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SEALED ROTARY SWITCH HAVING FIXED SUPPORTS

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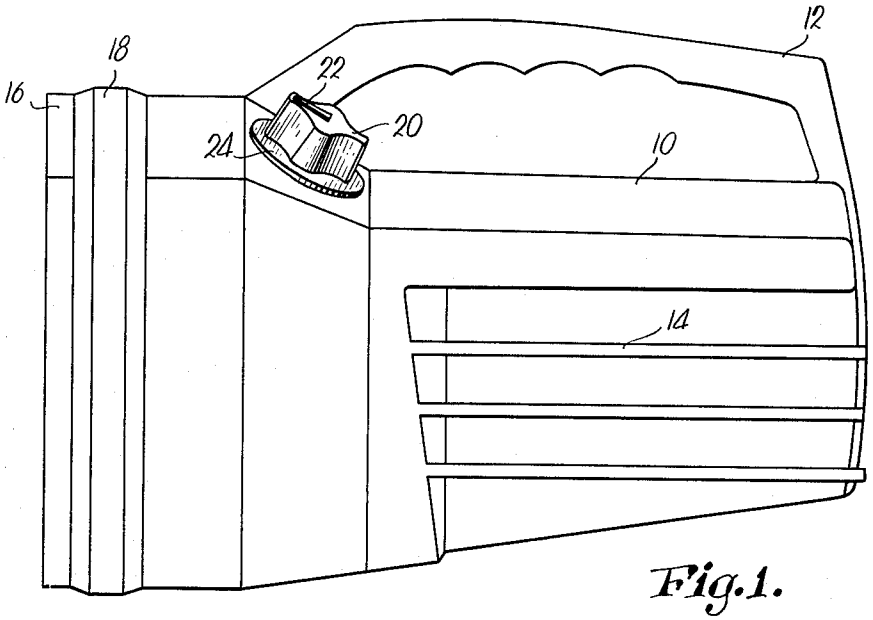


Fig. 1.

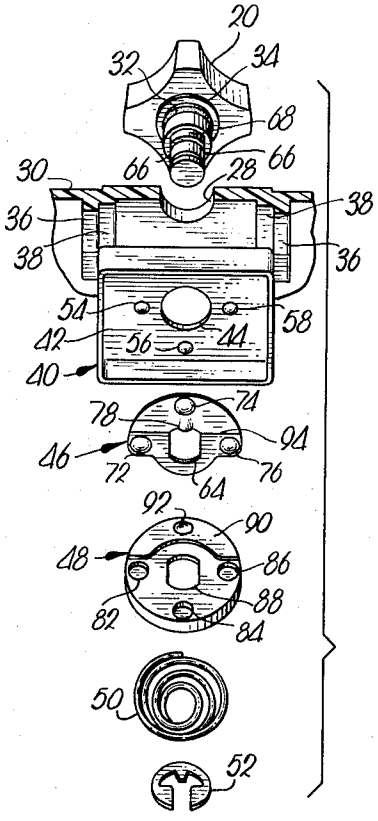


Fig. 2

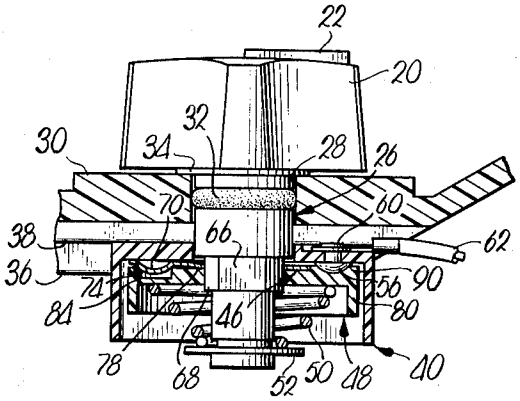


Fig. 3.

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SEALED ROTARY SWITCH HAVING FIXED SUPPORTS

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3 Claims. (Cl. 200—11)

This invention relates to an improved switching device for use in an electric lantern of the type disclosed in my copending application Serial No. 186,061, filed April 9, 1962, entitled, "Trouble Lantern." More specifically, this invention is directed to a finger-actuated, waterproof rotary switch which may be easily manipulated by the user of the lantern to select the desired light or light combination.

The lantern disclosed in the aforesaid copending application contains a pair of operationally independent light assemblies, one of which is employed as the lantern beam, while the other serves as a warning blinker for use in emergency situations. The body of the lantern is waterproof and translucent, and houses the blinker assembly so that, when the bulb is energized, the flashing light is seen through the body of the lantern itself. A red body color, of course, produces the effect of a flashing red light.

A waterproof, multiposition switch is employed with the lantern so that the operator may select the beam, the blinker, or both the beam and the blinker simultaneously. The switch is of the push-type and, although it has proven to be satisfactory, it would be desirable to provide a rotary switch if the same could be properly waterproofed. Since the waterproof and buoyant construction of the lantern disclosed in the aforesaid copending application is one of the features thereof, it is requisite that the lantern switch be of waterproof design since some parts of the switch necessarily must be on the outside of the lantern.

It is, therefore, an important object of this invention to provide a waterproof, rotary switch for use with an electric lantern.

Another important object of this invention is to provide a rotary switch which may be readily assembled on a support therefor and fixed in position solely by the interaction of the switch components with the support.

Still another important object of the instant invention is to provide a mounting support for the components of a rotary switch which has a configuration that cooperates with the components to form an integrated, operational assembly.

Other objects will become apparent as the detailed description proceeds.

In the drawing:

FIG. 1 is a side elevational view of an electric lantern showing a knob for the switch of the instant invention extending therefrom;

FIG. 2 is an exploded view of the rotary switch; and

FIG. 3 is a cross-sectional view of the switch, the stem, the O-ring, and the knob being shown in elevation for clarity.

Referring at the outset to FIG. 1, the numeral **10** denotes the waterproof, translucent case or body of the electric lantern, the latter being of similar construction to that as shown and described in the aforesaid copending application. Body **10** has a handle **12** and is provided with decorative molding **14**. A lens assembly **16** for the beam portion of the lantern is secured to body **10** by a waterproof sealing band **18**. A knob **20**, having a pointer **22**, is shown extending from body **10** and is employed to operate the switch of the instant invention. A position indicating dial **24** on the body underlies knob **20** and indicates the four switch positions of the switch to be

described hereinafter, knob **20** being selectively operable by the user of the lantern to align pointer **22** with any one of these four positions.

In FIGS. 2 and 3, the rotary switch of the instant invention is shown in detail. It may be seen that knob **20** is integral with a stem **26** which extends through an aperture **28** in a supporting wall **30**. It should be understood that wall **30** comprises a portion of the exterior wall structure of body **10**. An O-ring **32** is seated in an annular recess in stem **26** and sealingly engages supporting wall **30** within the aperture **28**. An annular retainer **34** is integral with knob **20** and stem **26** at the union thereof and bears against the exterior surface of the supporting wall.

Within the interior of body **10**, wall portion **30** thereof is provided with a pair of parallel, rectilinear ribs **36**, each of which has a channel **38** coextensive therewith. The channels **38** receive opposed margins of a dielectric housing **40** and hold the same in place in a manner which will become clear as the description proceeds. Housing **40** includes a rectangular contact mounting plate or member **42**, the channels **38** forming a seat for a pair of opposed edges of the plate. A central opening **44** in plate **42** receives stem **26**, the plate being slipped over the stem in the assembly of the device.

The side of housing **40** facing away from supporting wall **30** is open to permit the remaining parts of the switch to be slipped on stem **26**. The first of these parts is a generally semicircular, metallic component or wafer **46**, the next part is a cup-shaped dielectric disc **48**, then a spring **50** and finally, a C-clip **52**.

Plate **42** is provided with three electrical contacts which extend through the plate and present three contact heads **54**, **56** and **58**. In FIG. 3, one of the contacts (corresponding to head **56**) may be seen in its entirety at **60**. An electrical conductor **62** extends from contact **60** to the appropriate portion of the lantern apparatus. It should be noted that the three heads **54**, **56** and **58** are all equidistant from the axis of stem **26**. Heads **54** and **56**, and heads **56** and **58** are angularly spaced 90° from one another, while heads **54** and **58** are annularly spaced by an angle of 180°.

Wafer **46** has an opening **64** therein which receives opposed flats **66** of a reduced portion **68** of stem **26**. It may be noted that opening **64** is configured so that the wafer **46** is rotationally interlocked with stem **26** due to the mating of the opening with the flats **66**. Three dimples are stamped in wafer **46**, one of the dimples being shown at **70** in FIG. 3. Since FIG. 2 reveals the reverse side of wafer **46**, three bosses **72**, **74** and **76** corresponding to the three dimples are shown. Boss **74** corresponds to dimple **70**. Wafer **46** is also provided with a protuberance **78** which extends from the side of the wafer containing bosses **72–76**.

The dielectric disc **48** includes an annular flange **80** which gives the disc a cup-like configuration. The side of the disc facing away from the cup formed by flange **80** has three recesses **82**, **84** and **86** therein which receive bosses **72**, **74** and **76** respectively. It should be understood that disc **48** as depicted in FIG. 2, is inverted with respect to the normal manner of illustrating the disc in an exploded view. This is done so that the interrelation of the recesses **82–86** and the bosses **72–76** may be clearly seen.

Disc **48** has a central opening **88** therein which also receives the reduced portion **68** such that the flats **66** of the stem interlock with the disc so that the latter will rotate with the stem. The disc is provided with an arcuate shoulder **90** having a depression **92** therein, the function of depression **92** being to receive a selected head **54–58** during rotation of the stem from one switch position to another.

Spring **50** and C-clip **52** complete the switch assembly

and maintain the various parts of the switch in proper relation with one another. It should be understood that the action of spring **50** holds wafer **46** and disc **48** in engagement with one another in a complemental fashion to form the switch element of the switching device which rotates with the stem to establish the desired electrical continuity between the heads **54–58** at each switch position. When assembled, the edges of plate **42** in engagement with channels **38** are firmly seated in the channels by the action of spring **50** so that the ribs **36** positively prevent rotation of housing **40**. Spring **50** acts between the clip **52** (at the end of the stem remote from knob **20**) and the side of disc **48** within the cup formed by annular flange **80**. The dimples in wafer **46** and depression **92** in disc **48** receive heads **54–58** (except for one of the dimples or the depression, depending on the switch position) and transmit the force of spring **50** to plate **42**. Stem **26** is biased longitudinally inwardly of body **10** thereby forcing retainer **34** against the exterior surface of supporting wall **30**. Therefore, no other means is required for maintaining the various parts of the switch assembled into an operational unit.

It may be appreciated that a waterproof switch is thus provided since the action of spring **50** also maintains O-ring **32** within aperture **28**. Stem **26** does not reciprocate during rotation of knob **20**; therefore, retainer **34** remains engaged with the exterior surface of supporting wall **30** at all times. The use of retainer **34** not only permits easy rotation of knob **20**, but also assists O-ring in its sealing function.

The general operation of the switching structure is evident from the foregoing, it being only necessary to point out certain distinguishing and noteworthy features of the device which become apparent when operation thereof is considered. As stated above, wafer **46** and disc **48** move as a unit with stem **26** and form the switch element. As knob **20** is rotated, four switch positions are encountered. In three of these four positions, two of the heads **54**, **56** and **58** will be electrically interconnected by wafer **46**. In the remaining position all three of the heads **54**, **56** and **58** are electrically interconnected. Thus, by appropriate electrical connections to the heads well within the ability of one skilled in the art, four switching functions may be achieved. In the operation of the electric lantern described in the aforesaid copending application, these four positions would be arranged to initiate energization of the beam only, energization of the blinker light only, energization of both lights, and the "OFF" position.

In FIG. 2, a line of bend **94** is illustrated extending completely across wafer **46**, except for the presence of opening **64**. Along this line, the water is slightly bent away from the protuberance **78**. Wafer **46** is thin and resilient; therefore, it may be appreciated from FIG. 3 that a wedging action is achieved between the disc **48** and the adjacent, inner surface of plate **42**. FIG. 3 shows that the portion of wafer **46** provided with protuberance **78** is disposed at a slight angle in the cavity between disc **48** and plate **42**.

Besides the function of spring **50** discussed above, this spring also provides a relief for wafer **46** and disc **48** as stem **26** is rotated from position to position. It may be appreciated that, when disc **48** is moved from the position illustrated in FIG. 3, head **56** will no longer be received by depression **92** and will be forced to ride along the surface of shoulder **90**. The same is true for the other heads which were received by corresponding dimples. This necessitates that the disc and the wafer move away from contact plate **42**, this being permitted by the compression of spring **50**. Once the dimples and/or depression **92** again become aligned with the heads, the disc and the wafer are returned to their initial positions under the action of the spring and solid electrical connections are thereby made.

The various parts of the switch, except for wafer **46**, spring **50**, and clip **52** may be constructed of a molded plastic material. This enables knob **20**, retainer **34**, and stem **26** to be of one-piece construction. Housing **40** and disc **48** also may each be molded as a single piece, the entire switch thus consisting of the individual parts illustrated in the exploded view of FIG. 2. Manifestly, this type of construction in conjunction with the means of forming the various parts of the switch into an operational unit discussed above, greatly facilitates rapid assembly of the switch, disassembly thereof should maintenance or repair be required, and ease of manufacture of the electric lantern.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a rotary switch:

an elongated, rotatable stem provided with a retainer at one end thereof;

a mounting member having an opening therethrough receiving the stem and provided with electrical contact means;

a support between the member and the retainer, abutting the latter and engaged by the member, and having an aperture therethrough receiving said stem;

a switch element on the stem shiftable longitudinally thereof and rotatable therewith, said element being disposed for selective engagement with said contact means upon rotation of the stem; and

yieldable means coupled with the other end of said stem, engaging said element and biasing the retainer and the member toward the support, whereby to clamp the support between the member and the retainer while permitting rotation of the stem to operate the switch;

said member being disposed between the support and the element and comprising a plate having a pair of opposed edges,

said support comprising structure provided with a pair of spaced, elongated ribs projecting from the structure,

said plate being disposed between the ribs with the latter engaging corresponding edges of the plate to prevent rotation thereof during operation of the switch, whereby the ribs and the yieldable means cooperate to form the stem, plate, support, and element into an integrated, operational assembly.

2. In a rotary switch:

an elongated, rotatable stem provided with a retainer at one end thereof;

a mounting member having an opening therethrough receiving the stem and provided with electrical contact means;

a support between the member and the retainer, abutting the latter and engaged by the member, and having an aperture therethrough receiving said stem;

a switch element on the stem shiftable longitudinally thereof and rotatable therewith, said element being disposed for selective engagement with said contact means upon rotation of the stem; and

yieldable means coupled with the other end of said stem, engaging said element and biasing the retainer and the member toward the support, whereby to clamp the support between the member and the retainer while permitting rotation of the stem to operate the switch,

said member being disposed between the support and the element,

said contact means presenting a plurality of conductive heads extending toward the element and defining a number of switch positions,

said element including an electrically conductive component having a plurality of dimples receiving selected heads at each of said switch positions, the element moving on the stem away from the member against the action of said yieldable means as the

element is rotated between adjacent switch positions, and moving toward the member under the bias of the yieldable means when the dimples reach a selected position and receive the corresponding heads.

3. In a rotary switch:

an elongated, rotatable stem provided with an operating knob at one end thereof;

a switch element on said stem shiftable longitudinally thereof and rotatable therewith;

a mounting member between said knob and said element and having an opening therethrough receiving said stem,

said member being provided with a first set of electrical contacts defining a number of switch positions for said element,

said element having a second set of electrical contacts,

one of said sets of contacts comprising a plurality of conductive projections,

the other of said sets of contacts comprising structure configured to complementally receive selected projections at each of said positions;

a support between said member and said knob and engaged by the member, and having an aperture therethrough receiving the stem,

said stem being provided with a retainer between the knob and the support in engagement with the latter; and

yieldable means coupled with said stem and said element, biasing the retainer and the member toward the support, and biasing the element toward the member to forcibly maintain said sets of contacts in engagement with each other at a selected position, whereby the support is clamped between the member and the retainer while the stem is permitted to rotate and, upon rotation of the stem, the element shifts on the stem away from the member against the bias of the yieldable means as the element rotates between adjacent positions, whereupon said element moves toward the member under said bias when the next position is reached to thereby interengage selected contacts of said sets by snap action.

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