

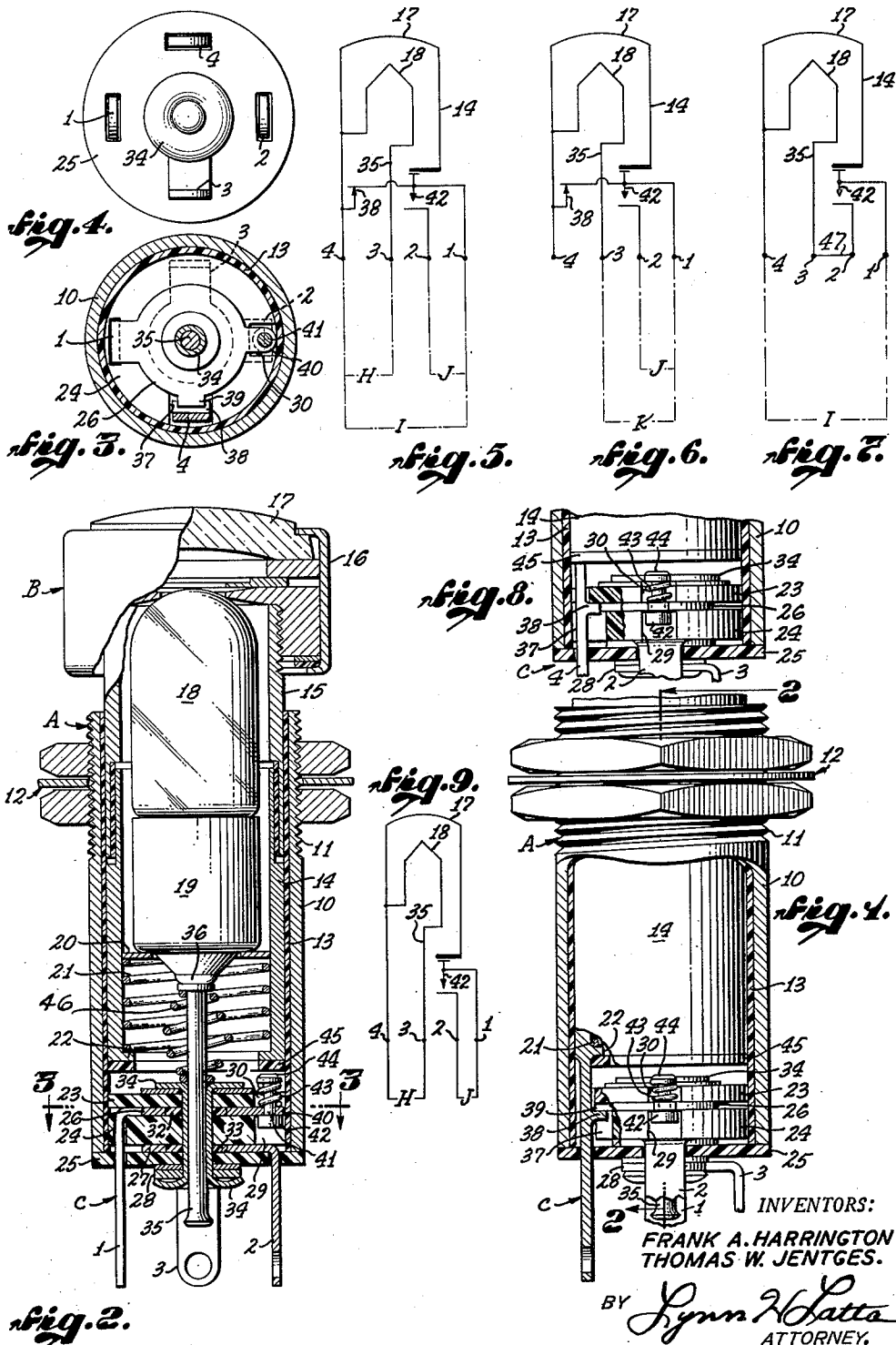
Dec. 17, 1957

F. A. HARRINGTON ET AL

2,816,995

PUSH BUTTON SWITCH WITH DOUBLE SWITCH MECHANISM

Filed April 3, 1956



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PUSH BUTTON SWITCH WITH DOUBLE SWITCH MECHANISM

Frank A. Harrington, Brea, and Thomas W. Jentges, Santa Ana, Calif., assignors to Marco Industries Company, Anaheim, Calif., a corporation of California

Application April 3, 1956, Serial No. 575,737

11 Claims. (Cl. 200—167)

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.

The general object of the invention is to provide a push-button switch having a novel and improved switch unit arranged to be actuated by rearward movement, in a mounting barrel, of a lamp-holding tube that is slidably mounted in the barrel, the forward end of the tube being provided with a push-button head having a lens or light aperture through which the rays of the lamp within the tube, will shine to illuminate such head.

More specifically, the invention contemplates such a switch embodying a fixed assembly of four terminals in its rear end, two of the terminals providing connections to the lamp for illuminating the same, and the other two terminals providing connections from said switch unit to a circuit that is entirely separate from the lamp circuit, and may be wholly isolated therefrom, electrically.

In particular, the invention contemplates a fixed assembly of terminal rings or equivalent parts disposed radially and axially spaced by insulator means such as a succession of discs sandwiched between the rings, the rings being integral with terminals that project from the rear end of the barrel for connection to circuits including a lamp energizing circuit and an external circuit; and wherein the switch unit comprises a spring urged plunger slidably mounted in one of the terminal rings at its periphery and movable into engagement with another of the terminal rings when the head is pushed. One of the terminals is connected to a center contact of the lamp through a sliding pin that extends through the terminal rings at their axis and is insulated therefrom.

In the preferred form of the invention, a fourth terminal, constituting an axial extension of the lamp housing tube, is provided with a radially inwardly extending stop finger which engages an insulator disc to determine the normal, retracted position of the lamp housing tube. In modified forms of the invention, such finger functions as a supplementary movable switch contact to engage one of the terminal ranges.

A specific object is to provide a double throw switch having a pair of normally closed contacts which are opened when the push button is pressed and having a pair of normally open contacts which are closed when the push button is pressed. The invention further contemplates such a switch, adapted to be connected to external circuits in different arrangements such that either its normally open or its normally closed switch contacts may be utilized to carry electric current to an illuminating lamp behind the switch button, whereby the button may be normally illuminated and darkened when pressed, or, in the alternative, may be normally dark and illuminated when pressed, depending upon the specifications of a particular installation.

The invention further contemplates such a switch that will provide for three alternative selections, namely, the normally illuminated push button and the normally dark push button, both referred to above; and, as a further

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alternative, a constantly illuminated push button remaining illuminated in both of the alternative positions of the switching mechanism, with the two pairs of switch contacts being available to control two external circuits. Thus, the invention provides for the possibility of three separate circuits including the internal button illuminating circuit and two separate external circuits, both switch-controlled and one normally energized and the other normally open.

The invention further aims to provide such a switch wherein a common connection from an external circuit element (e. g. a source of electric current) services both the normally open and the normally closed switch.

Other objects will become apparent in the specifications and appended drawings in which:

Figure 1 is a side elevational view, partially in section, of a push-button switch embodying my invention;

Figure 2 is a longitudinal sectional view thereof taken on the line 2—2 of Figure 1;

Figure 3 is a transverse sectional view taken on the line 3—3 of Figure 2;

Figure 4 is a terminal end view of the switch;

Figures 5, 6 and 7 are pneumatic wiring diagrams showing various circuit arrangements to which the switch can be adapted; and

Figs. 8 and 9 show a modified form of the invention.

Referring now to the drawings in detail, there is shown, as an example of one form in which the invention may be embodied, an illuminated push-button switch, including in general, a barrel assembly A, a lamp casing and head unit B, and a terminal and contact assembly C.

Barrel assembly A may embody a cylindrical barrel 10 having an external thread 11 and an assembly of mounting nuts and washers 12 thereon; also, a lining tube 13 of insulating material.

Lamp casing and head unit B includes a lamp casing tube 14 having an extension 15 telescoped thereon and insulated therefrom as indicated, a push-button head assembly 16 being attached to the outer end of extension 15 and having a transparent or translucent lens 17 for transmitting illumination from a lamp 18 mounted within casing tube 14. Merely as an illustration of one possible method of mounting the lamp, I have shown a known arrangement wherein the base capsule 19 of the lamp is seated against a washer 20 which, in turn, is seated on a coil spring 21 bearing against an inwardly extending radial flange 22 at the rear end of tube 14, the forward end of lamp 18 being seated against head 16, as shown.

Mounted in the rear end of barrel 10 is the terminal and contact assembly C, comprising a sandwich arrangement of insulating discs 23, 24 and 25 and a series of metal rings 26, 27 and 28, each of said rings constituting one arm of an L-shaped terminal including a second arm projecting axially through the rear end of the barrel assembly A, the three terminal arms being numbered 1, 2 and 3 respectively. Terminal arm 1 extends through registering slots in discs 24 and 25, as shown; terminal arm 2 extends through a slot in the disc 25, as shown, and terminal 3 is disposed externally of disc 25. Disc 25 constitutes a rear end cover for barrel 10.

Terminal rings 26 and 27 are internally insulated by small insulator washers 32 and 33 from the central bushing portion of a grommet 34, which extends through the assembly of discs 23, 24, 25 and rings 26, 27 and 28, and which has at its respective end, heads between which the said assembly of discs and rings is clamped tightly together. Grommet 34 provides a conducting connection between the ring portion 28 of terminal 3 and a conductor pin 35 which is slidably extended through the grommet 34 and has a head bearing against the central contact 36 of lamp 18.

Lamp base 19 is electrically connected, through casing

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tube 14, with a fourth terminal 4 (Figure 1) constituting an integral extension of casing tube 14 and projecting axially from one side thereof. At this point, it may be noted that terminal 4 is diametrically opposite terminal 3 and terminals 1 and 2 are diametrically opposite one another.

Insulator disc 24 has a peripheral radial notch 37 in which is received a radially inwardly projecting contact finger 38 on terminal 4. Terminal ring 26 has a co-acting radially outwardly projecting contact finger 39 against which contact finger 38 is normally engaged, as shown in Figure 1.

Contact ring 26 has a second radially projecting finger 40, disposed 90° around its circumference from contact finger 39. Finger 40 has a cylindrical aperture in which is slidably mounted a small switching plunger 41 having a contact head 42 normally engaged against the underside of finger 40 under the yielding load of a coil spring 43 which encircles plunger 41 and is engaged under compression between finger 40 and a head 44 at the inner end of plunger 41. Spring 43 is accommodated in a notch 30 in disc 23. Contact head is accommodated in a peripheral notch 29 in disc 24.

Interposed between plunger head 44 and the rear end of lamp housing tube 14 is an insulator washer 45. Washer 45 may be cemented to flange 22 or may simply rest loosely between the flange and the contact assembly C.

Lamp housing tube 14 is slidable axially within insulator lining 13 of barrel 10, from the normal position shown in the drawing to a position wherein plunger contact 42 is engaged against terminal ring 27 of terminal 2. The normal retracted position is provided for by a barrel spring 46 engaged under compression between the head of contact pin 35 and the inner head of grommet 34. Pressure against the head 16 of sliding unit B (i. e., against lens 17) is effective to move the housing tube 14 inwardly, compression spring 21, the insulator washer 45 engaging the head 44 of plunger 41 and shifting the plunger 41 to the point where contact head 42 thereof engages terminal 27.

Referring now to Figure 5, illustrating one possible circuit arrangement embodying this improved switch, it will be noted that one side of lamp 18 is permanently connected through sliding contact pin 35 with terminal 3, whereas the other side, through base 19, washer 20 and housing tube 14, is permanently connected to terminal 4. Thus, it becomes possible, if desired, to connect terminals 3 and 4 to a circuit, indicated at H, for constantly energizing lamp 18 if desired. A second circuit, indicated at I, may be connected to terminals 1 and 4, normally connected through contacts 38 and 39. A third circuit, indicated at J, may be connected across terminals 1 and 2. It will now be apparent that circuit I is a normally closed circuit and is opened when the push-button head is pressed; whereas circuit J is a normally open circuit and is closed when the push-button head is pressed.

Figure 6 illustrates an alternative arrangement, wherein the lamp energizing circuit K is connected across terminals 1 and 3 and is opened when the push-button head is pressed. Circuit J may be the same as in Figure 5, being a normally open circuit which is closed when the push-button head is pressed. Such an arrangement provides for normal illumination of the push button, with the button going dark when pushed to close an external circuit.

Referring now to Fig. 8, there is shown therein a preferred form of the invention wherein the switch 41, 42, 27 is completely isolated from the lamp circuit, and the lamp circuit is constantly energized. This form of the invention differs from the form shown in Figs. 1-3 in that the contact lug 39 is omitted from terminal ring 26 and the finger 38 of terminal 4 functions as a stop finger, normally engaging insulator disc 23 to determine the normal, retracted position of the lamp housing assembly B.

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Referring to Fig. 9, showing the electrical diagram for Fig. 8, it will be noted that the lamp energizing circuit H, including terminals 3 and 4, is completely isolated from the external circuit J which is closed when the lamp housing assembly B is pushed rearwardly.

Figure 7 illustrates a further possible arrangement utilizing the structure of Fig. 8, wherein the lamp 18 is normally dark. In this case, the normally open lamp energizing circuit, indicated at L, utilizes the connections 1, 4, and 2, 3, the latter terminals being connected by a jumper 47.

We claim:

1. In an illuminated push-button switch unit: a barrel having means for attachment thereof to a support; a lamp casing tube mounted for axially sliding movement in said barrel, said tube having a projecting forward end provided with a push-button head having a light transmitting window and having means for mounting an electric lamp therewithin; first, second and third terminals projecting axially from the rear end of said barrel, said first and second terminals each having at its inner end a part disposed in a radial plane, the second terminal part being disposed rearwardly of the first terminal part, insulator means secured in said rear end of the barrel and mounting said first, second and third terminals; a conductor pin slidable in said insulator means and having its forward end in engagement with a central end contact of said lamp; means yieldingly urging said conductor pin forwardly to maintain said engagement; a contact plunger mounted for axially sliding movement in said first terminal part; a spring acting between said plunger and tube and said first terminal part to normally retract said plunger forwardly; said plunger being arranged to receive rearward movement from said tube in response to pressure against said push-button head and being arranged, upon such rearward movement, to establish circuit-closing engagement with the second terminal part, said conductor pin establishing an electrical connection between said lamp end contact and the third terminal.

2. A switch unit as defined in claim 1, including a bearing washer of insulating material attached to the rear end of said lamp casing tube, for transmission of movement to said contact plunger.

3. In an illuminated push-button switch: a barrel having means for attachment thereof to a support; a lamp casing tube mounted for axially sliding movement in said barrel, said tube having a projecting forward end provided with a push-button head having a light transmitting window and having means for mounting an electric lamp therewithin; first, second, third and fourth terminals projecting axially from the rear end of said barrel, said first and second terminals each having at its inner end a part disposed in a radial plane, the second terminal part being disposed rearwardly of the first terminal part, insulator means secured in said rear end of the barrel and mounting said first, second and third terminals; a conductor pin slidable in said insulator means and having its forward end in engagement with a central end contact of said lamp; means yieldingly urging said conductor pin forwardly to maintain said engagement; a contact plunger mounted for axially sliding movement in said first terminal part; a spring acting between said plunger and said first terminal part to normally retract said plunger forwardly; said plunger being arranged to receive rearward movement from said tube in response to pressure against said push-button head, and being arranged, upon such rearward movement, to establish circuit-closing engagement with the second terminal part, said conductor pin establishing an electrical connection between said lamp end contact and the third terminal; said fourth terminal constituting an extension of said lamp casing tube and being slidably projected through a peripheral portion of said insulator means; said third and fourth terminals providing connections for an energizing circuit to said lamp.

4. In an illuminated push-button switch: a barrel having

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means for attachment thereof to a support; an insulator sleeve lining said barrel; a lamp casing tube mounted for axially sliding movement in said sleeve, said tube having a projecting forward end provided with a push-button head having a light-transmitting window and having means for mounting an electric lamp therewithin; first, second, third and fourth terminals projecting axially from the rear end of said barrel, said first, second and third terminals each having at its forward end a part disposed in a radial plane, the second terminal part being disposed rearwardly of the first terminal part, insulator means secured in said rear end of the barrel and mounting said first, second and third terminals; a conductor pin slidable in said insulator means, said pin being electrically connected to said third terminal part and having its forward end in engagement with a central end contact of said lamp; means yieldingly urging said conductor pin and tube forwardly; a contact plunger mounted for axially sliding movement in said first terminal part near the inner wall of said sleeve; a spring acting between said plunger and said first terminal part to normally retract said plunger forwardly; insulator means for transmitting rearward movement from said tube to said plunger in response to pressure against said push-button head, whereby to effect rearward movement of said plunger, the latter being arranged, upon such rearward movement, to establish circuit-closing engagement with the second terminal part; said fourth terminal constituting an extension of said lamp casing tube and being slidably projected through a peripheral portion of said insulator means; said fourth and third terminals providing for connecting said lamp to a circuit for constantly energizing the lamp.

5. In an illuminated push-button switch: a barrel having means for attachment thereof to a support; a tube mounted for axially sliding movement in said barrel, said tube having a projecting forward end provided with a push-button head, and having means for mounting an electrical element therewithin; spring means normally retracting said tube forwardly; first, second, third and fourth terminals projecting axially from the rear end of said barrel, said first and second terminals each having at its inner end a portion disposed in a radial plane, the second terminal end portion being disposed rearwardly of the first terminal end portion; a plurality of insulator discs secured in said rear end of the barrel and mounting the first, second and third terminals, said terminal end portions being arranged with said discs in a sandwich; means securing said discs and terminal end portions in said sandwich; means for establishing an electrical connection between the third terminal and one side of said electrical element; means providing a direct connection between the other side of said electrical element and said tube; the fourth terminal constituting an integral extension of the lateral wall of said tube, being slidably extended through peripheral areas of said discs, and having a radially inwardly projecting contact finger normally engaging said first terminal end portion on the rear side thereof with the retraction of said tube; a contact plunger mounted for axially sliding movement in said first terminal end portion; a spring acting between said plunger and said first terminal ring to normally retract said plunger forwardly; insulator means for transmitting rearward movement from said tube to said plunger in response to pressure against said push-button head, whereby to effect rearward movement of said plunger, the latter being arranged, upon such rearward movement, to establish circuit closing engagement with said second terminal end portion.

6. In an illuminated push-button switch: a barrel having means for attachment thereof to a support; an insulator sleeve lining said barrel; a tube mounted for axially sliding movement in said sleeve, said tube having a projecting forward end provided with a push-button head having a light-transmitting window and having means for mounting an electric lamp therewithin; first, second, third and fourth terminals projecting axially from the rear end of said

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barrel, said first and second terminals each having at its inner end a ring disposed in a radial plane, the second terminal ring being disposed rearwardly of the first ring; a plurality of insulator discs secured in said rear end of the barrel and mounting said first, second and third terminals, said terminal rings being sandwiched between said discs; a grommet extending through said discs and securing the sandwich of discs and terminal rings together; means insulating said grommet from said rings; a conductor pin slidable in said grommet and having its forward end in engagement with a central end contact of said lamp; means yieldingly urging said conductor pin forwardly to maintain said engagement; a contact plunger mounted for axially sliding movement in said first terminal ring at the periphery thereof; a spring acting between said plunger and said first terminal part to normally retract said plunger forwardly; insulator means for transmitting rearward movement from said tube to said plunger in response to pressure against said push-button head, whereby to effect rearward movement of said plunger, the latter being arranged, upon such rearward movement, to establish circuit-closing engagement with the second terminal ring, said conductor pin, grommet and spring establishing an electrical connection between said lamp end contact and the third terminal; said fourth terminal constituting an extension of said lamp casing tube, slidably projecting through peripheral portions of said insulator discs, and having a stop finger projecting radially inwardly between said insulator discs and normally engaging one of them for determining the forward limit position of said tube.

7. In an illuminated push-button switch: a barrel having means for attachment thereof to a support; a lamp casing tube mounted for axially sliding movement in said barrel, said tube having an end projecting from the forward end of said barrel and provided with a push-button head including a lens, and having means for mounting a lamp behind said lens; three terminals of L-form, each including an axially projecting terminal arm and a radially disposed ring at the inner end thereof; a plurality of insulator discs sandwiched with said rings, said discs being secured in the rear end of said barrel and supporting said terminal arms; a grommet extending through the sandwich of discs and rings and securing them together; a conductor pin slidable in said grommet and having at its forward end a head for engagement with a central end contact of said lamp; a coil spring encircling said pin, engaged between said head thereof and said grommet, and yieldingly maintaining said end contact engagement; a contact plunger mounted for axially sliding movement in a first one of said terminal rings; a spring acting between said plunger and said first ring to normally retract said plunger forwardly; insulator means for transmitting rearward movement from said tube to said plunger in response to pressure against said push-button head, whereby to effect rearward movement of said contact plunger, the latter being arranged, upon such rearward movement, to establish circuit-closing engagement with a second one of said terminal rings, disposed rearwardly of said first ring; said conductor pin, grommet and spring establishing an electrical connection between said lamp end contact and the third terminal ring; and a fourth terminal arm constituting an extension of said lamp casing tube and slidably projecting through peripheral portions of said insulator discs, said fourth terminal arm having a contact projecting radially inwardly between said first and second terminal rings and normally engaging said first terminal ring for normally closing another circuit.

8. In an illuminated push-button switch: a barrel having means for attachment thereof to a support; a lamp casing tube mounted for axially sliding movement in said barrel, said tube having an end projecting from the forward end of said barrel and provided with a push-button head including a lens, and having means for mounting a lamp behind said lens; first, second, third and fourth terminals projecting axially from the rear end of said barrel, said

