may likewise be composed of rubber or a rubber-like material, I prefer to form the same of a fine quality of top grain leather which has been subjected to a re-tanning operation, said leather diaphragm being further suitably treated with neat's-foot oil to render the same waterproof or water-tight. In practice the "hair" side of leather diaphragm 23 is faced toward the outer surface of the pistol-grip.

In order to restrain trigger lever 32 against counterclockwise movement from the normal position thereof illustrated in Fig. 1 I prefer to employ a threaded stop pin which is initially adjusted within a tapped opening 44 in an extension 45 of lever 32 so that its lower end just touches the upper surface of cover member 35. A locking effect is provided between pin 43 and extension 45 by first tapping the opening 44, then providing a kerf 46 extending transversely at a predetermined angle through the opening 44, and then bending the lower portion 47 of the extension upwardly as indicated to distort the thread thereof to a predetermined degree. This form of thread lock is well known in the art. After properly adjusting stop pin 43 the upper end of opening 44 is preferably filled with a cement, or a suitable wax of the desired color, to afford a smooth and uninterrupted appearance to the surface of extension 45.

Formed integrally with cover member 35 is a loop-shaped portion 48 which acts as a guard for trigger lever 32. The portion 49 of said loop which overlies insulating member 27 is provided with an opening 50 to afford clearance for pivoted member 30 and for trigger lever 32.

The aforementioned operating parts are adapted for use by either a right-handed or a left-handed operator where the combination device of portable type is desired. When the device is of portable type a metal plate (not shown) but of the same form in cross section and of the same length as the arm 51 of a metal bracket 52 (as indicated by dotted line 53 in Fig. 2) is seated within a transverse channel or groove 54 in the upper surface of cover member 35. Such plate is provided with clearance openings, and cover member 35 is provided with tapped openings (see Fig. 3) for cooperation with the shanks of a pair of securing screws 55, 55; the ends of said screw shanks being lightly staked or upset over the inner surface of cover member 35 to prevent accidental loosening thereof. Such plate will also be provided at the mid-length thereof with an unthreaded clearance opening (corresponding to 56 in Fig. 1) and cover member 30 is provided with a tapped opening 57 to accommodate the shank of a screw (not shown) whose primary purpose is to close said clearance opening.

However, when it is desired to provide for latching of trigger lever 32 in its extreme clockwise position (to latch the switch mechanism in circuit completing position) the last mentioned screw is omitted, and an assembly comprising a special form of shaft or spindle 58 and a latch lever 59 is substituted therefor. Shaft 58 comprises a lower threaded shank portion 60 which takes into the tapped opening 57 in cover member 30 until the lower surface of an integral shoulder 61 of hexagonal cross section (as shown) or other polygonal form abuts against the upper surface of the plate; a suitable wrench being employed to effect threaded engagement of said parts. The lower end of portion 60 is staked or upset over the lower surface of cover member 35 to prevent loosening of the shaft. Shaft 58 is provided with an integral cylindrical portion 62 and a reduced and threaded upper end portion 63. A coiled compression spring 64 is seated upon the upper surface of said plate and surrounds the hexagonal portion 61; the latch lever 59 having a circular opening to provide for telescoping thereof onto portion 62 of the shaft; the upper end of spring 64 being engaged by an annular shoulder 65, whereby lever 59 is biased away from cover member 35. A nut 66 is threaded onto the upper shank 63 of said shaft until the former is driven into engagement with the shoulder formed at the upper end of portion 62, thus compressing the spring 64 to a predetermined degree.

The outer end of shank 63 is staked or upset to prevent accidental loosening of nut 66.

Latch lever 59 is provided at its left-hand end with an enlargement 67 to facilitate operation thereof by a thumb or finger; and the same is provided at its opposite end with an integral arcuate portion 68 which includes a low level notch or recess 69 adapted to accommodate a lug 70, formed integrally with extension 45 of lever 32, in the normal position of the latter. When lever 32 is moved in a clockwise direction to its extreme position, lever 59 may be moved in a clockwise direction to bring the high level notch or surface 71 beneath lug 70, whereby trigger lever 32 will be maintained in a position to provide for engagement of the switch contacts pending counterclockwise movement of lever 59 to the position thereof shown in full lines in Figs. 1 and 2. By thus providing for latching of the switch mechanism in circuit completing position, the control of the associated circuit may be transferred to another station or operator.

When it is desired to support the combination device at a fixed point while providing for oscillatory movement of the device with respect to the support, I prefer to employ the means best illustrated in Fig. 3. Said means comprises a bracket having the aforementioned horizontal arm 51 (over cover member 35) and an integral vertical arm 72; the latter having a perforated, inwardly offset lower end portion 73 which seats within a countersink 74 in one side of pistol-grip 5. A screw 75 penetrates the perforation and takes into a correspondingly tapped recess in a molded-in metal insert 76 the inner end of which is closed, as indicated in Figs. 1 and 3. The bracket 51, 72 is positioned as shown in the drawings to adapt the supported device for use by a right-handed operator; whereas for a left-handed operator the position of bracket 51, 72 will preferably be reversed; the opposite side of pistol-grip 5 having a second countersink 74 and a like metal insert 76 to provide for such reverse mounting of said bracket.

Bracket arm 72 is provided with a circular opening 77 (Fig. 3) to provide for ready outward passage therethrough of a reduced cylindrical portion 78 and a relatively larger cylindrical portion 79 of a metal member, the latter portion having an outwardly extending annular flange 80 which is adapted to abut against the inner surface of arm 72. A separately molded insulating member 81 (Figs. 2 and 3) is adapted for telescoping in the opposite direction over portions 78 and 79 (with a fairly close fit thereagainst) until it engages the outer surface of arm 72; arm 72 having an outwardly extruded boss or stud 82 thereon and member 81 having a recess 83 to rather closely fit said boss, whereby member 81 may be locked against rotation or angular displacement with respect to arm 72. Member 81 is provided at its outer end with a countersink or annular recess 84 within which the still further reduced or thinned outer end of portion 78 is spun or upset, as indicated at 85 in Fig. 3, to rigidly, permanently and immovably secure said parts to arm 72.

A specially formed shaft has a cylindrical portion 86 which is insertable toward the left into, and adapted to serve as a bearing for, the cylindrical portion 78; said shaft having an integral collar 87 adapted to abut against upset portion 85 to limit the degree of inward movement. Said shaft is provided with a reduced and threaded inner end portion 88 which projects into the relatively large cylindrical portion 79, said portion penetrating a washer 89, which seats against the shoulder formed between portions 79 and 78, and being adapted to thread into a castellated nut 90; said nut being drawn tightly enough to prevent substantial endwise displacement of the shaft in either direction. A readily bendable metal member has a washer-like portion 91 interposed between washer 89 and nut 90, said metal member having a pair of relatively long, thin arms 92 and 93 which are bent inwardly toward each other through a pair of alined grooves in the nut and into a kerf 94 formed in the inner end of said threaded portion 88. By the arrangement aforedescribed the combined device is supported for rotation upon the portion 86 of the shaft.

Insulating member 81 is of the shape best illustrated in Fig. 3; the curved peripheral surface 95 acting as a suitable thumb rest when the device is held in an operator's right-hand. Member 81 will correspondingly act as a left-hand thumb rest when bracket 51, 72 is mounted in reverse position, as aforedescribed.

Collar 87 projects axially beyond insulating member 81 to act as an abutment for a perforated panel or similar support; the relatively large diameter portion 96 of the shaft being adapted to penetrate such support, and having a threaded outer end 97 upon which a grooved or castellated clamping nut 98 is adapted to fit. A washer 99 is preferably interposed between nut 98 and the support (not shown). The threaded end 97 is provided with a passage 100 drilled diametrically therethrough; said passage being alined with one pair of diametrically opposed grooves in the nut to provide for insertion and bending of a cotter pin 101 to lock the nut against rotary displacement. In order to facilitate tightening or loosening of nut 98, a passage 102 is provided jointly in member 81, portion 78 of the tubular metal member and in portion 86 of the shaft; the portions of said passage being alined in one or the other of two rotary positions of the shaft, whereby a screwdriver or the like may be inserted to lock the shaft against rotation during such tightening or loosening of nut 98.

The lower end of the pistol-grip 5 is provided with a metal insert 103 which is threaded for a portion of its length as shown at 104 for cooperation with the external thread 105 upon a hexagonal-headed nut 106. The through-passage 6 includes a portion 107 of reduced diameter, below which is an annular flared surface 108. A ring 109 of molded rubber, or other rubber-like elastic material fits loosely within the insert 103 and has opposite ends beveled outwardly toward each other to provide the surfaces 110 and 111. A metal clamping ring 112 is interposed between the nut 105 and member 109, ring 112 having at its inner end a beveled surface 113. Upon inward driving of nut 105 member 109 is compressed and distorted to reduce the size of the opening 114 therethrough, thus affording a watertight clamping connection between the same and a rubber-covered conductor cord 115 extending therethrough. Nut 105 is specially formed internally to accommodate (in a downward direction) a wire-cord guard 116, whose enlarged upper end 117 is adapted to seat against the annular shoulder 118. Adjacent the upper end of nut 105 is an internal peripheral groove 119 to accommodate a split spring ring 120 whereby upward displacement of said cord guard is prevented. The individually insulated wires of the cord are

of sufficient length to provide for attachment of the bared ends thereof to the several terminals of the switch. In practice said individual strands are made substantially longer than absolutely necessary, so that the switch may if necessary be withdrawn from the upper end of the pistol-grip for inspection without loosening the cord clamp. Also in practice the individual wires within the passage are provided with separately formed auxiliary coverings (such as shown at 121) to protect the excess lengths of said wires against abrasion with respect to each other and the walls of the passage 6.

The exterior surfaces of the pistol-grip 5 are provided with suitable roughened surface portions (not shown) to afford a proper hand-grip, and to render the same attractive in appearance. As aforeindicated, however, it is preferred that such surfaces shall have a dull matt finish to minimize reflection of light.

I claim:

1. In a waterproof combined electric switch and pistol-grip, in combination, a one-piece molded insulating pistol-grip having a passage formed therein by the molding operation and extending from end to end thereof, said passage being of relatively large substantially rectangular contour at one end thereof to bodily receive a switch unit of corresponding form in transverse cross section, said end of said passage being also provided with a plurality of grooves to accommodate the circuit wires associated with said switch, an operating plunger forming a part of said switch and spring biased outwardly with respect thereto, said end of said passage being shaped to require inward compression of said plunger against its bias to provide for insertion of said switch, a side wall of said end of the passage having an opening formed therein to accommodate said plunger in the assembled relation of said parts, a flexible waterproof diaphragm peripherally clamped within said opening and overlying the outer end of said plunger, a metal cover member overlying said end of said passage and attached to said pistol-grip, a rubber-like flexible diaphragm interposed between said cover member and said pistol-grip, a trigger-type lever pivotally attached to said cover member, a second plunger pivotally attached to said lever and alined with said first plunger to effect operation of the latter at will against its bias, the other end of said passage being shaped to slidably accommodate the end portion of a conductor cord having a waterproof covering thereon, said cord including a plurality of individually insulated wires for attachment to the switch terminals, a rubber-like elastic ring positioned within said last mentioned end of said passage, a nut having threaded engagement with said end, said nut being adapted to effect axial compression of said ring to effect water-tight engagement of the inner and outer peripheries thereof with the cord and the pistol-grip respectively and to provide an effective strain relief for said cord, said trigger-type lever having an integral extension formed thereon and adapted to overlie said cover member, a manually operable latch lever also pivotally supported by said cover member, said latch lever in one extreme position thereof being adapted to provide for movement of said trigger-type lever at will to either extreme position, and said latch lever in its other extreme position being adapted to retain said trigger-type lever in the extreme position of the latter corresponding to circuit completing positioning of the switch parts.

2. In combination, a one-piece molded insulating pistol-grip having a through passage formed therein by the molding operation, the upper end of said passage being relatively large and shaped to slidably accommodate and properly position a snap switch unit insertable thereinto, said switch unit comprising a frame composed of sheet metal, a pair of molded insulating members rigidly attached to the frame in spaced relationship to each other, a pair of contactors pivotally supported by the frame, a pair of stationary contacts carried by one of said base members into and out of engagement with which the contactors are jointly movable, means for effecting such movement of said contactors, said means comprising a plunger carried by the other insulating member, a coiled compression spring interposed between the last mentioned insulating member and a portion of said plunger to bias said contactors to circuit interrupting position, a side wall of said passage having an opening formed therein by the molding operation to afford reciprocating clearance for said plunger, said plunger extending laterally into said opening in the assembled relationship of said parts, a waterproof flexible diaphragm peripherally clamped against a shoulder formed in said opening and overlying the outer end of said plunger, a metal cover member rigidly but removably attached to said pistol-grip and overlying the aforementioned end of said passage to positively restrain said switch unit against displacement, a flexible waterproof diaphragm interposed between said cover member and said pistol-grip completely overlying said upper end of the passage, a trigger-type lever pivotally supported by said cover member, a plunger pivotally attached to said lever and guided within said opening for alinement with said first mentioned plunger, said second mentioned plunger being engageable with the outer surface of said first mentioned diaphragm, an internally threaded hollow metal insert at the other end of said passage, an annular beveled shoulder forming a part of said passage at the inner end of said insert, a relatively thick ring of elastic, rubber-like material having oppositely beveled ends one of which is adapted to seat against said beveled shoulder, a metal ring the inner end of which is beveled for cooperative engagement with the other end of said rubber-like ring, and an externally threaded adjustable nut adapted for cooperative engagement with said insert to effect axial compression of said rubber-like ring to render waterproof the connection between the latter and the pistol-grip and a waterproofed conductor cord positioned within said passage.

3. In combination, a one-piece molded insulating pistol-grip, said pistol-grip having a recess formed in one end thereof, a switch mechanism slidably insertable into said recess, a metal cover member overlying the outer end of said recess and attached to said pistol-grip to retain said switch mechanism in proper position, a flexible waterproof diaphragm interposed between said cover member and said pistol-grip and completely overlying said outer end of the recess, one side wall of said recess having an opening therethrough, a flexible waterproof diaphragm fixedly positioned within said opening, an operating part of said switch mechanism being spring-biased into engagement with the inner surface of said last mentioned diaphragm, an operating element supported by said cover member, said element having a part alined with said switch operating

part and engageable with the outer surface of said last mentioned diaphragm, a plurality of circuit wires extending from said switch mechanism to the exterior of said pistol-grip, associated clamping means affording a water-tight exit of said circuit wires from said pistol-grip, a metal bracket of inverted L-shape in transverse cross section, one arm of said bracket being removably secured flatwise to the upper surface of said cover member, the other arm of said bracket extending downwardly in substantially parallel relationship to one side of said pistol-grip and having its lower end removably secured to the latter, a tubular metal bearing member rigidly and permanently secured to said last mentioned arm, a bolt having a cylindrical end portion upon which said bearing is adapted to rotatably fit, said bolt and bearing having cooperating shoulders to prevent substantial endwise displacement of the latter with respect to the former, and means associated with the other end portion of said bolt to provide for rigid attachment thereof to a suitable support.

4. In combination, a one-piece molded insulating pistol-grip, said pistol-grip having a recess formed in one end thereof, a switch mechanism slidably insertable into said recess, a metal cover member overlying the outer end of said recess and attached to said pistol-grip to retain said switch mechanism in proper position, a flexible waterproof diaphragm interposed between said cover member and said pistol-grip and completely overlying said outer end of the recess, one side wall of said recess having an opening therethrough, a flexible waterproof diaphragm fixedly

positioned within said opening, an operating part of said switch mechanism being spring-biased into engagement with the inner surface of said last mentioned diaphragm, an operating element supported by said cover member, said element having a part alined with said switch operating part and engageable with the outer surface of said last mentioned diaphragm, a plurality of circuit wires extending from said switch mechanism to the exterior of said pistol-grip, associated clamping means affording a water-tight exit of said circuit wires from said pistol-grip, a metal bracket of inverted L-shape in transverse cross section, one arm of said bracket being removably secured flatwise to the upper surface of said cover member, the other arm of said bracket extending downwardly in substantially parallel relationship to one side of said pistol-grip and having its lower end removably secured to the latter, a tubular metal bearing member rigidly and permanently secured to said last mentioned arm, a bolt having a cylindrical end portion upon which said bearing is adapted to rotatably fit, said bolt and bearing having cooperating shoulders to prevent substantial endwise displacement of the latter with respect to the former, means associated with the other end portion of said bolt to provide for rigid attachment thereof to a suitable support, and means comprising a molded hollow insulating member adapted to freely telescope over said bearing member prior to attachment of the latter to said bracket and forming a part of the attaching means, said insulating member also acting as a thumb rest on said pistol-grip.

ALEX A. WRITZMANN.