Jan. 20, 1970 E. B. MITCHELL ET AL 3,491,220

LIGHTED ON-OFF SWITCH

Filed March 5, 1968 2 Sheets-Sheet 1

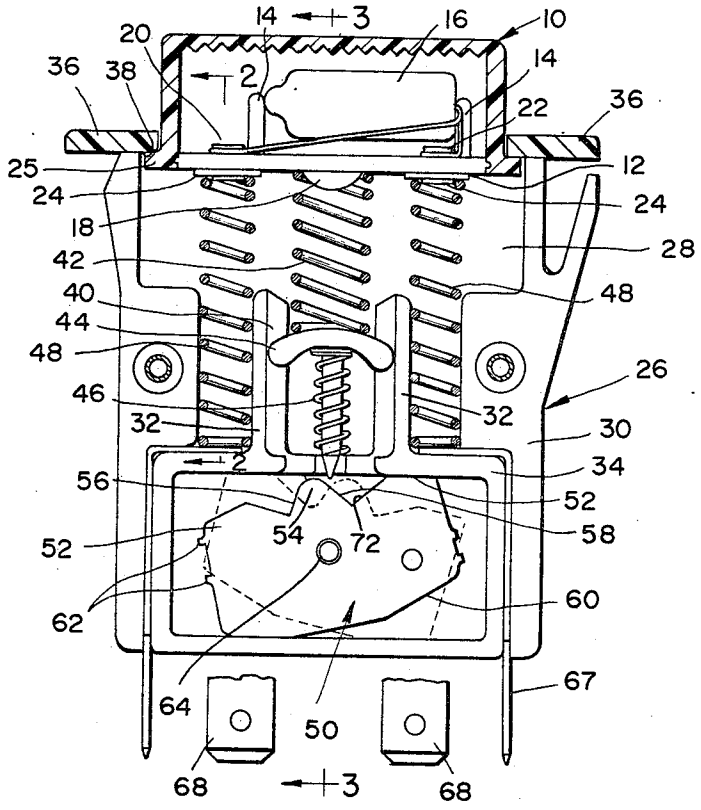


FIG. 1

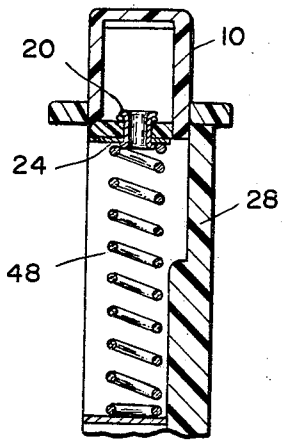


FIG. 2

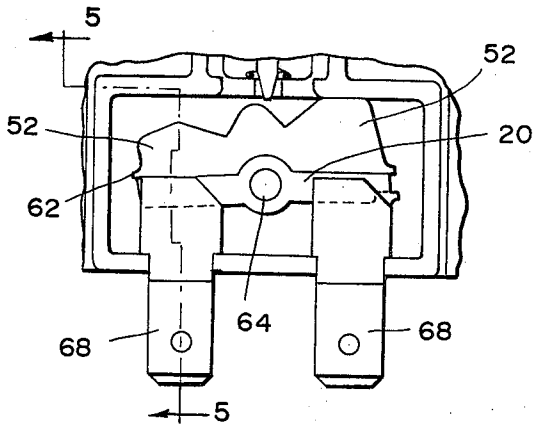


FIG. 4

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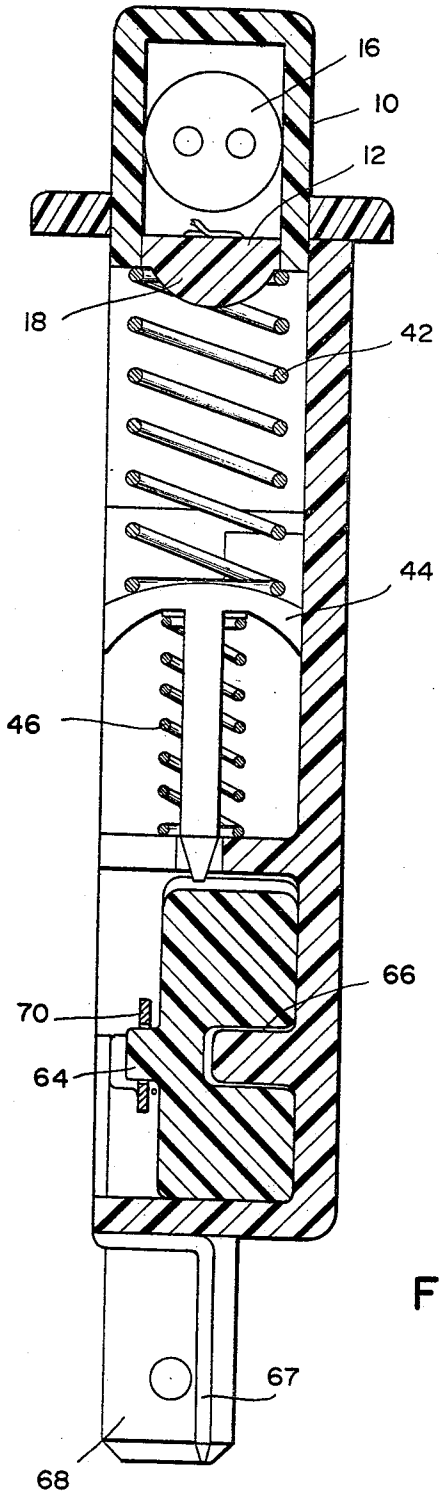


FIG. 3

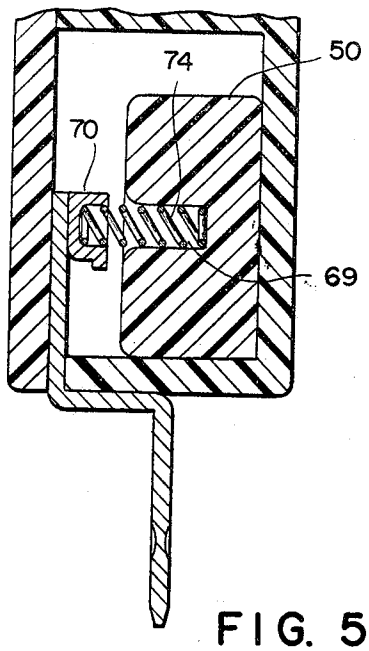


FIG. 5

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LIGHTED ON-OFF SWITCH

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Int. Cl. H01h 9/16, 9/18
U.S. Cl. 200—167 4 Claims

ABSTRACT OF THE DISCLOSURE

This is a switch mechanism utilizing a primary and secondary spring which alone hold the operating member in a floating engagement. The switch mechanism also utilizes a pair of spaced parallel compression springs both as mechanical spring elements and also as current carrying members.

BACKGROUND OF THE INVENTION

The use of what may be referred to as cam operated switching means is not new in the art. The patent to Horn, U.S. 1,726,897, shows an early use of a cam device which utilizes a primary spring, in a hollow plunger, adapted to depress the operating member along an angular surface of the cam actuator. Simultaneously, a base plate of the plunger compresses a secondary spring fixed between it and the housing while sliding a bow element along a detent of the operating member. When the bow element passes the detent, the cam actuator rotates and either engages or disengages contact elements.

In the patent to Douglas, U.S. 2,047,940, a cam actuated switch is disclosed having a spring loaded plunger and a secondary spring circumscribed in spaced relation by the first spring which is placed between the operating member and the plunger. The two springs are separated by a casing wall and a button wall. This patent also discloses that the cam actuator may be spring loaded.

The Krieger patent, U.S. 2,295,484, discloses a hollow plunger having a first spring engaging the plunger and the operating member and a secondary spring which engages the plunger and shoulders formed on the cam actuator.

In the Bentley patent, U.S. 2,576,771, the plunger mechanism comprises a primary compression spring which is engaged between the plunger head and an operating member and a secondary spring which engages between a spider, attached to the plunger, and plates acting as guides for the movable member. This mechanism includes a cam actuator.

The Raab patent which was issued in 1961 as U.S. 2,994,750 discloses a plunger mechanism which has a primary compression spring engaged between the plunger and a shoulder formed in the switch housing and a secondary spring which engages between the plunger and a spring seat 43 which is mounted on a lock bar 30 engaged with the operating member 40 which is engageable with the cam actuator.

In most cases where the design called for a lighted plunger, the means of carrying current to the bulb in the plunger was either through wires or through the use of some form of sliding contacts. The use of the sliding contact was brought about where the plunger was movable in relation to the housing proper and where this movement would not allow the convenient use of wires as a means of providing current. The inventor has utilized a pair of parallel springs which allow movement of the plunger and even provide a return means while also acting as current carrying members.

SUMMARY OF THE INVENTION

This invention relates to a switch mechanism of the cam actuated type wherein the operating member is held in position between upper and lower springs. It also relates to a switch mechanism having a lighted plunger which uses springs as a means of carrying current to the plunger from terminals.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the switch with the cap and lens shown in section;

FIG. 2 is a section taken on line 2—2 of FIG. 1;

FIG. 3 is a section taken on line 3—3 of FIG. 1;

FIG. 4 is a plan view of the lower portion of the switch shown in FIG. 1 including the switch terminals and the switching bar; and

FIG. 5 is a section taken on line 5—5 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The switch comprises a plunger assembly, a housing, an actuating assembly and terminals.

The plunger assembly has a lens 10 in the form of a rectangular box whose open side is closed off by a base portion 12. The base portion 12 is formed of an insulating material, snap engaged to the lens 10 and has a pair of barriers 14 in spaced relation to each other extending from a surface thereof between which a bulb 16 is placed, as shown in FIG. 1. An integral, centrally located, arced or dome-shaped portion 18 extends from the opposite surface of the base portion 12 for a purpose to be set forth hereinafter. Eyelets 20 and 22 are passed through apertures formed in the base portion 12. Each of the eyelets 20, 22 are engaged to the base portion 12 close to an end thereof and fixes a brass washer 24, through which it is passed, to the external surface of the base portion 12 as shown in FIG. 1. The washer 24 has a larger diameter than the eyelets 20, 22 and forms a shoulder with it. One of the leads of the bulb 16 is wrapped around the portion of the eyelet 20 which extends into the cavity of the lens 10 while the other lead of the bulb 16 is wrapped around the portion of the eyelet 22 extending into the cavity of the lens 10.

A flanged portion 25 extends from each of the short walls of the lens 10 in close proximity to the open side and to the engagement with the base portion 12.

The housing 26 includes a rectangular base 28 having a side wall 30, extending from the surface, along each long side in spaced relation to each other. Each of the side walls 30 has a rectangular projection extending inwardly separating the housing cavity into an upper portion, a midportion and a lower portion. The midportion is divided into three channels by a pair of wall portions 32 which are in spaced parallel relation to each other and the side walls 30. The wall portions 32 are integral and extend from a rectangular barrier portion 34 which extends around the lower cavity portion forming a narrow slot with each of the side walls 30 and almost completely closing off the bottom of the lower cavity portion as shown in FIG. 1. A cap portion 36 extends from the base 28 at a short edge of the upper cavity portion in abutting right angle relationship to the side walls 30 defining

an opening through which the lens **10** extends and forming an inner shoulder **38** with the side walls **30**. A shoulder **40** is formed on each of the wall portions **32** on the surfaces facing each other, a predetermined distance from the base **28**. The passageway between the midportion and the lower portion of the housing cavity is formed by extensions of the shoulders **40**. This passageway allows the shank of the actuator member **44** to pass therethrough but has a diameter smaller than the diameter of the secondary compression spring **46**. On assembly, the secondary spring will therefore be trapped between the head of the actuator member **44** and the shoulders formed adjacent the aperture leading into the lower portion of the housing cavity.

The actuating assembly comprises a primary or upper compression spring **42**, a movable member **44**, a secondary or lower compression spring **46**, a pair of spring members **48** and a cam **50**.

The cam **50** comprises a generally rectangular cubic form having an upper surface with a flat land portion **52** at each end and a triangular form **54** set between and spaced from the land portions **52**. The triangular form **54** has a rounded apex and its legs define a first cam surface **56** and a second cam surface **58**. The lower surface of the cam **50** has a slanted or angled surface **60** at each end and each of its side walls has a pair of spaced transverse ribs **62** extending therefrom as shown in FIGS. 1 and 4. A cylindrical protuberance **64** extends from the center of the forward surface of the cam **50** and a tubular cavity **66** is formed in the rear wall of the cam **50** with its axis coincident with the axis of the protuberance **64**. There is a spring cavity **69** formed in close proximity to each short side edge of the cam **50**.

The movable member **44** is of T-shaped configuration having an arced cap whose terminal ends are rounded and having a shank which terminates in a truncated point.

To assemble the switch, the lens assembly is placed into the housing cavity with its flanged portion **25** butted against the inner shoulder **38** which is provided by the cap portion **36**. A bulb terminal **67** is dropped into the slot formed between the side wall **30** and the barrier portion **34** and includes a right angled bend and a terminal end which extends into one of the channels defined by a wall portion **32**. A spring member **48** is now placed under compression butted against the shoulder formed by the eyelets **20**, **22** and the washer **24** and having its other terminal end butted against the right angled termination of the bulb terminal **67**. The spring members **48** also act as current carrying members in the lamp circuit. The movable member **44** is held within the switch by first placing the primary compression spring into abutting relationship with the base portion **12** and into circumscribing relationship with the dome-shaped portion **18**. Its other terminal end buts against the arced cap portion of the operating member **44**. The secondary compression spring **46** is butted against the under surface of the cap portion of the operating member **44** and circumscribes in spaced relation to its shank. The two rounded terminal ends of the cap portion of the actuator member **44** rides on the shoulders **40** formed in the wall portions **32**. The actuator member **44** is thus floated within the switch assembly. A pair of switch terminals **68** pass through apertures formed in the bottom wall of the barrier portion **34** and extend upwardly into the lower cavity of the housing **26**. A contact bar **70** comprising an engagement portion which is generally rectangular in form and has at each of its short ends an extension which is adapted to engage between the rib **62** and which has an aperture through which the protuberance **64** extends. A spring **74** is located in each of the spring cavities **69** and bears against the contact bar **70** and is trapped in the recess formed therein. The springs **74** bias the contact bar **70** into an effective physical contact with the switch terminals **68**. A cylindrical protuberance extends from the base **28** of the lower cavity portion of the housing **26** and into the

tubular cavity **66** of the cam **50** with one portion of the contact bar **70** engaged against one of the switch terminals **68** and another portion of the contact bar **70** engaged against the other switch terminal **68** but adapted to be disengaged on movement of the cam **50** from one position to another as will be set forth more fully hereinafter. To complete the assembly of the switch, a cover (not shown) is placed on the housing in spaced parallel relationship with the base **28**.

To operate the switch, the lens **10** is depressed which in turn applies a force to the primary compression spring **42** resulting in a compression of the secondary compression spring **46** and a movement of the actuator member **44** along the shoulders **40** until the terminal end of its shank butts against, in the position shown in FIG. 1, the second cam surface **58** which guides the terminal end of the shank down into the trough between the triangular form **54** and the land portion **52**. At this point, the actuator member **44** exerts a downward rotating force against the angled surface **72** of the land portion **52** rotating the cam **50** and disengaging the contact bar **70**. When the lens **10** is released, the compressed spring members **48**, primary compression spring **42** and secondary compression spring **46** spring back returning the lens **10** to its original position and disengaging the actuator member from the cam. At this point, the cam is in the position as shown in FIG. 1 in phantom with the apex of the triangular form **54** on the opposite side of the shank of the actuator member **44** from that position in which it was originally at the start of the switching action. The cam **50** is prevented from over-rotation by having its angled surface **60** brought into abutting relationship with the inner surface of the barrier portion **34** and having the upper surface of the portion **52** butted against the upper inner surface of the barrier portion **52** as shown in FIG. 1.

With reference to the foregoing description, it is to be understood that what has been disclosed herein represents several embodiments of the invention and is to be construed as illustrative rather than restrictive in nature and that the invention is best described by the following claims.

We claim:

1. A switch assembly comprising a plunger movably related to a housing, the housing having a cavity formed therein, the cavity having a cam member associated therewith, an actuating assembly having a primary spring and a secondary spring holding a movable member therebetween, the movable member of T-shaped configuration having an upper surface and a shank portion, the primary spring abutting against the upper surface and the secondary spring circumscribing the shank portion, and the actuating assembly lying within the cavity between the plunger and the cam member and adapted to drive the movable member toward the cam member when the plunger is depressed and the cam member having a contact attached thereto and being adapted to move the contact into engagement with a contact in the cavity.

2. A switch assembly as set forth in claim **1** wherein the cam member is rotatable in relation to the housing and comprises an upper surface having a land portion at each end and a triangular form therebetween, the triangular form and the land portions having surfaces against which the shank of the movable member engages thereby turning the cam member from a first position to a second position.

3. A switch assembly as set forth in claim **1** wherein said plunger has a bulb mounted therein and the cavity of the housing has a pair of terminals mounted therein and a pair of springs mounted between the plunger and the terminals, the springs being compressible by the plunger and forming the electrical connection between the bulb and the terminals.

4. A swich assembly comprising a plunger movably related to a housing, the housing having a cavity formed therein, the cavity having a cam member associated

therewith, an actuating assembly having a primary spring and a second spring holding a movable member therebetween, the actuating assembly lying within the cavity between a plunger and the cam member and adapted to drive the movable member toward the cam member when the plunger is depressed and the cam member having a contact attached thereto and being adapted to move the contact into engagement with a contact in the cavity; said plunger having a bulb mounted therein and the cavity of the housing having a pair of terminals mounted therein and a pair of springs mounted between the plunger and the terminals, the springs being compressible by the plunger and forming the electrical connection between the bulb and the terminals.

References Cited

UNITED STATES PATENTS

1,726,897	9/1929	Horn	200—68
2,295,484	9/1942	Krieger.	
2,576,771	11/1951	Bentley.	
2,994,750	8/1961	Raab	200—68
3,183,333	5/1965	Golbeck.	
2,469,337	5/1949	Kohl	200—68

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