Aug. 12, 1958 F. A. HARRINGTON ET AL 2,847,559

ILLUMINATED PUSH BUTTON SWITCH

Filed Nov. 25, 1955

Fig. 5.

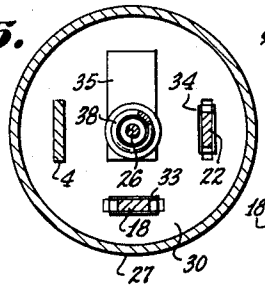


Fig. 6.

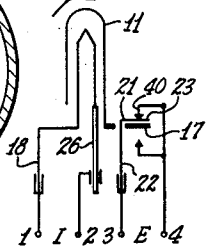


Fig. 4.

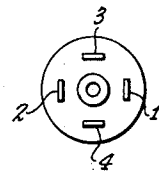


Fig. 6.

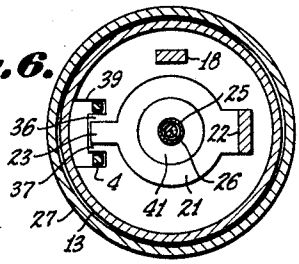


Fig. 7.

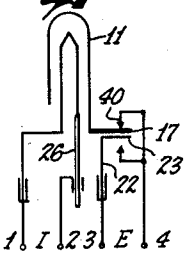


Fig. 1.

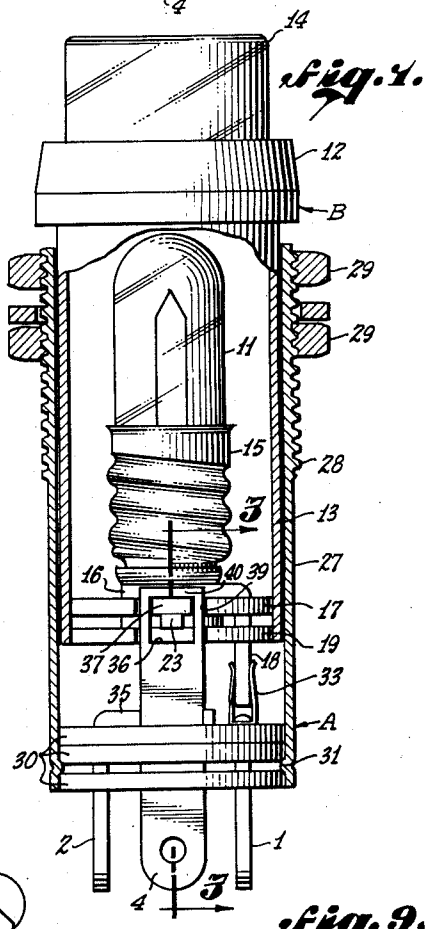


Fig. 2.

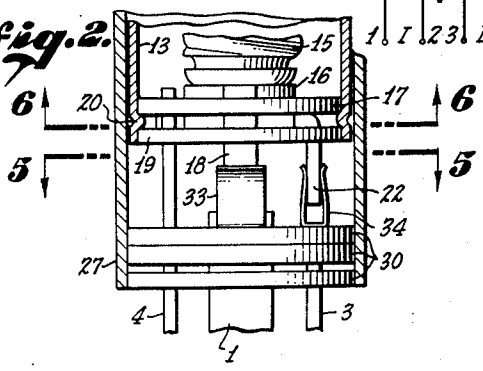


Fig. 3.

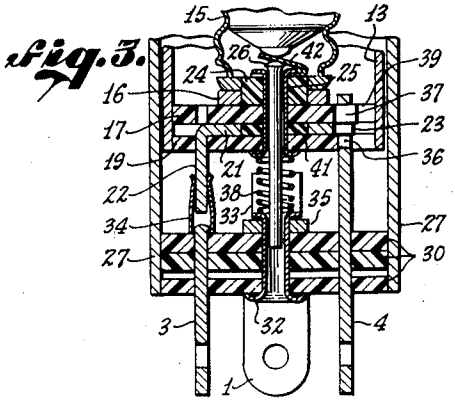
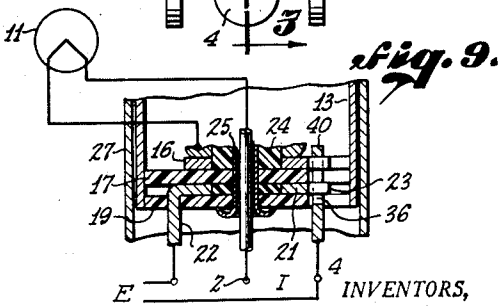


Fig. 9.



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ILLUMINATED PUSH BUTTON SWITCH

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9 Claims. (Cl. 240—2)

This invention relates to electric switches of the push-button type and has as its general object to provide a switch embodying an illuminated push button.

A specific object is to provide a switch having a push button actuator that may be readily connected into a circuit for constantly energizing its illuminating lamp while an entirely separate, external circuit is controlled by the push button actuated switch (e. g. energized when the button is pushed, deenergized when the button is released).

At the same time, the invention contemplates an arrangement of parts which can readily be converted, by a slight rearrangement thereof, from a normally open, push-to-close arrangement of the main switch, to a normally closed, push-to-open arrangement thereof. More specifically, the invention aims to provide for such conversion by as simple a procedure as the mere rearrangement, during assembly, of the relative positions of respective insulator and contact parts in a coaxial sandwich assembly of such parts.

The invention further aims to provide a switch having, in addition to the above mentioned conversion feature, an arrangement of parts that can be easily converted from a dual switching mechanism wherein the button illuminating lamp circuit may be actuated so as to register a change in the condition of illumination of the button, simultaneously with actuation of the external circuit by the main push button operated switch.

Other objects will become apparent in the ensuing specification and appended drawing, in which:

Fig. 1 is a side elevational view of a switch embodying the invention with casing and barrel parts shown in section;

Fig. 2 is a front elevational view of the same, with the same parts shown in section;

Fig. 3 is an axial sectional view of the same, taken on line 3—3 of Fig. 1;

Fig. 4 is a bottom end view of the device;

Fig. 5 is a transverse sectional view taken on the line 5—5 of Fig. 2;

Fig. 6 is a transverse sectional view taken on the line 6—6 of Fig. 2;

Fig. 7 is a circuit diagram of the device, arranged as a normally open switch;

Fig. 8 is a circuit diagram of the device in modified form, arranged as a normally closed switch; and Fig. 9 is a schematic view combining a fragmentary sectional view and circuit diagram of another modified form of the invention, embodying only three terminals.

Referring now to the drawings in detail, I have shown, therein, as an example of one form in which the invention may be embodied, a push button switch embodying generally a casing a fixed contact assembly A and a push button and movable contact assembly B, in which is incorporated an illuminating lamp **11**.

A push button head **12** it attached in any suitable manner to the outer end of a barrel **13** within which lamp **11** is housed, and a transparent or translucent lens **14** is

mounted in the center of head **12**, to transmit the light rays from lamp **11** so as to illuminate the push button.

Lamp **11** is mounted in a conventional socket **15** which is secured, as by soldering, to a connector ring **16**. Ring **16** is seated on an insulator washer **17**, and has a connector leg **18** projecting through registering slots in washer **17** and in a companion washer **19**. Washers **17** and **19** are snugly fitted into the end of barrel **13** and may be secured thereto by staking, at **20** (Fig. 2). Interposed between washers **17** and **19** (Fig. 3) is a connector disc **21** which embodies an integral connector leg **22** bent at right angles to its plane and extending through a slot in disc **19**. Diametrically opposite leg **22**, disc **21** has a radially projecting contact finger **23** constituting the movable contact of the switch mechanism. An insulator grommet **24** is disposed within the embrace of connector ring **16** and extends into the bottom of lamp socket **15**. A fastener grommet **25** extends through the sandwich assembly of grommet **24**, washers **17**, **19** and connector disc **21**, and is headed at both ends, in clamping engagement with grommet **24** and washer **19** respectively, to secure the sandwich tightly. A central contact pin **26** is mounted in fastener grommet **25**, and has a head retained by a spring contact **42** which engages the end contact of lamp bulb **11**. An insulator **41** insulates disc **21** from grommet **25**.

Barrel **13** is slidably mounted in the casing shell **27** of casing and fixed contact unit A. Shell **27** has an external thread **28**, on which are threaded mounting nuts **29** adapted to clamp between them a mounting panel having an opening to receive the shell **27**, thus to securely mount the device in such a panel. At its opposite end, shell **27** supports a sandwich assembly of insulator washers **30** snugly fitted within the end of the shell and positioned as by staking at **31** (Fig. 1). A fastener grommet **32** (Fig. 3) extends through the centers of washers **30** and secures them tightly in sandwich assembly.

Mounted in four series of registering slots in washers **30**, at the four respective sides of a square array, are four terminal bars **1**, **2**, **3** and **4**. Terminals **1** and **3** are connected, at their inner ends, to brush forks **33**, **34** respectively, of thin spring ribbon metal, embracing the connector legs with light, yielding pressure so as to maintain good electrical contact therewith as the connector legs slide within the yokes. Legs **18** and **22**, sliding in forks **33**, **34**, provide yielding electrical connections between their respective conductor parts and the terminals **1**, **3**.

Terminal **2** has at its inner end an integral connector ring **35**, bent at right angles thereto and clamped between the head of the inner end of grommet **32**, and the inner washer **30**. Terminal **4** (Fig. 1) at its inner end has a square opening **36** into which the movable contact finger **23** projects with insulating clearance on both sides.

The washer **17** has a tab **37** (Fig. 6) projecting through opening **36** and covering the upper face of contact finger **23** so that no contact between finger **23** and the inner end web **40** of terminal **4** can be established in the normal position of movable assembly B, although tab **37** will engage said end web **40** to act as a stop to determine such normal position. The movable assembly B is spring-urged to its said normal position by a coil spring **38**, engaged under compression between grommet **32** and grommet **25**. Tab **37** projects from the center of a rectangular notch **39** in washer **17**, through which the terminal **4** projects.

Referring now to Fig. 7, the switch, with parts arranged, as in Figs. 1–6, for press-to-make operation, are shown schematically therein. The circuit to lamp **11**, carried through contacts **1** and **2**, is indicated at **I**. Such circuit may be wholly independent of the circuit, indi-

cated at E, which is made under pressure applied to push button head 12, 14. Circuit E may be a low voltage circuit for operating an annunciator bell, or may operate a relay to energize a lighting or power circuit. Circuit I may be of different voltage than circuit E, or may incorporate a resistance to reduce the wattage consumption of lamp 11 to a low value for constant operation, and to cause lamp 11 to be illuminated only dimly. Other reasons may dictate the arrangement of circuits I and E wholly independent of one another. On the other hand, the switch can readily be connected into a system wherein circuits I and E each have one side connected to a common connector, if desired.

Fig. 8 illustrates how by a simple reversal of washers 17 and 19 (in which washer 17 is disposed beneath connector disc 21 instead of above it) movable contact 23 becomes exposed for contact with end web 40 of contact 4 in the normal, retracted position of movable unit B. Thus the switch, in the form shown in Fig. 8, is a normally closed switch, and has a push-to-open operation, the insulator tab 37 in this case contacting the bottom of the opening 36 when the head 12, 14 is pressed, and insulating the contact 23 from terminal 4.

Fig. 9 illustrates how a further modification of the switch may be utilized, when desired, to effect a double switching operation. In this case, insulation washer 17 and connector ring 16 are sufficiently thin so that a projecting contact on ring 16, corresponding to contact 23, may project into opening 36 and normally engage end web 40 of terminal 4, thus establishing normally the circuit I to lamp 11, which is extinguished when the head 12, 14 is pushed to establish circuit E. In such an arrangement, terminal 1 and connector 18 may, if desired, be eliminated so that lamp remains extinguished so long as head 12, 14 is pressed, or alternatively this connection may be retained so that lamp 11 is only momentarily extinguished and then re-energized as head 12, 14 is pushed.

Lens 14 functions merely as a window to transmit light rays from lamp 11 for illuminating the switch (e. g. making it visible in the dark, or furnishing a signal). A small aperture in an otherwise opaque push button head, could be utilized as an equivalent light transmitting window.

We claim:

1. In an illuminated push button switch: a tubular casing having means for mounting it in a supporting panel; insulator means fixed in the rear end of said casing; four terminals fixed in said insulator means; a barrel fitted within said casing and slidable therein; a push button head on the outer end of said barrel and having a light transmitting window therein; inner and outer axially spaced insulator washers fixed in the opposite end of said barrel; a lamp socket mounted on said inner insulator washer and facing said window so as to support an electric lamp for illuminating same, said socket having respective central and lateral contact parts; a connector mounted on the inner insulator washer adjacent said socket and engaging said lateral contact part, said connector having a leg projecting axially outwardly through said washers; means providing a yielding electrical connection between said central contact and one of said terminals; a movable switch contact disc sandwiched between said insulator washers and having a movable contact projecting radially from its periphery and having a leg projecting axially outwardly through the outer insulator washer; and means providing electrical connections between said legs and a second and third of said terminals; said means comprising spring yokes mounted on said insulator means of the casing and yieldingly embracing respective legs; the fourth of said terminals projecting into the casing to constitute a fixed switch contact; said movable contact being engageable with said fixed switch contact upon movement of said barrel axially in said casing.

2. In an illuminated push button switch, a tubular casing having means for mounting it in a supporting panel; insulator means fixed in the rear end of said casing; four terminals fixed in said insulator means; a barrel fitted within said casing and slidable therein; a push button head on the outer end of said barrel and having a light transmitting window therein; an electric lamp mounted in said barrel and facing said window for illuminating the same, said lamp having respective electrical contact parts; means providing electrical connections between said lamp contact parts and two of said terminals; a pair of axially spaced insulator washers fixed in the inner end of said barrel and providing the mounting for said lamp; a movable switch contact disc sandwiched between said insulator washers and having a contact exposed at the periphery thereof; and means providing an electrical connection between said movable switch contact and another of said terminals; the fourth of said terminals projecting into the casing to constitute a fixed switch contact; said movable contact being engageable with said fixed switch contact upon movement of said barrel axially in said casing.

3. In an illuminated push button switch: a tubular casing having means for mounting it in a supporting panel; insulator means fixed in the rear end of said casing; four terminals fixed in said insulator means; a barrel fitted within said casing and slidable therein; a push button head on the outer end of said barrel and having a light transmitting window therein; an insulator washer fixed in the opposite end of said barrel; a lamp socket mounted on said insulator washer and facing said window so as to support an electric lamp for illuminating the same, said socket having respective central and lateral contact parts; a connector mounted on said insulator washer and engaging said lateral contact part, said connector having a leg projecting outwardly through said washer; means providing a yielding electrical connection between said leg and one of said terminals; means providing a yielding electrical connection between said central contact and another of said terminals; a movable switch contact disc attached to said insulator washer and having a peripheral contact; and means providing a yielding electrical connection between said movable switch contact disc and a third of said terminals; the fourth of said terminals projecting into the casing to constitute a fixed switch contact; said peripheral contact being engageable with said fixed switch contact upon movement of said barrel axially in said casing.

4. In an illuminated push button switch, a tubular casing having means for mounting it in a supporting panel; insulator means fixed in the rear end of said casing; four terminals fixed in said insulator means; a barrel fitted within said casing and slidable therein; a push button head on the outer end of said barrel and having a light transmitting window therein; an insulator washer fixed in the opposite end of said barrel; a lamp socket mounted on said insulator washer and facing said window so as to support an electric lamp for illuminating the same, said socket having respective electrical contact parts; means providing electrical connections between said socket contact parts and two of said terminals; a movable switch contact attached to said insulator washer; and means providing electrical connections between said movable switch contact and another of said terminals; the fourth of said terminals projecting into the casing to constitute a fixed switch contact; said movable contact being engageable with said fixed switch contact upon movement of said barrel axially in said casing; said fourth terminal being in the form of a flat bar having a rectangular opening in its inner end, said movable contact extending into said opening with clearance at opposite lateral sides thereof and adapted to engage said fourth terminal at a third side of said opening upon axial movement of said barrel; said insulator washer having a radially projecting tab at its periphery, extending into said

opening and engageable with said fourth terminal at the fourth side of said opening to provide a stop to limit axial movement of said barrel in one direction while insulating said movable contact from said fourth terminal.

5. In an illuminated push button switch: a tubular casing having means for mounting it in a supporting panel; insulator means fixed in the rear end of said casing; four terminals fixed in said insulator means; a barrel fitted within said casing and slidable therein; a push button head on the outer end of said barrel and having a light transmitting window therein; an insulator washer fixed in the opposite end of said barrel; a lamp socket mounted on said insulator washer and facing said window so as to support an electric lamp for illuminating the same, said socket having respective central and lateral contact parts; a connector mounted on said insulator washer and engaged between said lateral contact part and said insulator washer, said connector having a leg projecting axially outwardly through said washer; a connector ring having a movable contact as a radial projection on the periphery thereof, said connector ring being attached to the face of said insulator washer opposite said connector and having an integral leg extending axially therefrom parallel to said connector leg; means providing a yielding electrical connection between said central contact and one of said terminals; means providing yielding electrical connections between said legs and a second and third of said terminals; the fourth of said terminals projecting into the casing to constitute a fixed switch contact; said movable contact being engageable with said fixed switch contact upon movement of said barrel axially in said casing; said yielding electrical connections with said legs each comprising a spring yoke mounted on said insulator means of the casing and yieldingly embracing a respective leg.

6. An illuminated push button switch as defined in claim 3, wherein said means providing a yielding electrical connection between said central contact and another of said terminals comprises a conductor element securing said other terminal to said insulator means, a conductor element electrically connected to said central contact at its inner end and extending axially outwardly through said insulator washer, and a coil spring engaged under compression between said conductor elements and maintaining a yielding spring bias against the outer end of the assembly of the barrel, insulator washer, push button head, socket and movable contact, toward a normal position for said assembly.

7. An illuminated push button switch as defined in claim 3, wherein said means providing a yielding electrical connection between said central contact and another of said terminals comprises a conductor element securing said other terminal to said insulator means, a conductor element electrically connected to said central contact at its inner end and extending axially outwardly through said insulator washer, and a coil spring engaged under compression between said conductor elements and maintaining a yielding spring bias against the outer end of the assembly of the barrel, insulator washer, push button head, socket and movable contact, toward a normal position for said assembly, said normal position being one in which said fixed and movable contacts are separated.

8. An illuminated push button switch as defined in claim 3, wherein said means providing a yielding electrical connection between said central contact and another of said terminals comprises a conductor element securing said other terminal to said insulator means, a conductor element electrically connected to said central contact at its inner end and extending axially outwardly through said insulator washer, and a coil spring engaged under compression between said conductor elements and maintaining a yielding spring bias against the outer end of the movable contact, toward a normal position for said assembly, said normal position being one in which said movable and fixed contacts are in closed engagement with one another.

9. An illuminated push button switch as defined in claim 2, wherein said lamp contact parts comprise a central contact and an outer contact, wherein the means providing an electrical connection between said outer contact and its respective terminal comprises a socket receiving and connected to said outer contact and having a base in opposed relation to the inner one of said insulators washers, a connector ring interposed between said base and said inner insulator washer and having a leg extending axially outwardly through both of said insulator washers, and a yielding connection between said leg and the respective terminal; said switch further including an insulator collar extending through said connector ring and through said socket base; and wherein said means providing an electrical connection between the other lamp contact part and a second one of said terminals comprises a tubular rivet extending axially through said insulator washers and said insulator collar and electrically connected at its inner end to said central lamp contact, a conductor pin extending through said tubular rivet and secured at the inner end thereof, said pin having a projecting outer end portion, a tubular rivet extending axially through said insulator means and slidably receiving said projecting outer end portion of the pin, an annular conductor part secured between the inner end of said last mentioned tubular rivet and said insulator means and integrally joined to said second terminal, adjacent ends of said tubular rivets being in opposed relation, and a coil spring engaged under compression between said adjacent ends of said rivets and maintaining a yielding spring bias against the assembly of said barrel, lamp, socket, insulator washers, collar and movable contact in the direction of a normal position of said movable contact.

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