

[54] FLASHLIGHT AND SWITCH ASSEMBLY

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1971.

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[51] Int. Cl. H01h 9/00, F21i 7/00

[58] Field of Search 240/10.66, 10.6; 335/205

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Primary Examiner—Donald O. Woodiel

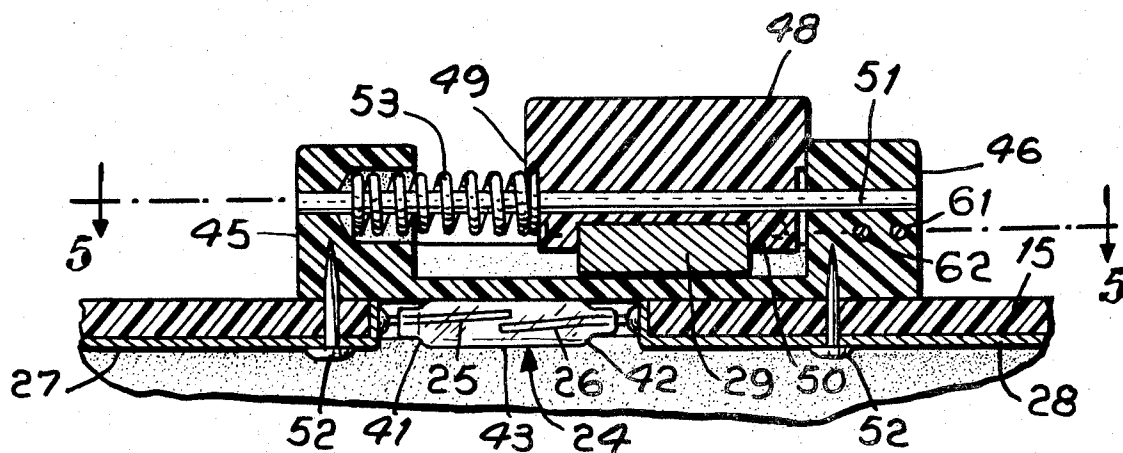
Attorney, Agent, or Firm—Gloria K. Koenig

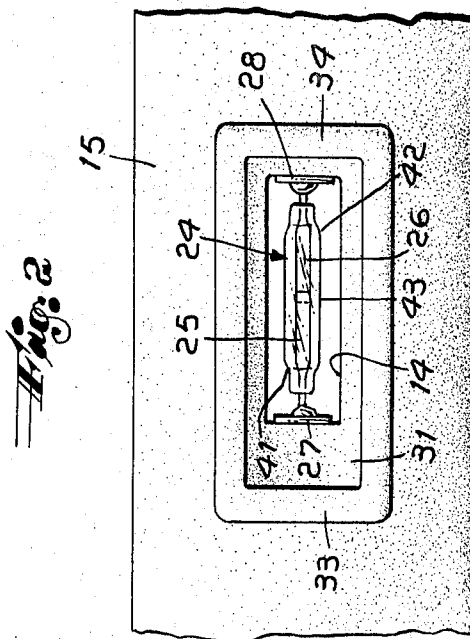
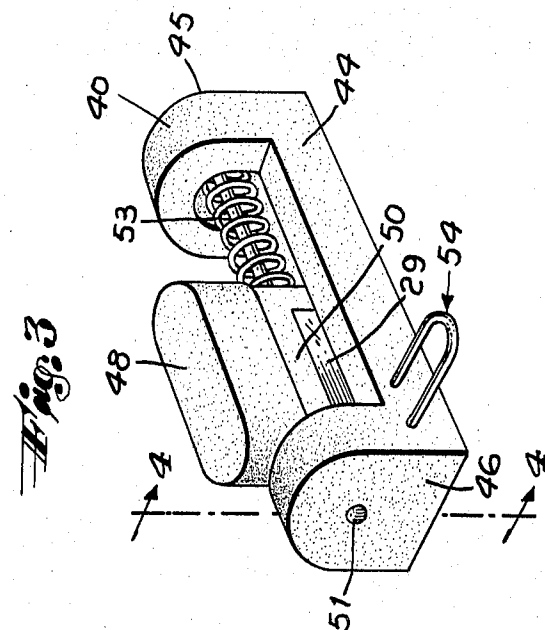
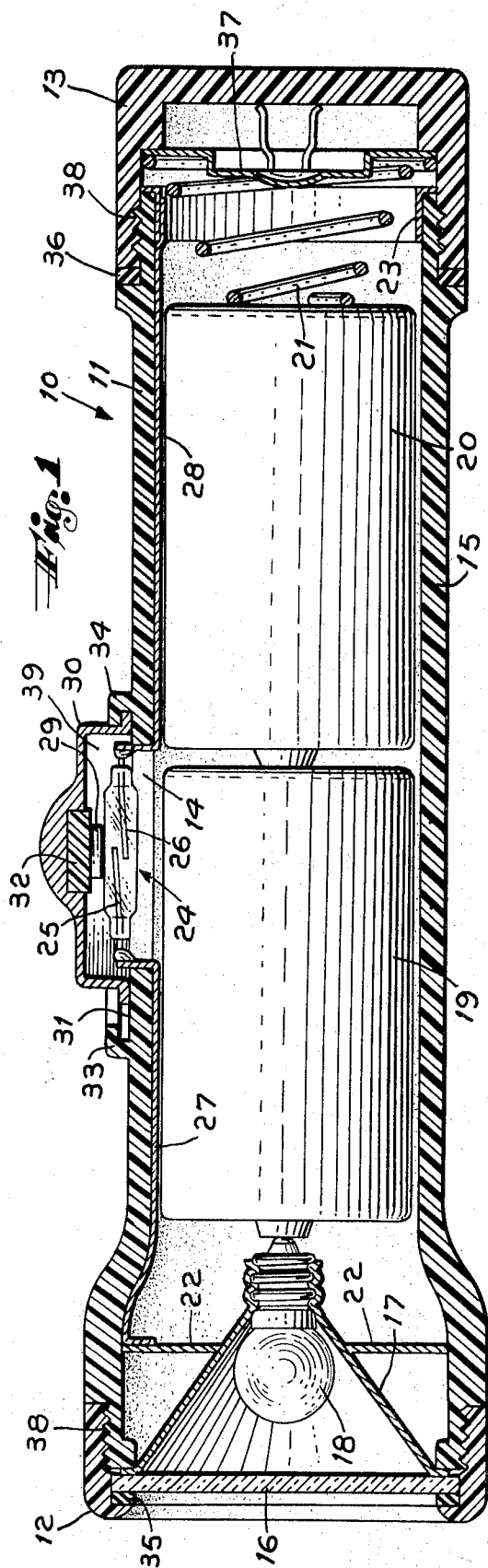
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ABSTRACT

An improved flashlight construction which substantially reduces the possibility of arcing, having a glass enclosed magnetic reed switch electrically connected to the conductor strips along the wall of the flashlight case and having the magnet required to close the contact arms of the reed switch incorporated into a slidably mounted switch cover, the conductor strips being electrically connected in a fixed position between the conductor rings at the ends of the case. In a modified form of the switch assembly, the magnet is positioned in a preformed case which is mounted on the outside of the flashlight case so that the movable parts of the switch are completely separated from the internal parts of the flashlight. Other modifications of switch covers having magnets mounted therein which can be locked in either the "On" or "Off" position by means of magnetizable steel are also shown.

5 Claims, 12 Drawing Figures





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Fig. 4

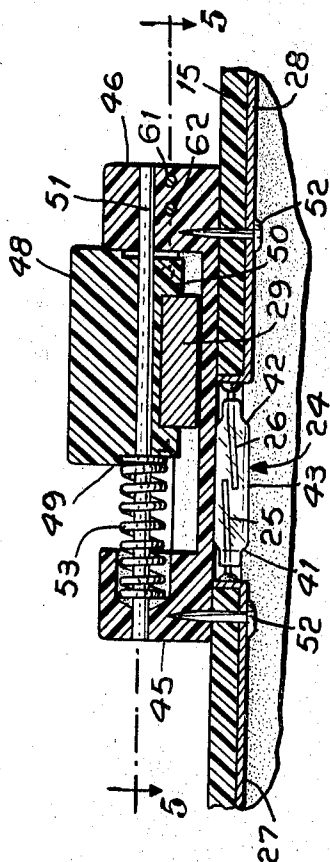


Fig. 5

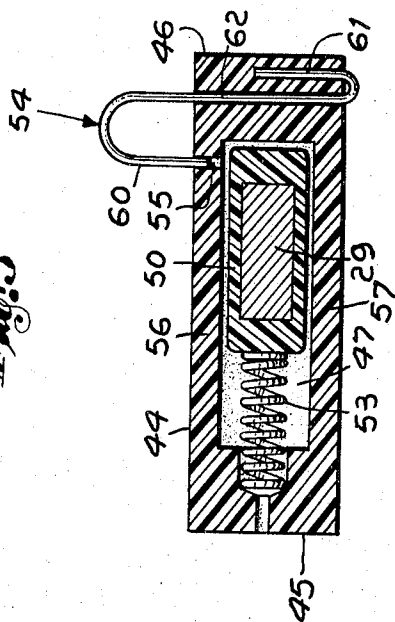


Fig. 6

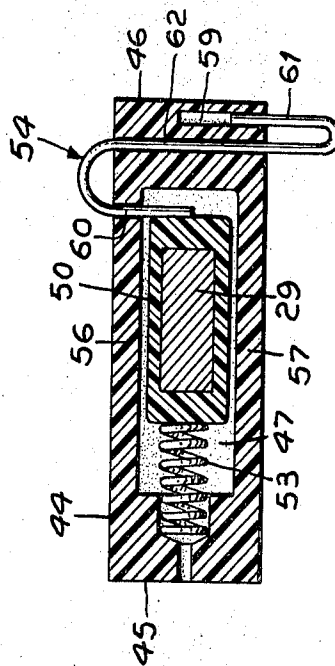
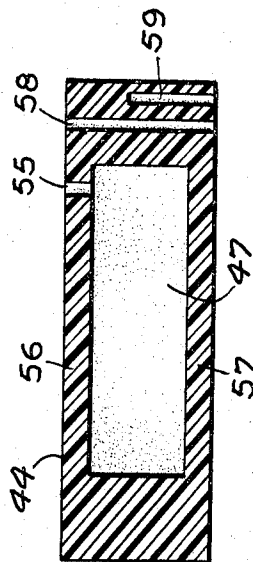


Fig. 7



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Fig. 8

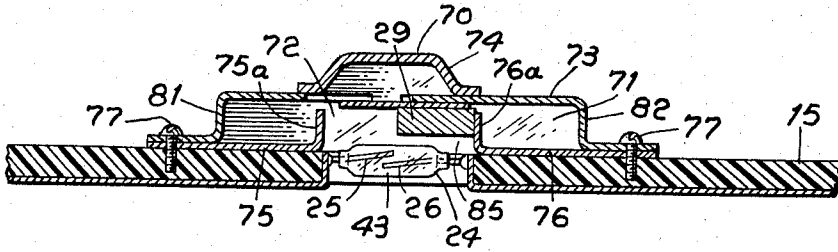


Fig. 9

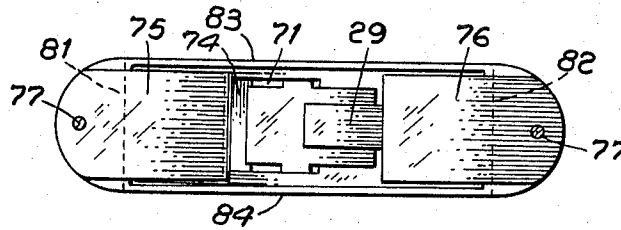


Fig. 10

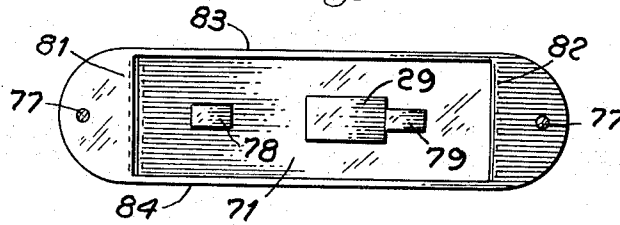


Fig. 11

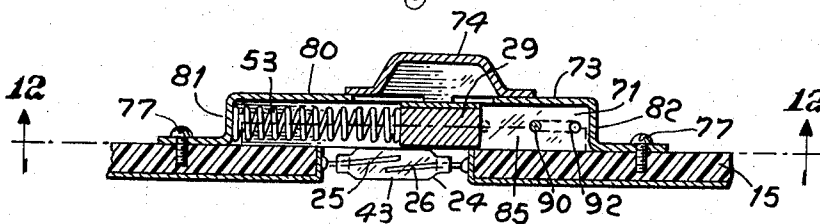
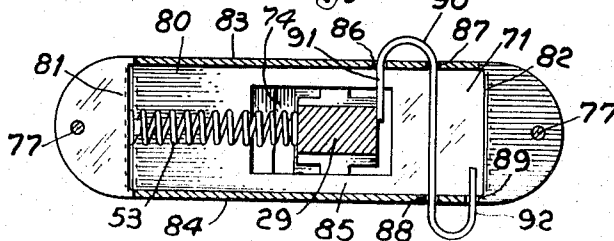


Fig. 12



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FLASHLIGHT AND SWITCH ASSEMBLY**CROSS-REFERENCE TO RELATED APPLICATION**

This application is a continuation-in-part of my earlier filed pending application, Ser. No. 156,661, filed June 25, 1971.

BACKGROUND OF THE INVENTION**Field of the Invention**

This invention relates to an improved flashlight wherein the switching mechanism comprises a glass enclosed magnetic reed switch mounted in the case and electrically connected to the conductor strips between the conductor rings formed at the ends of the case. The normally open contact arms of the reed switch are closed and the battery operated circuit is completed by the attraction of a magnet over the contact arms of the reed switch, the magnet being encased within a slidably mounted switch cover positioned over the reed switch. In a modified form of the invention, the magnet is positioned in a preformed plastic case mounted outside of the case and completely separated from the flashlight assembly within the case.

In two other modifications of the switch cover, the attraction of the magnet to steel strips or auxiliary magnets mounted at the ends of the switch cover is employed to hold the magnet over or away from the contact arms of the reed switch.

In all forms of the invention, the contact strips along the longitudinal dimension of the case are welded to the contact rings at the ends of the case. The reed switch assembly and fixed contact strips reduce the possibility of arcing within the flashlight and greatly increase the safety aspects of the flashlight.

Description of the Prior Art

There is a great need in mines, in oil refineries and in other explosive atmospheres for flashlights with safety features which reduce the chance of any spark which might cause an explosion. Flashlights are manufactured, known as "permissible" flashlights, which have received the approval of the Bureau of Mines, Underwriters Laboratories, Bureau of Ships and the U.S. Coast Guard which have safety features such as no exposed metal parts, hermetic seals, and contact points in the switch sealed with rubber. Nevertheless, even the most carefully made flash-light has several contact points within the housing of the flashlight which may arc and cause an explosion in a flammable atmosphere if any part of the insulation in the housing is defective. The six contact points within the ordinary flashlight, whether or not safety approved, are between the coiled spring and one battery, between the batteries, at the switch where one resilient conductor strip is moved to contact another resilient conductor strip working in cooperation with the switch moved to contact the metal reflector cone holding the bulb assembly, at the friction socket holding the bulb and at the point of contact between bulb assembly and the battery.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an improved construction of a flashlight which eliminates two of the contact points between pieces of metal which are found in all flashlights made at the present time and which thereby substantially reduces the possi-

bility of arcing in the flashlight. The use of a glass enclosed magnetic reed switch whose contact arms are in a normally opened position, provides a switch wherein any spark which might be caused upon opening or closing the switch is rendered harmless because of the glass enclosure; the use of the reed switch also eliminates the need for movable contact strips along the length of the flashlight case, thus providing a safer flashlight.

It is another object of this invention to provide a novel switch means by slidably mounting the magnet required to close the contact arms of the reed switch within the preformed housing which is affixed to the case separate from the flashlight assembly within the case.

It is another object of this invention to provide several structures of switch covers wherein a magnet is mounted within the switch cover.

It is another object of this invention to provide an inexpensive, compact flashlight unit which is easy to manufacture.

It is a further object of this invention to provide a switch assembly which is adaptable for use with other portable devices, such as sealed beam lanterns.

These and various other objects and advantages of this invention will be more fully apparent from a consideration of the following description, drawings and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal sectional view of the device, showing one form of switch assembly.

FIG. 2 is a top plan view of a portion of the exterior wall of the device shown in FIG. 1 with the switch removed.

FIG. 3 is a perspective view of a modified form of switch.

FIG. 4 is a sectional view of the switch on the line 4 — 4 of FIG. 3.

FIG. 5 is a sectional view of the switch on the line 5 — 5 of FIG. 4.

FIG. 6 is a view similar to FIG. 5 with the locking pin in a different position.

FIG. 7 is a view similar to FIGS. 5 and 6 with the magnet assembly, spring and locking pin removed.

FIG. 8 is a sectional view of a modified form of switch cover.

FIG. 9 is a bottom plan view of the switch cover shown in FIG. 8.

FIG. 10 is a bottom plan view of another modified form of switch cover.

FIG. 11 is a sectional view of another modified form of switch cover.

FIG. 12 is a sectional view of the switch on the line 12 — 12 of FIG. 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now specifically to the drawings, a flashlight constructed according to my invention is shown generally by the numeral 10 in FIG. 1. The flashlight is formed with a cylindrical insulating case 11 having a removable front end 12 formed with an opening and removable back end 13. An aperture 14 is formed in the circumferential wall 15 of the case. The front end 12 and back end are threadably mounted on the case 11 by threads 38 formed on the inner surfaces of ends 12, 13 and the outer surface of the case 11. A lens 16 and

rubber gasket 35 are mounted at the front end of the case, the rubber gasket 35 forming an airtight seal at the front end of the case. A rubber gasket 36 is also mounted between back end 13 of the case and the body 11 of the case to form an airtight seal.

The case serves to house a reflector cone 17 of conducting material, a bulb 18, two D-batteries 19, 20 and a compression spring 21 of conducting material; the bulb 18 being in electrical contact with the metal end of one of the batteries 19. Two rings of conducting material 22, 23 are formed along the inner walls at the front and back of the case respectively, and a metal contact strip 37 is formed at the back end 13 of the case, one metal ring 23 and the metal contact strip 37 at the back end of the housing being in contact with the compression spring 21 and the second metal ring 22 being in contact with the reflector 17, the spring 21 urging the batteries, reflector, bulb and conducting rings into touching relationship.

The details of construction and placement to form a partial circuit between the reflector, bulb, batteries, spring and metal rings are well understood and further description is not believed necessary.

A commercially available glass enclosed magnetic reed switch 24 of the spring leaf type having two contact arms 25, 26 in a normally open position is mounted in the aperture 14 of the case 11. The reed switch has a front end 41, back end 42 and center portion 43. Two strips of conducting material 27, 28 are fixedly mounted along the longitudinal dimension of the inner wall of the case in alignment with the ends of the reed switch 24. One conducting strip 27 is electrically connected between the conducting ring 22 at the front of the case and the front end of the reed switch 41 and the second conducting strip 28 is electrically connected between the conducting ring 23 at the back of the case and the back end 42 of the reed switch.

The closing of the contact arms 25, 26 of the reed switch 24 is controlled by the attraction of a magnet 29. When a magnet having its north and south poles parallel to the longitudinal dimension of the contact arms 25, 26 is placed adjacent to the center portion 43 of the reed switch 24, the normally separated contact arms 25, 26 are brought together by the attraction of the magnet 29 and the circuit is closed. When the magnet 29 is moved from the center portion 43 of the reed switch the contact arms 25, 26 separate the circuit is opened.

As shown in FIGS. 1 and 2, a switch cover 30 formed with a chamber 39 is slidably mounted in a track 31 formed on the circumferential wall 15 of the case, on each side of the aperture 14 in which the reed switch 24 is mounted. The magnet 29 is mounted within the chamber 39 of the switch cover 30, over the reed switch, with the north and south poles of the magnet 29 parallel to the longitudinal dimension of the contact arms 25, 26 of the reed switch. The magnet may be tied, bolted or held adhesively to a nonconducting block 32 for mounting within the switch cover. Stops 33, 34 or a ridge are formed on the ends of the track 31 to limit the movement of the switch cover 30. The switch cover and magnet are positioned so that when the switch cover 30 is moved forward toward the front end 12 of the case the magnet 29 is directly over the center portion 43 of the reed switch 24 and the contact arms 25, 26 close to complete the circuit. When the cover is moved toward the back end of the case 13 the

magnet 29 is moved away from the center portion of the reed switch 24 and the contact arms open to break the circuit, the stops 33, 34 limiting the forward and backward movement of the switch cover 30.

Two modified forms of switch covers to hold the magnet 29 are shown in FIGS. 8, 9 and 10. As shown in FIGS. 8 and 9, a switch cover, indicated generally by the numeral 70, is formed as a hollow rectangular housing having a chamber 71 and having a top face 73, a front end 81, a back end 82, two side walls 83, 84 and an open bottom 85 which is adapted to cover a magnetic reed switch 24 which is mounted in a flashlight case 15 or other device. An opening 72 is formed in the top face 73 of the housing over which a switch button 74 is slidably mounted. A magnet 29 having its north and south poles in alignment with the front end 81 and back end 82 of the switch cover is fixedly mounted on the underside of the switch button 72 for movement therewith. The magnet 29 is positioned over a reed switch 24 with its north and south poles parallel to the longitudinal dimensions of the contact arms 25, 26 of the reed switch 24 to cause the reed switch to operate as heretofore described. Two strips of steel 75, 76 are mounted at the ends 81, 82 of the switch cover, parallel to the top face 73 of the switch cover with the inner or unattached ends of each strip, 75a and 76a, formed or bent upward at right angles, perpendicular to the strip so that the perpendicular faces are substantially parallel to the end faces of the magnet 29. When the magnet 29 is manually moved by the switch button 74 to either end of the switch cover chamber 71, it is magnetically attracted to a perpendicular face 75a, 76a of a steel strip 75, 76 and is held in position until the switch button 74 is again moved manually. The perpendicular faces 75a, 76a of the magnetizable strips 75, 76 are positioned a predetermined distance from each other with respect to the magnet 29 so that when the magnet is magnetically held at one steel face 75a it will be directly over the center portion 43 of the reed switch 24 and the contact arms 25, 26 of the reed switch 24 will close. When the magnet 29 is magnetically held at the second steel face 76a it will be held away from the center portion 43 of the reed switch 24, and the contact arms 25, 26 of the reed switch will open. The switch cover assembly is mounted over a reed switch 24 in a flashlight or other device by fastening means 77, such as screws, pins or studs.

A modified form of the aforesaid switch cover is shown in FIG. 10. In this form of the invention, two magnets 78 and 79 are fixedly mounted at the ends 81, 82 of the chamber 71 of the switch cover with the north pole of the magnet facing the south pole of the switch-controlling magnet 29 and the south pole of the second magnet facing the north pole of the switch-controlling magnet 29. As previously described with respect to the steel strips 75, 76, the magnets 78, 79 are positioned a predetermined distance from each other with respect to the switch-controlling magnet 29, so that when the switch-controlling magnet 29 is magnetically held by one magnet 78 it will be directly over the center portion 43 of the reed switch 24 and the contact arms 25, 26 of the reed switch will close. When the switch-controlling magnet 29 is held by the second magnet 79 it will be held away from the center portion 43 of the reed switch 24, and the contact arms 25, 26 will open.

It can be seen that the aforesaid arrangements provide switch assemblies which lock the switch in either the "On" or "Off" positions and which are responsive to gently finger pressure to change the position.

A modified form of switch assembly indicated generally by the numeral 40 is shown in FIGS. 3 through 7, where like parts are identified by the same numerals as in FIGS. 1 and 2. A base 44 of non-conductive material preferably rectangular in shape, is formed with a front wall 45, a back wall 46, and a channel 47 extending axially of the base between the front and back walls 45, 46. A switch button 48 is slidably mounted within the channel 47. As shown in FIG. 4, the button 48 is slidably mounted on rod 51 mounted between the front and back walls 45, 46. The button 48 may be formed with a projection 50 along its lower surface, which projection is formed with a slot for holding the magnet 29. However, other means of mounting the magnet onto the underside of the button may be used. As heretofore described, the magnet 29 is positioned with its north and south poles parallel to the longitudinal dimensions of the contact arms 25, 26 of a magnetic reed switch 24 mounted in aperture 14 along a circumferential wall 15 of a flashlight case.

The switch assembly 40 is affixed to the wall 15 of the flashlight case, over the magnetic reed switch 24 by fastening means 52, such as pins or studs. The base 44 is affixed to the flashlight case so that when the switch button 48 is pushed to the front end of the base, the magnet 29 is positioned directly over the reed switch 24 and the contact arms 25, 26 will close to complete the circuit. When the button is pushed to the back end 46 of the base the magnet is shifted away from the center portion 43 of the reed switch and the contact arm 25, 26 open to break the circuit. The attractive force of the magnet is effective to close the contact arms of the reed switch despite the presence of the plastic base 44 of the switch between the magnet 29 and the reed switch 24.

To increase the safety aspects of the flashlight, the switch may contain resilient means, such as a compression spring 53 positioned around the guide rod 51, between the front wall 45 of the base and the front surface 49 of the switch button 48, the guide rod 51 retaining the compression spring 53 and switch button 48 in alignment. The compression spring 53 urges the switch button 48 toward the back wall 46 of the base, thereby urging the magnet 29 away from the center portion 43 of the reed switch 24. In the event that a person using the flashlight inadvertently dropped it, the forward finger pressure on the switch button would be removed, the switch button 48 with magnet 29 attached would be urged away from the center portion 43 of the reed switch 24 and the flashlight circuit would open. However, even in flammable situations it is sometimes necessary for a person to have the flashlight on while his hands are free to do some work. Therefore, I have provided a locking means such as non-magnetizable S-shaped pin 54 for holding the switch button in the forward or on-position when required. To support the locking means 54, an aperture 55 is formed through one side 56 of the base, proximate to the back wall 46 and opening into the channel 47; a hole 58 is formed through the center portion of the back wall 46 and an aperture 59 is formed in the back wall 46, rearward from the hole 58, the aperture 59 extending part way through said back wall 46, the apertures 55 and 59

being on opposite sides of the case. An S-shaped pin 54 is movably mounted transversely of the channel 47, through the hole 58 and apertures 55 and 59, one arm 60 of the S-pin 54 passing through the aperture 55, the second arm 61 of the S-pin 54 passing into the aperture 59, and the body of the S-pin 54 passing through the hole 58. In ordinary operation the arm 60 of the S-pin is positioned within the side wall 56 of base and does not extend into the channel 47 as shown in FIG. 5. The switch button 48 can then move forward and backward in the channel, with the spring 53 urging the switch button toward the back wall 46. When it is desired to lock the switch in the on-position, the switch button 48 is pushed toward the front wall 45, the arm 60 of the S-pin is pushed into the channel 47, blocking the backward movement of the switch button and thereby locking the magnet in position over the contact arms 25, 26 of the reed switch 24. The movement of the arm 60 into the channel 47 forces the arm 61 to extend out of the aperture 59 at the other side 57 of the back wall. To release the switch button, the arm 61 is pressed into the aperture 59 thereby moving arm 60 out of the channel. The switch assembly described provides a unit in which all moving parts are completely separated from the electrical circuitry within the flashlight. It is obvious that the switch assembly may be used on any device containing a magnetic reed switch operatively mounted in an external wall of the device.

Another modified form of switch cover to hold a magnet 29 is shown in FIGS. 11 and 12. A switch cover, indicated generally by the numeral 80, is formed as a hollow rectangular housing having a chamber 71 and having a top face 73, a front end 81, a back end 82, two side walls 83, 84 and an open bottom 85 which is adapted to cover a magnetic reed switch 24 which is mounted in a flashlight case 15 as heretofore described. An opening 72 is formed in the top face 73 of housing over which a switch button 74 is slidably mounted. A magnet 29 is fixedly mounted on the underside of the switch button 74 for movement therewith within the chamber 71. Resilient means such as a compression spring 53 are positioned within the chamber 71 between the front end 81 of the switch cover and one end of the magnet 29, the compression spring 53 urging the magnet toward the back end 82 of the switch cover. The switch cover is affixed to the wall 15 of the flashlight case, over the magnetic reed switch 24 by fastening means 77 such as screws, pins or studs. The switch cover 80 is affixed to the flashlight case so that when the switch button is pushed toward the front end 81 of the switch cover, the magnet 29 is positioned directly over the reed switch 24 and the contact arms 25, 26 will close to complete the circuit. Locking means such as a steel S-shaped pin 90 are provided for holding the magnet in the forward or on-position when the switch button is pushed forward. To support the locking means, the first side wall 83 is formed with a pair of apertures, a front aperture 86 and a back aperture 87, both apertures being positioned toward the back end 82 of the switch cover 80. The second side wall 84 is also formed with a pair of apertures, a front aperture 88 and a back aperture 89, both apertures being positioned toward the back end 82 of the switch cover, slightly rearward of the apertures 86, 87 in the first side wall 86. The S-shaped steel pin 90 is movably mounted transversely of the chamber 71, the front arm 91 of the S-pin passing into the aperture 86, the back arm 92 of

the S-pin passing into the aperture 89 and the body of the S-pin passing through apertures 87 and 88. In the off-position, the front arm 91 is positioned at the edge of the first side wall 86 and the magnet 29 is urged toward the back wall 82 of the switch cover, away from the reed switch 24. When the switch button is manually moved toward the front wall 81 of the switch cover the attraction of the magnet pulls the front arm 91 of the steel S-pin 90 into the chamber 71 behind the magnet thereby locking the magnet into the forward or on-position directly over the center portion of the reed switch 24. When it is desired to turn the flashlight to the off-position, finger pressure on the back arm 92 of the S-pin forces the front arm 91 out of the chamber 71 and the pressure of the spring 53 on the magnet 29 forces the magnet away from the center portion of the reed switch 24 toward the back wall 82 of the switch cover. The front aperture 86 is formed in the first side wall 83 at a predetermined distance from the magnetic reed switch 24 with respect to the size of the magnet 29 so that when the front arm 91 of the S-shaped steel pin 90 is pulled into the chamber 71 by magnetic attraction it will hold the magnet over the center portion 43 of the reed switch 24 to cause the contact arms 25, 26 to remain closed until the front arm 91 of the S-shaped steel pin 90 is forced out of the chamber 71.

It will thus be seen that I have provided a new and improved flashlight with several modifications of switch assemblies. Modifications may, of course, be made in the illustrated and described embodiments without departing from the invention as set forth in the accompanying claims.

I claim:

1. A switch assembly for use with a magnetic reed switch operatively mounted in the external wall of a device comprising:

- a. a nonconductive base having a front wall and a back wall and formed with a channel between the front wall and back wall along the longitudinal dimension of the base;
- b. a switch button slidably mounted in the channel;

- c. a magnet affixed to the underside of the switch button for movement therewith, the magnet having its north and south poles in alignment with the longitudinal dimension of the channel of the base, the base being positioned over a magnetic reed switch in alignment with the longitudinal dimensions of the contact arms of the reed switch, in such position that when the switch button and magnet are moved toward the front wall of the base, the magnet will cause the contact arms of the reed switch to close;

- d. means to mount the switch assembly on the external wall of a device,

- e. resilient means positioned between the front wall of the base and the front surface of the switch button to urge the switch button toward the back wall of the base; and

- f. movable locking means mounted in the base to hold the switch button toward the front wall of the base.

2. A switch assembly as recited in claim 1 wherein:

- a. the base is formed with a first aperture through one side, proximate to the back wall and opening into the channel of the base;

- b. the back wall is formed with a hole through the center portion and with a second aperture rearward of the hole, the second aperture extending part way through the back wall and being on the opposite side of the base from the first aperture; and

- c. a non-magnetic S-shaped pin is movably mounted transversely of the channel, through the hole and first and second apertures, one arm of the pin passing into the first aperture, the body of the pin passing through the hole and the second arm of the pin passing into the second aperture, the movement of one arm through the first aperture into the channel locking the switch button in a position toward the front end of the base, the movement of the second arm into the second aperture causing the withdrawal of the first arm from the channel to release the switch button.

3. A switch assembly for use with a magnetic reed switch operatively mounted in the external wall of a device comprising:

- a. switch cover formed with a chamfer and having a front end, back end, two side walls, an open bottom and a top face formed with an opening;

- b. a switch button slidably mounted over the opening in the top face of the switch cover;

- c. a magnet having its north and south poles in alignment with the front and back ends of the switch cover and having its north and south poles positioned parallel to the longitudinal dimensions of the contact arms of the reed switch, affixed to the underside of the switch button for movement therewith within the chamber;

- d. resilient means positioned between the front end of the switch cover and one end of the magnet to urge the magnet toward the back end of the switch cover and away from the center portion of the magnetic reed switch;

- e. magnetizable locking means movably mounted in the chamber at the back end of the switch cover; and

- f. means to mount the switch assembly on the external wall of a device.

4. A switch assembly as recited in claim 3 wherein:

- a. the first side wall of the switch cover is formed with a pair of apertures, a front aperture and a back aperture, both apertures being positioned toward the back end of the switch cover;

- b. the second side wall of the switch cover is formed with a pair of apertures, a front aperture and a back aperture, both apertures being positioned toward the back end of the switch cover slightly rearward of the apertures in the first side wall; and

- c. a magnetizable S-shaped pin is movably mounted transversely of the chamber, the front arm of the S-shaped pin passing into the front aperture on the first side wall, the back arm of the S-shaped pin passing into the back aperture in the second side wall and the body of the S-shaped pin passing through the back aperture of the first side wall and the front aperture of the second side wall, the front aperture in the first side wall being a predetermined distance from the magnetic reed switch with respect to the size of the magnet so that when the front arm of the S-shaped pin is pulled into the chamber by magnetic attraction it will hold the magnet over the center portion of the magnetic reed switch.

5. A switch assembly as recited in claim 4 wherein the S-shaped pin is made of steel.

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