Dec. 28, 1965 W. F. SCHUCHARD 3,226,520

ILLUMINATED PUSH BUTTON SWITCH ASSEMBLY INCLUDING LATCHING MEANS

Filed March 4, 1963 2 Sheets-Sheet 1

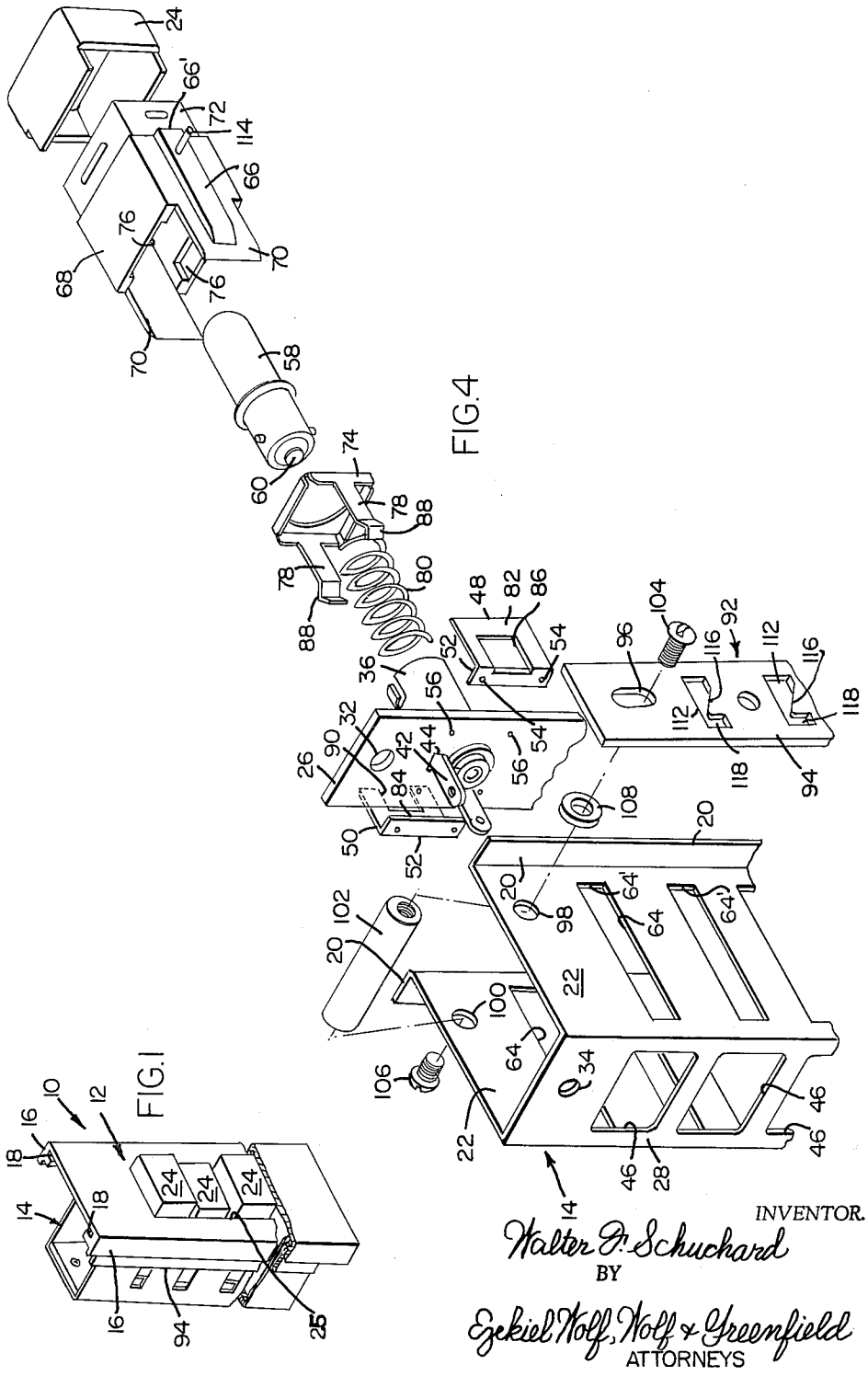


FIG. 4

FIG. 1

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FIG. 2

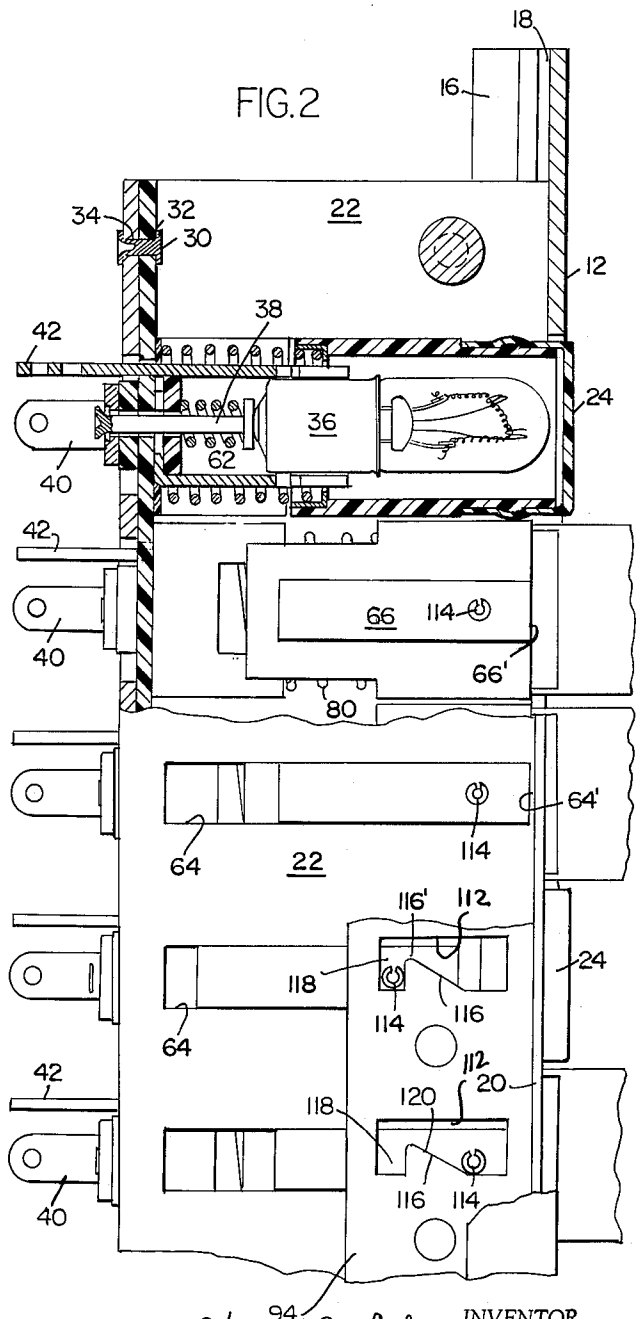
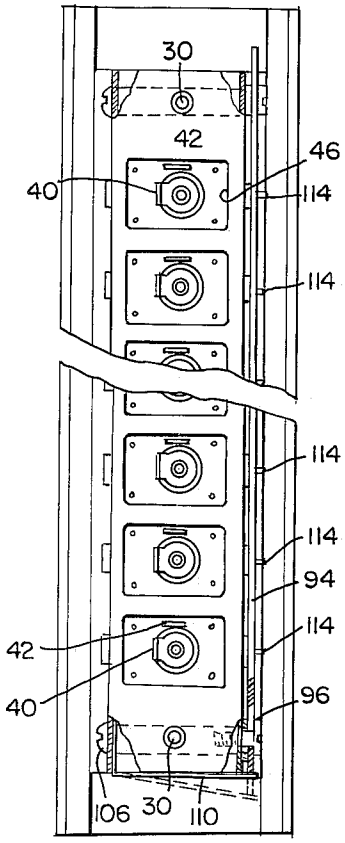


FIG. 3



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ILLUMINATED PUSH BUTTON SWITCH ASSEMBLY INCLUDING LATCHING MEANS

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This invention relates to illuminated switches and more particularly comprises a new and improved interlocking illuminated push button switch assembly.

The illuminated interlocking push button switches presently available are rather large and complex and are consequently costly. It is an important objective of the present invention to simplify the construction and reduce the size and cost of such switches.

To accomplish these and other objects, the push button switch parts of the present invention are organized about the lamp and socket so that the depth of the assembly is substantially limited to the combined length of the lamp and socket employed. Thus, the limiting factor of the assembly depth is the lamp and socket combination rather than the combined length of the switch parts, lamp and socket.

These and other objects and features of the present invention will be better understood and appreciated from the following detailed description of one embodiment thereof, selected for purposes of illustration and shown in the accompanying drawing, in which:

FIG. 1 is a fragmentary perspective view of an interlocking illuminated push button switch constructed in accordance with this invention;

FIG. 2 is a fragmentary side view partly in section of the switch shown in FIG. 1;

FIG. 3 is a rear view of the switch shown in FIGS. 1 and 2; and,

FIG. 4 is an exploded perspective view of a portion of the switch shown in FIGS. 1–3.

The switch shown in the drawings is organized within a housing **10** composed of a front panel **12** and a U-shaped channel **14**. In FIG. 1, the panel **12** is shown to include inwardly directed flanges **16** spaced from the rear surface of the panel central wall to define slots **18** which receive the outwardly extending flanges **20** provided on the forward edges of the side walls **22** of the channel **14**. Thus the housing may be assembled without the use of any visible fasteners.

Mounted in the housing are a plurality of substantially independent illuminated push button switch sub-assemblies. Each sub-assembly includes a cap or head **24** that extends through slot **25** in the front wall of the panel **12**, and the caps may be depressed manually independently of one another to actuate their respective switches. In FIG. 1 three such caps are shown and the middle cap is in the depressed position while the others are in the released position.

An insulating block **26** riveted to the base **28** of the channel member **14** supports many of the switch components. It will be noted in FIGS. 2 and 3 that rivets **30** extend through the aligned openings **32** and **34** in the insulating block **26** and base **28** respectively, to secure the block to the channel. A light socket **36** of the bayonet type is mounted on the block **26**, and its conducting stem **38** extends through the base of the socket and is electrically connected to terminal **40** carried on the rear face of the block. The terminal **40** and the other terminal **42** formed as an integral part of the socket and which projects through a slot **44** in the block, both extend out of the housing **14** through the rectangular opening **46** in the base **28** of the channel member **14**. One such opening

46 is provided for each of the sub-assemblies as is evident in FIGS. 3 and 4.

In FIG. 4 lamp or bulb **58** is shown provided with a bayonet base which fits in the socket **36**. When the base of the bulb **58** is inserted in the socket **36** the bulb base contact **60** engages the socket conducting stem **38** which is biased against the contact **60** by the spring **62**.

The block **26** supports on opposite sides of the socket **36** two fixed contacts **48** and **50** which are disposed parallel to the side walls **22** of the channel member **14**. Each of the fixed contacts **48** and **50** is provided with a flange **52** which sits on the upper face of the block **26** and is riveted in place by rivets which extend through holes **54** in the flange and holes **56** in the block.

The other components of the sub-assembly are supported in the housing on the channel member **14**. It will be noted in FIG. 4 that the channel side walls **22** are provided with elongated slots **64** which extend from adjacent the channel base **28** to the region of the flanges **20**. The slots **64** serve as tracks for the outwardly extending ribs **66** provided on each side of the switch button body **68**. The body **68** has a pair of elongated side walls **70** disposed between the fixed contacts **48** and **50** and the sides **22** of the channel, and the walls **70** carry the ribs **66** on their outer surfaces. The outer surfaces of the side walls **70** lie against the inner surfaces of the sides **22** of the channel **14**, and the ribs **66** extend into the slots **64** to restrict movement of the button body **68** to a path parallel with the axes of the socket **36** and bulb **58**. The cap **24** snaps over the end **72** of the button body as is clearly evident in FIGS. 2 and 4. The caps **24** serve as lamp covers and are removable from the front end so that burnt out lamps can be replaced from the front.

The button body **68** carries a movable contact **74** which fits snugly within the side walls **70** and the shorter side walls **76**. The contact **74** may be press fitted within the body, or the two parts may be fastened together by other convenient means. The contact **74** includes a pair of blades **78** which are generally parallel to and spaced inwardly from the side walls **70** of the body. One of the blades **78** is positioned to engage the fixed contact **48** when the button is in the released position and the other blade **78** engages contact **50** when the button is depressed.

A spring **80** surrounds the socket **36** and bears against the movable contact **74** to urge the button body **68** to its released or extended position wherein the ribs **66** are moved to an extreme position in the slots **64** with the ends **66'** of the ribs bearing against the end wall **64'** of the slots adjacent the flanges **20**. When the body **68** is in its biased position, one of the contact blades **78** engages the bar **82** of fixed contact **48** to form a normally closed switch and the other blade **78** does not engage the bar **84** of fixed contact **50** and thus forms a normally open switch. The condition of each switch is reversed when the button body **68** and more particularly the cap **24** which extends through the panel **12** is depressed. It will be noted in FIG. 4 that fixed contact **48** has a cut-out **86** beyond its contact bar **82** so that when the blade **78** moves toward the base **28** of channel member **14**, the tip **88** of blade **78** lies in the cut-out area and does not engage the fixed contact **48**. Conversely, the fixed contact **50** has a cut-out **90** within which the tip **88** of the other blade **78** is disposed when the button body and cap are in the released position. Contact is made with the contact bar **84** only when the button body is depressed against the bias of the spring **80**.

A latching mechanism **92** serves to retain the bodies in their depressed position against the bias of spring **80**. The latching mechanism includes an elongated locking plate **94** disposed outside the housing **14**. As shown in FIGS. 1, 2, and 4, the plate **94** is disposed against the

outer surface of and is substantially coextensive with one of the sides **22** of the channel member and lies close to the flange **20** on that side. The plate **94** has a longitudinally extending slot **96** at each end, and the slots overlie openings **98** in the adjacent channel side **22**. Openings **100** are provided in the other channel side **22**, aligned with the openings **98**, and sleeves **102** internally threaded at each end serve as a spacer between the channel sides **22** and receive screws **104** and **106** as is evident in FIG. 4 to hold the assembly together. One screw **106** at each end of the housing extends through slot **96**, a spacing washer **108**, and opening **98** and threads into sleeve **102** to support the plate **94** for movement in a longitudinal direction on the channel side **22**. The slots **96** at each end of the locking plate **94** define the limits of movement afforded the plate.

In FIG. 3 leaf spring **110** shown supported at one end by the screw **106**, serves to bias the plate **94** in a raised position as viewed in that figure, and the plate may be moved against the bias of the spring as suggested by the broken lines so that it lies in a lower position. The locking plate **94** has a number of transverse slots **112**, each of which overlies one of the slots **64** in the side wall **22** of the channel member. The slots **112** receive pins **114** carried on the ribs **66** on the side walls **70** of the button bodies **68**. The pins **114** cooperate with cams **116** provided on one side of each of the slots **112** intermediate the slot ends to retain the bodies in depressed positions against the bias of springs **80**. In FIG. 2, the lowermost switch sub-assembly is shown in its released position and its pin **114** is on the right side of the cam **116**. For the pin **114** to reach the other side **118** of the cam **116** that serves as a keeper, a plate **94** must be moved downwardly so as to move the cam **116** out of the way of the travel of the pin. The inclined surface **120** of the cam **116** causes the pin **114** upon actuation of the body **68** towards its depressed position to move the plate **94** against the bias of the spring **110** until the pin passes the cam and is aligned with the keeper side **118**. When the pin reaches that position, it effectively falls off the end of the cam edge **120**, and the spring **110** returns the plate to the position shown in FIGS. 2 and 3 (in full lines). It will be noted in FIG. 2 that the subassembly next to the bottom is in the depressed position and its pin **114** lies in the keeper side **118**, and the cam retains that pin and consequently its body **68** in the depressed position. FIG. 2 also reveals that when one of the sub-assemblies is in the depressed position, actuation of another of the sub-assemblies in the absence of the retaining force applied to the depressed sub-assembly, causes the depressed sub-assembly to move to its release position. Consider the effect upon the plate **94** when the lowermost sub-assembly in FIG. 2 is depressed. When that sub-assembly is depressed, its pin **114** will force the frame **94** downwardly which will cause the release of the pin **114** of the next upper sub-assembly from the keeper **118**. That is, the crown **116'** of the cam **116** of the next upper sub-assembly will lie below the pin **114** when the pin **114** of the lowermost assembly is about to drop into its keeper **118**.

In the embodiment illustrated each lamp and switch sub-assembly includes a normally open and a normally closed contact, and the lamp socket serves as a distinct part of the switch circuit. The return spring **80** which surrounds the socket **36** and urges the switch body **68** to an extended position electrically connects the movable contact **74** and the socket **36**, and a conductor connected to terminal **42** may serve as a lead common to both the switch and lamp circuits. If it is desired to divorce the lamp socket from the circuit of the switch or switches, an insulating sleeve may be used about the socket and within the spring to electrically insulate the two from one another.

In many applications only one or the other of the fixed contacts will be employed, and in certain applications the fixed contacts on one side of the housing may be connected together by a common bus bar extending the length of the block **26**. In the fabrication of such an assembly all of the fixed contacts to be connected together may be integrally formed from a single piece of conducting material.

While in the configuration of the invention illustrated a single locking plate **94** is provided it will be appreciated that a similar plate may be provided on the other side of the housing, and the two plates could work with different groups of switch assemblies. For example, in a twelve switch assembly the locking plate on one side of the housing could be operatively connected to six of the switches and the plate on the other side could be operatively connected to the remaining six switches. Obviously a wide variety of arrangements are possible. By eliminating the locking plates or the pins **114** carried by the button bodies **68** one or more of the switches may be converted to a non-locking momentary push button switch. It is also possible, using conventional techniques, to provide what is generally termed positive lock-out operation which prevents more than one button from being depressed at a time.

In use both terminals **40** and **42** and one or both of the fixed contacts may be connected to external conductors, and actuation of the push button switch may operate either or both of the lamp and switch circuits, depending upon how the circuits are connected. In a typical nurse-patient hospital communication system, the assembly may be mounted in the nurse's office, and one sub-assembly may be incorporated in the installation for each patient's room to be monitored. A switch in each room will light its particular lamp in the office by a circuit connected to the socket terminals **40** and **42**, and a speaker system between that room and the office may be energized by depressing the push button switch of the particular sub-assembly so as to close the normally open switch in the speaker circuit. The assembly thus enables the patient by actuating a switch in his room to light his particular lamp in the office installation, and the nurse in turn by depressing the switch body can energize the communication system which enables the nurse and patient to communicate by voice with one another.

The foregoing description will suggest to those skilled in the art many modifications within the scope of this invention. Therefore, it is not intended that the breadth of the invention be limited to the single embodiment illustrated and described in detail. Rather, it is intended that the scope of this invention be determined by the appended claims and their equivalents.

What is claimed is:

1. An illuminated switch assembly comprising

a panel,

a U-shaped channel member secured to and open in the direction of the panel and providing with the panel a housing for the assembly,

an insulating block secured to the base of the channel and carrying a lamp socket open in the direction of the panel,

a pair of fixed contacts disposed on opposite sides of the socket within the channel,

a switch body disposed in the housing and including a pair of legs disposed immediately inwardly of the sides of the U-shaped channel member,

means provided on the legs and on the sides of the channel member cooperating to support the body for sliding movement toward and away from the fixed contacts,

a pair of contact arms carried by the body inwardly of the legs,

a spring surrounding the socket and bearing against the block and the switch body biasing the body to an outer position wherein the contact arms are disposed adjacent the outer ends of the fixed contact,

and latching means including a plate disposed outside the housing and operatively connected to the body for releasibly retaining the body in a depressed posi-

tion wherein the contact arms are disposed adjacent the inner ends of the fixed contacts.

2. A switch assembly as defined in claim 1 further characterized by

the latching means including a support for the plate enabling the plate to move in a direction parallel to the panel,

a spring biasing the plate to a first position,

a slot formed in the plate extending generally parallel to the direction of travel of the body,

a pin carried by the body extending out of the housing and disposed in the slot,

a cam formed as part of the margin of the slot and in the path of travel of the pin when the body moves from the outer to the depressed position causing the plate to move from the first position to a second position against the bias of its spring when the body moves between those positions,

and a keeper disposed in the margin of the slot beyond the cam for retaining the pin and enabling the plate to return to its first position when the body is in the depressed position.

3. A switch assembly as defined in claim 1 further characterized by

a cap removably mounted on the body and extending through an opening in the panel and providing a cover for a lamp mounted in the socket and a push button for the switch.

4. A switch assembly as defined in claim 1 further characterized by

a pair of terminal posts disposed outside the housing and beneath the base of the channel member, one of said terminal posts being electrically connected to the socket and the other of said terminals being adapted to be connected to the base of a lamp mounted in the socket.

5. A switch assembly as defined in claim 1 further characterized by

one of said fixed contacts being engaged by a contact arm when the body is in its outer position and the other of the fixed contacts being engaged by the other of the contact arms when the body is in its depressed position.

6. A switch assembly comprising

a panel,

means cooperating with the panel to form a housing,

a plurality of illuminated push button switch subassemblies carried by the housing and each comprising,

an insulating block in the housing,

a light socket mounted on the block,

a fixed contact disposed on the side of the socket and within the housing,

a body having a longitudinally extending axis and carrying a contact blade substantially in the plane of the fixed contact and movable between depressed and released positions, a spring surrounding the socket and urging the body to its released position wherein the contacts are in one condition,

latching means disposed outside the housing and engaging the body for holding the body in a depressed position upon restricted movement of the body along its axis against the bias of the spring, and in which position the contacts are in another condition,

and a translucent cap forming part of the body and disposed outside the panel and over the socket for manually actuating the body and for covering a lamp in the socket.

7. An illuminated switch assembly comprising

a housing having a front panel and a pair of parallel side walls,

a plurality of illuminated push button switch subassemblies carried by the housing and each comprising,

an insulating block disposed in the housing and carrying a lamp socket,

a fixed contact mounted on the block adjacent the socket,

a switch body having a pair of legs disposed on the side walls of the housing and positioned to surround a lamp mounted in the socket,

means formed on the side walls and the legs for confining movement of the body along a path parallel to the axis of the socket between released and depressed positions,

a spring surrounding the socket and engaging the body urging the body to its released position,

and a movable contact carried by the body and extending generally parallel to the legs and engaging the fixed contact when the body is in one of its two positions, and means for holding selected ones of said bodies in said depressed positions upon movement of said bodies along said parallel paths.

8. An illuminated switch assembly as defined in claim 7 further characterized by

said spring engaging the socket and movable contact electrically connecting the two together.

9. An illuminated switch assembly as defined in claim 7 further characterized by

a locking plate disposed outside the housing and operatively connected to the body for releasably retaining the body in a depressed position against the action of the spring.

10. An illuminated switch assembly as defined in claim 7 further characterized by

said holding means comprising

a locking plate disposed outside the housing and operatively connected to a plurality of the bodies for retaining each of these bodies in a depressed position against the action of the spring,

and means forming part of the locking plate for releasing depressed bodies when another body is depressed.

11. An illuminated switch assembly as defined in claim 7 further characterized by

a cap removably mounted on the body and extending through the panel and providing a push button for the switch and a cover for a lamp mounted in the socket, said cap exposing the socket when the cap is removed from the body enabling a lamp to be mounted in the socket through the panel.

12. An illuminated switch assembly as defined in claim 7 further characterized by

a pair of tracks provided in the panel,

and flanges secured to the side walls and slidably mounted in the track to removably secure the housing together.

13. An illuminated switch assembly as defined in claim 8 further characterized by

a terminal post connected to the socket and extending out of the housing and adapted to be connected to a lead common to a lamp and switch circuit.

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