Oct. 16, 1945. W. H. GEY 2,387,144

ELECTRIC FLASHLIGHT

Filed Aug. 26, 1942

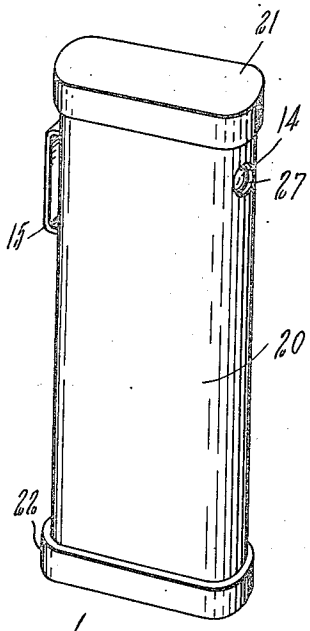


Fig. 1.

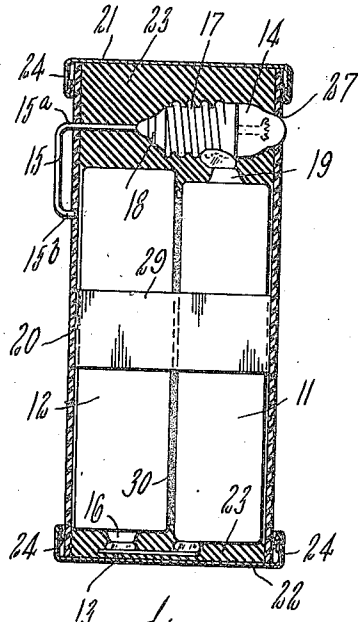


Fig. 2.

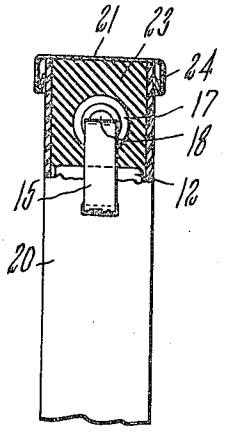


Fig. 3.

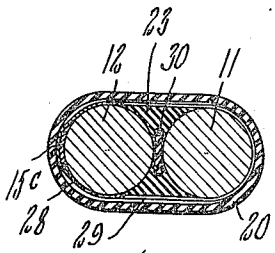


Fig. 5.

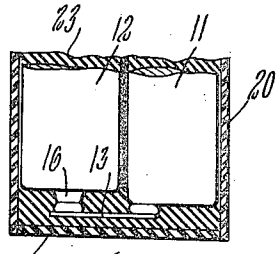


Fig. 6.

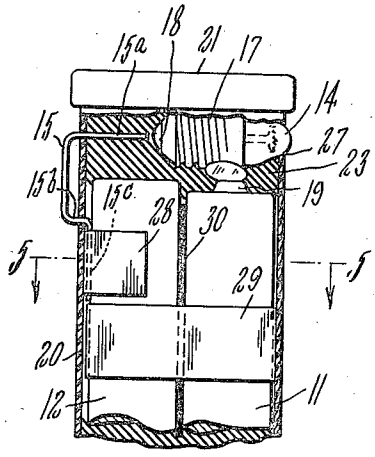


Fig. 4.

Inventor
William H. Gey
by Wright, Brown, Quinby & Shay
Attys.

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ELECTRIC FLASHLIGHT

William H. Gey, Boston, Mass.

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2 Claims. (Cl. 240—10.6)

The object of the present invention is to provide an electric flashlight unit including a battery, a lamp, circuit connections between the battery and lamp, and a casing surrounding, embedding and protecting the precedently named parts which is impervious to water and air so as to prevent depletion of the battery, otherwise than by the expenditure of current in operating the lamp, in the greatest possible measure and to afford the longest possible useful life to the battery. A further object is to make such a unit at low cost, whereof the casing is made of readily available material, including little or no metal, which material is so inexpensive that the entire unit can be economically discarded when the battery is exhausted. Still another object is to embody the principles above mentioned in a small, compact electric flashlight capable of being carried in the user's pocket, where it is available for instant use at need, and capable of furnishing a brilliant light. This last mentioned object is subordinate to those first mentioned, since the invention may be embodied equally in flashlights of large capacity and dimensions.

In the drawing,

Fig. 1 is a perspective view on an enlarged scale of a pocket size flashlight unit made in accordance with this invention and embodying the novel features thereof;

Fig. 2 is a longitudinal section of the flashlight casing taken on the width dimension thereof and showing the battery, lamp and connections in elevation;

Fig. 3 is a partial side elevation of the flashlight as seen from the left of Figs. 1 and 2 and with the upper part of the casing broken away;

Fig. 4 is a partial view similar to Fig. 2 showing a different form of circuit closer from that shown in Fig. 2;

Fig. 5 is a cross section taken on line 5—5 of Fig. 4;

Fig. 6 is a fragmentary sectional view of one end of a flashlight embodying this invention and showing a modification in the structure of the casing.

Like reference characters designate the same parts wherever they occur in all the figures.

The working parts of the flashlight consist of a battery composed of two dry cells 11 and 12 electrically connected in series by a conductor 13, an incandescent lamp 14 and a circuit closer 15. The battery cells are of a standard commercial type having a cylindrical metal shell constituting one pole and an axially located rod constituting the other pole and protruding from one end. For compactness the two cells are located side by side with their axes parallel and with the base end of each beside the head end of the other. The connector 13 is secured in good electrical connection, as by solder, to the end wall of the shell of cell 11 and to the extremity of electrode 16 of the inner pole of cell 12.

The incandescent lamp 14 is likewise preferably a standard commercial type having a glass bulb of substantially hemispherical form at its outer end, a metal shell 17 surrounding the base portion of the bulb, to which one terminal of the filament is connected, and a conductor 18 insulated from the shell 17 and protruding from the end thereof opposite to the bulb, to which the opposite terminal of the filament is connected; said shell and conductor constituting the external terminals of the lamp. The shell 17 of the lamp is secured rigidly and in good electrical connection, as by solder, with the terminal 19 of battery cell 11; the terminal or pole of opposite sign from that to which the connector 13 is secured.

The parts thus described are enclosed and embedded in a casing or matrix which excludes air and moisture and protects them from mechanical injury. In the form here shown, which at present is preferred to others, the casing is an assemblage consisting of a hard and substantially rigid flattened tube 20, forming side walls, end walls or heads 21, 22, forming transverse members which close the ends of the interior of the casing, and a filling 23 of insulating material of a character capable of being prepared and introduced in fluid condition and of thereafter solidifying into a non fluid state. Various fusible dielectrics and other solidifiable liquids may be used for this purpose, such as waxes, resins, plaster, etc.; but in the interests of low cost and water repellency I prefer to use a wax composition which is liquefiable at a temperature well above the highest atmospheric temperatures but low enough so that only moderate expenditure of heat is needed to melt it. The wax used in the embodiment here illustrated has a melting point between 150° and 170° Fahrenheit.

The part of the casing, heretofore described as a flattened tube, is likewise of moisture repellent insulating material, preferably paper impregnated and coated with a suitable gum or resin, such as varnish, shellac or one of the synthetic resins, sufficiently thick, or made of a sufficient number of sheets or plies, to have the desired rigidity. It is suitably shaped to conform with the battery cells in the arrangement

previously described, and its dimensions may be such as to embrace the outer semi-circumferences of the cells closely or to leave spaces wholly surrounding the cells, as well as the spaces within the tangent sides of the tube, into which the liquid insulating material may flow. The heads 21 and 22, in the form shown in Figs. 1, 2, 3 and 5, are caps of thin sheet metal with flanges shaped to surround the respective ends of the flattened tube and provided with an inturned lip 24, (or equivalently one or more separated tongues or prongs of like formation), arranged to afford an automatic lock when the flanges are forced over the ends of the casing.

Instead of providing metal caps as the end closures of the casing, I may use other means for the purpose. One such alternative closure is shown in Fig. 6 consisting of a plate 25 having the same outline and dimensions as the inner walls of the casing, inserted into the end of the tubular part and secured therein by friction, adhesive, or other suitable means. Either end or both ends may be closed by such plates; and the plates so used are preferably made of insulating material such as thick paper or cardboard, hard fiber, etc. impregnated with water repellent material, or otherwise rendered impervious to moisture. Where the bottom head 22 is made of metal, the ends of the battery cells and the connector 13 are insulated from it by the solidified insulating material 23, as shown in Fig. 2, or by an interposed sheet of insulating material. But where the head itself is nonconducting, the solidified fluid material between it and the battery electrodes and connector is needed only for moisture exclusion.

The spherical extremity of the lamp bulb registers with a hole 27 in the casing and preferably bears on the rim of the hole, or is so close thereto as to retain the fluid insulating material prior to hardening or setting thereof.

The circuit closer 15 is a strip of flexible metal having some resilience which is suitably bent to form a leg 15*a* extending through a slit in the casing wall toward the electrode 18 of the lamp, a second leg 15*b* extending into a slit beside the shell of battery cell 12, and an intermediate connecting portion lying outside of the casing accessible for pressure application by the finger of the user. In the preferred arrangement, which is that shown in Fig. 2, the leg 15*a* of the circuit closer is permanently connected to the lamp electrode 18 by solder or the like and the leg 15*b* is held slightly separated from the battery cell 12 by the resilience of the metal. But in an alternative form, shown in Fig. 4, the circuit closer strip has an extension 15*c* which leads from the leg 15*b* and is in permanent contact with the shell of battery cell 12, being so held by suitable means, such as a strap 28 adhesively secured to the battery cell, solder or other suitable means, while the leg 15*a* is normally separated a short distance from the lamp electrode 18 and may be brought against that electrode by pressure on the external part of the closer strip.

The part shown at 29 in Figs. 2 and 4 is a band or strap passed around and secured to the battery cells to hold them closely together prior to insertion into the casing tube 20 and prior to the introduction of the fluid insulation. 30 represents a strip of insulating material between the battery cells to prevent short circuiting. When the cells are encased in a wrapping of paper, such as is commonly applied to commercial dry batteries, the strip 30 is unnecessary and may be omitted.

Variations from the specific details of construction and arrangement above described are within the scope of this invention. Thus, for instance, the casing may be made wholly of fluid material poured into a mold so as to embed the battery and lamp with their connections, and removed from the mold after solidifying; the material then used being such as is sufficiently rigid when in the solid state as to maintain its shape under rough usage. Such a unit cast casing may be impregnated or coated with water repellent material if not inherently impervious to moisture. But liquid compounds are known which will harden to the necessary degree of rigidity and are impervious to water, water vapor and air; and I may use any of such compounds. The construction here shown, however, is preferable to others on account of its simplicity and low cost. In assembling this unit, the associated battery and lamp are placed in the tubular member of the casing with the lamp bulb projecting into the hole in one side and the circuit closer located in the slots at the opposite side, and the liquid insulating material is poured in so as to fill the open spaces within the tube and envelop the lamp and battery, substantially as shown in the sectional views of the drawing. The flexibility and low elastic limit of the metal strip forming the circuit closer allow it to be located as shown even though permanently attached at one end to the lamp terminal or to the battery shell, as shown respectively in Fig. 2 and Fig. 5, while its resilience causes it, when properly shaped, to occupy the open circuit position except when its external portion or loop is pressed toward the casing.

Reversals and other minor changes in the relative positions of the battery cells and the lamp and in the location of the circuit closer may likewise be made without departing from the invention.

The flashlight used as the model for the accompanying drawing employs standard battery cells of which the length is about 1⅞'' and the diameter is about ½'', and the other parts are in approximately the proportions indicated in the drawing. This makes an assemblage of convenient size and weight to be carried in the pocket. But the invention is not limited in respect to dimensions and proportions and includes also combinations where the battery cells are of much larger dimensions and greater voltage. Any suitable lamp may be used.

The two cells of the unit here shown, being connected electrically in series, cause the lamp filament to glow with great brilliancy. The effective life of the lamp in these circumstances is approximately the same as the life of the battery, wherefore when the battery is exhausted, the lamp is near, or may have reached, its point of failure and the whole assemblage can be thrown away.

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

1. An electric flashlight comprising a plurality of dry cell batteries side by side electrically connected in series, an incandescent lamp including a metal shell and a transparent bulb disposed across the end of one of said cells and being united with the latter by a soldered joint between the lamp shell and one of the terminals of said battery cell, a tubular casing of moisture-repellent insulating material surrounding the

battery and lamp and having an opening in register with the bulb extremity of the lamp, said extremity being located in contact with the rim of the opening and disposed so that emitted light rays will pass through the opening, a water-repellent insulating plastic disposed in both ends of the tubular casing filling the spaces between the opposite ends of the battery and adjacent portions of the casing walls, and completely enveloping the lamp except for that area of its extremity which registers with the before-named opening, covers secured to the tubular casing extending across and covering the masses of plastic in the end portions of the casing, and a circuit closer arranged to be operated by exertion and release of pressure at the outside of the casing for making and breaking circuit between the lamp and battery.

2. An electric flashlight comprising a casing of moisture-repellent insulating material including a tubular part and transverse members disposed to close the interior space, a plurality of battery cells in said casing of less length than the distance between said transverse members, the ends of said cells being separated by end spaces from both transverse members of the casing, a conductor in one of said end spaces connected to parts of adjacent cells having opposite electric polarity, an incandescent electric lamp having a base with external terminals constituted by a metal shell and a conductor insulated from said shell, the casing having an opening communicating with the other end space of the casing and the lamp being located in the last named space with a light-emitting portion protruding into the opening and bearing against the rim thereof, one of said lamp terminals being in soldered connection with a terminal of one of the battery cells, a conductor forming part of circuit closing means in soldered connection with the other lamp terminal, and water-repellent insulating plastic filling both end spaces of the casing and embedding the lamp and conductors in moisture-sealing contact therewith.

WILLIAM H. GEY.