FLASHLIGHT HAVING A PUSH BUTTON SWITCH MEANS

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References Cited
UNITED STATES PATENTS
2,984,726 5/1961 Roeser

FOREIGN PATENTS OR APPLICATIONS
3,226,538 12/1965 Bustamante
3,798,440 3/1974 Brindley
966,578 8/1964 United Kingdom

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ABSTRACT
A flashlight employing a push button switch fixedly secured on a mounting bracket disposed within the battery casing with the button member of the switch disposed in an opening in the wall of the battery casing and having a flexible boot member disposed and secured over said opening and said button member.

10 Claims, 14 Drawing Figures
FLASHLIGHT HAVING A PUSH BUTTON SWITCH MEANS

FIELD OF THE INVENTION

This invention relates to a flashlight, such as a waterproof flashlight, and more specifically to a flashlight employing a novel push button switch.

BACKGROUND OF THE INVENTION

Flashlights presently available are generally fabricated with various sliding switches which are activated from the outside of the flashlight casing. These types of flashlights generally require a switch arrangement whereby sliding means disposed on the outside of the casing have to be moved parallel to the axis of the casing to complete the electrical circuit within the flashlight which, in the presence of conventional cells, causes the bulb to light. This type switch arrangement usually can be unintentionally activated while being stored in a rather confined compartment or when the switch member of the flashlight is accidentally bumped against an object.

Another type of flashlight is of the waterproof type which utilizes a watertight flexible rubber member over a slideable switch disposed in a water-tight casing. Repeated use of the slideable switch subjects the rubber member to friction wear and possible damage to its water-tight characteristics.

Waterproof type flashlights have also been fabricated with part of a conductive metal switch embedded in the wall of an enclosed casing made of synthetic resin or the like. A second part of the metal switch is exposed on the outside wall of the casing and is coupled to an operating member which controls said exposed switch for activating the flashlight to the "on" and "off" position. The disadvantage with this type flashlight is that the water-tightness of the casing is subject to damage owing to the corrosion of the conductive metal on the switch segment positioned on the outside of the casing. In addition, the operating parts of the switch are rather difficult and expensive to fabricate.

Another type of waterproof flashlight presently available is fabricated with magnetically-operated switches which are activated from the outside of the flashlight casing. This type of waterproof flashlight generally requires a dual type switch arrangement whereby a first switch operating member is disposed outside the water-tight casing which upon being moved will activate a second switch operating member disposed inside said casing. Damage to the outside mounted switch will render the inside switch ineffective to control the operation of the lamp.

In my U.S. Pat. No. 3,798,440, a switching module is disclosed which utilizes a push button switch and which is adapted for coupling between various size and shape battery casings and lens and reflector units.

One of the principal objects of this invention is to provide a flashlight with a novel push button switching component.

Another object is to provide a push button switch for waterproof flashlights that can be repeatedly operated without losing its water-tight features. It is another object to provide various type and size battery casings and lens housings utilizing a push button switch.

It is another object to provide floatable waterproof flashlights which utilize a push button switch. It is another object to provide a flashlight with a push button switch that is easy to operate and has an attractive appearance.

Another object is to provide a push button switch for flashlights wherein the push button switch is fixedly disposed within the casing of the flashlight.

These and other objects are accomplished by a push button switch adapted for mounting within a battery casing and operable in conjunction with other normal components of a flashlight for intermittently completing and interrupting the electrical circuit between the battery casing and the lens housings.

One embodiment of this invention is a flashlight comprising a lens and reflector unit having a front open end adapted to be detachably mounted to a battery casing and having a lens, a lens ring, a lamp holder adapted for accommodating a lamp and containing a first contact means therein; a battery casing provided with a first open end adapted to receive battery means and adapted to be detachably mounted to an end cap for securing said battery means therein, a second open end at the opposite end thereof adapted to be detachably mounted to the front open end of the lens and reflector unit, and wherein second contact means are provided for electrically connecting the interior vicinity of the end cap to said first contact means; a push button switch fixedly secured on a mounting bracket disposed within the second open end of the battery casing with the battery member of the switch disposed within an opening in the wall of the battery casing at the vicinity of the second open end and having a flexible boot member disposed and secured over said opening so that upon being depressed, the boot will in turn depress the button member of the switch; and third contact means adapted through activation of the push button switch in the presence of a lamp bulb and battery means assembled in the flashlight to complete or interrupt the continuity of an electrical circuit between the lamp bulb and the battery means.

The button member of the switch is preferably recessed slightly below the wall defining the opening in the battery casing or substantially flash mounted with said wall of the battery casing.

As used herein, the second contact means used to connect the interior vicinity of the end cap; i.e., the vicinity within the end cap occupied by a conductive member, such as a coil spring, that contacts one pole of the battery disposed at the lower end of the battery casing, can comprise one or more conductive strips or the battery casing, when such is conductive, with or without additional contact strips. The primary function of the second contact means is to provide a conductive path from one pole of a battery to the first contact means contained in the lens and reflector unit. It is also within the scope of this invention to have the switch function as a contact element in connecting the pole of the battery disposed at the lower end of the battery casing to the first contact means in the lens and reflector unit. This arrangement is disclosed in my U.S. Pat. No. 3,798,440.

As used herein, battery means shall mean one or more cells with the specific number and size being governed by the size and shape of the battery casing. The more conventional size battery casing usually accommodates two D-size or C-size cells.

In one specific embodiment of this invention, the battery casing can be of the usual metallic tubular type in
which the casing itself provides the electrical path from the vicinity of the end cap to the vicinity of the open end adapted to be detachably mounted to the lens and reflector unit. In another specific embodiment where the battery casing is made of a nonconductive material, then a conductive strip has to be employed to electrically connect the interior of the end cap to the vicinity of the open end of the battery casing adapted to be detachably mounted to the lens and reflector unit. In both embodiments, it is preferable to have a coil spring secured to the interior of the end cap so as to provide sufficient pressure on the battery means within the casing to insure good electrical contact between the battery means and the switch contact means therein. The coil spring also electrically connects one pole of the battery to either a conductive battery casing or to a conductive strip depending upon the material used for the battery casing.

When the battery casing is made of conductive material, then this embodiment of the flashlight could comprise a metallic tubular battery casing closed at its lower or first open end by means of an end cap of similar material which could be threadably engaged to said first open end while the upper or second open end at the opposite end thereof could be threadably mounted to a lens and reflector unit. The end cap would preferably contain a coil spring to constantly supply pressure on the battery or batteries within the casing to maintain or urge said battery or batteries toward the upper or second open end of the casing where a push button switch fixedly secured on a mounting bracket would be disposed. A suitably shaped contact strip would be employed to connect the battery casing to the contact shell of the lens and reflector unit which in turn would be electrically connected to, or adapted to be connected to, a lamp bulb mounted in said lens and reflector unit. The battery casing of the flashlight would be electrically connected to one pole of the battery adjacent the end cap via the coil spring. The push button switch, which is secured on a mounting bracket within the battery casing with its button member disposed in an opening in the wall of the battery casing, would provide the contact means adaptable for electrically connecting the opposite pole of the battery (center terminal), or the center terminal of the battery closest to the push button switch when more than one battery is employed, to the center terminal of the lamp bulb thereby completing the electrical circuit for the flashlight when the switch is activated to the "on" position. Thus by depressing the button member of the switch, the electrical contact between the center terminal of the battery and the lamp bulb would be completed or interrupted depending upon the state of the electrical connection prior to the button being depressed.

In another embodiment of this invention, the battery casing could be made of a nonconductive material whereupon a conductive strip would have to be employed to electrically connect the coil spring disposed at the end cap to the contact shell member in the lens and reflector unit. In both of the above embodiments, a flexible boot would be secured over the opening in the battery casing where the button member of the switch is disposed. In the flashlight embodiment utilizing the nonconductive battery casing, the flashlight could be made waterproof by water-tightly securing the flexible boot to the opening in the battery casing and by employing suitable O-ring seals at each threaded area, i.e., between the lens and reflector unit and the upper end of battery casing and between the lower end of the battery casing and end cap. By selecting a suitable floatable material for the casing of the flashlight, an excellent waterproof, floatable flashlight can be produced which will have the capability of being repeatedly operated without losing its water-tight features. The novel push button switch arrangement of this invention can be used with various size and shape battery casings which could be coupled to various size and shape lens and reflector units to produce flashlights for all purposes.

In the drawings:
FIG. 1 is a side view of a flashlight embodying this invention;
FIG. 2 is a vertical sectional view of the flashlight of FIG. 1;
FIG. 3 is a partial top sectional view of the flashlight of FIG. 1;
FIG. 4 is an enlarged isometric view of a push button switch fixedly secured on a mounting bracket;
FIG. 5 is a top view of a mounting bracket in the open position;
FIG. 6 is a partial side sectional view of FIG. 5 taken along lines 6—6;
FIG. 7 is a sectional view of a mounting bracket in the closed position taken along the longitudinal axis;
FIG. 8 is a side view of a flexible boot for use over the button member of the switch shown in FIG. 2;
FIG. 9 is a side view of a lock ring used to secure the boot of FIG. 8 and the mounting bracket of FIGS. 4 to 7 to the battery casing of the flashlight shown in FIG. 2;
FIG. 10 is a side view of an accent ring used to form a tight fit between the boot of FIG. 8 and the lock ring of FIG. 9;
FIG. 11 is an isometric view of a flashlight embodying the invention;
FIG. 12 is a vertical sectional view of the flashlight of FIG. 11;
FIG. 13 is a partial top sectional view of the flashlight of FIG. 11;
FIG. 14 is an isometric view of a mounting bracket for use in the flashlight of FIG. 11.

Referring to FIGS. 1, 2 and 3, there is shown a flashlight 1 having a battery casing 2, an end cap 3, and a lens and reflector unit 4. The battery casing 2 is of the usual metallic tubular type of thin gauge metal such as chrome plated steel, aluminum, brass or copper coated steel or other similarly conductive material, preferably a metal capable of being finished to a high polished state. Battery casing 2 is closed at its lower end by means of end cap 3 which is threadably engaged to the lower end of casing 2. End cap 3 contains a coil spring 84 which electrically connects casing 2 with one pole of battery 5 while simultaneously exerting pressure on batteries 5 and 6 to maintain good electrical contact to conductive strip 72 of push button switch 8. The upper open end portion of casing 2 terminates with a threaded segment 9 designed to engage threaded segment 10 of the lens and reflector unit 4. Disposed in the side wall of casing 2 at the vicinity of the upper open end is a circular opening 50.

Lens and reflector unit 4 comprises lens 11, lens ring 12, reflector 13, contact shell 14, bulb holder 15 and lamp 16. Reflector 13 is of the conventional type comprising a molded reflector body composed of a non-
conducting material, such as plastic, for instance, polystyrene, and having substantially corresponding concave-convex sides, the concave side of which is provided with a metallic reflectory coating 17 such as aluminum applied by conventional vacuum-metallizing techniques or the like, and a central apertured cylindrical neck not shown. The contact shell 14, composed of an electrically conducting material, is preferably of frustoconical shape with a tubular socket axially formed therein. The tubular socket, as generally disclosed in U.S. Pat. No. 3,798,440, is generally secured within the apertured neck of reflector 13 and has a flanged end which interlocks with an annular flange which is integrally molded to the opening of the apertured neck of the reflector. The frusto-conical portion of contact shell 14 forms an annular shaped skirt 18 which projects radially outwardly from and out of contact with reflector 13. The flanged end of the tubular socket within reflector 13 also provides a seat against which is mounted the flanged neck of lamp bulb 16 which is of the conventional type having a cylindrical base 19 including a button type terminal 20.

Lens ring 12 is preferably made of the same material as casing 2 as to give an overall streamline appearance. It is also within the scope of this invention to have the lens ring 12 made of a different material than that of casing 2. End cap 3 is preferably made of the same material as casing 2 but if a different material is desired, then said material has to be conductive so as to provide a complete electrical path for the flashlght.

Bulb holder 15 is tubular shaped and is composed of a resilient material, preferably a molded plastic, such as polyethylene. Bulb holder 15 is securely mounted within the tubular socket of reflector 13 by conventional means as also disclosed in U.S. Pat. No. 3,798,440. To remove holder 15 to replace lamp 16, the holder 15 is simply pulled outwardly from the tubular socket to detach its forward end. Once the lamp is replaced, it is simply pushed back into the socket. The assembled unit containing reflector 13, contact shell 14, bulb holder 15 and lamp 16 is held securely within the lens and lens ring assembly by friction fit between the reflector rib periphery and a bead within the lens ring 12. After assembly, the forward opening of the battery casing entraps the reflector between its forward thread and the lens.

As shown in FIGS. 4 to 7, a push button switch bracket 22 comprises an overall flat sided (24,26) substantially tubular configuration which is pivotable about the midpoint 28 of one of the side walls 26. In the open position, as shown in FIGS. 5 and 6, a flat base 30 is disposed in one half of the tubular bracket with an inwardly projecting annular wall 32 disposed in the other half of the tubular bracket. Inwardly projecting annular member 32 defines an opening 34 through which the bottom member 36 of switch 8 is inserted while the base 38 of switch 8 seats on base 30 of the mounting bracket 22 as shown in FIG. 2. Disposed on opposite sides of opening 34 are semi-circular projection members 40 which help maintain the base 38 of switch 8 in proper alignment when switch 8 is placed in the mounting bracket 22. The flat surfaces 42 are aligned such that they are parallel with the longitudinal side walls of base 38 when switch 8 is positioned on mounting bracket 22. Disposed at each end of the longitudinal outer extremities of mounting bracket 22 at the upper vicinity of the annular member 32 are grooves or openings 44 whose function will be described below. A longitudinal groove 46 is disposed at the center of the outer lower half of the bracket to accommodate a contract strip as will be described below.

Mounting bracket 22 can be molded in one piece as shown in FIGS. 5 to 7 using a suitable plastic material such as polystyrene, polyethylene, polypropylene, copolymers of acrylonitrile, butadiene, or styrene or any other suitable material capable of securing switch 8 within battery casing 2.

A conventional type push button switch 8 can be positioned in bracket 22 by inserting the button member 36 through opening 34 whereupon the top surface of the base 38 will rest on the flange 48 of annular wall 32 and be aligned between members 40 as shown in FIG. 2. Thereupon both halves of bracket 22 can be pivoted together so that the bottom surface of base 38 of switch 8 will rest on base 30 of the bracket. The switch and bracket assembly along with a conductive strip 68 placed in recess 46 can then be inserted into the upper end of battery casing 2 and positioned such that the button 36 of switch 8 is centered within opening 50 of the side wall of casing 2. A flexible boot 52, as shown in FIG. 8 and made of rubber, a low density polyolefin or the like, is assembled above switch 8 in opening 50 of casing 2 whereupon the lower flange 60 seats upon surface 62 of bracket 22. A rigid circular type lock ring 54, having a flange 66 extending from the top end thereof and two narrow flexible projecting tabs 64 extending from the lower end thereof, is assembled over boot 52 and pressed onto mounting bracket 22 such that the projecting tabs 64 will first be flexed inwardly until they are aligned with openings 44 in bracket 22 whereupon they will then spring out and into said openings 44. This will secure both the bracket 22 and boot 52 to casing 2. To further secure the boot 52 to lock ring 54, an accent ring 56, as shown in FIG. 10, can be forced fit between said boot 52 and lock ring 54 as shown in FIG. 2.

Lock ring 54 and accent ring 56 can be made of a material similar to the material used to make bracket 22 or some other rigid metallic-like material. However, the projecting tabs 64 on lock ring 54 have to be flexible for the reason advanced above.

As shown in FIGS. 2 to 4, with the batteries 5 and 6 in place and both the end cap 3 and lens and reflector unit 4 threadably secured to casing 2, the flashlight is fully assembled and ready for operation. As shown in the drawings, one pole of battery 5 is electrically connected to coil spring 84 which in turn is electrically connected to shell 14 via conductive casing 2 and conductive strip 68. Push button switch 8 has two contact strips 70 and 72 as shown in FIGS. 2 to 4 with contact strip 70 aligned and in contact with the lamp terminal 20 while contact strip 72 is aligned and in contact with the center terminal 74 of battery 6. Thus the activation of switch 8 will internally couple or uncouple contact strips 72 and 70, thereby electrically connecting or disconnecting, respectively, the battery terminal to the lamp terminal which will effect complete or intermittent, respectively, the electrical circuit of the flashlight.

FIGS. 11 to 14 show another embodiment of this invention in a flashlight 99 having a nonconductive casing and commonly referred to as an industrial flashlight. Lens and reflector unit 100 comprises a lens ring 101, lens 102, reflector 103, contact shell 104, lamp 105 and lamp holder 106. The components are similar.
to those shown in FIGS. 2 and 3 except that the lens ring 101 has a different shape and is made of a nonconductive material such as polyolefin, polyethylene, polypropylene, copolymers of acrylonitrile, butadiene or styrene, or any other suitable nonconductive material. Lens ring 101 has a threaded segment 107 for engaging with threaded segment 108 of battery casing 109. Lens 102 can be made of a clear plastic material similar to that of lens ring 101 although lens ring 101 will preferably have various color pigments added to give it an attractive appearance. Lens 102 can be secured watertight to lens ring 101 by embedding the peripheral edge of lens 102 in a groove (not shown) in the lens ring as described in U.S. Pat. No. 3,798,440. It is also possible to provide a one-piece lens and lens ring by molding the lens and lens ring in one operation. Preferably, the lens could be molded first of a transparent synthetic resin or the like, followed by a second molding operation whereby the lens ring could be molded onto said lens using a translucent or opaque synthetic resin material as described above. This dual molding operation could be easily accomplished by first molding the transparent lens and then placing the lens within the mold of the lens ring followed thereafter by injecting the material for the lens ring among the lens.

Battery casing 109, having circular ridges or grooves 144, is made of a nonconductive material, as described above, and has a closed lower end by means of end cap 110 which is threadably engaged to the lower end of the casing at 111. The end cap 110 contains an electrically conductive coil spring 112 secured to its inner wall. An electrically conductive L-shaped strip 113 is secured to spring 112 at one end and the other end extends longitudinally such that when end cap 110 is screwed onto the battery casing 109, said strip 113 will electrically contact a conductive annular ring 114 disposed at the internal lower end of battery casing 109.

The upper end of battery casing 109 has an opening 137 disposed in its side wall to expose button 115 of push button switch 116 which is mounted on bracket 117. As shown in FIG. 14, bracket 117 comprises a substantially circular flat wall 118 having an opening 130 therein and a support member 119 extending perpendicularly therefrom in one direction while in the opposite direction the wall 118 circumferentially terminates with an extending substantially annular wall 120. Support 119 has an opening 121 disposed therein and annular wall 120 has a flat segment 122 so as to provide an opening or space between wall 120 and the internal wall 123 of casing 109. The outside diameter wall 120 is slightly smaller at a segment of its leading edge 124 so as to provide an arc surface 125 therein which can seat against molded flange or projecting rim 126 on the internal surface of casing 109. A second molded flange or projecting rim 127 is disposed downward of flange 126 on the internal surface of casing 109 and is provided to butt the opposite edge 128 of wall 120. Thus, bracket 117 can be first properly aligned within casing 109, i.e., proper alignment of surface 125 with flange 127, and then bracket 117 can be forced into casing 109 until it is fixedly secured between flanges 126 and 127.

Push button switch 116 is fixedly mounted to support 117 by placing its button member 115 through opening 121 and then securing it in place by screwing nut 143 onto the threaded portion 129 of switch 116. The switch is shown in FIG. 12 with a first contact strip 131 projecting through opening 130 in bracket 117 and positioned so as to be aligned and in contact with the center terminal 142 of battery 132. A second contact strip 133 is shown projecting in the opposite direction and positioned so as to be aligned and in contact with the lamp terminal 134. Thus the activation of switch 116 will internally couple or un Couple contact strips 131 and 133 thereby electrically connecting or disconnecting, respectively, battery terminal 142 to lamp terminal 134, respectively. A longitudinal contact strip 155 extends from annular ring 114 through the opening formed between wall 122 of bracket 117 and wall 123 of casing 109 to electrically contact shell 104 of the lens and reflector unit 100. This completes the electrical circuit between batteries 132 and 135 to lamp 105. Thus when the switch 116 is activated to the "on" position and batteries 132 and 135 are assembled in the battery casing 109 with lens and reflector unit 100 coupled to the upper end thereof, a flashlight will be produced having a complete electric circuit for operating the lamp.

A flexible switch boot 136, made of rubber, a low density polyolefin, or the like, is assembled above switch 116 in opening 137 of battery casing 109. A rigid gasket 138 of ABS copolymers or some other rigid metallic-like material provides a seal between boot 136 and opening 137 while simultaneously securing boot 136 in a molded recess or groove 139 in casing 109. This boot and gasket arrangement provides a watertight assembly for switch 116 while also providing the flexibility necessary for activating said switch 116. Thus by depressing flexible boot 136, button 115 of switch 116 can be lowered thereby effectively operating said switch 116.

To insure a water-tight seal at the threaded engagement areas between one end of casing 109 and the lens and reflector unit 100, and between the opposite end of casing 109 and the end cap 110, gaskets or O-rings 140 and 141, respectively, are added. The gaskets or O-rings could be made of rubber, a low density polyolefin, or the like, as long as such gaskets are water resistant so as to provide a water-tight seal for the threaded areas. The overall assembled flashlight shown in FIGS. 11 to 13, if made of a floatable material, will be water-tight, floatable, and capable of being repeatedly operated without losing its water-tightness.

Preferably, longitudinal ribs could be disposed on the interior of the battery casing to more accurately center the batteries within said casing.

In some applications, the gaskets at the threaded areas of the flashlight may not be necessary, and the gasket for the switch boot may be dispensed with if the boot is fabricated with a peripheral rim having sufficient thickness so that it can be fixedly secured into the molded recess at the circumference of the opening in the wall of the module casing.

A flashlight constructed in the manner described above would be admirably suited for use in all applications requiring a sturdy, durable lightweight flashlight. Although this invention has been described with reference to many specific details thereof, it is apparent that the invention is not limited to such details.

What is claimed is:

1. A flashlight comprising a lens and reflector unit having a front open end adapted to be detachably mounted to a battery casing and having a lens, a lamp ring, a lamp holder adapted for accommodating a lamp
and containing a first contact means therein; a battery casing provided with a first open end adapted to receive battery means and adapted to be detachably mounted to an end cap for securing said battery means therein, a second open end at the opposite end thereof adapted to be detachably mounted to the front open end of the lens and reflector unit, and wherein second contact means are provided for electrically connecting the interior vicinity of the end cap to said first contact means; a push button switch fixedly secured on a mounting bracket disposed within the second open end of the battery casing with the button member of the switch disposed within an opening in the wall of the battery casing at the vicinity of the second open end thereof and having a flexible boot member disposed and secured over said opening so that upon being depressed, the boot will in turn depress the button member of the switch; and third contact means adapted through activation of the push button switch in the presence of a lamp bulb and battery means assembled in the flashlight to complete or interrupt the continuity of an electrical circuit between the lamp bulb and the battery means.

2. The flashlight of claim 1 wherein the first open end of the battery casing is threadably secured to the end cap and wherein the second open end is threadably secured to the lens and reflector unit.

3. The flashlight of claim 1 wherein the battery casing is made of a conductive material.

4. The flashlight of claim 3 wherein the battery casing, end cap and lens ring are made of the same material.

5. The flashlight of claim 3 wherein a lock ring secures the mounting bracket within the battery casing and secures the flexible boot to the opening in the side wall of said battery casing.

6. The flashlight of claim 5 wherein an accent ring is disposed between the flexible boot and the lock ring.

7. The flashlight of claim 1 wherein the battery casing is made of a nonconductive material and wherein said battery casing has an electrical contact strip extending from its first open end to its second open end.

8. The flashlight of claim 7 wherein the battery casing, end cap and lens ring are made of the same material.

9. The flashlight of claim 7 wherein a gasket is added between the flexible boot and the opening in the wall of the battery casing so as to provide a water-tight seal thereat.

10. The flashlight of claim 9 wherein a gasket is added between the first open end of the battery casing and the end cap and between the second open end and the lens and reflector unit so as to provide a water-tight seal at these detachable joints.