June 9, 1942. W. R. KOPP ET AL 2,285,589

HAND LAMP

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Fig. 1,

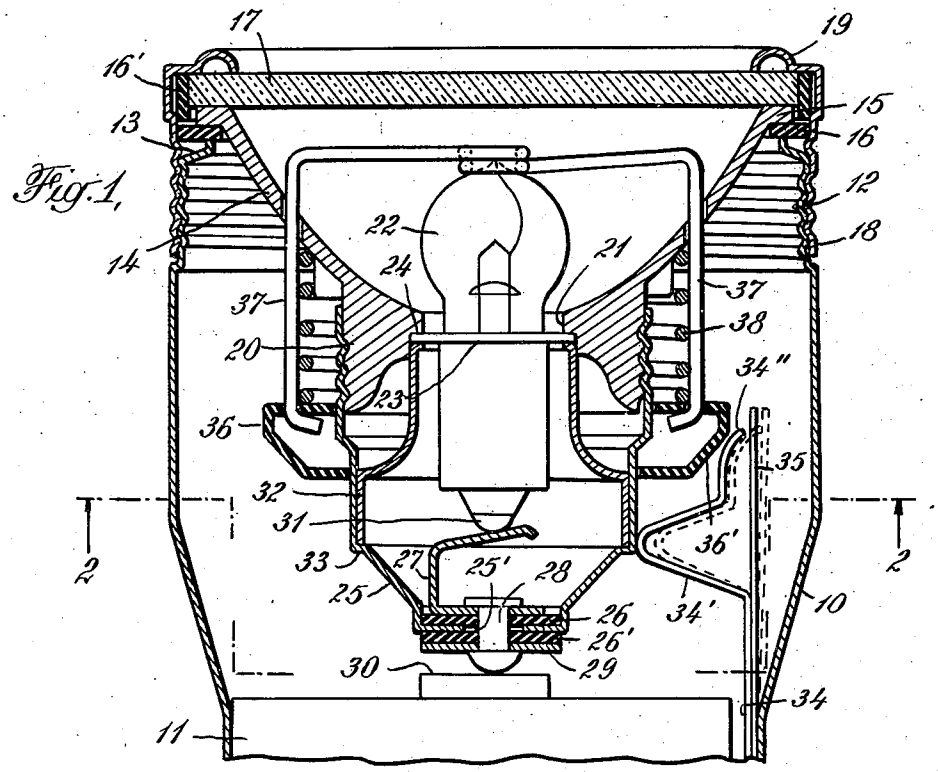
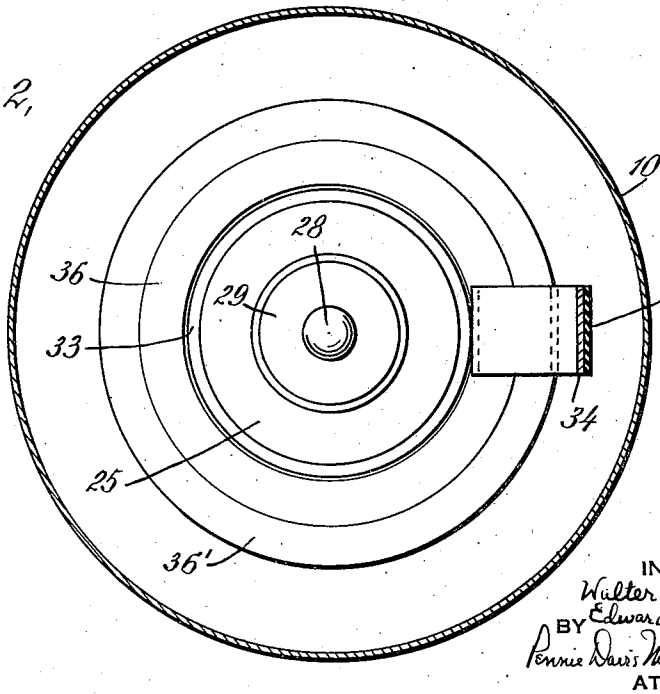


Fig. 2,



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Fig. 3.

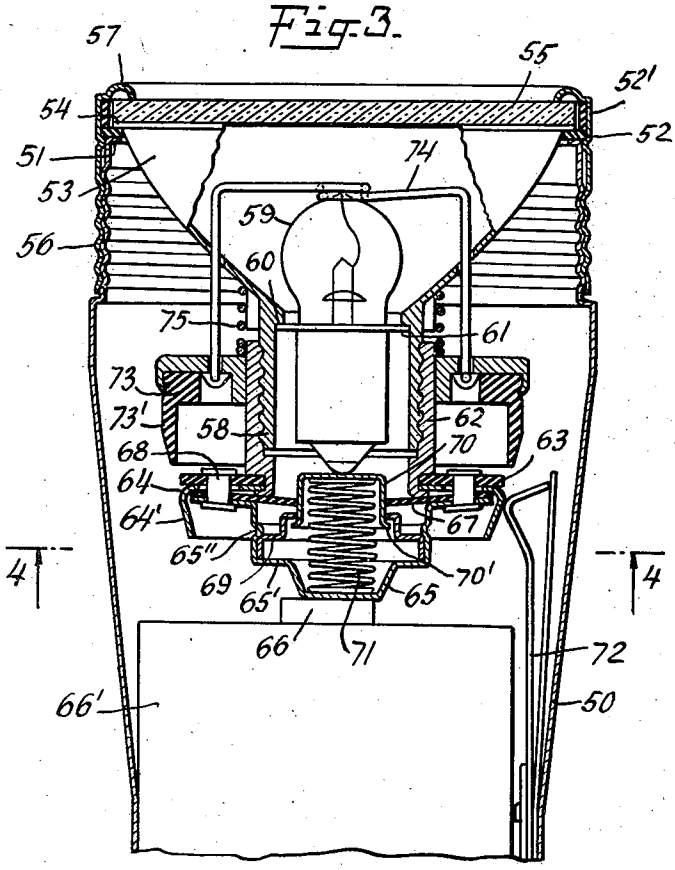
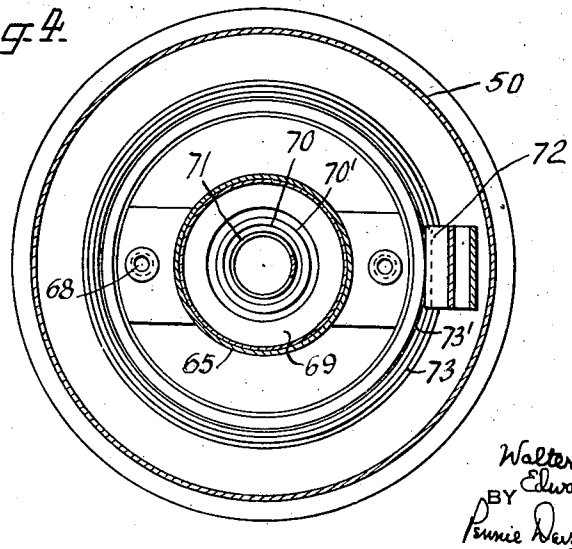


Fig. 4.



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HAND LAMP

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Application August 9, 1938, Serial No. 223,782

11 Claims. (Cl. 240—11.3)

This invention relates to lamps and is concerned more particularly with a novel portable lamp of simple construction which is explosion-proof, whereby it may be used with safety in an atmosphere of explosive gases and the like.

Portable lamps, such as flashlights, commonly include a battery casing and an incandescent lamp bulb mounted in the casing and electrically connected to a battery in the casing through a switch. While the bulb is generally covered by a lens, it is subject to breakage in various ways, as for example, by violent jarring of the lamp or by an object crushing the lens and the bulb. When the bulb is thus broken, the hot filament therein is exposed to the surrounding atmosphere, and if the atmosphere should contain an inflammable gas, an explosion might occur. Accordingly, the use of lamps of this type is dangerous if not prohibitive in certain locations, such as oil fields, mines, explosive plants, etc.

One feature of the present invention resides in the provision of a new portable lamp which is explosion-proof by reason of its inclusion of novel means for immediately destroying the energizing circuit of the lamp filament upon breaking of the bulb. In the preferred form of our new lamp, the filament circuit, upon breaking of the bulb, is destroyed by two operating elements acting conjointly, one of which is a member engaging the bulb and adapted to spring inwardly and crush the filament when the bulb is broken. The other element is a member which is released upon breaking of the bulb and operates to open the circuit outside the bulb, whereby, in the event that the lamp terminals should for any reason be electrically bridged after crushing of the filament, the circuit will be deenergized. Preferably, the two elements for breaking the circuit are operated simultaneously by a common actuating means, such as a spring or the like.

Another feature of the invention resides in the provision of a novel lamp comprising a mounting which holds the lamp bulb in a predetermined relation to a reflector at all times while the lamp is in use, and an insulating ring surrounding the mounting and movable axially thereof to open a switch and deenergize the bulb. The lamp bulb may be provided with a smooth base, as distinguished from the usual threaded base, and is located by a shoulder on the base which engages a seat on the reflector or a part connected thereto. The shoulder on the base may be held against its seat by a collar surrounding the base and releasably connected to the reflector, or it may be held against its seat by spring pressed means engaging the base contact of the bulb and forming part of the circuit through the lamp filament, or both of these expedients may be employed together.

These and other features of the invention will be better understood by reference to the accompanying drawings in which

Fig. 1 is a view in longitudinal section showing the front portion of one form of the now portable lamp

Fig. 2 is a section on the line 2—2 in Fig. 1;

Fig. 3 is a view in longitudinal section of the front portion of another form of the new lamp, and

Fig. 4 is a section on the line 4—4 in Fig. 3.

Referring to Figs. 1 and 2, the hand lamp there shown comprises a casing 10 which houses one or more battery units 11 and is provided with the usual end cap (not shown) which electrically connects one terminal of the battery to the casing. The casing 10 may be of any suitable form, but is preferably enlarged near its front end and provided with a threaded portion 12 which terminates in an inwardly extending, peripheral flange 13 at the front of the casing. A reflector 14 is mounted on flange 13 and is provided with an outwardly extending peripheral flange 15 seated on an annulus 16 of insulating material which rests on the flange 13. A lens 17 lies against the front of the flange 15 on the reflector, and the lens, reflector and insulating annulus are clamped against flange 13 on the casing by a sleeve 18 threaded on the front portion 12 of the casing and provided with an inwardly extending flange 19 engaging the front face of the lens. Closely surrounding the lens 17 is a ring of insulating material 16'.

The base of reflector 14 is formed in back with a central boss 20, and disposed in an opening 21 in the boss is an incandescent lamp bulb 22, the filament of which is in front of the reflector base. Preferably, the metal base of the bulb 22 is formed with a smooth cylindrical surface, as distinguished from the usual threaded surface, and the bulb is located with respect to the reflector by means of a peripheral flange 23 at the top of the base which is held against a seat 24 formed in the base of the reflector. The bulb 22 is held against the reflector by clamping means comprising a metallic cap 25 threaded on the boss 20 and provided at its end with a central opening 25'. Insulating disks 26 and 26' are disposed over the central opening 25' inside and outside the cap, respectively, and a U-shaped contact arm 27 is held against the inner insu-

lating disk 26 by a rivet 28 which extends forwardly through a washer 29, the insulating disks, the opening 25' and one leg of the contact arm. The head of the rivet engages the central terminal 30 of battery 11, and since the opening 25' is sufficiently large to permit a clearance between the cap 25 and the rivet, the latter forms an electric connection between the battery terminal 30 and the contact arm, which is insulated from the cap. The other leg of contact arm 27 engages the base terminal 31 of the lamp bulb and urges the bulb forwardly against the seat 24 on the reflector.

In order to hold flange 23 of the bulb positively against seat 24 on the reflector, a metal collar 32 is disposed in the cap 25 with the rear end of the collar seated on a shoulder 33 in the cap. The front portion of collar 32 is reduced and surrounds the base of bulb 22, the front end of the collar being clamped by cap 25 against the flange 23 so as to exert a pressure around the periphery of the flange and hold the latter against its seat.

The energizing of bulb 22 is controlled by a switch including a switch arm 34 slidably mounted in the casing between the battery 11 and casing wall and separated from the latter by an insulating strip 35. The front portion of the switch arm 34 is bent into a V-shaped part 34' adapted to engage the cap 25, the arm being provided in front of the part 34' with an extension 34''. The contact arm 34 may be actuated by a suitable button (not shown) to move the V-shaped part 34' into and out of engagement with the cap 25, and when the contact arm engages the cap the bulb is energized by a circuit traceable through terminal 30 of the battery, rivet 28, arm 27, terminal 31 of the lamp, the lamp filament, flange 23, where the current divides and passes to cap 25 by way of collar 32 and boss 20, and from cap 25 to contact arm 34 and back to the other terminal of the battery by way of the casing and the end cap. Since the cap 25 and reflector 14 are insulated from the casing by annulus 16, disengagement of contact arm 34 from the cap results in breaking of this circuit and extinguishment of the bulb.

Surrounding the cap 25 and slidable lengthwise thereof is a hollow annulus 36 made of insulating material, the front and rear ends of the annulus being fitted closely around the cap. The back of annulus 36 has a bevelled part 36' which faces the extension 34'' on the switch arm 34 and is normally spaced therefrom. In its front end, the annulus 36 is provided with two diametrically opposed openings through which extend the legs of an inverted U-shaped wire member 37, the ends of the legs being turned inwardly so as to secure the member to the annulus. The legs of the member 37 extend forwardly from the annulus through openings in the reflector, and the horizontal portion connecting the legs is coiled intermediate its ends, the coiled portion bearing against the front end of bulb 22. A spring 38 is coiled around the cap inside the legs of member 37, and the front end of the spring bears against the base of reflector 14 and the rear end against the annulus 36. The spring 38 exerts a rearward thrust on the annulus tending to force the bevelled part 36' against the extension 34'', but the annulus is normally held in its retracted position by engagement of the member 37 with the front end of the lamp bulb.

In operation, assuming that the switch arm 34 is in engagement with cap 25 and the lamp bulb is illuminated, if the bulb should be broken for any reason, the support for member 37 normally afforded by the bulb becomes ineffective, whereupon the coil spring 38 forces the annulus 36 rearwardly. The coiled part of member 37 is thus forced against the filament of the lamp bulb so as to crush the filament and thereby break the circuit through the bulb, the crushing action tending also to extinguish immediately any glow in the filament particle. Simultaneously, the beveled part 36' of the annulus is forced rearwardly against extension 34'' of the switch arm so as to move the front part of the latter outwardly from cap 25 to the dotted line position shown in Fig. 1, whereby the switch arm disengages the cap and breaks the circuit outside the lamp bulb. Accordingly, if the filament wires in the bulb, after crushing of the filament, should remain bridged for any reason, for example, by particles of the filament or by the member 37, there will be no current flow through the bulb. The broken lamp bulb may be readily replaced by removing the reflector from the casing, unscrewing the cap 25 from the reflector, and substituting a new lamp bulb for the broken one. The parts may then be assembled by screwing the cap 25 on the reflector so as to force the collar 32 against the flange 23 of the bulb, and then replacing the reflector on the casing.

The flashlight shown in Figs. 3 and 4 comprises a casing 50 having the usual end cap (not shown) and terminating at its front end in an inwardly extending flange 51. An annulus 52 of insulating material is disposed on the front end of the casing over flange 51, and supported on the annulus 52 is a reflector 53 having a flange 54 which rests on the annulus. In front of the reflector is a lens 55 which is clamped against flange 54 of the reflector by a sleeve 56 threaded on the front portion of the casing, the sleeve being formed with an inwardly extending peripheral flange 57 engaging the front face of the lens. A ring of insulating material 52' is interposed between the edge of lens 55 and the sleeve 56.

The reflector 53 is formed in back with a hollow boss 58 provided with a central opening in which a lamp bulb 59 is disposed, the filament of the bulb being located in front of the base of the reflector. The interior of boss 58 is formed with a shoulder or seat 60, and the bulb is positioned with respect to the reflector by a flange 61 formed on the top of the base of the bulb and seated against shoulder 60. Threaded on the end of boss 58 is a bushing 62 which supports at its rear end an annulus 63 of insulating material and a contact ring 64 lying against the rear face of the annulus, the ring 64 being formed with a rearwardly extending apron 64'. A metal cap 65 is supported on the annulus 63 and is adapted to engage the central terminal 66 at the front of a battery 66' in the casing. A piece of insulating material 67 is interposed between the contact ring 64 and a flange on the cap, and the cap, insulating piece and contact ring are connected to annulus 63 by eyelets 68 extending through openings in these members. The openings in contact ring 64 are enlarged to provide a clearance between the ring and the eyelets, whereby the contact ring is insulated from cap 65.

Seated on a shoulder 65' in cap 65 is a retainer ring 69, the ring being hold on shoulder 65' by an internal rib 65'' on cap 65. A plunger 70 ex-

tends forwardly through a central opening in retainer ring 69 and a similar opening in the insulating piece 67, the front end of the plunger bearing against the usual base contact on the lamp bulb. At its rear end, the plunger 70 is formed with a flange 70' disposed between the front end of retaining ring 69 and cap 65. A coil spring 71 in the cap 65 is seated at one end against the rear end of the cap, and the front end of the spring bears against the inside of plunger 70 and forces the plunger and lamp 59 forwardly, so that the flange 61 on the lamp is held securely against its seat 60.

A switch element 72 in the casing is adapted to be moved longitudinally into and out of engagement with the apron 64' on the contact ring, and when it engages the contact ring, the lamp bulb is energized through a circuit traceable from the terminal 66 of the battery, cap 65, spring 71, plunger 70, the base terminal of the lamp bulb, the filament, shoulder 61, boss 58, bushing 62, contact ring 64, switch element 72, and through the casing back to the other terminal of the battery.

A ring of insulating material 73 is slidably mounted on the bushing 62 and is formed with a rearwardly extending flange 73' adapted to encompass the contact ring 64 and disconnect switch element 72 therefrom when the ring 73 is moved rearwardly on the bushing. Removably mounted on the insulating ring 73 is an inverted U-shaped wire member 74, the legs of which extend through openings in reflector 53. The horizontal portion of the member 74 intermediate the legs is coiled and engages the top of bulb 59. A coil spring 75 interposed between the reflector and ring 73 urges the latter member rearwardly so as to hold the wire member 74 firmly against the lamp bulb. The operation of the lamp will be apparent from the description of the embodiment shown in Figs. 1 and 2.

It will be observed that the new lamp, in addition to its explosion-proof feature, provides spring means for yieldingly holding the flange of the lamp bulb against its seat on the reflector, whereby the lamp is held in the desired predetermined position relative to the reflector at all times while the lamp is in use, regardless of the position of the reflector on the casing.

We claim:

1. A portable lamp comprising a casing, a reflector on the casing having an extension at the base thereof, a lamp bulb disposed near the base of the reflector, a circuit for energizing the lamp bulb, means surrounding said extension and responsive to breaking of the bulb for opening said circuit at a point remote from the bulb, and an element connected to said means normally engaging the bulb and operable by said means to crush the lamp filament upon breaking of the bulb.

2. A portable lamp comprising a casing, a lamp bulb in the casing, a circuit for energizing the bulb including a contact member in the casing and a switch member movable selectively into and out of engagement with the contact member from outside the casing, and means responsive to breaking of the bulb for separating said members at a point remote from the bulb and thereby deenergizing the circuit.

3. A portable lamp comprising a casing, a lamp bulb in the casing, a circuit for energizing the lamp bulb including a contact member in the casing and a switch member movable selectively into and out of engagement with the contact member from outside the casing, means movable relative to the bulb, an element connected to said means and engaging the bulb, a spring engaged at one end with said means, and a fixed member for mounting the opposite end of the spring independently of the bulb, the spring biasing the movable means in one direction to urge said element downwardly against the bulb, said means being operable by the spring in response to breaking of the bulb to disengage said members and thereby deenergize the circuit.

4. A portable lamp comprising a casing, a reflector on the casing, a lamp bulb mounted near the base of the reflector and having a filament, a circuit for energizing the filament, a member movable relative to the bulb, an element mounted on said member and engaging the bulb, and a compression spring interposed between the reflector and said member and biasing the member to urge said element against the bulb, said element being movable inwardly by the spring and member to crush the filament upon breaking of the bulb.

5. A portable lamp comprising a casing, a reflector on the casing having a hollow extension on the back thereof, a lamp bulb mounted in said extension and having a filament, a circuit for energizing the filament including a conducting member near the rear end of the extension and a switch member movable selectively into and out of engagement with the conducting member from outside the casing, a member movable relative to the extension to separate the switch member and conducting member and thereby deenergizing the circuit, and means responsive to breaking of the bulb for actuating said movable member.

6. A portable lamp comprising a casing, a reflector on the casing having a hollow extension on the back thereof, a lamp bulb mounted in said extension and having a filament, a circuit for energizing the filament including a conducting member near the rear end of the extension and a switch element engageable therewith, a member movable relative to the extension and operable to disengage the switch element and conducting member and thereby deenergize the circuit, a second element mounted on said movable member and engaging the bulb, and a compression spring between the reflector and movable member for biasing the movable member toward the switch element and urging said second element against the filament to crush the filament when the bulb is broken.

7. A portable lamp comprising a casing, a reflector on the casing having a hollow extension on the back thereof, a lamp bulb disposed in said extension and having a filament, a bushing threaded on said extension, a cap mounted on the bushing near the rear end thereof and electrically connected to the base terminal of the bulb and adapted to engage one terminal of a battery in the casing, said cap being insulated from the bushing, a contact member mounted on the bushing and insulated from the cap, a switch element in the casing adapted to engage the contact member, an insulating member movable relative to the bushing and adapted to separate the contact member and switch element, a second element mounted on the insulating member and extending through the reflector with the front part of the element engaging the lamp bulb, and a spring interposed between the reflector and insulating member for biasing the insulating member toward the switch element

and urging said second element against the bulb.

8. In a portable lamp, a lamp bulb having a shoulder thereon, a reflector having a seat for the shoulder, a cap releasably connected to the reflector, a collar in the cap engaging said flange to hold the flange against the seat, a spring-pressed contact in the cap engaging the base contact of the bulb and insulated from the cap, means connected to said first contact for engaging a battery terminal, a switch element adapted to engage the cap, a member surrounding the cap and movable relative to the cap to separate said element and cap, and means responsive to breaking of the bulb for actuating said member.

9. In a portable lamp, a casing, a lamp bulb in the casing having a shoulder thereon, a reflector secured to the casing and having a seat for the shoulder, means for urging the bulb in one direction to hold the shoulder against the seat, a circuit for energizing the filament of the bulb including a contact member in the casing and a switch member movable selectively into and out of engagement with the contact member from outside the casing, means engaging the bulb and movable relative thereto for disengaging said members and thereby breaking the circuit, and a spring for biasing said movable means against the bulb in a direction opposite to the direction in which the shoulder is urged against the seat, the spring being operable in response to breaking of the bulb to actuate the movable means into position for disengaging said members.

10. In a portable lamp, a casing, a reflector in the casing having a hollow extension on the back thereof, a lamp bulb mounted in the extension and having a filament, a circuit for energizing the filament including a contact member in the casing and a switch member movable selectively into and out of engagement with the contact member from outside the casing, means movable lengthwise of the extension for disengaging said members and thereby breaking the circuit and including a part engaging the bulb, and a spring engaged at one end by the reflector and at the opposite end by the movable means and normally urging said means against the bulb, the spring being operable in response to breaking of the bulb to move said means into position for disengaging said members.

11. In a portable lamp, a reflector having a hollow extension on the back thereof, a lamp bulb mounted in the extension and having a filament, a circuit for energizing the filament, means for securing the bulb against axial movement in the extension, and spring-pressed means independent of said last means for engaging the bulb and crushing the filament in response to breaking of the bulb.

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