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T. A. SEEGRIST

2,681,982

FLASHLIGHT

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Fig. 1.

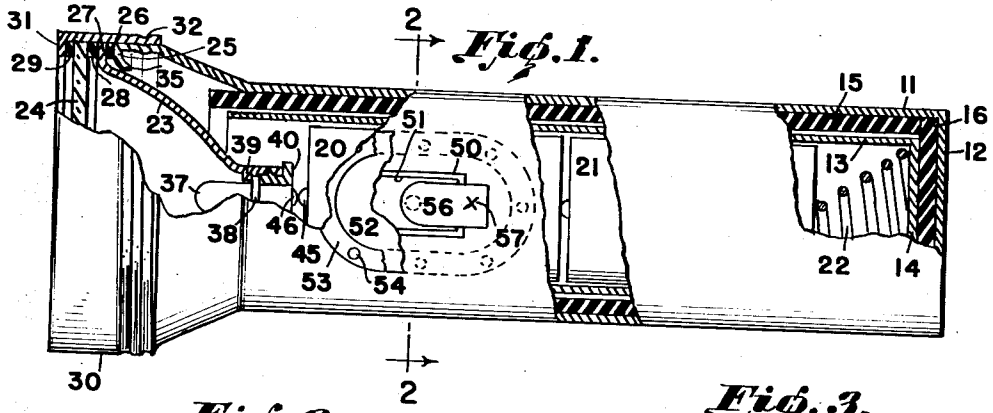


Fig. 2.

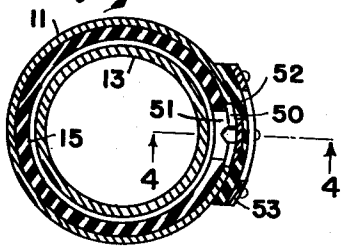


Fig. 3.

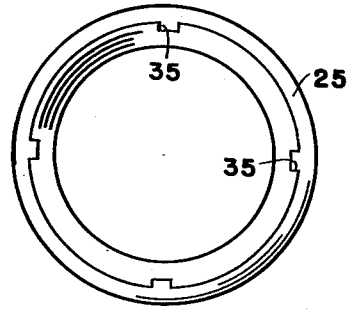


Fig. 4.

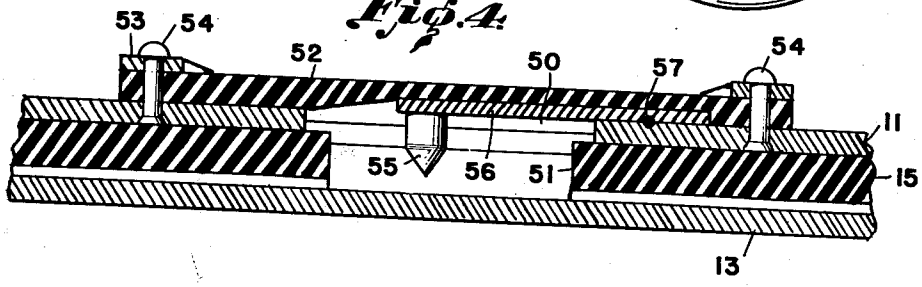
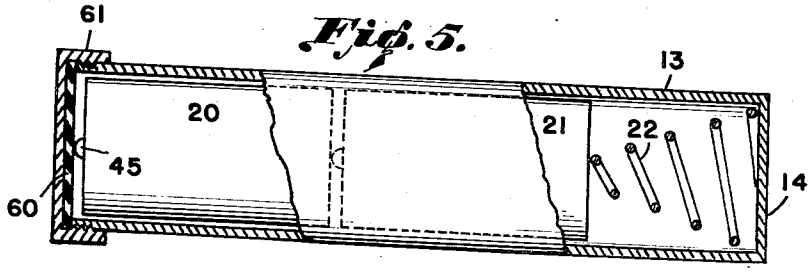


Fig. 5.



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UNITED STATES PATENT OFFICE

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FLASHLIGHT

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Application January 13, 1950, Serial No. 138,479

7 Claims. (Cl. 240—10.68)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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The invention herewith described may be manufactured and used by or for the Government of the United States of America for governmental purposes throughout the world, without the payment to me of any royalty thereon.

This invention relates to a flashlight and has among its objects the provision of a battery-powered light that has low battery leakage losses, is effectively waterproof, is easily serviced in case of internal corrosion and freezing of a dead battery therewithin, and provides an effective manner for merchandizing new batteries and replacement parts.

In general, according to the invention, the flashlight has an outer casing of electrical conducting material, preferably cylindrical and closed at one end and open at the other for removing parts like the lens, reflector and light bulb. The battery is mounted in a retainer, preferably in form of a tubular housing of electrical conducting material, supported in the casing, the retainer being normally insulated from the casing such as by tubular insulation between it and the casing. Means is provided for so mounting the light bulb that one of its terminals makes continuous electrical connection with the casing. Means, preferably a spring of conducting material in one end of the housing, is provided, for making continuous electrical connection between one of the terminals of the battery and the retainer or housing, and means is further provided for making continuous electrical connection between the other terminal of the battery and the other terminal of the light bulb. To complete the circuit through the filament of the light bulb, it is merely necessary to make connection between the retainer and casing. A manually operated switch carried by the casing is provided for this purpose.

Such construction provides effective insulation against surface leakage battery drains.

For waterproofing purposes the casing is sealed against ingress of moisture as by properly sealingly, mounting such parts as the lens and reflector in the casing opening, and proper design of the switch. Preferably the switch has a movable contact in the casing and in electrical connection therewith, and is operated by manual movement of a flexible section of the casing wall to make connection with the battery retainer, the flexible section being sealed to the casing.

The retainer for the battery is preferably a housing easily removable from and replaceable in the casing, so that if a dead battery becomes frozen therein or it becomes corroded, it may

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be easily and economically replaced. Also, the housing is preferably the package in which a new battery is merchandized, it being sealed during merchandizing to protect the live battery from moisture and assure the customer receiving a good battery. Thus to replace the battery, the old housing and dead battery may be discarded and the new battery and its housing installed, thus effecting replacement of the probably damaged parts as well as supplying a properly live or fresh battery.

For a description of the invention in detail, reference is made to the accompanying drawing, in which

Figure 1 is a side view of a flashlight embodying the improvements with parts broken away for purposes of illustration;

Figure 2 is a section on line 2—2 of Figure 1;

Figure 3 is a front end view of the outer casing of the flashlight;

Figure 4 is a section on line 4—4 of Figure 2; and

Figure 5 is a side view of the battery housing in operative condition for merchandizing purposes, parts being broken away.

The cylindrical outer casing 11 of the flashlight is formed of electrical conducting material, preferably metal such as brass or aluminum, one end thereof being closed as by an integral end wall 12, thus to seal the casing at this end against ingress of moisture. A battery retainer in the form of a cylindrical battery housing 13 is also formed of electrical conducting material and has one end wall thereof closed by an integral end wall 14. The housing is adapted readily to be inserted within the outer casing as a replacement part and is of such length that the battery in operative position is entirely contained within the housing. In use the housing is supported within the casing and normally insulated therefrom by tubular insulation 15 fitted inside the casing, the housing fitting loosely within the tubular insulation. Insulation 16 covers the end wall 14, and the closed end of the battery housing is located adjacent this insulation, the other end of the housing being open.

The battery retained within the housing is shown in the construction illustrated as two separate dry cells 20 and 21 of conventional design. Means for making continuous electrical connection between one terminal (the usual dry cell outer casing terminal) of the battery and the battery housing is provided by a usual type spring 22 of conducting material located in the closed

end of the housing and biased to urge the battery toward the open end.

The outer casing 11 is provided with an opening (an open end) opposite the closed end for receiving a light reflector 23 of electrical conducting material, such as metal, and a lens 24, mounted in the opening and sealed with the casing to prevent ingress of moisture. To accomplish this, the casing is provided with an integral inwardly extending annular ledge 25 on which an annular gasket 26 is seated, the reflector is provided with an outwardly extending annular lip 27 seated on the gasket 26, an annular gasket 28 is seated on lip 27, lens 24 is seated on gasket 28, an annular gasket 29 is seated on the lens, and a retaining ring 30 has an inwardly extending annular ledge 31 seated on gasket 29 and is screw threaded onto the casing as at 32, thus to seal the parts against ingress of moisture.

The reflector makes continuous electrical connection with the outer casing, this being accomplished by an inwardly extending tab or tabs 35 integral with ledge 25, these being sprung into efficient contact with the reflector as it is clamped into position by tightening the retaining ring 30.

A light bulb 37 having a flange terminal 38 is removably mounted in the reflector with this terminal making continuous electrical connection with the reflector by engaging a flange 39 integral with the reflector, a cap 40 being screw threaded onto the reflector to press the flange terminal into engagement with the reflector flange. Thus, means is provided through the medium of the reflector for making continuous electrical connection between the flange terminal 38 of the bulb and the casing.

The open end of the battery housing 13 is situated adjacent the light bulb mounting means of the reflector so that the bias of spring 22 urges central battery terminal 45 into efficient, continuous electrical connection with the central terminal 46 of the light bulb.

The structure thus far described provides for completing the circuit through the light bulb filament and battery except for electrical connection between the outer casing 11 and battery retainer or housing 13. A manually operated switch carried by the casing is provided for making and breaking electrical connection between these parts, thus to energize and de-energize the light bulb.

For this purpose, a section of outer casing wall is cut away providing a cut-out portion 50 therethrough aligned with an aperture 51 in the tubular insulation 15. The cut-away section of the outer casing wall is replaced with a flexible section 52, preferably formed of an impervious sheet of flexible material like rubber and sealed around the cut-out portion by a rigid clamp ring 53 tightly clamping the sheet at its edges to the outer casing as by means of rivets 54, thus to seal the casing at this region against the ingress of moisture. A movable electric contact 55 is carried by a conducting spring tab 56 which in turn is attached to the wall as by solder 57, thus to make a permanent, efficient, electrical connection of the contact with the outer casing. The tab extends into the casing in the cut-out portion under the flexible section 52. Thus, manual flexing of the section moves the contact into electrical connection with retainer 13, the spring tab automatically removing it from contact.

The switch structure thus far described is complete, since the flexible wall section 52 can be pressed inwardly with the thumb to close the switch.

As before described, the battery housing 13 is readily removable from and insertable into operative position within the flashlight outer casing for replacement purposes. In addition the battery housing furnishes a hermetically sealed merchandizing housing as illustrated in Figure 5. The merchandizing unit includes the spring 22 and dry cells 20 and 21, the open end of the housing being closed with a cap constructed to insulate the battery terminal 45 from the housing and preferably sealed thereto to prevent ingress of moisture during merchandizing. In the particular structure shown, the cap includes a gasket 60 of insulating material closing the open end of the housing and against which the battery terminal bears and a retaining ring 61 for sealing the gasket to the open end as by being screw-threaded to the housing.

When replacement is made, the old battery housing and contained battery and spring are removed from the flashlight. Retaining ring 61 and gasket 60 are removed from the new unit which is then inserted in place.

A number of significant advantages flow from the structure disclosed.

In some instances flashlights drain constantly on the battery to a detrimental extent due to leakage across insulation, especially where the path is short, and moisture may enter and debris formed from dead batteries may deposit. The disclosed structure provides substantially complete elimination of such leakage losses. Only two regions of surface leakage exist. One is from the open end edge of the housing 13 (see Figure 1) over the insulator 15 and to the casing 11, leakage current thus flowing in parallel with the switch. This path can be made long, since with the structure shown insulation 15 can be made considerably longer than the housing. The other is from the side of housing 13 near the switch, over the edge of aperture 51 and to the edge of cut-out portion 50. This path can be made long by making aperture 51 small compared to the cut-out portion. Also, since the flashlight is waterproof and may be kept clean inside by replacement of the battery housing, the insulation surfaces may be kept free of conducting paths.

The battery housing being sufficiently long so that the battery is entirely contained therein, debris resulting from dead batteries is substantially entirely deposited within the housing and thereby removed with the housing.

The waterproof feature is quite desirable both from the standpoint of longevity of the battery and of the flashlight and for preventing malfunctioning. The outer casing being impervious, except for the open end and cut-out section, only these regions require sealing. This is simply and efficiently accomplished with the structure shown.

Making the battery housing easily removed and replaced with a new one is advantageous, since destruction of a flashlight is frequently due to allowing a dead battery to remain therein until debris from it freezes the battery in the casing and corrodes to destruction other parts. Also, the electrolytic action at the contact of the spring 22 and outer terminal of the battery, due to differences in material of these parts, may soon cause destruction of the spring which, with the structure shown, is replaced along with the battery housing.

To prevent such electrolytic action, it is desirable that the same or similar metals be used for

all parts making electrical contact. With the structure shown, all these parts except spring **22** to the dry cell terminal, may be made of similar material, the decomposition between the spring and battery terminal being of little consequence due to the easily replaceable feature.

Merchandizing the battery in the replaceable housing is desirable. It is convenient to both the battery supplier and customer. The battery may be packed at the factory in the sealed container from which it is not removed, and is not unsealed until ready for use, thus to assure the customer receiving a non-contaminated or fresh battery that is fully alive, and to protect the good will of the producer.

Variations in structure may be made without sacrificing the various features of the invention. For example, instead of closing one end of the outer casing with an integral end wall as at **14**, a screw threaded cap may be used to close this end and be sealed thereto as for example by making insulation **16** cover the edge and clamping it thereto as in the cap structure of Figure 5. Thus all parts can be removed by opening this end of the casing, and in this instance the lens may be permanently sealed in the other open end. Desirably in this case the outer casing is made of uniform diameter, and the tubular insulation extends its full length. The reflector is merely dropped into place, its outer periphery engaging directly against an inwardly extending flange on the outer casing to make the continuous electrical connection required.

Also, a sealed beam type of bulb (i. e., one in which the lens and reflector are sealed together forming the envelope for the filament) may be used by sealing it in the front opening of the outer casing. Thus it is merely necessary to make continuous electrical connection between one terminal of the bulb and the outer casing, as by means of a collar fitted onto the outer or shell terminal and having spring fingers extending into resilient or integral engagement with the outer casing wall.

A simple switch structure is shown. As an alternative, the tab **56** may be an integral part of the outer casing if the casing be formed of sufficiently flexible, resilient material, and the contact **55** may be a turned-in part of the tab.

An operating means may also be provided, if desired, such for example as a bracket mounted by some of the rivets **54** and carrying a cam operated by a thumb lever, the cam in the one position holding the switch closed and frictionally retaining the set. A wear plate may be made integral with ring **53**, if the material is flexible, and extend as a tab under the cam. Such plate may also carry a push button for thumb operation of the switch.

The outer casing may not be cut away, but may have a flat flexible section integral with the wall which is movable in the manner of a conventional oil can bottom, this section having the contact connected directly thereto. The flat section may be provided by making the outer casing rectangular in cross section.

I claim:

1. A flashlight comprising a cylindrical outer casing of electrical conducting material closed at one end and open at the other for receiving a light reflector and lens, tubular insulation fitted inside the casing, insulation covering the closed end on the inside of the casing, and a cylindrical battery retaining housing also of electrical conducting material loosely fitted inside the tubular insulation so as to be readily removable therefrom, said housing having a closed end located adjacent the insulation covering the closed end of the casing and having an open end located adjacent the open end of the casing, the tubular insulation and insulation covering the closed end on the inside of the casing insulating the housing from the casing, said housing also having a spring of conducting material located in its closed end for making continuous electrical connection between one terminal of a battery when retained in the housing and the housing and for biasing the battery toward the open end.

2. The flashlight as defined in claim 1 wherein the housing is of such length that the battery when in operative position is entirely contained therewithin.

3. The flashlight as defined in claim 1 wherein the housing is of such length relative to the tubular insulation that the end of the tubular insulation adjacent the open end of the casing projects beyond the open end of the housing.

4. A flashlight comprising an outer casing of electrical conducting material, a battery retainer supported in the casing, said retainer being also of electrical conducting material and normally insulated from the casing, means for making continuous electrical connection between one terminal of a battery retained by the battery retainer and the retainer, a light reflector and lens mounted in an opening in the casing, said reflector making continuous electrical connection with the casing, means for mounting a light bulb in the reflector with one terminal of the light bulb making continuous electrical connection with the reflector, means for making continuous electrical connection between the other terminal of the light bulb and the other terminal of the battery, and a manually operated switch carried by the casing for making and breaking electrical connection between the casing and the battery retainer thus to energize and de-energize the light bulb, said battery retainer comprising an open-end cylindrical housing readily removable from the casing, the open end of the housing being situated adjacent the means for mounting the light bulb in the reflector, and the means for making continuous electrical connection between one terminal of the battery and the retainer being a spring of conducting material located in the end of the housing opposite the open end and biased to urge the battery toward the open end and the said other terminal of the battery into electrical connection with the said other terminal of the light bulb.

5. A flashlight comprising an outer casing of electrical conducting material, a battery retainer supported in the casing, said retainer being also of electrical conducting material and normally insulated from the casing, means for making continuous electrical connection between one terminal of a battery retained by the battery retainer and the retainer, means for mounting a light bulb to the casing with one terminal of the light bulb making continuous electrical connection with the casing, means for making continuous electrical connection between the other terminal of the light bulb and the other terminal of the battery, and a manually operated switch carried by the casing for making and breaking electrical connection between the casing and the battery retainer thus to energize and de-energize the light bulb, said battery retainer comprising an open-end cylindrical housing readily removable from the casing, the open end

of the housing being situated adjacent the means for mounting the light bulb to the casing, and the means for making continuous electrical connection between one terminal of the battery and the retainer being a spring of conducting material located in the end of the housing opposite the open end and biased to urge the battery toward the open end and the said other terminal of the battery into electrical connection with the said other terminal of the light bulb.

6. A waterproof flashlight comprising an outer casing of electrical conducting material sealed against ingress of moisture, a battery retainer supported in the casing, said retainer being also of electrical conducting material and normally insulated from the casing, means for making continuous electrical connection between one terminal of a battery retained by the battery retainer and the retainer, a light reflector of electrical conducting material and lens mounted and sealed in an opening in the outer casing, said reflector making continuous electrical connection with the casing, means for mounting a light bulb in the reflector with one terminal of the light bulb making continuous electrical connection with the reflector, means for making continuous electrical connection between the other terminal of the light bulb and the other terminal of the battery, and a manually operated switch carried by the casing for making and breaking electrical connection between the casing and the battery retainer, thus to energize and

de-energize the light bulb, said battery retainer comprising an open-end cylindrical housing readily removable from the casing, the open end of the housing being situated adjacent the means for mounting the light bulb in the reflector, and the means for making continuous electrical connection between one terminal of the battery and the retainer being a spring of conducting material located in the end of the housing opposite the open end and biased to urge the battery toward the open end and the said other terminal of the battery into electrical connection with the said other terminal of the light bulb.

7. The flashlight defined in claim 6 wherein the switch comprises a flexible section of wall of the casing and a movable electrical contact in electrical connection with the casing, the construction and arrangement being such that manual flexing of the wall moves the contact into and out of electrical connection with the battery retainer.

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