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SWITCH ASSEMBLY AND ITS USE IN A FLASHLIGHT

The present invention relates to an electrical switch assembly, particularly to an electrical switch assembly for use in a flashlight.

In general, flashlights and portable lanterns include a protective body which contains one or more batteries electrically connected, either in a series or in parallel, by a conductor to a light source. The conductor is typically interrupted by a switch mechanism which moves the light source into contact with the conductors. There are three well-known switching mechanisms which are used in this way, that is a push button switch, a slide, or a twisting head.

Although such switching mechanisms are commonly used on many articles, including flashlights, there are disadvantages associated with their use. Thus, in the push button and slide switches the aesthetic incorporation of the switch within the design of the flashlight often causes problems. A further problem associated with the push button switch is the occasional failure of the spring mechanism used to rebound the switch between the on/off positions. In addition, there is often a loss of electrical continuity and, as a result, failure of the article to operate, associates with the use of a push button switch, caused by a general lack of a wiping action to clear contact points or to prevent corrosion build-up.

A disadvantage associated with the twisting head switch, that is a switch in which the head is twisted into contact with the conductors, is that the operator often does not know which way to rotate the head in order to turn the flashlight on. This is a particular problem when there is a focus adjustment feature incorporated into the head of the flashlight, which requires that the head assembly be rotated through various positions in order to adjust the focus. In that case there is inevitable confusion between twisting to activate the light and twisting to adjust the focus of the light. The ideal action for such an embodiment would be for the switch to be off when the head or lens housing is in its forward-most position. Some rotation, and resulting rearward longitudinal motion, would be required to make contact and activate the light source. Contact could then be maintained during subsequent rotation and resulting longitudinal motion rearward as the focus is adjusted. The problem that occurs with this method is that the head must always be returned to its forward-most position to deactivate the light. Inevitably, this means that the specific focal position achieved during previous use

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of the light is lost when the head is twisted to switch the light off. Therefore, with every use of the light, the focus position must be adjusted, with the added disadvantage that the user can never be sure that he will obtain the previously set focus. This can be very frustrating for the user of such a light.

It is apparent, therefore, that numerous problems exist with the presently available switching mechanisms, particularly when these are used with flashlights. There remains a need, therefore, for a switch assembly which can be incorporated into or with the article which it is intended to operate in an aesthetically pleasing manner, which can be used without affecting other features of the article, such as the focal adjustment of a flashlight, and which can allow for easy, corrosion-free use of the article with which it is associated.

The switch assembly of the present invention overcomes the problems associated with known switch mechanisms and satisfies the requirements outlined above.

The present invention provides a two-position switch assembly, particularly for use in flashlights, which blends aesthetically with the exterior of the article with which it is used, characterised in that the switch has positively locking first and second positions defining the on/off status of the article with which it is used, and wherein movement between said first and second positions provides corrosion-cleaning of the operating components.

In one embodiment of this aspect of the invention, there is provided a switch for selectively placing a light source in electrical communication with at least one battery disposed in a body, comprising;

a housing detachably adapted to be coupled to said body, and having a detent extending from an inner surface thereof;

an end cap having a neck portion received in said housing, said neck portion having a groove for receiving said detent to define at least a first and second position;

a contact assembly disposed in said neck portion and having a first portion in electrical communication with the battery and a second portion forming a contact; and

a retaining member received in said neck portion for fixing said contact assembly therein and pivotally retaining said neck portion within said housing;

said end cap being manually pivotable between said positions for selectively moving said contact into electrical communication with the light source.

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In a further aspect, the present invention provides a flashlight incorporating a switch assembly as defined above.

In one embodiment of this aspect of the invention, there is provided a flashlight comprising:

a body for receiving a power source therein;

a light assembly including a light source coupled to said body, said light source having one terminal positioned to be in electrical contact with one pole of said power source and a second terminal positioned to be proximate an opposite pole of said power source; and

a switch assembly closing said body, for selectively connecting and disconnecting said light source with said opposite pole of said power source.

The present invention may be further understood with reference to the drawings attached hereto, in which:

Figure 1 is a oblique view of the flashlight embodying this invention;

Figure 2 is an elevational sectional view of the flashlight taken along lines II-II shown in Figure 1;

Figure 3 is a sectional elevational view of an end cap used in the invention;

Figure 4 is a top view of the end cap shown in Figure 3;

Figure 5 is a bottom view of the end cap shown in Figure 3;

Figure 6 is an end view of the end cap shown in Figure 3;

Figure 7 is a sectional elevational view of a threaded housing;

Figure 8 is an end view of the housing shown in Figure 7;

Figure 9 is a side elevation view of the housing shown in Figures 7-8;

Figure 10 is an elevational sectional view of a retaining cap and sleeve used in connection with the invention;

Figure 11 is an end view of the retaining cap and sleeve shown in Figure 9;

Figure 12 is a side elevational view of the retaining cap and sleeve shown in Figure 10;

Figure 13 is a top view of the retaining cap and sleeve shown in Figure 10; and

Figure 14 is an exploded view illustrating the components comprising the switch assembly.

In the switch assembly of the present invention, when used in a flashlight, for example, one of the positively locking first and second positions defines an electrical connection between, for example the light source, and the power source and the other

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of the positively locking first and second positions defines electrical disconnection between the light and power sources.

In a preferred embodiment of this invention, the switch assembly includes an end cap and a housing member, the housing member adapted to receive at least a portion of the end cap and having a ridge or detent extending from an inner wall thereof, the end cap having, on the portion received by the housing member, a slot or groove for receiving said ridge or detent.

In a particularly preferred embodiment, the end cap includes two slots or grooves interspaced by and forming therebetween a cantilevered spring.

It is preferred that the relationship between the ridge or detent extending from an inner wall of the housing member, the slot or groove in the end cap and the spring defines at least the first and second positively locking positions of the switch.

In operation, therefore, of a switch assembly forming part of a flashlight, rotation of the end cap within the housing member will cause the detent to be dislodged from one slot or groove, forming the disconnected or "off" position, via the spring into the second slot or groove, thereby allowing an electrical connection between various components of the switch assembly and the flashlight, and the "on" status of the flashlight. More details of the operation of the switch are given hereinafter in relation to the drawings appended hereto.

As discussed above, the switch assembly of the present invention is particularly suitable for use with a flashlight. When used with a flashlight, the assembly can be adapted to form, for example, the end of the light opposite that containing the light source. Thus, for example, the assembly including the housing member and the end cap may be adapted to be received by an open end of the body of a flashlight. As is readily apparent, the switch assembly may be a self-contained unit which may be removably incorporated with, for example, a flashlight. Inspection, cleaning and replacement of the switch assembly are thus facilitated.

The switch assembly may be attached to, for example, the body of a flashlight using standard, releasable, means. The exact means of attachment of the switch assembly to the flashlight body is not essential to the present invention, so long as the means for such attachment is not affected by operation of the switch. We have found,

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for example, that screwing via threaded sections or attachment via interaction between appropriate male and female members, are appropriate methods.

The particular material from which the exterior surfaces of the switch assembly are formed is not essential to the present invention. Suitably, however, the exterior surfaces of the switch assembly are formed from the same material as the article of which it is to form a part. Thus, when forming part of a flashlight, the exterior surfaces of the switch assembly are suitably chosen to be of the same, or similar, material and colour as the body of the flashlight.

To provide a substantially rugged flashlight capable of withstanding harsh treatment, it is preferred that substantially all of the components, i.e. the flahlight body and the switch assembly, are moulded from a high impact polymeric material such as XENOY ® 5230 available from G.E. Plastics Co. of Pittsfield, Massachusetts, U.S.A.

The remaining components of the switch assembly and of the flashlight of which the switch assembly may form a part, are made from materials standard in the art for such components. Thus, conductive elements may suitably be formed from copper and any spring member(s) may, for example, be made from chrome-plated spring steel. It is also preferred that the light source in the flashlight includes a bi-pin lamp capable of handling a voltage and amperage consistent with that provided by the batteries.

The interior of the article, for example a flashlight, including the switch assembly of the present invention may be made generally impervious to the invasion of water or water vapour by the inclusion of, for example, seals, typically O-ring seals, along or around each opening. Thus, for example, an O-ring seal can be included at the juncture of the end cap and housing member of the switch assembly. In addition, a further seal may be included at the point of attachment of the switch assembly to the body of the flashlight and between the body of the flashlight and the section including the light source. With the inclusion of O-ring seals such as described above, the flashlight may be waterproof to a depth of at least three feet (say 0.9144 m) of water or 1.1 atmospheres of pressure for at least 30 minutes.

As described above, the switch assembly includes an end cap and a housing member. It is preferred that the end cap includes means to facilitate switching between the first and second positively locking positions. Typically, this means includes a handle or gripping point formed, for example, from a flange extending from that portion of the end cap not accomodated by the housing member.

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It is furthermore preferred that the switch and/or flashlight of which it may form a part, includes indicator means to show when electrical contact is made and the switch is on and when that electrical contact is broken such that the switch is off. Such indicator means may take any appropriate and aesthetically pleasing form, and any indicator means used in this or related arts may equally be employed here. Typically, the indicator means include alignment marks formed, for example, from positive relief structures, on the switch assembly and the body of the flashlight.

An additional and advantageous feature of the switch assembly and/or of the flashlight of which it may form a part, is the texturing of the exterior surfaces of those components. Texturing may be included so as to form a slip-resistant surface and to provide a good grip for the user. In a preferred embodiment, this texturing may take the form of a series of concentric and equidistantly-spaced grooves.

In a preferred form, the switch assembly of the present invention is adapted for use with a flashlight and includes a housing, which is suitably detachably coupled to one end of a flashlight body, having a detent extending from an inner wall thereof. The housing may be adapted to receive, concentrically, a neck portion of an end cap which typically closes one end of the housing. The neck portion of the end cap may be formed to contain a pair of grooves separated by a cantilevered spring adapted to receive the detent extending inwardly from the housing, thereby suitably defining at least a first and second position for the end cap. A hole in the neck portion concentric with the longitudinal axis of the end cap may then receive a contact assembly typically having a first portion for contacting the opposite pole of the power source and a second portion which selectively contacts the second terminal of the light source upon rotation of the end cap between the first and second position. The contact assembly may be retained within the neck portion, and the end cap may be retained within the housing, by a retaining member received in the hole in the neck portion. The retaining member permits manual movement of the end cap about its longitudinal axis to move the contact assembly in selective contact with the second terminal of the light source.

Referring to Figures 1 and 2, a first embodiment of flashlight 20 includes an elongate tubular body 22 having a first end 24 and a second end 26. In a preferred embodiment, tubular body 22 contains a longitudinal battery retention chamber which forms an inner wall 28 and extends from first end 24 along the length of body 22 and through to second end 26. The diameter of inner wall 28 is preferably of a dimension suitable to accommodate one row of one or more dry cell batteries 30. The batteries

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may be of standard size, such as "D", "C", "AA" or "AAA". As in common practice, if more than one battery 30 is used, the batteries are of the same size and arranged in serial alignment with the positive pole 30a of one battery in contact with the negative pole 30b of the next battery.

Referring to Figure 2, the first end 24 of tubular body 22 contains a light assembly 32. Assembly 32 includes a lens housing 34 which is threadably received along the first end 24 of tubular body 22. Lens housing 34 receives a lens bezel 36 which, in turn, retains a lens 38. Disposed between lens bezel 36, lens 38 and lens housing 34 is a reflector 40 having an opening 42 at its apex to receive a light source 44, such as a light bulb. Light assembly 32 can be longitudinally adjusted by twisting housing 34 along the threads to vary the position of light source 44 with respect to reflector 40 thus changing the focus and/or clarity of the light beam reflected from reflector 40.

Disposed behind reflector 40 in first end 24 of tubular body 22 is a lamp-retaining module 46 for retaining light source 44 having pins 46a, 46b received in socket 50a with an opposite end lying adjacent the interior end 54 of module 46 so as to contact one pole, preferably the positive pole 30a, of battery 30 received in tubular body 22. A second conductive contact strip 56 has one end disposed in socket 50b and in contact with lamp pin 46b. Contact strip 56 preferably extends from module 46 and runs the length of tubular body 22 along wall 28 terminating at end 58 against the inner wall 28 proximate second end 26.

Closing the second end 26 of tubular body 22 is a switch assembly 60. Assembly 60 includes an end cap 62 having a cylindrical portion 63 (Figures 3-6) defining a first end 66 and a flange or projection 68 extending from the second end 70 of the end cap 62. Flange 68 extends across the diameter of end cap 62 and transversely to the longitudinal axis A of flashlight 20. It is preferred that flange 68 contain an opening 72 extending through it. Flange 68 provides a gripping point to turn switch assembly between a first "on" position and a second "off" position.

The cylindrical first end 64 of end cap 62 includes a concentric hole 74 which extends from the first end 66 to the main body of end cap 62 and defines an inner peripheral wall 76. A portion of wall 76 is removed to form a rectangular, radially and longitudinally extending opening 78 with the long axis of the opening oriented generally parallel to the longitudinal axis A of flashlight 20. Transverse to rectangular opening 78 is a second rectangular opening or slot 80 which defines tabs 82a, 82b at end 66 on

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opposite sides of opening 78. Extending inwardly into hole 74 from wall 76 between slot 80 and the main body of end cap 62 are ribs 84 to provide strength to cylindrical portion 64 as well as a seat for a conventional hydrogen absorbing or "getter" material (not shown) such as platinum-plated, sintered aluminium.

In a preferred embodiment, opposite rectangular opening 78 and slot 80 in a portion of wall 76, are two longitudinal slots or grooves 86a, 86b on opposite sides of a cantilevered portion 88 of wall 76, which serves as a spring. The exterior surface 90 of cantilever spring 88 will be readily apparent when described in greater detail below.

A threaded housing 100, which receives, concentrically, cylindrical portion 64 of end cap 62, has a first externally-threaded end 103 engaging internal threads 104 in the second end 26 of tubular body 22; see Figures 2, 7-9 and 14. The inside diameter of inner wall 106 is slightly greater than the outside diameter of cylindrical portion or neck 64 to act like a bearing surface and allow rotation of end cap 62 therein. A longitudinal, radially inwardly extending ridge or detent 108 extends from inner wall 106 and has a dimension appropriate to seat firmly within either longitudinal slot 86a or 86b, yet has a height slightly greater than the distance between inner peripheral wall 106 and the exterior surface 90 of cantilever spring 88. It is this structural relationship between slots 86a, 86b, cantilevered spring 88 and ridge or detent 108 which defines the first and second positions of switch assembly 60.

Disposed in concentric hole 74 and providing electrical continuity between the opposite pole of battery 30 disposed in tubular body 22 and end 58 of contact 56 is a rear contact 110 and a spring conductor 112 (see Figures 2 and 14). Rear contact 110 is an L-shaped electrically conductive strip of material such as copper or similar conductive material which has a first transverse end 111 disposed diametrically across hole 74 and supported by ribs 83. Through a series of right angle bends, contact 110 extends from hole 74, and longitudinally through rectangular opening 78 formed in wall 76 to overlie a portion of inner wall 28 and selectively contact end 58 of contact strip 56 (Figure 2). Spring conductor 112 is located with one end 113 urged against first end 111 of contact 110, and extends along longitudinal axis A of light 20 to engage the opposite pole of the one or more batteries 30.

End cap 62, contact 110 and spring 112 are held in place and within threaded housing 100 by a retaining member 114 (see Figures 2, and 10-14), which includes cylindrical sleeve portion 116 extending generally perpendicular from and concentric with a circular flange 118. Dependent from, and extending substantially the exterior

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length of sleeve 116 is a generally rectangular spline 120. The dimensions of sleeve portion 116 and dependent spline 120 are such so as to be received in a specific or "keyed" manner within concentric hole 74 in end cap 62. That is to say that sleeve portion 116 is adapted to be received by hole 74 in one way such that spline 120 is received by rectangular opening 78 formed in wall 76. Detents 122a, 122b formed along opposite sides of spline 120 slide past tabs 82a, 82b defined in the first end 66 or neck 64, and prevent withdrawal of sleeve 116. A concentric hole 124 extending the length of sleeve 116 allows spring 112 to extend therethrough while sleeve 116 urges the bottom 113 of spring 112 against the first end of contact 110. With sleeve 116 locked in hole 74 by detents 122a, 122b, circular flange 118 prevents withdrawal of neck 64 from threaded housing 100 because the diameter of flange 118 is greater than the outside diameter of neck 64 and abuts against the first end 102 of threaded housing 100. Segments of flange 118 are shown removed at 126a, 126b to provide access to tabs 82a, 82b after assembly so that switch assembly 60 may be disassembled for service as necessary. A tool may be inserted between spline 120 and each tab 82a, 82b to disengage detents 122a, 122b and allow withdrawal of retaining member 114.

Conductive elements such as contact strips 52, 56 and 110 are preferably made from copper while spring 112 is made from chrome-plated spring steel. It is also preferred that light source 44 include a bi-pin lamp capable of handling a voltage and amperage consistent with that provided by the batteries.

The interior of flashlight 20 can be made generally impervious to the invasion of water or water vapour by locating O-ring seals along each of the openings. For example, O-ring 130 is received about neck portion 64 proximate the main body of end cap 72 and adapted to seal with an inner wall of threaded housing 100. A second O-ring 132 is disposed in an annular groove 134 of threaded housing 100 and adapted to seal with an inner surface of wall of tubular body 22. In a similar fashion, O-ring seals such as 136 may be positioned to form seals between head assembly 50 and tubular body 22. With O-ring seals 130, 132 and 136 located as described above, flashlight 20 is waterproof as descibed above.

Referring again to Figures 1 and 2, the exterior of tubular body 22 may be textured to form a slip-resistant surface and provide a good grip for the user. In a preferred embodiment, a series of concentric and equidistantly-spaced grooves 140 about the tubular body provide this function. In addition, the exterior of tubular body 22 contains an alignment mark 142 defined by a positive relief structure, which is aligned with a similar mark 144 formed at the end of flange 68 extending from end cap 62 to

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indicate when the switch is in the "on" position. Figures 1 and 2 also indicate that the exterior of lens housing 34 portion of light assembly 32 may be textured to form a slip-resistant surface and assist in rotating assembly 32 to achieve focus adjustment. In a preferred embodiment, a series of longitudinal and equidistantly spaced grooves 35 are formed about the housing to provide this function.

In operation, switch assembly 60 is removed from flashlight housing or casing 22 by turning end cap 62 about the longitudinal axis of the flashlight, to unthread switch assembly 60 from housing 22. The appropriate number of batteries are inserted into housing 22 through end 26 and switch assembly 60 closes end 26 by rotating end cap 62 in the opposite direction and engaging threads 104. Switch assembly 60 is threaded into housing 22 until end cap 62 is tight. Preferably, threads 104 and mutual threads within housing 22 are designed so that switch assembly 60 stops at a predetermined point. Such may be accomplished by designing a thread stop in the connection between such assemblies 60 and housing 22.

With the appropriate number of batteries disposed within flashlight 20 and switch assembly 60 closing the end of flashlight 20, the flashlight may be turned on or off by twisting end cap 62 between the first and second positions defined by the engagement of ridge 108 with detents or grooves 86a and 86b. The rotation of end cap 62 causes rear contact 110 to swing into contact with the end 58 of contact strip 56. Electrical current is then allowed to flow between the positive and negative contacts, 30a, 30b, through spring 112, rear contact 110, contact strip 56, and contact strip 52, with the rotation of end cap 62 swinging rear contact 110 into engagement with contact strip 56. The circular motion of the end of rear contact 110 engaging contact strip 56 creates a "wiping action" which reduces corrosion and clears the contact points and provides good electrical continuity therebetween. The flashlight may be turned off by rotating end cap 62 in an opposite direction to locate ridge 108 in the opposite detent slot 86a, 86b, and swing rear contact strip 110 away from contact strip 56, thus breaking electrical continuity between the poles of the batteries. The operator may determine whether or not the switch is in the "on" position by looking at the alignment of indicators 142, 144. It is preferred that the flashlight be in the "on" position with indicators 142, 144 positioned directly across from each other. By rotating end cap 62 to the "off" position, indicator 144 is moved with respect to indicator 142, causing the indicators to no longer be aligned with each other.

The preferred manner of inserting or removing batteries for flashlight 20 is by unscrewing assembly 60 from the rear 26 of housing 22. By unthreading switch

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assembly 60 from housing 22, the entire switch assembly 60 is removed intact and contained within thread housing 100. If for some reason switch assembly 60 were to malfunction or break down, switch assembly 60 may be replaced in its entirely without requiring to replace the entire flashlight. In addition, this invention provides that switch assembly 60 may be serviced by removing retaining sleeve 114 from the neck portion 64 of end cap 62. Removing of retaining sleeve 114 provides access to rear contact 110 and spring 112. Thus, according to this construction, any one of the malfunctioning parts may be replaced, or the entire assembly may be replaced as a whole.

Light assembly 32 at the opposite end 24 of flashlight 20 allows the operator to focus the beam of light reflected from reflector 40. By rotating lens housing 34 about the longitudinal axis A, the threads joining lens assembly 34 to body 22 move reflector 40 with respect to light source 44 and thus produce either a broad or narrow pattern of light reflected through lens 38. The advantage provided by this structure is that the operator may maintain a desired light beam configuration when turning on the flashlight.

The advantages provided by each form of the invention include a more aesthetically appealing switch which is integral with the overall design of the flashlight. Secondly, the switch disposed within the end cap allows easy inspection of the critical contacts of the switch to make sure that electrical continuity is achieved. Additionally, as the on/off action requires that the contact strips pass one over the other in mutual tangency, a corrosion-reducing wiping action is automatically provided. The switch also has few parts for easy assembly without special tools. If necessary, the switch may be disassembled to effect repairs, or may be replaced in its entirely for little cost.

The above description is considered that of the preferred embodiments only. Modifications on the invention will occur to those skilled in the art and to those who make or use the invention. Therefore, it is understood that the embodiments shown in the drawings and described above are merely for illustrative purposes and are not intended to limit the scope of the invention.

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CLAIMS:

1. A two-position switch assembly, particularly for use in flashlights, which blends aesthetically with the exterior of the article with which it is used, characterised in that the switch has positively locking first and second positions defining the on/off status of the article with which it is used, and wherein movement between said first and second positions provides corrosion-cleaning of the operating components.

2. An assembly according to Claim 1 for use in a flashlight, in which one of the positively locking first and second positions defines an electrical connection between the light source and the power source and the other of the positively locking first and second positions defines electrical disconnection between the light and power sources.

3. An assembly according to Claim 1 or 2 in which the assembly includes an end cap and a housing member, the housing member adapted to receive at least a portion of the end cap and having a ridge or detent extending from an inner wall thereof, the end cap having, on the portion received by the housing member, a slot or groove for receiving said ridge or detent.

4. An assembly according to Claim 3 in which the end cap includes two slots or grooves, interspaced by and forming therebetween, a cantilevered spring.

5. An assembly according to Claim 4, in which the relationship between the ridge or detent, the slot or groove and the spring defines at least the first and second positively locking positions of the switch.

6. An assembly according to Claim 5 in which rotational movement about an axis causes said ridge or detent to be dislodged from a first, electrically disconnected, position in one of said slots or grooves to a second, electrically connected, position in the other of said slots or grooves.

7. A switch assembly according to Claim 1, for selectively placing a light source in electrical communication with at least one battery disposed in a body, comprising;

a housing detachably adapted to be coupled to said body, and having a detent extending from an inner surface thereof;

an end cap having a neck portion received in said housing, said neck portion having a groove for receiving said detent to define at least a first and second position;

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a contact assembly disposed in said neck portion and having a first portion in electrical communication with the battery and a second portion forming a contact; and

a retaining member received in said neck portion for fixing said contact assembly therein and pivotally retaining said neck portion within said housing;

said end cap being manually pivotal between said positions for selectively moving said contact into electrical communication with the light source.

8. An assembly according to Claim 7, wherein said housing has a longitudinal axis coincident with the body and said end cap is pivotal about said longitudinal axis.

9. An assembly according to Claim 8, wherein said end cap further includes:

a cantilever defined in said neck portion and extending parallel to said longitudinal axis for locating said detent in first and second positions on opposite sides of said cantilever;

10. An assembly according to Claim 7, wherein said retaining member is fixed in said neck portion by at least one detent extending from said retaining member and engaging at least one tab defined in said neck portion.

11. An assembly according to claim 10, wherein said retaining member includes a circular flange having a diameter generally equal to an end of said housing within said body for preventing a withdrawal of said end cap from said housing yet permitting pivotal movement of said end cap within said housing.

12. An assembly according to claim 7, wherein said contact assembly includes:

a first contact strip having a first end disposed within said neck portion and a second end extending inwardly of said body and positioned proximate a peripheral edge of said switch; and

a conductive spring concentrically disposed within said neck portion and having a fist end in contact with said first end of said contact strip, and a second end for engaging one pole of said battery.

13. An assembly according to claim 7, further comprising:

a key slot defined in and extending through a wall of said neck portion;

a spline extending from said retaining member to be received in said key slot for orienting said retaining member in said neck portion and urging a portion of said contact assembly toward a periphery of said neck portion.

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14. An assembly according to claim 7, wherein said end cap includes a grip for manually pivoting said switch between said positions.

15. An assembly according to claim 12, further comprising:

a second contact strip extending generally the length of said housing interior and having a first end in electrical contact with the light source and a second end disposed proximate said second end of said first contact strip.

said first contact strip selectively contacting said second contact strip in a wiping action with said end cap pivoted between said positions.

16. A switch for selectively connecting and disconnecting a direct current circuit, comprising:

a housing having a cylindrical inner wall;

a detent extending from said inner wall;

an end cap having a neck portion received by said housing;

a cantilever spring disposed in a slot formed in said neck portion for defining first and second positions for said detent on opposite sides of said cantilever spring;

a contact assembly disposed within said neck portion and having a first end for contacting one end of the circuit and a second end for selectively contacting an opposite end of the circuit; and

a retaining member disposed within said neck portion and fixed therein for preventing said neck portion form being withdrawn from said housing while allowing rotation of said end cap between said first and second positions.

17. A flashlight including a switch assembly as defined in any one of the preceding claims.

18. A flashlight, comprising:

a body for receiving a power source therein;

a light assembly including a light source coupled to said body, said light source having one terminal positioned to be in electrical contact with one pole of said power source and a second terminal positioned to be proximate an opposite pole of said power source; and

a switch assembly closing said body, for selectively connecting and disconnecting said light source with said opposite pole of said power source.

19. A flashlight according to Claim 18, wherein said switch assembly further includes:

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a housing having a first end detachably received in said body, and receiving said end cap;

a contact assembly disposed in said end cap for contacting said opposite end of said battery; and

a retaining member disposed within said end cap for retaining said end cap within said housing.

20. A flashlight according to Claim 19, further including a contact strip extending from said light assembly substantially the length of said housing and selectively in contact with said contact assembly disposed in said end cap.

21. A flashlight according to Claim 20, further including a hydrogen absorbing device disposed in said end cap.

22. A flashlight according to Claim 19, wherein said switch assembly further includes;

a cam extending from an inner surface of said member;

a cam follower of predetermined length concentrically defined on an exterior surface of said end cap for following said cam; and

a detent on said cam follower for engaging said cam and retaining said end cap in at least one of said first and second positions.

23. A flashlight according to Claim 22, further including a projection extending from a second end of said end cap for manually rotating said end cap between said first and second positions.

24. A flashlight according to Claim 22, further including;

a first seal disposed between said end cap and said housing; and

a second seal disposed between said housing and said body.

25. A flashlight according to Claim 19, wherein said retaining member includes;

a key received in said end cap;

a flange defined at one end of dais key to lie adjacent said end cap and said housing; and

a locking detent formed on said key for engaging said end cap, locking said flange adjacent said end cap and said housing;

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26. A flashlight according to any one of Claims 17 to 25 wherein said switch assembly is detachable from said body.

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ABSTRACT

SWITCH ASSEMBLY AND ITS USE IN A FLASHLIGHT

A switch assembly, particularly for use in a flashlight, is provided which is moveable about a longitudinal axis of a flashlight between at least a first position for placing the light source in electrical continuity with the power source and a second position breaking the electrical continuity between the light source and the power source. The switch assembly is connected to the flashlight in a removable and aesthetically pleasing manner and, during operation, wiping of contact strips ensures continual prevention of corrosion build-up.

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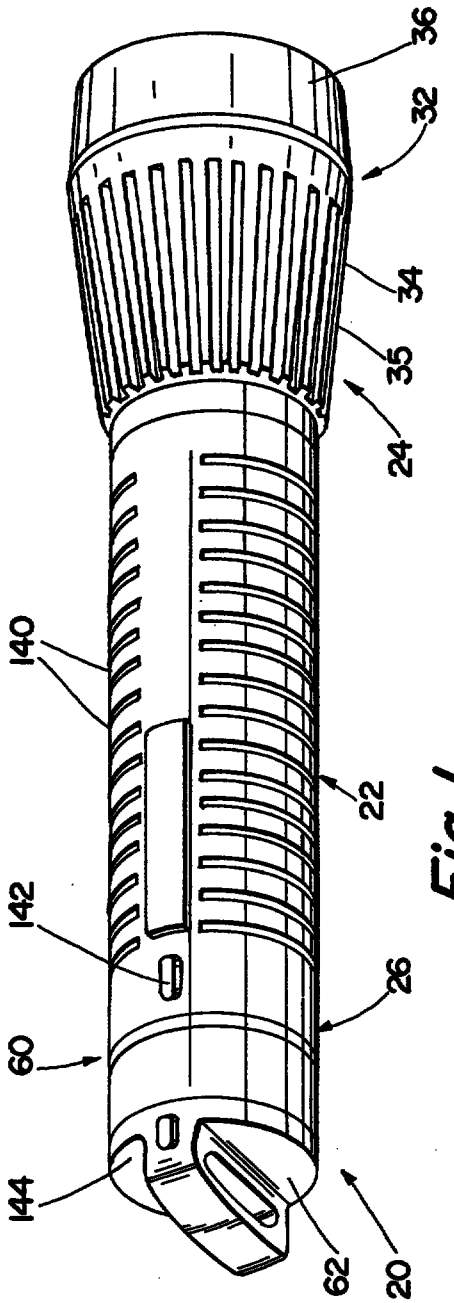


Fig. 1

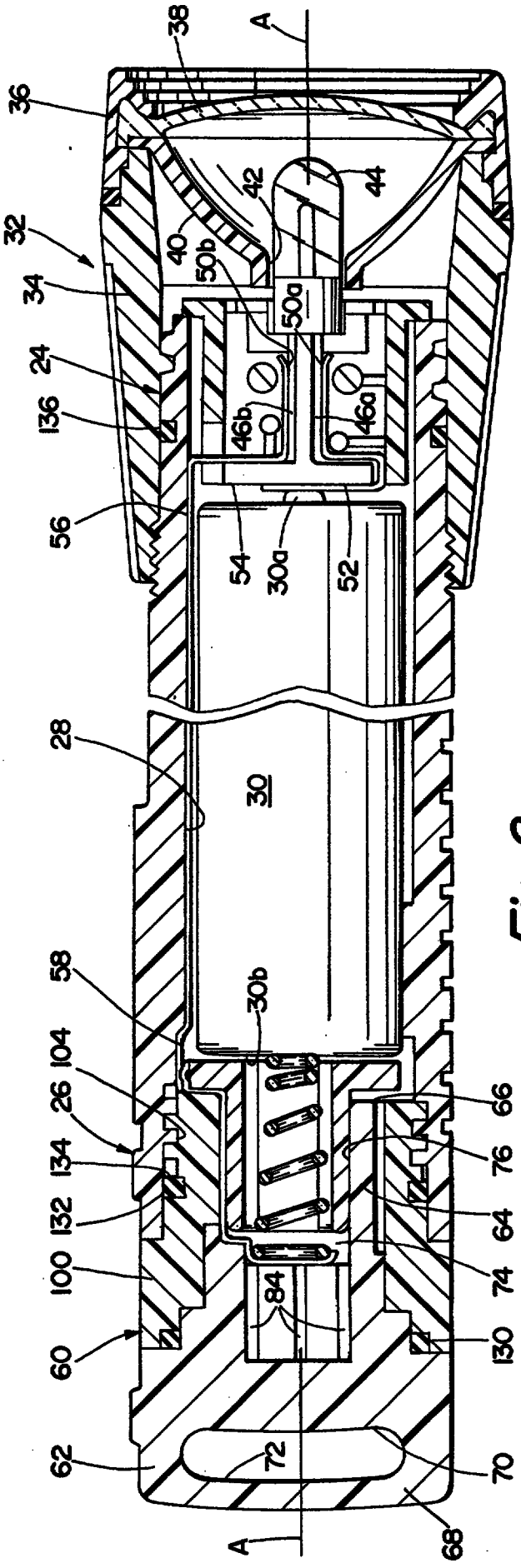


Fig. 2

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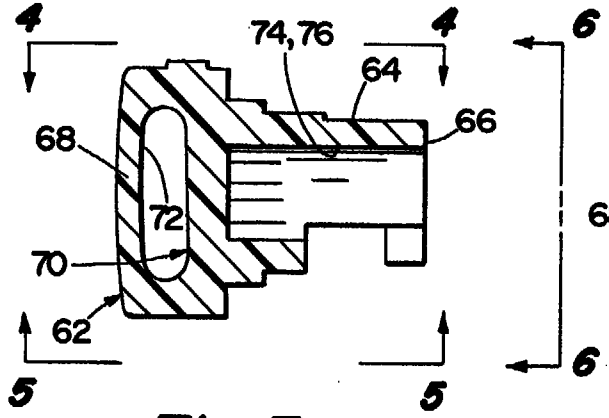


Fig. 3

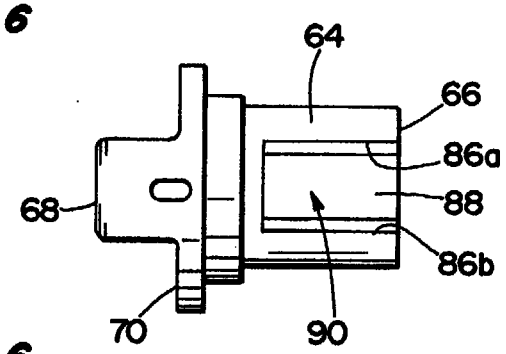


Fig. 4

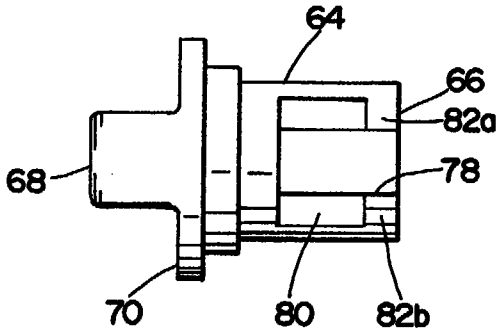


Fig. 5

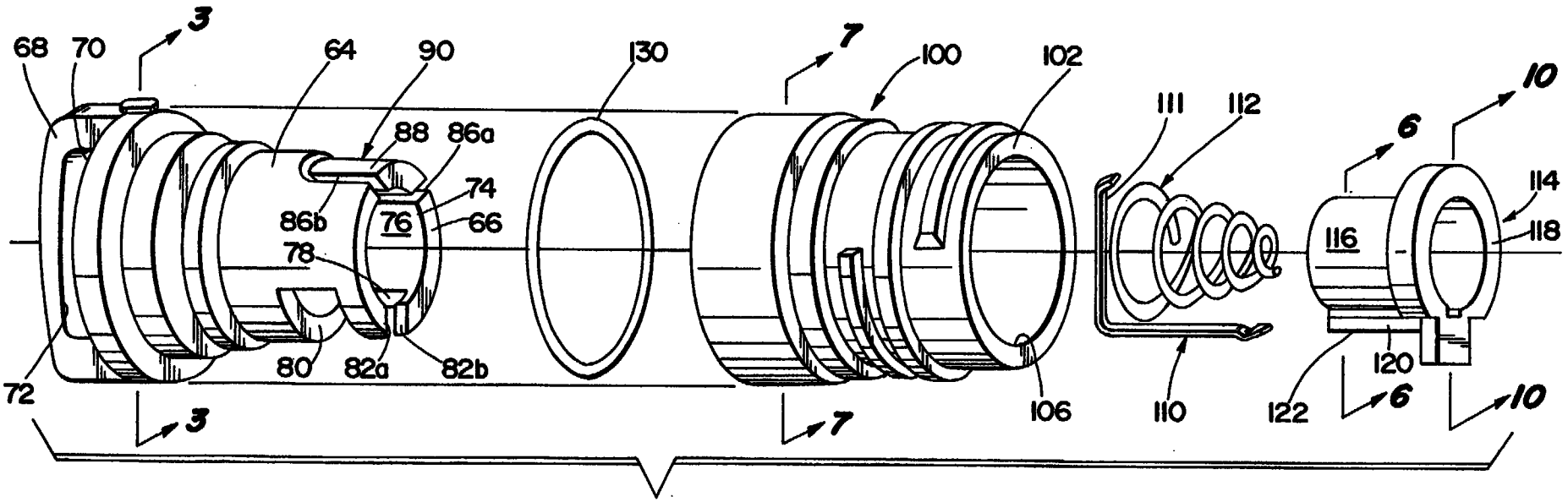


Fig. 14

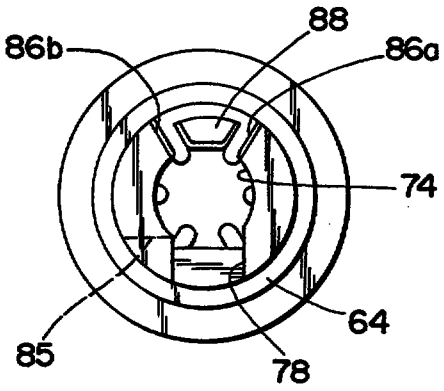


Fig. 6

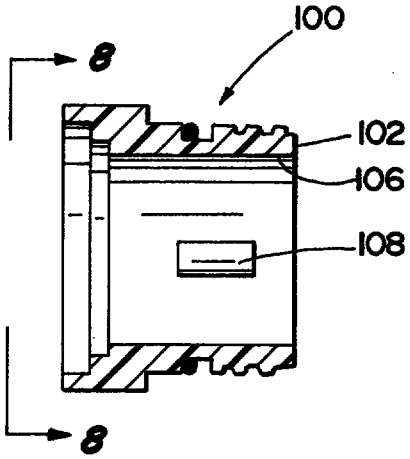


Fig. 7

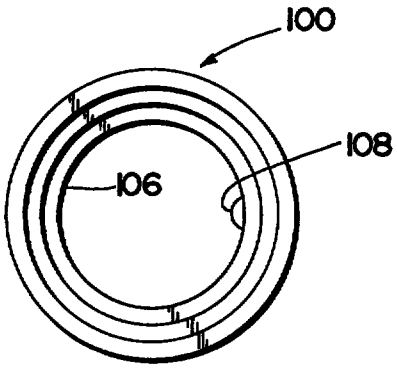


Fig. 8

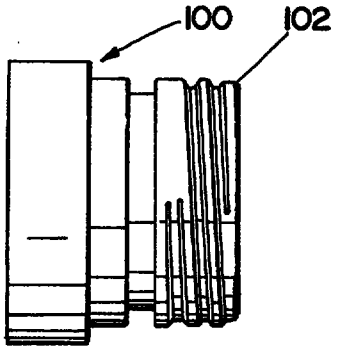


Fig. 9

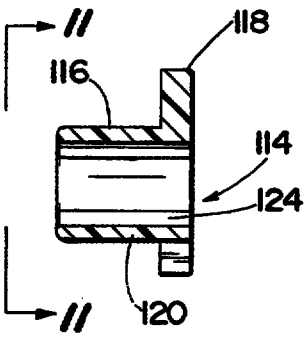


Fig. 10

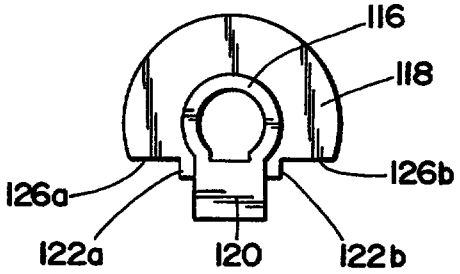


Fig. 11

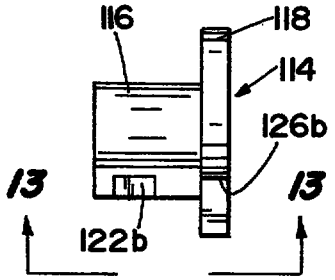


Fig. 12

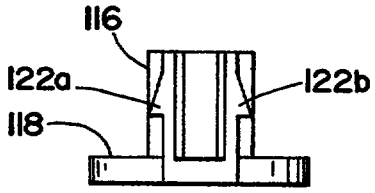


Fig. 13

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☑ Description : paged ...1. to paged ..11.
☑ Claim(s) : paged ..12 to paged ..14.
☑ Drawing(s) : paged ...1/3 to paged .3/3.
☑ Abstract : paged ...1. to paged ...1.

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SWITCH ASSEMBLY AND ITS USE IN A FLASHLIGHT

The present invention relates to an electrical switch assembly, particularly to an electrical switch assembly for use in a flashlight.

In general, flashlights and portable lanterns include a protective body which contains one or more batteries electrically connected, either in a series or in parallel, by a conductor to a light source. The conductor is typically interrupted by a switch mechanism which moves the light source into contact with the conductors. There are three well-known switching mechanisms which are used in this way, that is a push button switch, a slide, or a twisting head.

Although such switching mechanisms are commonly used on many articles, including flashlights, there are disadvantages associated with their use. Thus, in the push button and slide switches the aesthetic incorporation of the switch within the design of the flashlight often causes problems. A further problem associated with the push button switch is the occasional failure of the spring mechanism used to rebound the switch between the on/off positions. In addition, there is often a loss of electrical continuity and, as a result, failure of the article to operate, associates with the use of a push button switch, caused by a general lack of a wiping action to clear contact points or to prevent corrosion build-up.

A disadvantage associated with the twisting head switch, that is a switch in which the head is twisted into contact with the conductors, is that the operator often does not know which way to rotate the head in order to turn the flashlight on. This is a particular problem when there is a focus adjustment feature incorporated into the head of the flashlight, which requires that the head assembly be rotated through various positions in order to adjust the focus. In that case there is inevitable confusion between twisting to activate the light and twisting to adjust the focus of the light. The ideal action for such an embodiment would be for the switch to be off when the head or lens housing is in its forward-most position. Some rotation, and resulting rearward longitudinal motion, would be required to make contact and activate the light source. Contact could then be maintained during subsequent rotation and resulting longitudinal motion rearward as the focus is adjusted. The problem that occurs with this method is that the head must always be returned to its forward-most position to deactivate the light. Inevitably, this means that the specific focal position achieved during previous use

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of the light is lost when the head is twisted to switch the light off. Therefore, with every use of the light, the focus position must be adjusted, with the added disadvantage that the user can never be sure that he will obtain the previously set focus. This can be very frustrating for the user of such a light.

It is apparent, therefore, that numerous problems exist with the presently available switching mechanisms, particularly when these are used with flashlights. There remains a need, therefore, for a switch assembly which can be incorporated into or with the article which it is intended to operate in an aesthetically pleasing manner, which can be used without affecting other features of the article, such as the focal adjustment of a flashlight, and which can allow for easy, corrosion-free use of the article with which it is associated.

The switch assembly of the present invention overcomes the problems associated with known switch mechanisms and satisfies the requirements outlined above.

The present invention provides a two-position switch assembly comprising a switch having positively locking first and second positions defining the on/off status of the article with which it is used, the article having a light source or other power utilizing means, wherein movement between said first and second positions provides corrosion-cleaning of the operating components, characterised in that the assembly blends aesthetically with the exterior of the article, is self-contained, and is adapted to form the end of the article opposite to the end containing the light source or other power utilizing means.

In one embodiment of this aspect of the invention, there is provided a switch for selectively placing a light source in electrical communication with at least one battery disposed in a body, comprising;

a housing detachably adapted to be coupled to said body, and having a detent extending from an inner surface thereof;

an end cap having a neck portion received in said housing, said neck portion having a groove for receiving said detent to define at least a first and second position;

a contact assembly disposed in said neck portion and having a first portion in electrical communication with the battery and a second portion forming a contact; and

a retaining member received in said neck portion for fixing said contact assembly therein and pivotally retaining said neck portion within said housing;

said end cap being manually pivotable between said positions for selectively moving said contact into electrical communication with the light source.

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In a further aspect, the present invention provides a flashlight incorporating a switch assembly as defined above.

In one embodiment of this aspect of the invention, there is provided a flashlight comprising:

a body for receiving a power source therein;

a light assembly including a light source coupled to said body, said light source having one terminal positioned to be in electrical contact with one pole of said power source and a second terminal positioned to be proximate an opposite pole of said power source; and

a switch assembly closing said body, for selectively connecting and disconnecting said light source with said opposite pole of said power source.

The present invention may be further understood with reference to the drawings attached hereto, in which:

Figure 1 is a oblique view of the flashlight embodying this invention;

Figure 2 is an elevational sectional view of the flashlight taken along lines II-II shown in Figure 1;

Figure 3 is a sectional elevational view of an end cap used in the invention;

Figure 4 is a top view of the end cap shown in Figure 3;

Figure 5 is a bottom view of the end cap shown in Figure 3;

Figure 6 is an end view of the end cap shown in Figure 3;

Figure 7 is a sectional elevational view of a threaded housing;

Figure 8 is an end view of the housing shown in Figure 7;

Figure 9 is a side elevation view of the housing shown in Figures 7-8;

Figure 10 is an elevational sectional view of a retaining cap and sleeve used in connection with the invention;

Figure 11 is an end view of the retaining cap and sleeve shown in Figure 9;

Figure 12 is a side elevational view of the retaining cap and sleeve shown in Figure 10;

Figure 13 is a top view of the retaining cap and sleeve shown in Figure 10; and

Figure 14 is an exploded view illustrating the components comprising the switch assembly.

In the switch assembly of the present invention, when used in a flashlight, for example, one of the positively locking first and second positions defines an electrical connection between, for example the light source, and the power source and the other

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of the positively locking first and second positions defines electrical disconnection between the light and power sources.

In a preferred embodiment of this invention, the switch assembly includes an end cap and a housing member, the housing member adapted to receive at least a portion of the end cap and having a ridge or detent extending from an inner wall thereof, the end cap having, on the portion received by the housing member, a slot or groove for receiving said ridge or detent.

In a particularly preferred embodiment, the end cap includes two slots or grooves interspaced by and forming therebetween a cantilevered spring.

It is preferred that the relationship between the ridge or detent extending from an inner wall of the housing member, the slot or groove in the end cap and the spring defines at least the first and second positively locking positions of the switch.

In operation, therefore, of a switch assembly forming part of a flashlight, rotation of the end cap within the housing member will cause the detent to be dislodged from one slot or groove, forming the disconnected or "off" position, via the spring into the second slot or groove, thereby allowing an electrical connection between various components of the switch assembly and the flashlight, and the "on" status of the flashlight. More details of the operation of the switch are given hereinafter in relation to the drawings appended hereto.

As discussed above, the switch assembly of the present invention is particularly suitable for use with a flashlight. When used with a flashlight, the assembly can be adapted to form, for example, the end of the light opposite that containing the light source. Thus, for example, the assembly including the housing member and the end cap may be adapted to be received by an open end of the body of a flashlight. As is readily apparent, the switch assembly may be a self-contained unit which may be removably incorporated with, for example, a flashlight. Inspection, cleaning and replacement of the switch assembly are thus facilitated.

The switch assembly may be attached to, for example, the body of a flashlight using standard, releasable, means. The exact means of attachment of the switch assembly to the flashlight body is not essential to the present invention, so long as the means for such attachment is not affected by operation of the switch. We have found,

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for example, that screwing via threaded sections or attachment via interaction between appropriate male and female members, are appropriate methods.

The particular material from which the exterior surfaces of the switch assembly are formed is not essential to the present invention. Suitably, however, the exterior surfaces of the switch assembly are formed from the same material as the article of which it is to form a part. Thus, when forming part of a flashlight, the exterior surfaces of the switch assembly are suitably chosen to be of the same, or similar, material and colour as the body of the flashlight.

To provide a substantially rugged flashlight capable of withstanding harsh treatment, it is preferred that substantially all of the components, i.e. the flahlight body and the switch assembly, are moulded from a high impact polymeric material such as XENOY ® 5230 available from G.E. Plastics Co. of Pittsfield, Massachusetts, U.S.A.

The remaining components of the switch assembly and of the flashlight of which the switch assembly may form a part, are made from materials standard in the art for such components. Thus, conductive elements may suitably be formed from copper and any spring member(s) may, for example, be made from chrome-plated spring steel. It is also preferred that the light source in the flashlight includes a bi-pin lamp capable of handling a voltage and amperage consistent with that provided by the batteries.

The interior of the article, for example a flashlight, including the switch assembly of the present invention may be made generally impervious to the invasion of water or water vapour by the inclusion of, for example, seals, typically O-ring seals, along or around each opening. Thus, for example, an O-ring seal can be included at the juncture of the end cap and housing member of the switch assembly. In addition, a further seal may be included at the point of attachment of the switch assembly to the body of the flashlight and between the body of the flashlight and the section including the light source. With the inclusion of O-ring seals such as described above, the flashlight may be waterproof to a depth of at least three feet (say 0.9144 m) of water or 1.1 atmospheres of pressure for at least 30 minutes.

As described above, the switch assembly includes an end cap and a housing member. It is preferred that the end cap includes means to facilitate switching between the first and second positively locking positions. Typically, this means includes a handle or gripping point formed, for example, from a flange extending from that portion of the end cap not accomodated by the housing member.

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It is furthermore preferred that the switch and/or flashlight of which it may form a part, includes indicator means to show when electrical contact is made and the switch is on and when that electrical contact is broken such that the switch is off. Such indicator means may take any appropriate and aesthetically pleasing form, and any indicator means used in this or related arts may equally be employed here. Typically, the indicator means include alignment marks formed, for example, from positive relief structures, on the switch assembly and the body of the flashlight.

An additional and advantageous feature of the switch assembly and/or of the flashlight of which it may form a part, is the texturing of the exterior surfaces of those components. Texturing may be included so as to form a slip-resistant surface and to provide a good grip for the user. In a preferred embodiment, this texturing may take the form of a series of concentric and equidistantly-spaced grooves.

In a preferred form, the switch assembly of the present invention is adapted for use with a flashlight and includes a housing, which is suitably detachably coupled to one end of a flashlight body, having a detent extending from an inner wall thereof. The housing may be adapted to receive, concentrically, a neck portion of an end cap which typically closes one end of the housing. The neck portion of the end cap may be formed to contain a pair of grooves separated by a cantilevered spring adapted to receive the detent extending inwardly from the housing, thereby suitably defining at least a first and second position for the end cap. A hole in the neck portion concentric with the longitudinal axis of the end cap may then receive a contact assembly typically having a first portion for contacting the opposite pole of the power source and a second portion which selectively contacts the second terminal of the light source upon rotation of the end cap between the first and second position. The contact assembly may be retained within the neck portion, and the end cap may be retained within the housing, by a retaining member received in the hole in the neck portion. The retaining member permits manual movement of the end cap about its longitudinal axis to move the contact assembly in selective contact with the second terminal of the light source.

Referring to Figures 1 and 2, a first embodiment of flashlight 20 includes an elongate tubular body 22 having a first end 24 and a second end 26. In a preferred embodiment, tubular body 22 contains a longitudinal battery retention chamber which forms an inner wall 28 and extends from first end 24 along the length of body 22 and through to second end 26. The diameter of inner wall 28 is preferably of a dimension suitable to accommodate one row of one or more dry cell batteries 30. The batteries

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may be of standard size, such as "D", "C", "AA" or "AAA". As in common practice, if more than one battery 30 is used, the batteries are of the same size and arranged in serial alignment with the positive pole 30a of one battery in contact with the negative pole 30b of the next battery.

Referring to Figure 2, the first end 24 of tubular body 22 contains a light assembly 32. Assembly 32 includes a lens housing 34 which is threadably received along the first end 24 of tubular body 22. Lens housing 34 receives a lens bezel 36 which, in turn, retains a lens 38. Disposed between lens bezel 36, lens 38 and lens housing 34 is a reflector 40 having an opening 42 at its apex to receive a light source 44, such as a light bulb. Light assembly 32 can be longitudinally adjusted by twisting housing 34 along the threads to vary the position of light source 44 with respect to reflector 40 thus changing the focus and/or clarity of the light beam reflected from reflector 40.

Disposed behind reflector 40 in first end 24 of tubular body 22 is a lamp-retaining module 46 for retaining light source 44 having pins 46a, 46b received in socket 50a with an opposite end lying adjacent the interior end 54 of module 46 so as to contact one pole, preferably the positive pole 30a, of battery 30 received in tubular body 22. A second conductive contact strip 56 has one end disposed in socket 50b and in contact with lamp pin 46b. Contact strip 56 preferably extends from module 46 and runs the length of tubular body 22 along wall 28 terminating at end 58 against the inner wall 28 proximate second end 26.

Closing the second end 26 of tubular body 22 is a switch assembly 60. Assembly 60 includes an end cap 62 having a cylindrical portion 63 (Figures 3-6) defining a first end 66 and a flange or projection 68 extending from the second end 70 of the end cap 62. Flange 68 extends across the diameter of end cap 62 and transversely to the longitudinal axis A of flashlight 20. It is preferred that flange 68 contain an opening 72 extending through it. Flange 68 provides a gripping point to turn switch assembly between a first "on" position and a second "off" position.

The cylindrical first end 64 of end cap 62 includes a concentric hole 74 which extends from the first end 66 to the main body of end cap 62 and defines an inner peripheral wall 76. A portion of wall 76 is removed to form a rectangular, radially and longitudinally extending opening 78 with the long axis of the opening oriented generally parallel to the longitudinal axis A of flashlight 20. Transverse to rectangular opening 78 is a second rectangular opening or slot 80 which defines tabs 82a, 82b at end 66 on

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opposite sides of opening 78. Extending inwardly into hole 74 from wall 76 between slot 80 and the main body of end cap 62 are ribs 84 to provide strength to cylindrical portion 64 as well as a seat for a conventional hydrogen absorbing or "getter" material (not shown) such as platinum-plated, sintered aluminium.

In a preferred embodiment, opposite rectangular opening 78 and slot 80 in a portion of wall 76, are two longitudinal slots or grooves 86a, 86b on opposite sides of a cantilevered portion 88 of wall 76, which serves as a spring. The exterior surface 90 of cantilever spring 88 will be readily apparent when described in greater detail below.

A threaded housing 100, which receives, concentrically, cylindrical portion 64 of end cap 62, has a first externally-threaded end 103 engaging internal threads 104 in the second end 26 of tubular body 22; see Figures 2, 7-9 and 14. The inside diameter of inner wall 106 is slightly greater than the outside diameter of cylindrical portion or neck 64 to act like a bearing surface and allow rotation of end cap 62 therein. A longitudinal, radially inwardly extending ridge or detent 108 extends from inner wall 106 and has a dimension appropriate to seat firmly within either longitudinal slot 86a or 86b, yet has a height slightly greater than the distance between inner peripheral wall 106 and the exterior surface 90 of cantilever spring 88. It is this structural relationship between slots 86a, 86b, cantilevered spring 88 and ridge or detent 108 which defines the first and second positions of switch assembly 60.

Disposed in concentric hole 74 and providing electrical continuity between the opposite pole of battery 30 disposed in tubular body 22 and end 58 of contact 56 is a rear contact 110 and a spring conductor 112 (see Figures 2 and 14). Rear contact 110 is an L-shaped electrically conductive strip of material such as copper or similar conductive material which has a first transverse end 111 disposed diametrically across hole 74 and supported by ribs 83. Through a series of right angle bends, contact 110 extends from hole 74, and longitudinally through rectangular opening 78 formed in wall 76 to overlie a portion of inner wall 28 and selectively contact end 58 of contact strip 56 (Figure 2). Spring conductor 112 is located with one end 113 urged against first end 111 of contact 110, and extends along longitudinal axis A of light 20 to engage the opposite pole of the one or more batteries 30.

End cap 62, contact 110 and spring 112 are held in place and within threaded housing 100 by a retaining member 114 (see Figures 2, and 10-14), which includes cylindrical sleeve portion 116 extending generally perpendicular from and concentric with a circular flange 118. Dependent from, and extending substantially the exterior

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length of sleeve 116 is a generally rectangular spline 120. The dimensions of sleeve portion 116 and dependent spline 120 are such so as to be received in a specific or "keyed" manner within concentric hole 74 in end cap 62. That is to say that sleeve portion 116 is adapted to be received by hole 74 in one way such that spline 120 is received by rectangular opening 78 formed in wall 76. Detents 122a, 122b formed along opposite sides of spline 120 slide past tabs 82a, 82b defined in the first end 66 or neck 64, and prevent withdrawal of sleeve 116. A concentric hole 124 extending the length of sleeve 116 allows spring 112 to extend therethrough while sleeve 116 urges the bottom 113 of spring 112 against the first end of contact 110. With sleeve 116 locked in hole 74 by detents 122a, 122b, circular flange 118 prevents withdrawal of neck 64 from threaded housing 100 because the diameter of flange 118 is greater than the outside diameter of neck 64 and abuts against the first end 102 of threaded housing 100. Segments of flange 118 are shown removed at 126a, 126b to provide access to tabs 82a, 82b after assembly so that switch assembly 60 may be disassembled for service as necessary. A tool may be inserted between spline 120 and each tab 82a, 82b to disengage detents 122a, 122b and allow withdrawal of retaining member 114..

Conductive elements such as contact strips 52, 56 and 110 are preferably made from copper while spring 112 is made from chrome-plated spring steel. It is also preferred that light source 44 include a bi-pin lamp capable of handling a voltage and amperage consistent with that provided by the batteries.

The interior of flashlight 20 can be made generally impervious to the invasion of water or water vapour by locating O-ring seals along each of the openings. For example, O-ring 130 is received about neck portion 64 proximate the main body of end cap 72 and adapted to seal with an inner wall of threaded housing 100. A second O-ring 132 is disposed in an annular groove 134 of threaded housing 100 and adapted to seal with an inner surface of wall of tubular body 22. In a similar fashion, O-ring seals such as 136 may be positioned to form seals between head assembly 50 and tubular body 22. With O-ring seals 130, 132 and 136 located as described above, flashlight 20 is waterproof as descibed above.

Referring again to Figures 1 and 2, the exterior of tubular body 22 may be textured to form a slip-resistant surface and provide a good grip for the user. In a preferred embodiment, a series of concentric and equidistantly-spaced grooves 140 about the tubular body provide this function. In addition, the exterior of tubular body 22 contains an alignment mark 142 defined by a positive relief structure, which is aligned with a similar mark 144 formed at the end of flange 68 extending from end cap 62 to

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indicate when the switch is in the "on" position. Figures 1 and 2 also indicate that the exterior of lens housing 34 portion of light assembly 32 may be textured to form a slip-resistant surface and assist in rotating assembly 32 to achieve focus adjustment. In a preferred embodiment, a series of longitudinal and equidistantly spaced grooves 35 are formed about the housing to provide this function.

In operation, switch assembly 60 is removed from flashlight housing or casing 22 by turning end cap 62 about the longitudinal axis of the flashlight, to unthread switch assembly 60 from housing 22. The appropriate number of batteries are inserted into housing 22 through end 26 and switch assembly 60 closes end 26 by rotating end cap 62 in the opposite direction and engaging threads 104. Switch assembly 60 is threaded into housing 22 until end cap 62 is tight. Preferably, threads 104 and mutual threads within housing 22 are designed so that switch assembly 60 stops at a predetermined point. Such may be accomplished by designing a thread stop in the connection between such assemblies 60 and housing 22.

With the appropriate number of batteries disposed within flashlight 20 and switch assembly 60 closing the end of flashlight 20, the flashlight may be turned on or off by twisting end cap 62 between the first and second positions defined by the engagement of ridge 108 with detents or grooves 86a and 86b. The rotation of end cap 62 causes rear contact 110 to swing into contact with the end 58 of contact strip 56. Electrical current is then allowed to flow between the positive and negative contacts, 30a, 30b, through spring 112, rear contact 110, contact strip 56, and contact strip 52, with the rotation of end cap 62 swinging rear contact 110 into engagement with contact strip 56. The circular motion of the end of rear contact 110 engaging contact strip 56 creates a "wiping action" which reduces corrosion and clears the contact points and provides good electrical continuity therebetween. The flashlight may be turned off by rotating end cap 62 in an opposite direction to locate ridge 108 in the opposite detent slot 86a, 86b, and swing rear contact strip 110 away from contact strip 56, thus breaking electrical continuity between the poles of the batteries. The operator may determine whether or not the switch is in the "on" position by looking at the alignment of indicators 142, 144. It is preferred that the flashlight be in the "on" position with indicators 142, 144 positioned directly across from each other. By rotating end cap 62 to the "off" position, indicator 144 is moved with respect to indicator 142, causing the indicators to no longer be aligned with each other.

The preferred manner of inserting or removing batteries for flashlight 20 is by unscrewing assembly 60 from the rear 26 of housing 22. By unthreading switch

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assembly 60 from housing 22, the entire switch assembly 60 is removed intact and contained within thread housing 100. If for some reason switch assembly 60 were to malfunction or break down, switch assembly 60 may be replaced in its entirely without requiring to replace the entire flashlight. In addition, this invention provides that switch assembly 60 may be serviced by removing retaining sleeve 114 from the neck portion 64 of end cap 62. Removing of retaining sleeve 114 provides access to rear contact 110 and spring 112. Thus, according to this construction, any one of the malfunctioning parts may be replaced, or the entire assembly may be replaced as a whole.

Light assembly 32 at the opposite end 24 of flashlight 20 allows the operator to focus the beam of light reflected from reflector 40. By rotating lens housing 34 about the longitudinal axis A, the threads joining lens assembly 34 to body 22 move reflector 40 with respect to light source 44 and thus produce either a broad or narrow pattern of light reflected through lens 38. The advantage provided by this structure is that the operator may maintain a desired light beam configuration when turning on the flashlight.

The advantages provided by each form of the invention include a more aesthetically appealing switch which is integral with the overall design of the flashlight. Secondly, the switch disposed within the end cap allows easy inspection of the critical contacts of the switch to make sure that electrical continuity is achieved. Additionally, as the on/off action requires that the contact strips pass one over the other in mutual tangency, a corrosion-reducing wiping action is automatically provided. The switch also has few parts for easy assembly without special tools. If necessary, the switch may be disassembled to effect repairs, or may be replaced in its entirely for little cost.

The above description is considered that of the preferred embodiments only. Modifications on the invention will occur to those skilled in the art and to those who make or use the invention. Therefore, it is understood that the embodiments shown in the drawings and described above are merely for illustrative purposes and are not intended to limit the scope of the invention.

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CLAIMS:

1. A two-position switch assembly comprising a switch having positively locking first and second positions defining the on/off status of the article with which it is used, the article having a light source or other power utilizing means, wherein movement between said first and second positions provides corrosion-cleaning of the operating components, characterised in that the assembly blends aesthetically with the exterior of the article, is self-contained, and is adapted to form the end of the article opposite to the end containing the light source or other power utilizing means.

2. An assembly according to Claim 1 for use in a flashlight, in which one of the positively locking first and second positions defines an electrical connection between the light source and the power source and the other of the positively locking first and second positions defines electrical disconnection between the light and power sources.

3. An assembly according to Claim 1 or 2 in which the assembly includes an end cap and a housing member, the housing member adapted to receive at least a portion of the end cap and having a ridge or detent extending from an inner wall thereof, the end cap having, on the portion received by the housing member, a slot or groove for receiving said ridge or detent.

4. An assembly according to Claim 3 in which the end cap includes two slots or grooves, interspaced by and forming thereberween, a cantilevered spring.

5. An assembly according to Claim 4, in which the relationship between the ridge or detent, the slot or groove and the spring defines at least the first and second positively locking positions of the switch.

6. An assembly according to Claim 5 in which rotational movement about an axis causes said ridge or detent to be dislodged from a first, electrically disconnected, position in one of said slots or grooves to a second, electrically connected, position in the other of said slots or grooves.

7. A switch assembly according to Claim 1, for selectively placing a light source in electrical communication with at least one battery disposed in a body, comprising;

a housing detachably adapted to be coupled to said body, and having a detent extending from an inner surface thereof;

an end cap having a neck portion received in said housing, said neck portion having a groove for receiving said detent to define at least a first and second position;

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a contact assembly disposed in said neck portion and having a first portion in electrical communication with the battery and a second portion forming a contact; and

a retaining member received in said neck portion for fixing said contact assembly therein and pivotally retaining said neck portion within said housing;

said end cap being manually pivotal between said positions for selectively moving said contact into electrical communication with the light source.

8. An assembly according to Claim 7, wherein said housing has a longitudinal axis coincident with the body and said end cap is pivotal about said longitudinal axis.

9. An assembly according to Claim 8, wherein said end cap further includes:

a cantilever defined in said neck portion and extending parallel to said longitudinal axis for locating said detent in first and second positions on opposite sides of said cantilever;

10. An assembly according to Claim 7, wherein said retaining member is fixed in said neck portion by at least one detent extending from said retaining member and engaging at least one tab defined in said neck portion.

11. An assembly according to claim 10, wherein said retaining member includes a circular flange having a diameter generally equal to an end of said housing within said body for preventing a withdrawal of said end cap from said housing yet permitting pivotal movement of said end cap within said housing.

12. An assembly according to claim 7, wherein said contact assembly includes:

a first contact strip having a first end disposed within said neck portion and a second end extending inwardly of said body and positioned proximate a peripheral edge of said switch; and

a conductive spring concentrically disposed within said neck portion and having a fist end in contact with said first end of said contact strip, and a second end for engaging one pole of said battery.

13. An assembly according to claim 7, further comprising:

a key slot defined in and extending through a wall of said neck portion;

a spline extending from said retaining member to be received in said key slot for orienting said retaining member in said neck portion and urging a portion of said contact assembly toward a periphery of said neck portion.

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14. An assembly according to claim 7, wherein said end cap includes a grip for manually pivoting said switch between said positions.

15. An assembly according to claim 12, further comprising:

a second contact strip extending generally the length of said housing interior and having a first end in electrical contact with the light source and a second end disposed proximate said second end of said first contact strip.

said first contact strip selectively contacting said second contact strip in a wiping action with said end cap pivoted between said positions.

16. A switch for selectively connecting and disconnecting a direct current circuit, comprising:

a housing having a cylindrical inner wall;

a detent extending from said inner wall;

an end cap having a neck portion received by said housing;

a cantilever spring disposed in a slot formed in said neck portion for defining first and second positions for said detent on opposite sides of said cantilever spring;

a contact assembly disposed within said neck portion and having a first end for contacting one end of the circuit and a second end for selectively contacting an opposite end of the circuit: and

a retaining member disposed within said neck portion and fixed therein for preventing said neck portion form being withdrawn from said housing while allowing rotation of said end cap between said first and second positions.

17. A flashlight including a switch assembly as defined in any one of the preceding claims.

18. A flashlight, comprising:

a body for receiving a power source therein;

a light assembly including a light source coupled to said body, said light source having one terminal positioned to be in electrical contact with one pole of said power source and a second terminal positioned to be proximate an opposite pole of said power source; and

a switch assembly as defined in claim 1 closing said body, for selectively connecting and disconnecting said light source with said opposite pole of said power source.

19. A flashlight according to Claim 18, wherein said switch assembly further includes:

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a housing having a first end detachably received in said body, and receiving said end cap;

a contact assembly disposed in said end cap for contacting said opposite end of said battery; and

a retaining member disposed within said end cap for retaining said end cap within said housing.

20. A flashlight according to Claim 19, further including a contact strip extending from said light assembly substantially the length of said housing and selectively in contact with said contact assembly disposed in said end cap.

21. A flashlight according to Claim 20, further including a hydrogen absorbing device disposed in said end cap.

22. A flashlight according to Claim 19, wherein said switch assembly further includes;

a cam extending from an inner surface of said member;

a cam follower of predetermined length concentrically defined on an exterior surface of said end cap for following said cam; and

a detent on said cam follower for engaging said cam and retaining said end cap in at least one of said first and second positions.

23. A flashlight according to Claim 22, further including a projection extending from a second end of said end cap for manually rotating said end cap between said first and second positions.

24. A flashlight according to Claim 22, further including;

a first seal disposed between said end cap and said housing; and

a second seal disposed between said housing and said body.

25. A flashlight according to Claim 19, wherein said retaining member includes;

a key received in said end cap;

a flange defined at one end of dais key to lie adjacent said end cap and said housing; and

a locking detent formed on said key for engaging said end cap, locking said flange adjacent said end cap and said housing;

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26. A flashlight according to any one of Claims 17 to 25 wherein said switch assembly is detachable from said body.

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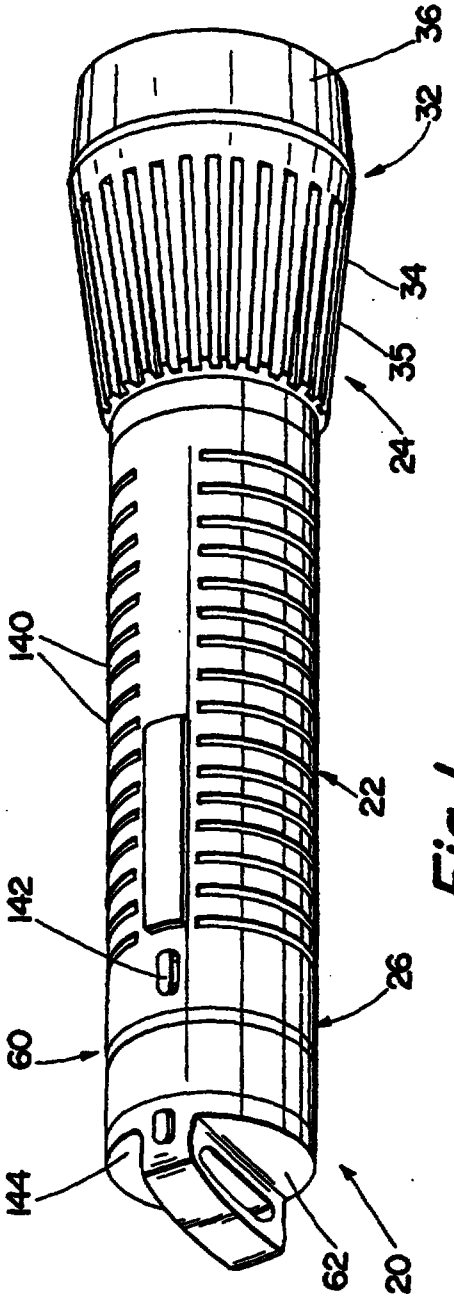


Fig. 1

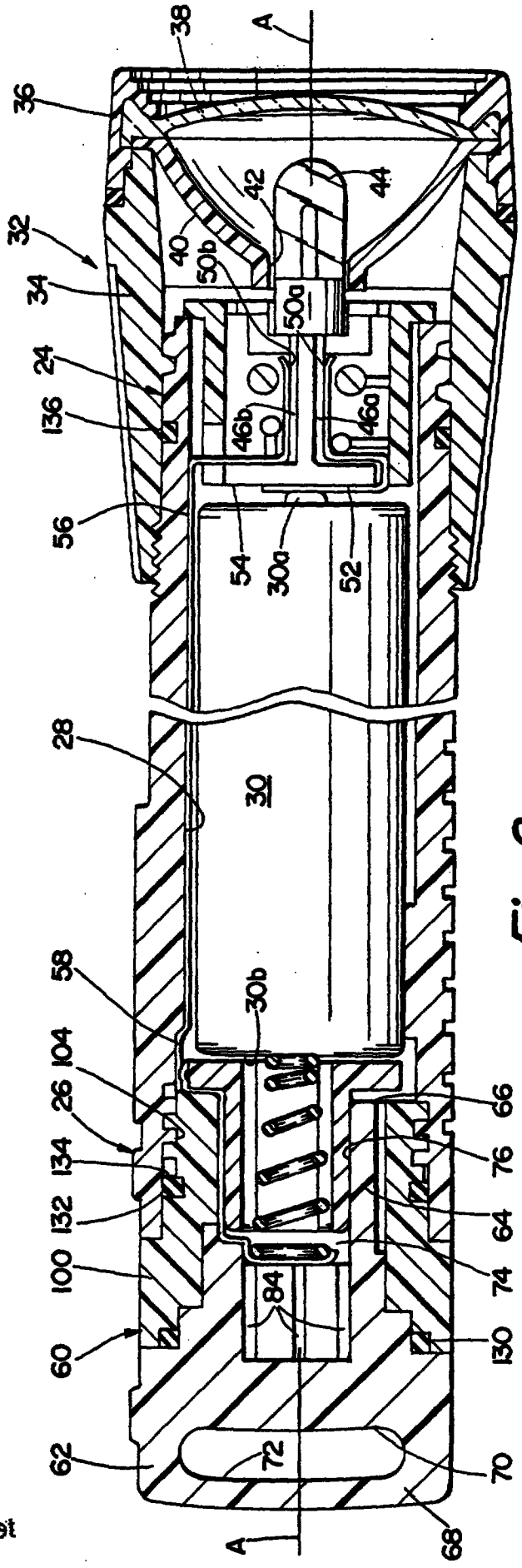


Fig. 2

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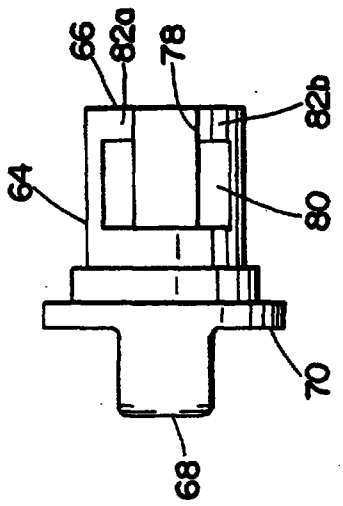


Fig. 5

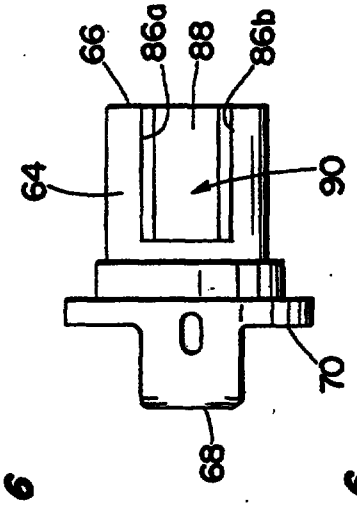


Fig. 4

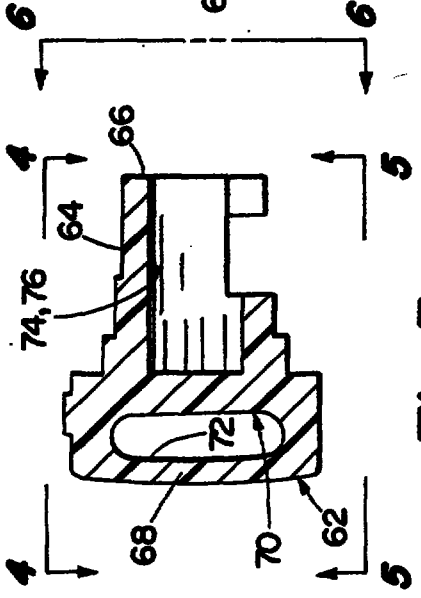


Fig. 3

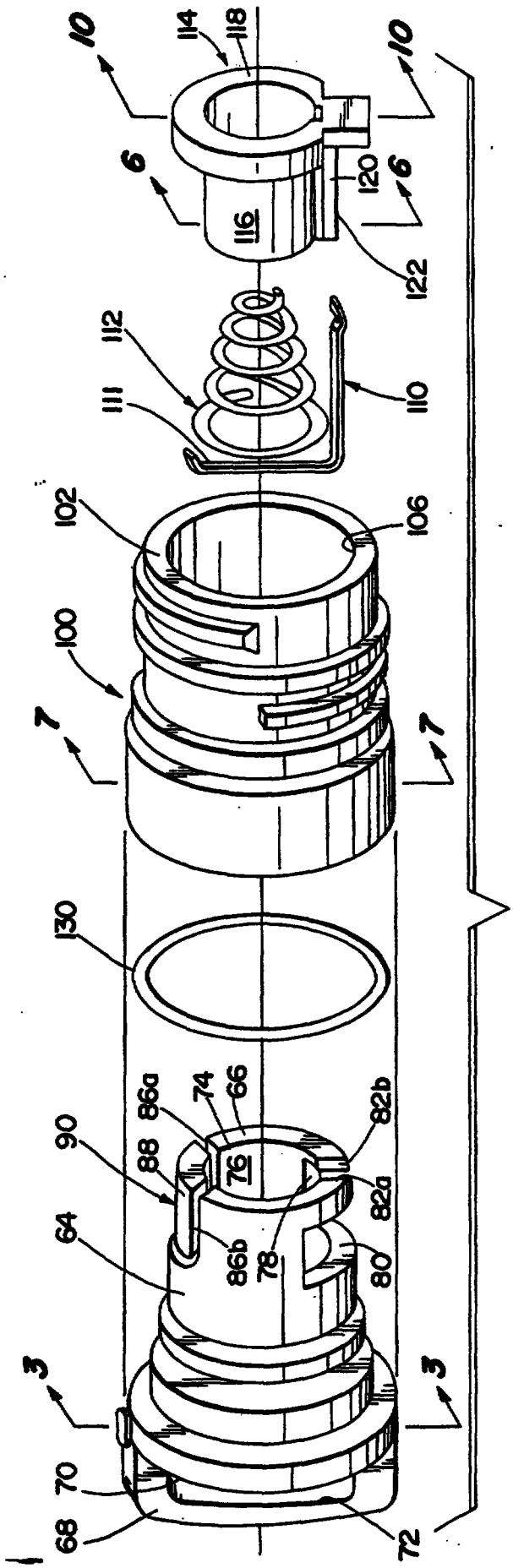


Fig. 14

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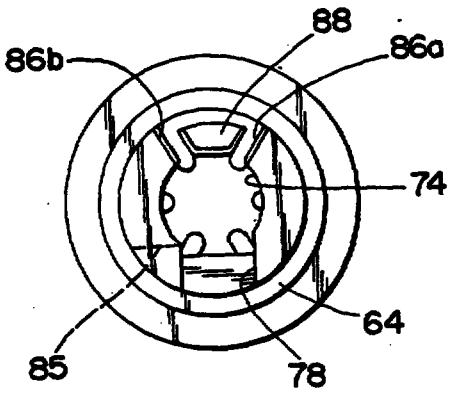


Fig. 6

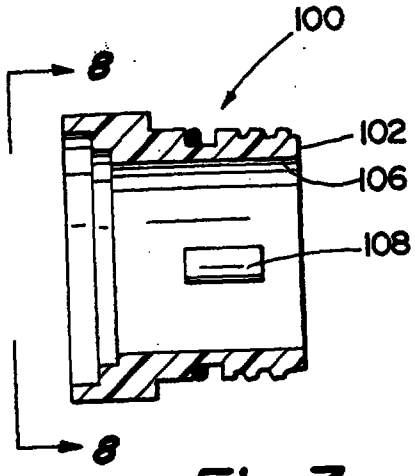


Fig. 7

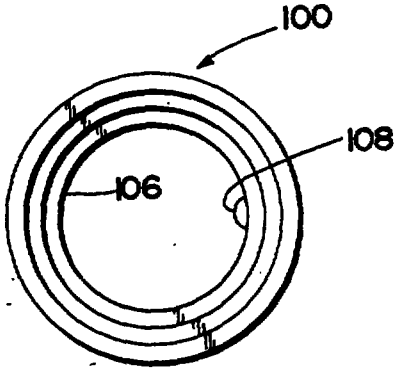


Fig. 8

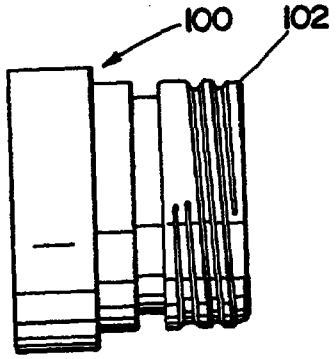


Fig. 9

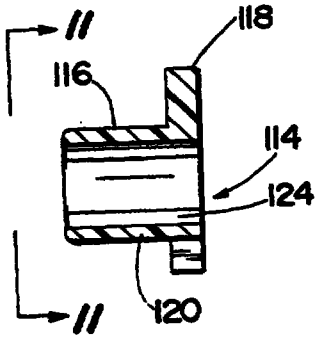


Fig. 10

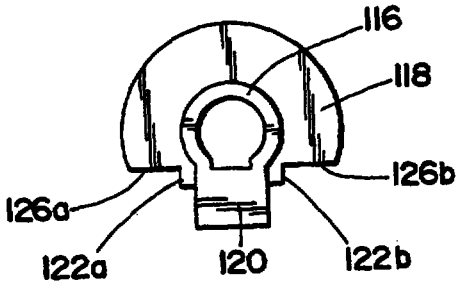


Fig. 11

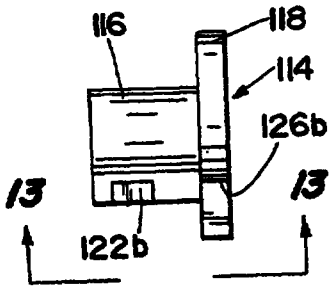


Fig. 12

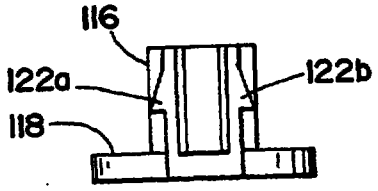


Fig. 13

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of the light is lost when the head is twisted to switch the light off. Therefore, with every use of the light, the focus position must be adjusted, with the added disadvantage that the user can never be sure that he will obtain the previously set focus. This can be very frustrating for the user of such a light.

It is apparent, therefore, that numerous problems exist with the presently available switching mechanisms, particularly when these are used with flashlights. There remains a need, therefore, for a switch assembly which can be incorporated into or with the article which it is intended to operate in an aesthetically pleasing manner, which can be used without affecting other features of the article, such as the focal adjustment of a flashlight, and which can allow for easy, corrosion-free use of the article with which it is associated.

The switch assembly of the present invention overcomes the problems associated with known switch mechanisms and satisfies the requirements outlined above.

The present invention provides a two-position switch assembly comprising a switch having positively locking first and second positions defining the on/off status of the article with which it is used, wherein movement between said first and second positions provides corrosion-cleaning of the operating components, characterised in that the assembly blends aesthetically with the exterior of the article, is self-contained, and is adapted to form the end of the article opposite to the end containing the light source or other power utilizing means.

In one embodiment of this aspect of the invention, there is provided a switch for selectively placing a light source in electrical communication with at least one battery disposed in a body, comprising;

a housing detachably adapted to be coupled to said body, and having a detent extending from an inner surface thereof;

an end cap having a neck portion received in said housing, said neck portion having a groove for receiving said detent to define at least a first and second position;

a contact assembly disposed in said neck portion and having a first portion in electrical communication with the battery and a second portion forming a contact; and

a retaining member received in said neck portion for fixing said contact assembly therein and pivotally retaining said neck portion within said housing;

said end cap being manually pivotable between said positions for selectively moving said contact into electrical communication with the light source.

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CLAIMS:

1. A two-position switch assembly comprising a switch having positively locking first and second positions defining the on/off status of the article with which it is used, wherein movement between said first and second positions provides corrosion-cleaning of the operating components, characterised in that the assembly blends aesthetically with the exterior of the article, is self-contained, and is adapted to form the end of the article opposite to the end containing the light source or other power utilizing means.

2. An assembly according to Claim 1 for use in a flashlight, in which one of the positively locking first and second positions defines an electrical connection between the light source and the power source and the other of the positively locking first and second positions defines electrical disconnection between the light and power sources.

3. An assembly according to Claim 1 or 2 in which the assembly includes an end cap and a housing member, the housing member adapted to receive at least a portion of the end cap and having a ridge or detent extending from an inner wall thereof, the end cap having, on the portion received by the housing member, a slot or groove for receiving said ridge or detent.

4. An assembly according to Claim 3 in which the end cap includes two slots or grooves, interspaced by and forming therebetween, a cantilevered spring.

5. An assembly according to Claim 4, in which the relationship between the ridge or detent, the slot or groove and the spring defines at least the first and second positively locking positions of the switch.

6. An assembly according to Claim 5 in which rotational movement about an axis causes said ridge or detent to be dislodged from a first, electrically disconnected, position in one of said slots or grooves to a second, electrically connected, position in the other of said slots or grooves.

7. A switch assembly according to Claim 1, for selectively placing a light source in electrical communication with at least one battery disposed in a body, comprising;

a housing detachably adapted to be coupled to said body, and having a detent extending from an inner surface thereof;

an end cap having a neck portion received in said housing, said neck portion having a groove for receiving said detent to define at least a first and second position;

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14. An assembly according to claim 7, wherein said end cap includes a grip for manually pivoting said switch between said positions.

15. An assembly according to claim 12, further comprising:

a second contact strip extending generally the length of said housing interior and having a first end in electrical contact with the light source and a second end disposed proximate said second end of said first contact strip.

said first contact strip selectively contacting said second contact strip in a wiping action with said end cap pivoted between said positions.

16. A switch for selectively connecting and disconnecting a direct current circuit, comprising:

a housing having a cylindrical inner wall;

a detent extending from said inner wall;

an end cap having a neck portion received by said housing;

a cantilever spring disposed in a slot formed in said neck portion for defining first and second positions for said detent on opposite sides of said cantilever spring;

a contact assembly disposed within said neck portion and having a first end for contacting one end of the circuit and a second end for selectively contacting an opposite end of the circuit: and

a retaining member disposed within said neck portion and fixed therein for preventing said neck portion form being withdrawn from said housing while allowing rotation of said end cap between said first and second positions.

17. A flashlight including a switch assembly as defined in any one of the preceding claims.

18. A flashlight, comprising:

a body for receiving a power source therein;

a light assembly including a light source coupled to said body, said light source having one terminal positioned to be in electrical contact with one pole of said power source and a second terminal positioned to be proximate an opposite pole of said power source; and

a switch assembly as defined in claim 1 closing said body, for selectively connecting and disconnecting said light source with said opposite pole of said power source.

19. A flashlight according to Claim 18, wherein said switch assembly further includes:

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of the light is lost when the head is twisted to switch the light off. Therefore, with every use of the light, the focus position must be adjusted, with the added disadvantage that the user can never be sure that he will obtain the previously set focus. This can be very frustrating for the user of such a light.

It is apparent, therefore, that numerous problems exist with the presently available switching mechanisms, particularly when these are used with flashlights. There remains a need, therefore, for a switch assembly which can be incorporated into or with the article which it is intended to operate in an aesthetically pleasing manner, which can be used without affecting other features of the article, such as the focal adjustment of a flashlight, and which can allow for easy, corrosion-free use of the article with which it is associated.

The switch assembly of the present invention overcomes the problems associated with known switch mechanisms and satisfies the requirements outlined above.

The present invention provides a two-position switch assembly comprising a switch having positively locking first and second positions defining the on/off status of the article with which it is used, the article having a light source or other power utilizing means, wherein movement between said first and second positions provides corrosion-cleaning of the operating components, characterised in that the assembly blends aesthetically with the exterior of the article, is self-contained, and is adapted to form the end of the article opposite to the end containing the light source or other power utilizing means.

In one embodiment of this aspect of the invention, there is provided a switch for selectively placing a light source in electrical communication with at least one battery disposed in a body, comprising;

a housing detachably adapted to be coupled to said body, and having a detent extending from an inner surface thereof;

an end cap having a neck portion received in said housing, said neck portion having a groove for receiving said detent to define at least a first and second position;

a contact assembly disposed in said neck portion and having a first portion in electrical communication with the battery and a second portion forming a contact; and

a retaining member received in said neck portion for fixing said contact assembly therein and pivotally retaining said neck portion within said housing;

said end cap being manually pivotable between said positions for selectively moving said contact into electrical communication with the light source.

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CLAIMS:

1. A two-position switch assembly comprising a switch having positively locking first and second positions defining the on/off status of the article with which it is used, the article having a light source or other power utilizing means, wherein movement between said first and second positions provides corrosion-cleaning of the operating components, characterised in that the assembly blends aesthetically with the exterior of the article, is self-contained, and is adapted to form the end of the article opposite to the end containing the light source or other power utilizing means.

2. An assembly according to Claim 1 for use in a flashlight, in which one of the positively locking first and second positions defines an electrical connection between the light source and the power source and the other of the positively locking first and second positions defines electrical disconnection between the light and power sources.

3. An assembly according to Claim 1 or 2 in which the assembly includes an end cap and a housing member, the housing member adapted to receive at least a portion of the end cap and having a ridge or detent extending from an inner wall thereof, the end cap having, on the portion received by the housing member, a slot or groove for receiving said ridge or detent.

4. An assembly according to Claim 3 in which the end cap includes two slots or grooves, interspaced by and forming therebetween, a cantilevered spring.

5. An assembly according to Claim 4, in which the relationship between the ridge or detent, the slot or groove and the spring defines at least the first and second positively locking positions of the switch.

6. An assembly according to Claim 5 in which rotational movement about an axis causes said ridge or detent to be dislodged from a first, electrically disconnected, position in one of said slots or grooves to a second, electrically connected, position in the other of said slots or grooves.

7. A switch assembly according to Claim 1, for selectively placing a light source in electrical communication with at least one battery disposed in a body, comprising;

a housing detachably adapted to be coupled to said body, and having a detent extending from an inner surface thereof;

an end cap having a neck portion received in said housing, said neck portion having a groove for receiving said detent to define at least a first and second position;

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