Oct. 18, 1960 L. A. RIGEL 2,957,072

ILLUMINATED SWITCH

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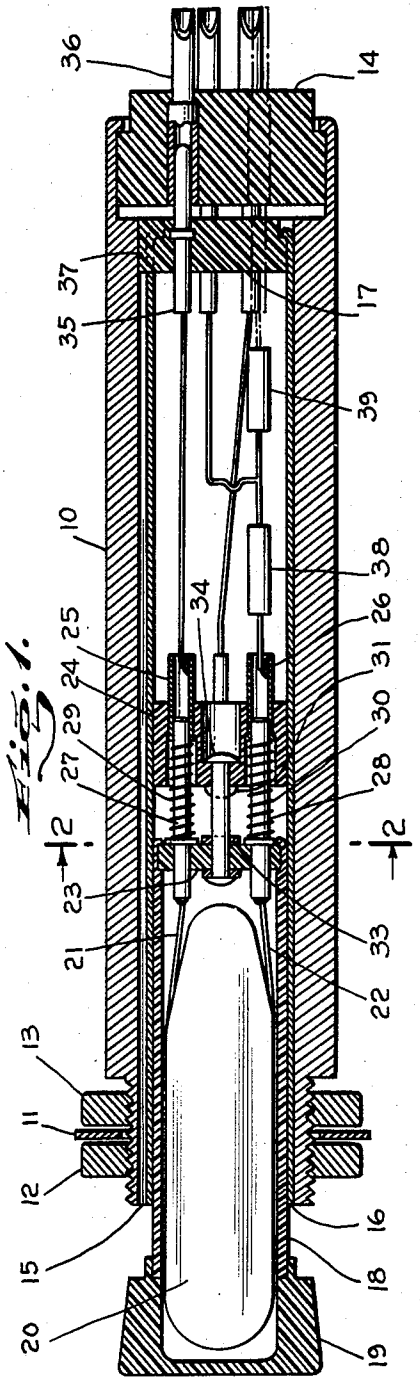


Fig. 1.

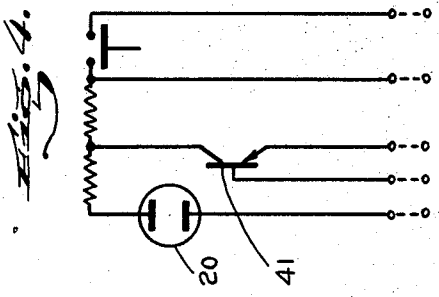


Fig. 4.

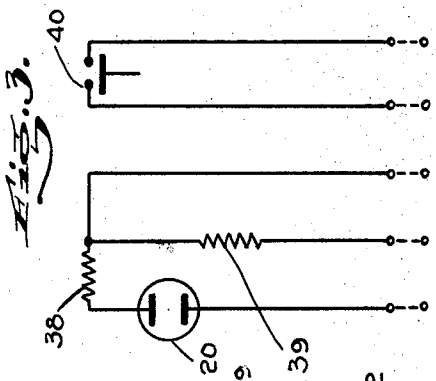


Fig. 3.

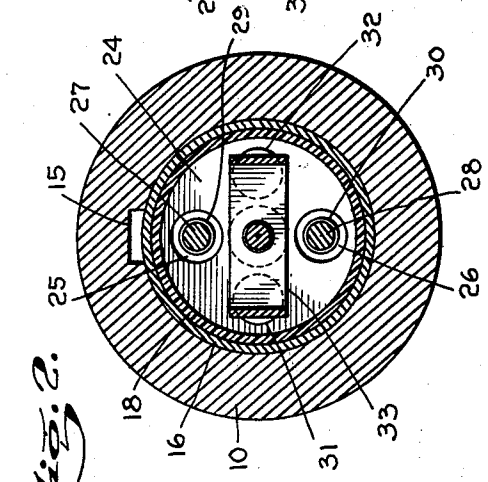


Fig. 2.

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ILLUMINATED SWITCH

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3 Claims. (Cl. 240—2)

This invention relates to illuminated switches, and more particularly to illuminated switches of the miniature push-button type adapted for panel mounting.

In the miniaturization of electronic assemblies, particularly with miniature illuminated switches of the general type concerned, difficulties of various kinds are encountered especially in providing for easy replacement of burned-out units, for the compact disposition of circuit components, and for reliability of the switching elements.

An object of the present invention is to provide an illuminated push-button type switch in which a positive switching action capable of almost indefinite switching without breakdown is provided, together with a convenient disposition of necessary associated circuit elements, and all in a physical form permitting easy replacement of the working part of the unit within its holder.

Other objects of the invention will appear as the description thereof proceeds.

In the drawings, Figure 1 is a longitudinal sectional view of my improved illuminated switch.

Figure 2 is a transverse cross section taken at the level indicated in Figure 1.

Figures 3 and 4 show various methods of connecting circuit elements within the switch.

Turning now to Figure 1, this shows a case **10** which is adapted to be mounted in a panel **11** by two lock nuts **12** and **13**. The case terminates in its lower end in a base **14** which is conveniently made of an insulating material such as melamine plastic. The case **10** is most conveniently made of metal, such as aluminum, although brass may be used. The case **10** is of generally cylindrical construction, and bears a slot or keyway **15** running longitudinally in its inner wall.

The case serves to retain a replaceable lamp-switch assembly which is generally contained within a principal housing **16**, which is terminated at its lower end by a secondary base **17**, likewise made of suitable insulating material such as a plastic. As is evident from the drawing, the principal housing **16** is likewise of generally cylindrical construction, and in turn receives at its upper end a cylindrical lamp housing **18**. Lamp housing **18** is terminated at its upper end by a translucent cap **19**; it contains a lamp bulb **20** with associated leads **21** and **22**; and it is terminated at its lower end by a disc **23** which is force-fitted into a suitable recessed portion of the end of the lamp housing. The lamp housing **18** is free to slide longitudinally within the principle housing **16**, except that its motion outward is limited by a detent means to be described, and its motion inwards is against a compression spring action and terminated by the closing of a switch device, likewise to be described. The translucent cap **19** serves as a convienient means of applying force to the lamp housing so as to push it longitudinally inwards, and may conveniently be made of a suitable plastic material such as polystyrene.

Approximately in the middle of the principal housing **16** there is secured a septum **24** which again is of insulating material. Mounted in the septum **24** are a pair of

tubulations **25** and **26**, into which are slidably fitted a pair of rods **27** and **28**, which are mounted in the disc **23**. Leads **21** and **22** are electrically connected to rods **27** and **28** respectively. A pair of helical compression springs **29** and **30** are carried by rods **27** and **28** and serve the double purpose of urging the lamp in its housing outwardly and of augmenting the electrical connection between each rod and its associated tubulation, for example rod **27** and tubulation **25**. A common difficulty in push switches of the general type under consideration is the uncertainty of electrical connection between fixed and moving parts, but in my present construction I overcome this by the conjoint use of a sliding contact and a direct contact through the spring, as has just been described.

Septum **24** also carries a pair of switch electrodes **31** and **32**, which are terminated by a hemispherical cap on the side facing the lamp and by a simple rod on the side facing the secondary base **17**. The disc **23** carries a metal shorting bar **33** which is normally out of contact with electrodes **31** and **32** because the disc **23** is kept pushed away by the springs. However, when pressure is applied to the cap **19** and the lamp assembly pushed into the principal housing **16**, then the metal shorting bar **33** eventually makes contact with the switch electrode caps **31** and **32**, closing any circuit that may be connected through these electrodes. Passing axially through disc **23**, through the center of the shorting bar **33**, and through the center of the septum **24** is a detent means in the form of a double capped rod **34**, which has merely a sliding fit through septum **24**. This serves to retain the lamp housing **18** within the principal housing **16**, but yet permits motion in the sense of closing the switch.

Secondary base **17** carries a plurality of prong electrodes **35**, which fit in tubular electrodes **36** which are mounted in base **14**. Base **14** with its electrodes thus forms a terminal block. In general, I will provide at least five such electrodes, in order to be able to connect up the various circuit elements contained in housing **16**. While secondary base **17** is generally round in shape, it carries a lug **37** which engages the keyway **15** in the case **10**. This makes it possible to remove the entire assembly inside of case **10** and replace it with a new one. Lug **37** and keyway **15** permit accurate engagement of electrodes **35** and **36**.

As will be apparent from Figure 1, I provide a suitable space within principal housing **16** between septum **24** and the secondary base **17**. In this space I may put circuit elements as desired. In Figure 1 there are shown two resistors **38** and **39**. One possible way of wiring up the switch-lamp assembly using the two resistors as shown in Figure 1 is depicted in Figure 3, where the switch **40** is independent of the lamp **20** and resistors **38** and **39**, although contained within the same encasement. In certain applications of my illuminated switch, it is desirable to make use of a transistor **41**, wired so as to cooperate with the switch and the lamp all as shown in Figure 4. The particular circuits usable with my device are known to those skilled in the art, and need not be described in greater detail herein.

It will be seen that the invention accomplishes its objects, and the superiority of the inventive construction has been amply demonstrated by severe testing programs, which have shown that the combination of elements not only coact in the manner shown but are capable of doing so over extended periods of use. I attribute these results in part to the positive switching action as provided by the shorting bar and the switch electrodes, the positive electrical connection through the moving portion of the switch, the placement of the circuit elements in a relatively cool part of the case instead of near the lamp bulb as commonly done, and to like factors.

It will be apparent that while my invention has been

described in terms of a particular embodiment, numerous variations of detail are permissible within the broad scope of the invention as defined by the appended claims.

Having described my invention I claim:

1. In an illuminated switch, in combination, a principal housing of generally tubular form; a lamp housing of tubular form and telescopically fitted into one end of said principal housing; a lamp having a pair of electrode leads and contained within said lamp housing; base means secured by said lamp housing at the end thereof within said principal housing; a septum mounted in said principal housing and spaced from said base means; a pair of tubulations mounted within said septum and parallel to the axis of said principal housing and said lamp housing; a pair of rod means secured to said base means electrically connected to said lamp electrode leads and slidably fitted within said tubulations; a pair of helical springs carried by said rod means intermediate of said base and of said tubulations and physically contacting both said rod means and said tubulations and establishing electrical contact between each rod and its corresponding tubulation; detent means restraining said lamp housing from being pushed out of said principal housing by said springs; a metal bar attached to the bottom of said base means and facing said septum; a pair of switch electrodes mounted in said septum out of contact of said tubulations and adapted to be contacted by said metal bar; a principal housing base carrying a multiplicity of electrodes communicating from the interior of said principal housing to the exterior of said principal housing base; and electrical conduction means establishing electrical connection between said principal housing base electrodes and said tubulations and said switch electrodes.

2. In an illuminated switch, in combination, a principal housing of generally tubular form; a lamp housing of tubular form and telescopically fitted into one end of said principal housing; a lamp having a pair of electrode leads and contained within said lamp housing; an at least translucent cap means on the end of said lamp housing without said principal housing; base means having electrodes thereon and secured by said lamp housing at the end thereof within said principal housing; a septum mounted in said principal housing and spaced from said base means; a pair of tubulations mounted within said septum and parallel to the axis of said principal housing and said lamp housing; a pair of rod means secured to said base means and slidably fitted within said tubulations, said lamp electrode means being electrically connected to said pair of rod means; a pair of helical springs carried by said rod means intermediate of said base and of said tubulations and physically contacting both said rod means and said tubulations and establishing electrical contact between each rod and its corresponding tubulation; a detent means comprising a double capped rod passing through said base means and through said septum; a metal bar attached to the bottom of said base means and facing said septum; a pair of switch electrodes mounted in said septum out of contact

of said tubulations and adapted to be contacted by said metal bar; a principal housing base carrying a multiplicity of electrodes communicating from the interior of said principal housing to the exterior of said principal housing base, said principal housing electrodes being electrically connected to said pair of tubulations and said pair of switch electrodes; and circuit element means connected by means of wire leads in the lamp circuit disposed within the space defined by said septum and said principal housing base.

3. In an illuminated switch, in combination, a casing of generally tubular form open at one end and closed at the other by a terminal block having electrodes thereon; a principal housing of generally tubular form telescopically fitted into said casing; a lamp housing of tubular form and telescopically fitted into one end of said principal housing; a lamp having a pair of electrode leads and contained within said lamp housing; an at least translucent cap means on the end of said lamp housing without said principal housing; base means secured by said lamp housing at the end thereof within said principal housing; a septum mounted in said principal housing and spaced from said base means; a pair of tubulations mounted within said septum and parallel to the axis of said principal housing and said lamp housing; a pair of rod means secured to said base means and slidably fitted within said tubulations, said lamp electrode leads being electrically connected to said pair of rod means; a pair of helical springs carried by said rod means intermediate of said base and of said tubulations and physically contacting both said rod means and said tubulations and establishing electrical contact between each rod and its corresponding tubulation; a detent means comprising a double capped rod passing through said base means and through said septum; a metal bar attached to the bottom of said base means and facing said septum; a pair of switch electrodes mounted in said septum out of contact of said tubulations and adapted to be contacted by said metal bar; a principal housing base carrying a multiplicity of electrodes communicating from the interior of said principal housing to the exterior of said principal housing base, said principal housing electrodes being electrically connected to said pair of tubulations and said pair of switch electrodes, and said principal housing base electrodes being electrically connected to said terminal block electrodes when said principal housing is in place in said casing; and circuit element means comprising resistors and transistors connected by means of wire leads in the lamp circuit disposed within the space defined by said septum and said principal housing base.

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