July 4, 1939. W. K. WILBUR 2,165,194

SAFETY MINE LAMP

Original Filed Sept. 11, 1935

Fig. 1.

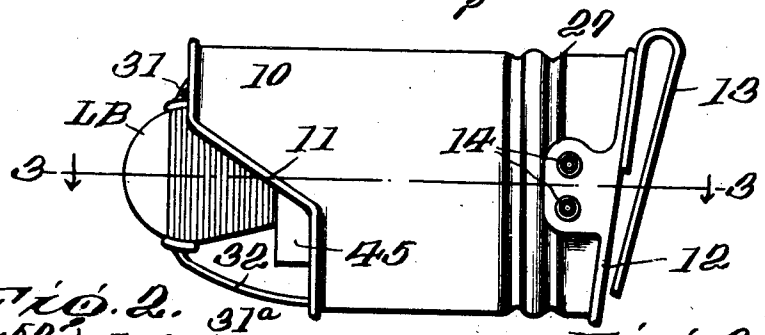


Fig. 2.

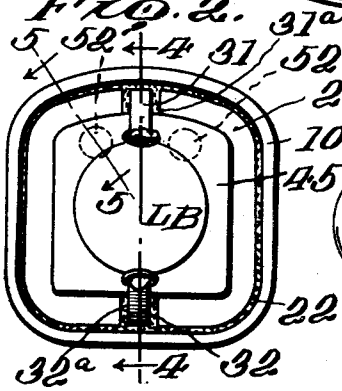


Fig. 3.

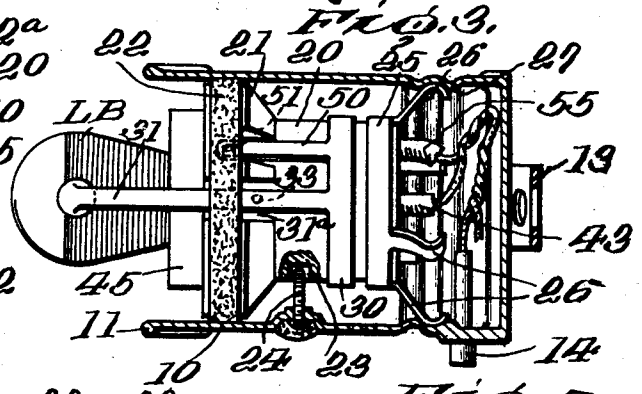


Fig. 4.

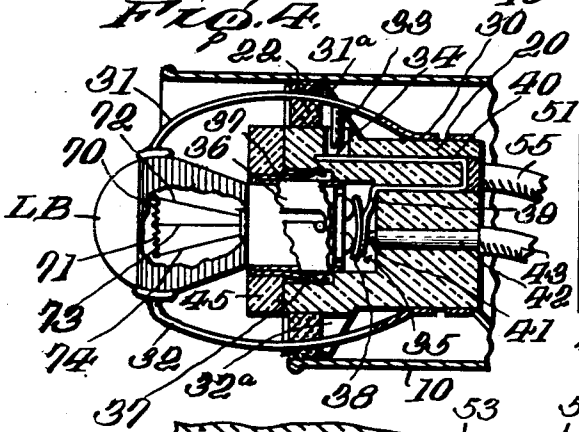


Fig. 5.

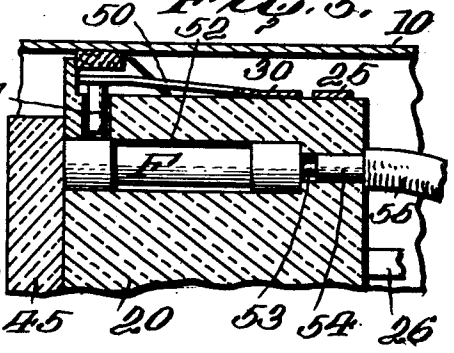
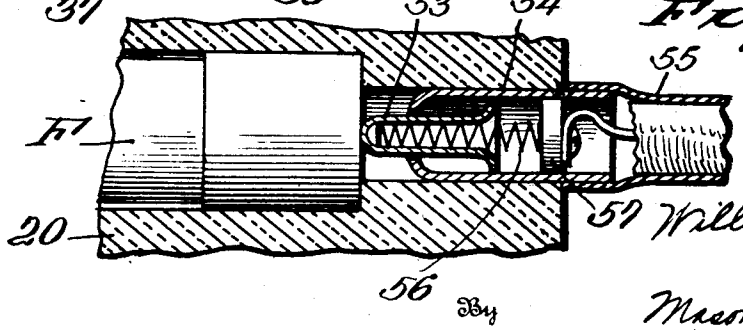


Fig. 6.



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2,165,194

SAFETY MINE LAMP

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Application September 11, 1935, Serial No. 40,176
Renewed October 8, 1938

9 Claims. (Cl. 240—11.3)

This invention relates to lamps of the safety type such as are employed in coal and like mines.

One of the features of the present invention is the provision of a safety lamp including an incandescent bulb and means for electrically disconnecting the same upon cracking or breakage of the bulb.

Another feature of the present invention is the provision of a lamp having an incandescent electric bulb with a plurality of filaments and means for operating said filaments in multiple, in conjunction with safety devices for preventing ignition of explosive gases if the bulb is cracked.

A further feature of the present invention is the provision of a lamp of this type in which the conductive portions are so constructed and arranged mechanically and electrically in respect to one another that the miner is prevented from drawing current from the lamp, as for lighting cigarettes or fuses.

Still another feature of the present invention is the provision of a lamp having a simple and light assemblage, and including sills for preventing access of dust to the interior of the casing.

A still further feature of the present invention is the provision of a lamp having a fuse in the circuits thereof and means for short circuiting the fuse when the device is utilized under conditions capable of causing the ignition of explosive surrounding gases.

A still further feature of the present invention is the provision of a mine lamp having an incandescent electric bulb and circuit means for connecting said bulb to a source of electricity, in conjunction with switches and further circuit means which are automatically actuated according to the condition and presence of the bulb for de-energizing a bulb contact and/or accomplishing a disconnection of such contact from the source of electricity.

With these and other features as objects in view, an illustrative form of practicing the invention is shown on the accompanying drawing, in which:

Figure 1 is a side elevation of a head lamp, according to the present invention.

Figure 2 is a front elevation of the same.

Figure 3 is a horizontal cross-section through the same substantially on line 3—3 of Fig. 1.

Figure 4 is an upright cross-section of the same, on a larger scale, substantially on line 4—4 of Fig. 2.

Figure 5 is a cross-sectional view, on a still larger scale, substantially on line 5—5 of Fig. 2.

Figure 6 is a detail view, on a yet larger scale, of a spring plunger contact.

In the drawing, a stiff outer casing 10 is provided with a reinforcing rim 11 at its open front end, and a fixed back closure 12 to which is joined the usual tongue 13 which is received in the loop of the miner's cap. This casing therefore provides a structure which is substantially closed except at its open front end and is provided with the inlets 14 for the passage of the conductor wires leading to a source of electricity, such as the usual storage battery which is suspended at the miner's waist. These inlets 14 are tightly sealed against the penetration of dust and for securing the wires in position so that they cannot be removed by the miner so long as the front end of the casing is closed. It will be noted that it is preferred to cut away the surfaces of the casing 10 adjacent the front end to provide an overhanging upper guard portion above the lamp bulb, while the lower structure permits the easy mounting of the parts of the bulb holder assembly.

The open front end of the casing 10 is closed by a bulb holder assembly comprising a body 20 having a peripheral flange 21 provided with a peripheral groove for receiving the sponge rubber cushioning and sealing band 22 which tightly fits the inside of the casing 10 and prevents the penetration of dust into the casing. The body 20 has a cavity 23 for receiving a screw 24 which passes through the wall of the casing 10 and is sealed to prevent disengagement thereof by the miner.

At its inner end the body insulatedly supports a metal band 25 having the outwardly extending spring fingers 26 which are curved at their ends for easy gliding motion along the inner wall of the casing 10 and which fit when the parts are in operating position within an internal groove formed by a bead 27 of the casing. These spring fingers operate in conjunction with the rubber band 22 to hold the bulb holder in cushioned relationship to the casing, and it will be noted that the casing is insulated from all conductive portions.

The bulb holder assembly also has a metal band 30 surrounding its body 20 and provided with two spring fingers 31, 32 which extend through the flange 21 and are engaged with the lamp bulb LB substantially at diametrically opposite points of this bulb. These fingers pass through notches 31*a*, 32*a* in the flange (Fig. 4), and are surrounded by portions of sponge rubber which are joined to the band 22 so as to

complete the seal at these points. The upper spring breaker finger 31 is provided with a contact piece 33 which extends into an aperture 34 of the body 20.

The front end of the body 20 has a cavity 35 for receiving the metal sleeve 36, which supports the lamp bulb and is provided with the usual bayonet slots for receiving the customary pins on the base of the lamp bulb (see Fig. 4). This sleeve has the spring fingers 37 which are engaged in axial recesses within the cavity 35 and operate to hold the sleeve in position against axial and relative movement. Adjacent the inner end of the cavity 35 is provided a contact piece 38 which is mounted on a resilient arm 39 of a metal member which extends through a channel in the body 20 and is joined to a conductor member 40 extending in a channel of the body 20 and across the opening 34, so that it can be engaged by the contact 33 when the finger 31 is at an inner position. Beneath the contact piece 38 is provided a spring contact 41 which is supported by the contact sleeve 42 and thereby joined to a conductor 43 constituting one of the battery leads issuing at an inlet 14.

The sleeve 36 is fixedly joined to a flange 45 which overlaps the flange 21 of the insulating body 20 and is itself preferably of insulating material. It will be noted from Fig. 2 that the casing 10 is preferably of non-round shape and that the flange 45 is of similar conformation and that it extends to differing radial distances from the axis of the lamp bulb in order to cover and protect the fuse pockets, as will be described hereinafter.

The metal band 30 also is joined to a spring contact arm 50 (Figs. 3 and 5) which has a contact piece 51 at its free end, this contact piece passing through an aperture in the body 20 and opening into a fuse pocket 52 which has its open end normally concealed by the flange 45 (see Fig. 2). Thus the contact 51 is engaged with the conductive metal cap at the outer end of the fuse F (Fig. 5), while the cap at the lower end of the fuse rests against a spring contact piece 53 carried by a metal holder 54 and thus joined to the other wire 55 which leads outwardly through the other inlet 14. As shown in Fig. 6, the spring contacts 41 and 53 are preferably formed as cups having peripheral flanges and received in the holder portions 42 and 54 which in turn are fixed in the body 20. The spring contact can move back and forth but is prevented from escape by its peripheral flange. A spring 56 is provided for constantly urging the contact 41 or 53 outwardly, the reaction of this spring being taken by a metal piece 57 which is connected to the conductor 43 or 55.

The body 20 is also provided with a second aperture 52a for receiving a spare fuse, this aperture having a spring assembly 53, 54 but no conductive elements leading thereto in the illustrated form.

The lamp bulb LB is illustrated as having the usual pin or Swan type of base and as provided with two filaments 70, 71 in a single plane which are supported by the three wires 72, 73, 74 leading upwardly from the squash; the wire 73 being joined to the base sleeve and the wires 72 and 74 leading to individual contacts in this illustrated form at the bottom of the base, so that they are engaged by the contact piece 38 which for this purpose is preferably formed with a slight arch to assure proper contact. Thus the contact piece 38 serves for connecting the two filaments 70 and 71 in multiple when the arm 39 has been depressed by the bulb a sufficient distance to cause it to engage with the spring contact 41. The lamp bulb preferably is of the silvered reflector type having a conductive coating extending over a major portion of its surface but having the front end bare so that the light is emitted with substantial uniformity in a conical beam having an apex angle of at least 130 degrees; and this coating is connected to the filament in the lamp bulb so that it provides an essential part of the lighting circuit and so that rupture of the frangible portion of the bulb and its coating will interrupt this circuit.

It will particularly be noted that no loose or accessible screws are provided and that no movable switch pieces are included for making or breaking circuits at the will of the miner. He is thus assured a light which is not accidentally turned off so long as the parts are in operative condition.

If a falling rock encounters the lamp bulb, for example, and cracks it, the pressure exerted by the fingers 31 and 32 burst the bulb into fragments so that there is no danger of a leakage of explosive gas into the bulb, with ignition thereof and possibility of a disastrous explosion in the mine. As the finger 31 moves inward in crushing the bulb, its contact 33 encounters the contact member 40 and thus a circuit is established from one battery lead by conductor 43 and contact portions 42, 41 to the contact piece 38, and thus by the spring arm 39 and its extension to the contact element 40, and thus to the breaker finger 31. This breaker finger is connected through the band 30 with the spring finger 50 and thus with the outer cap of the fuse F, so that a circuit is established between the battery conductors 43, 55 and through the fuse F which instantly blows this fuse. In practice it is found that the normal main circuit through the lamp filaments is interrupted so quickly that there is no danger whatever of ignition of gases.

In order to replace the bulb, it is merely necessary to remove its base from the holder. This is easily accomplished by removing the flange 45 and the sleeve 36, spreading the fingers 31, 32 as necessary to disengage the parts and permit them to be moved laterally away. The end of the lamp bulb is thus exposed and it may be pushed through without danger of cutting the fingers on broken edges of glass. The operation of separating the flange 45 from the flange 21 of the bulb holder body has permitted the springs 56 beneath the fuses to project them outwardly, so that they may be easily grasped by the fingers. The burnt fuse is discarded and the spare fuse inserted in its place. It will be noted that the withdrawal of the lamp base from the contact piece 38 permits this contact piece to spring toward the left in Fig. 4 until it is disengaged from the spring contact 41, thus opening the main circuit and preventing the blowing of the new fuse when inserted.

A new lamp bulb is now inserted in the sleeve and the sleeve and flange are returned to position. In order to bring the bulb into position, it is necessary to spread the fingers 31 and 32, thus opening the engagement between contact 33 and contact member 40 and avoiding a short circuiting through the fuse. Further, it is possible to return the flange 45 and sleeve 36 and then insert the lamp bulb afterward, as the electrical engagement is not made at contact 41 until the lamp bulb has been inserted properly.

If the miner endeavors to obtain an electric spark from the device by removing the bulb or other parts, the spring finger **31** brings its contact **33** against the contact member **40**. The insertion of a wire or other piece into contact with the contact piece **38** does not permit drawing current, as the wire **43** is not in electrical connection. If the wire is pressed to effect electrical connection between the contact piece **38** and the contact **41**, then short circuiting again occurs at contact **33** and contact member **40**, as the two circuit closers (**33—40** and **38—41**) are now in series with one another and with the fuse.

It will be understood that the invention is not limited to the specific form of embodiment shown but that it may be employed in many ways within the scope of the appended claims.

I claim:

1. A mine lamp assembly including an incandescent lamp bulb, a casing, and a bulb holder assembly including a structure having a cavity, a bulb sleeve supported by said structure and having an exposed peripheral flange, said bulb sleeve extending into the cavity, said structure having a second cavity for receiving a fuse, conductors on said structure for connecting the lamp and fuse in circuit, said second cavity normally being covered by said flange so that the flange holds the fuse in position.

2. A mine lamp assembly including an incandescent lamp bulb having a frangible portion, a casing, and a bulb holder assembly including a structure having a cavity, a bulb sleeve supported by said structure and having an exposed peripheral flange, said bulb sleeve extending into the cavity, said structure having a second cavity for receiving a fuse, conductors on said structure for connecting the lamp and fuse in circuit and including two circuit breakers responsive to the insertion and removal of the bulb for alternate opening and closing, one said breaker being closed when the lamp bulb is removed or broken, so that the other breaker if closed or upon being closed will establish a short circuit through said fuse, said second cavity normally being covered by said flange so that the flange holds the fuse in position.

3. A mine lamp including a casing and a bulb holder assembly; said assembly including a structure supported in the casing and having a cavity, a bulb sleeve engaged with said structure for supporting a bulb base in said cavity, a first resilient terminal member located with a contact end in said cavity, a second resilient terminal having a contact end in said cavity for engaging the bulb base and being normally free of said first terminal member and being mechanically moved by the bulb base into engagement with said first terminal member, a conductive member responsive to the condition of the bulb and engaged with the second terminal member when the bulb is broken or removed, and circuit conductor means connected to said first terminal member and to said conductive member and including a fusible element.

4. A safety lamp comprising a lamp bulb having a glass portion with a conductive external coating on the glass portion connected with a bulb filament, a casing, a body in said casing, a bulb sleeve removably supported on said body and having open ends, and contact members supported on the body for conducting current to a bulb in said sleeve and including a resilient finger engaged with said coating, the path through said finger and coating being a necessary part of the circuit for energizing the filament, said sleeve being removable to permit ejection of a broken bulb without danger from the broken glass thereof.

5. A mine lamp including a casing, a lamp bulb having a frangible portion and a filament, and a bulb holder assembly; said assembly including a structure having a cavity and a body portion, a resilient finger mounted on the body portion and extending past the cavity for engaging the frangible portion of the bulb, and conductor means mounted on said body portion and extending into said cavity, said conductor means including a relatively fixed contact for connection with a source of supply and a relatively movable contact held in engagement therewith by the bulb when the bulb is positioned in the cavity, said bulb when so positioned having its filament electrically connected to said movable contact, a short-circuiting means for closing a shunt circuit in parallel to the filament and including a circuit-closing device in series with said contacts and closed by said finger when the frangible portion is broken, and a fuse connected between said circuit-closing device and the source of supply.

6. A mine lamp assembly including a lamp bulb having a frangible portion and a filament, a bulb holder assembly having a structure with a fuse cavity, a fuse in said cavity, resilient means in the cavity for expelling the fuse, a bulb sleeve supported on the structure and having means effective when the sleeve is in assembled position for holding the fuse in the cavity, and circuit means for connecting the bulb filament and fuse in circuit; said circuit means also including a resilient finger for resting on the said frangible portion, a contact for engagement by said finger when the bulb is broken, and connections for establishing a short circuit through said fuse when the said contact is engaged.

7. A mine lamp including electrical supply terminals, a bulb holder, a fuse, a first circuit breaker responsive by closing to the absence or breakage of the bulb, a second circuit breaker responsive by closing to the presence of the bulb, and conductor means for establishing two current paths between the electrical supply terminals, one said path connecting the bulb filament, fuse and second breaker in series and the other said path connecting both said breakers and fuse in series, so that the fuse is caused to open the supply circuit if said breakers are closed together.

8. A mine lamp including a bulb holder, electric supply terminals, said holder having a bulb receiving cavity, one of said supply terminals extending into said cavity, a bulb adapted to be mounted in the cavity and having a filament, a yieldingly supported saddle conductor normally disengaged from the supply terminal in said cavity and adapted to make circuit connection between said terminal in the cavity and one terminal of the filament when the bulb is inserted in the cavity, a conductor means between the other supply terminal and the other terminal of the filament, a conductor means including a normally open switch for connecting the saddle to said other electric terminal, and means for closing the switch when the bulb is removed so that all exposed parts are of the same polarity as said other supply terminal.

9. A mine lamp including a bulb holder, electric supply terminals, said holder having a bulb receiving cavity, one of said supply terminals extending into said cavity, a bulb adapted to be mounted in the cavity and having a filament, a

yieldingly supported saddle conductor normally disengaged from the supply terminal in said cavity and adapted to make circuit connection between said terminal in the cavity and one terminal of the filament when the bulb is inserted in the cavity, a conductor means between the other supply terminal and the other terminal of the filament, a conductor means including a normally open switch for connecting the saddle to said other electrical terminal, and means for closing the switch when the bulb is removed so that all exposed parts are of the same polarity as said other supply terminal, said saddle conductor being dimensioned so as to substantially close the cavity and cover and house the exposed terminal therein.

WILLIAM K. WILBUR.