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ILLUMINATED PUSH BUTTON

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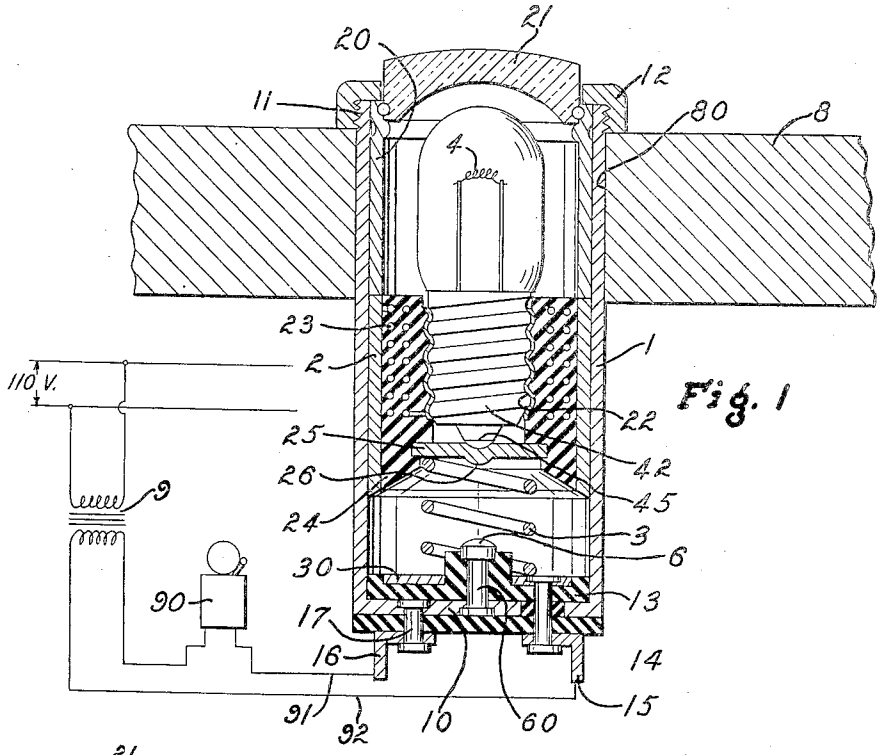


Fig. 1

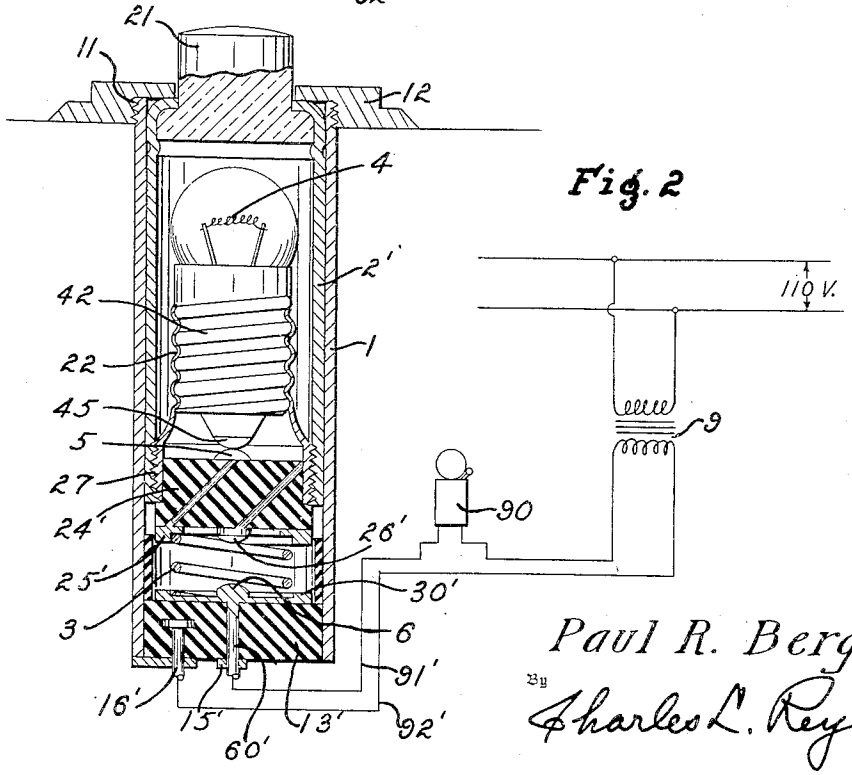


Fig. 2

Inventor
Paul R. Bergman
By
Charles L. Reynolds
Attorney

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ILLUMINATED PUSH BUTTON

Paul R. Bergman, near Seattle, Wash.

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4 Claims. (Cl. 200—167)

My invention relates to illuminated push buttons, and is a continuation in part of my application Serial No. 184,582, filed January 12, 1938.

When a signal circuit push button is, in use, in a dark location, it is desirable that it be always illuminated, so that it may be readily found in the dark. Such a push button is used at the entrance of a home, so that callers may energize a signal to announce their presence, and it is always difficult to find it in the dark. Such push buttons are also useful, for example, in hospitals, as call buttons to summon an attendant during the night. Again, it is hard to find them in the dark, unless illuminated, the more so as they have no fixed location, but are on the end of a cord. The position of a button used as a switch button to turn on light in a room may also be so located by illuminating it positively.

In such uses, while it is desirable to be able to locate the button, so that by pressure upon or by movement of the button a circuit may be closed to energize a signal or the like, yet it is undesirable that the button be conspicuous, especially that it be conspicuous in bright light. Moreover, the moldings around door frames, within or upon which such push buttons are located when used as annunciator buttons, are generaly small and somewhat narrow, and there is not room for a large button. No more is there room for a large button in the bulb or similar device employed in a hospital call system. It is desirable, then, that the mechanism of such a button be small and compact, and capable of being received within a bore of the type and size usually employed for a simple push button in modern construction.

Thus while it is known to provide a push button which is illuminated and which may be operated to close a further circuit, it is an object of the present invention to devise such a push button, the mechanical construction of which will enable it to be made small and compact, and suitable for use under conditions such as are fixed by modern requirements.

Such push buttons employ a continuously burning lamp, and a lamp of current capacity greatly in excess of that available may be chosen, so that there is no likelihood that the lamp will burn out, but if, through overload or by reason of a defect in the lamp, it should burn out, it is a further object to provide such a push button, the mechanical construction of which is such that the lamp may readily be removed and replaced with a new lamp, preferably without the use of tools of any nature.

It is a further object to provide such a push button, the mechanical construction of which is such that there may be incorporated in circuit with the lamp a resistance whereby the brightness of the lamp may be determined or varied, and whereby its life may be prolonged, and which will permit the incorporation of the lamp in a circuit always closed through an annunciator, thus eliminating a requirement for more than the normal two wires, but which will reduce the current through the closed circuit to such a degree that the annunciator, included in that circuit, can only be energized (regardless of its electrical characteristics) by by-passing or short-circuiting the lamp and resistance, through contacts and a branch circuit provided within the push button.

A further object of the invention is to simplify and lessen the cost of the mechanical structure of such a push button, and in all ways to adapt it most thoroughly to the needs of modern construction.

With these and other objects in mind, as will appear hereafter, my invention comprises the novel push button, and the novel mechanical and electrical arrangements thereof, as shown in the accompanying drawing in two alternative forms, and as will be hereinafter more fully described and defined by the claims.

In the accompanying drawing I have shown a preferred form and an alternative form, both incorporating the principles of my invention.

Figure 1 is an axial section through a push button, incorporating the preferred construction, and Figure 2 is a similar view illustrating a modified construction, the external circuit being shown in diagrammatical form in both these views.

In the normal doorbell push button installation two wires extend through a current source of small voltage and through a signal device, ending adjacent the outer door, beside which the button is to be placed. The current source is generally a bell transformer 9, the primary of which is connected to the normal house supply circuit, and the secondary of which produces low-voltage current. The signal device in the drawing is indicated by the bell 90, although any suitable signal device may be employed, as a buzzer, chimes, light, etc. Such a signal device and such a current source are normally chosen to have such electrical characteristics that it requires a certain strength of current, corresponding substantially to the full strength of the current through the secondary of the transformer 9, to energize the signal 90, and the signal will not be energized by a current of materially reduced strength. The leads 91 and 92 extend thence to the door frame 8, within

which is bored a small hole 80 for the reception of the push button. Without restriction as to actual sizes, the opening 80 is normally approximately 5/8 inch in diameter, and frequently there is not room for an opening of appreciably greater size, or if there were room, it would be esthetically undesirable to provide a larger opening. It follows, then, that the push button must be so constructed that it can be received in such a bore, and yet it must not be of excess length; otherwise it will interfere with structure behind the frame or molding 6. The present push button is suitable for new installations, or as a substitute for one in current use.

The push button incorporates an outer conductive shell 1, preferably cylindrical in cross section and open at its outer end. Its inner end is preferably closed. In the form shown in Figure 1 the end closure 10 constitutes an integral part of the shell. About its outer end it may be threaded, as indicated at 11, for the reception of a collar 12, which finishes it and prevents the shell being pushed inwardly entirely through the bore 80. The collar 12 is also flanged inwardly of the shell 1, and serves to prevent outward movement of a conductive sleeve which is slidably received within the shell 1.

Preferably the sleeve is formed of two parts, an inner part 2 and an outer extension 20. The formation of the sleeve in two parts is largely a matter of convenience, however, and the two parts may be formed integral, as is the case in the form of Figure 2. The outer end of the sleeve protrudes from the outer end of the shell 1, and is translucent. It may be made translucent by cut-outs or by leaving its outer end open in part, but preferably it is provided with a translucent end closure, indicated at 21, which may be a button of transparent or translucent plastic material, glass, or the like, suitably held within the open end of the outer sleeve part 20. The collar 12, it will be noted, extends inward sufficiently to limit outward movement of the sleeve, such outward movement being induced under the influence of a spring 3, interposed between the inner end of the shell and the inner end of the sleeve, and urging the latter outwardly.

Carried upon the sleeve is a lamp socket 22, within which is threaded or otherwise received the shell 42 of a lamp base, the lamp being thereby so disposed within the sleeve that its filament 4 will illuminate the translucent button 21. The socket 22 is connected electrically to the shell part 2, preferably through a resistance element 23 supported or embedded in insulating material 24, and the sleeve also carries a conductive disk 25, insulated from the sleeve 2, but positioned to be engaged by the center button 45 of the lamp. The spring 3, which is of conductive material, is so centered that it engages the conductive disk 25, but not the shell 1, and engages at its other end a conductive disk 30 which is insulated from the shell 1 by an insulating piece 13, and a rivet 14 conducts current to the disk 30 from a terminal 15 supported upon and insulated from the inner end 10 of the shell. A second terminal 16 is connected to the shell by a rivet 17, received in the shell end 10. While rivets are shown and described, other suitable forms of connectors may be substituted therefor.

It may now be seen that current from the secondary of the bell transformer 9 passes to the shell 1 from the lead 91 to the terminal 16 and through the rivet 17 or its equivalent, and thence passes to the sleeve parts, either by direct contact of the relatively sliding parts or more reliably by the firm pressure contact achieved by the spring pressure pressing the outer end of the sleeve part 20 against the collar 12, and pressing the sleeve parts 2 and 20 together. From the sleeve part 2 the current proceeds through the resistance 23, the value of which is calculated according to the characteristics of the lamp 4 and the signal 90, to the socket 22, and thence through the lamp and out at the disk 25, the circuit being completed through the conductive spring 3, the disk 30, the rivet 4, and the terminal 15, and back through the lead 92. By such a circuit the lamp may be caused to glow at all times, the current strength being insufficient, however, to energize the signal 90, due to the resistance at 23 and also due to the resistance of the lamp filament 4.

It can be seen that if the current is sufficiently strong that it tends to operate the signal 90, additional resistance may be supplied by removing the inner sleeve part 2, with its accompanying resistance and socket, and replacing it with a similar part having greater resistance incorporated in it. In the same way, if the resistance is so great that with a given lamp the lamp does not glow sufficiently brightly, the resistance can be lessened by replacing the sleeve part 2 with one having less resistance incorporated in it.

It will be observed that there is no mechanical pressure upon the lamp itself. The outer sleeve part 20 spaces the button 21 from the lamp, and transmits pressure of the finger to the sleeve 2. If the lamp burns out, it is a simple matter to replace it, since the sleeve, or so much thereof as is necessary, may be removed merely by unscrewing the collar 12 whereupon spring 3 ejects button 21, sleeve 2, 20, and the parts contained therein, namely, lamp 4, socket 22, and resistance 23. The lamp is then accessible for removal and replacement.

I have not yet described the means for closing the signal circuit. That may be simply accomplished in various ways, in principle by providing a branch circuit from the circuit already described, which branch circuit includes two normally open contacts, which upon their closure, short circuit or by-pass the lamp and resistance circuit, thereby providing current of sufficient strength to energize the signal 90. In the arrangement shown this is conveniently and simply accomplished by providing a contact point 26 upon the disk 25, and by providing a complementary contact point 6 upon a rivet 60, which projects inwardly from and is electrically connected to the shell through its end 10. The rivet 60 and contact point 6 are insulated by the insulating disk 13 from the conductive disk 30.

Upon inward pressure on the button 21, in opposition to the conductive spring 3, sufficient to engage the contact points 26 and 6, a circuit is closed from the lead 91 through the terminal 16, rivet 17, shell end 10, rivet 60, and contact point 6 to the contact point 26, the disk 25, the spring 3, the disk 30, rivet 14, and terminal 15 to the lead 92. In this manner a circuit is closed through the signal 90, and since this circuit bypasses the lamp 4 and the resistance 23, the current in the circuit thus closed is of sufficient strength to energize the signal 90. The circuit through the lamp need not be broken, but since the by-pass circuit just described is of so much less resistance than

the circuit through the lamp, the latter is in effect by-passed, and the current strength is so reduced that the lamp may cease to glow momentarily. That is of no consequence, however, since at the time this occurs the caller's thumb or finger has already located and is pressed upon the translucent button 21. As soon as the pressure of the finger is released the signal circuit is broken, and the entire current again passes through the lamp circuit, and the lamp again glows.

In the alternative form shown in Figure 2 the shell 1 is substantially as described above, the sleeve 2', however, being formed of one piece only. The inner end of the shell may be closed by the insulating disk 13', and the lamp socket 22, by an extension, is threadedly received at 27 in the inner end of the sleeve 2', whence it can be removed by removing the sleeve 2' and unscrewing the socket from the inner end of the sleeve. An insulating disk 24' closes this end of the sleeve, and constitutes the support for a conductive ring 25' electrically connected to a button 5 that contacts the center button 45 of the lamp, and the insulating disk 24' also supports the contact button 26', electrically connected to the sleeve 2' or to the socket 22, and positioned centrally of the device to contact with the center contact point 6', the rivet 60' of which is, however, not connected to the shell 1, but is insulated therefrom. The center contact 6' is also electrically connected with a contact disk 30', and the conductive spring 3 serves as a current conductor between the disk 30' and the disk 25'. A terminal 16' is grounded to the shell 1, and a terminal 15' is electrically connected to the rivet 60'. The leads 91' and 92' extend through the signal 90 and the secondary of the transformer 9.

The operation of the modified form is much the same as that of the preferred form. Current from the lead 91' entering through the terminal 15', the rivet 60', to the contact point 6' and the disk 30', passes by the spring 3 to the disk 25', thence to the contact point 5, and through the lamp to the socket 22, thence through the sleeve 2' to the shell 1, and back by the terminal 16' to the lead 92'. This maintains the lamp 4 glowing at all times, and in this form the lamp is so chosen that its resistance is sufficient to reduce the current through the signal 90 to a point such that the latter will not be energized while the lamp glows. Now when a finger is pressed upon the translucent button 21 the sleeve 2' is pressed inwardly against the opposition of the spring 3 until the contact points 26' and 6' come into contact. Current now flows from the lead 91' through the terminal 15', rivet 60', contact point 6', to the contact point 26', and since the latter is connected to the socket 22 and sleeve 2', current passes immediately back to the shell 1 and out through the terminal 16' to the lead 92', thus by-passing the lamp and its resistance, and energizing the signal 90.

The modified form of Figure 2 has the same advantages of compactness and relative simplicity as are present in the form of Figure 1. To replace a burned out lamp or to install a lamp of different resistance it is only necessary to unscrew the collar 12, whereupon the entire sleeve 2' together with the lamp and socket contained therein will be ejected by spring 3, and by unscrewing the socket 22 from the inner end of the sleeve the socket may be removed and then the lamp may be unscrewed.

What I claim as my invention is:

1. A self-contained illuminated push button device, comprising an outer shell open at one end only, and having two external terminals in its base, a spring received within said shell and reacting from its base, an inner shell snugly telescoping within the open end of said outer shell; and urged outward by said spring, the outer end of said inner shell being closed by a translucent wall, a lamp base receptacle reciprocable with the inner end of the inner shell, an electric lamp mounted therein and received within said inner shell, a stop normally limiting outward movement of said inner shell under the action of said spring, and easily removable for ejection of said inner shell, receptacle, and lamp assembly from said outer shell, conducting means operable in the normal limiting outer position of said inner shell to complete a circuit through said receptacle and lamp between said two terminals, and further conducting means within the outer shell operable to shunt said terminals by inward telescoping movement of said shells, said conducting means enabling complete ejection of the inner shell and said receptacle from the outer shell.

2. A self-contained illuminated push button device adapted for snug insertion within a wall aperture, comprising two snugly telescoping, relatively reciprocable tubes, the exposed end of the inner tube being substantially flush with one end of the outer tube and closed by a translucent wall, and the opposite end of the outer tube being closed and provided with two external terminals, one being electrically connected to the outer tube, and the other being electrically connected to a contact on the inner side of the outer tube end wall, a lamp base receptacle reciprocable with the inner end of said inner tube, an electric lamp mounted therein and received within the inner tube to illuminate its translucent end, a spring within the outer tube interengaged between said lamp base receptacle and the outer tube's end wall, seating on said contact, for effecting relative extending movement of said tubes and electrically connecting the receptacle to one of said outer tube base terminals, a stop collar secured upon the open end of said outer tube, normally engaging the closed end of said inner tube to limit relative extending movement of the tubes by the action of said spring, but being easily removable for ejection of said inner tube, receptacle, and lamp from the outer tube by expansion of said spring, an electric circuit between said two terminals including said spring, receptacle and lamp, and conducting means operable to shunt said terminals by inward telescoping movement of said tubes.

3. The illuminated push button device of claim 2, wherein the removable receptacle includes, integral therewith, an annulus of insulating material encircling the lamp base, a resistance coil carried by said annulus also encircling the lamp base, having one end thereof connected to the inner telescoping tube, and means electrically connecting the other end of the resistance coil to the lamp base.

4. A self-contained illuminated push button device adapted for snug insertion within a wall aperture, comprising a cylindrical shell open at one end only, and having two external terminals in its base, a cylindrical lamp base receptacle making a snug sliding fit within the open end of said shell, a cylindrical tube having an external diameter equal to that of said receptacle, received within the open end of said shell with its inner

end abutting the outer end of said receptacle, and its outer end closed by a translucent wall substantially flush with the open end of said shell, a spring within said shell reacting between its end wall and said cylindrical receptacle urging it and said tube toward the shell's open end, a stop collar secured upon the open end of said shell normally engaging the outer end of said tube to limit outward movement of the tube and receptacle, but easily removable for ejection of said tube and receptacle from said shell, a lamp within said tube and mounted in said lamp base receptacle for illuminating the translucent end of said tube, and conducting means operable in the normal limiting outer position of said tube and receptacle to complete a circuit between said two terminals through said receptacle and lamp received therein, and including contact points one on the base of said receptacle, and the other on the end of said shell, operable to shunt said terminals by inward movement of said receptacle.

P. R. BERGMAN.