Nov. 24, 1970 K. H. WALTERICK 3,542,975

SWITCH, ESPECIALLY USABLE AS A STARTER AND CONTROL SWITCH FOR FLUORESCENT LAMPS

Filed March 27, 1969 2 Sheets-Sheet 1

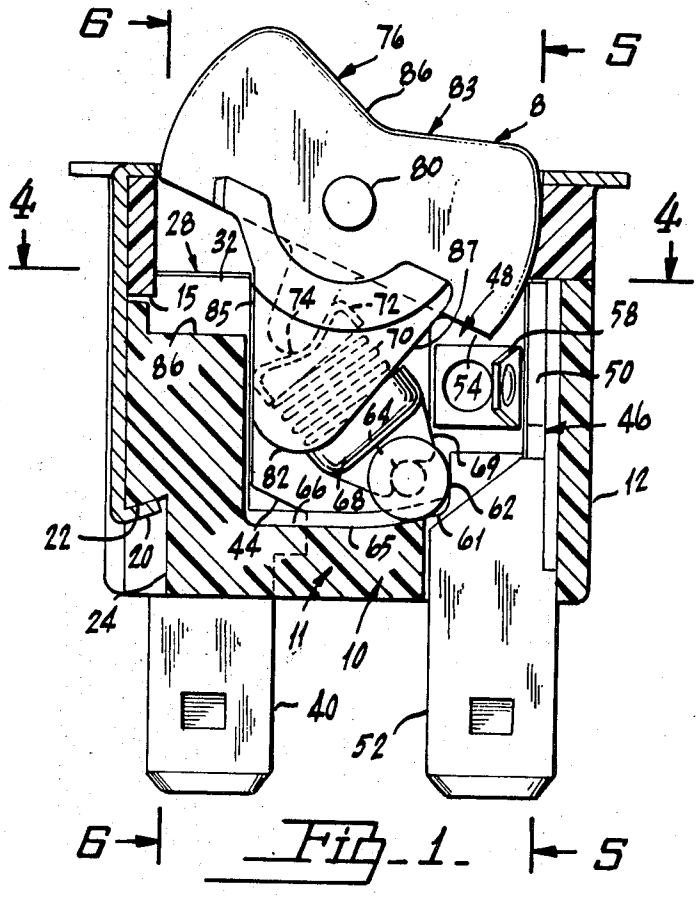


Fig. 1.

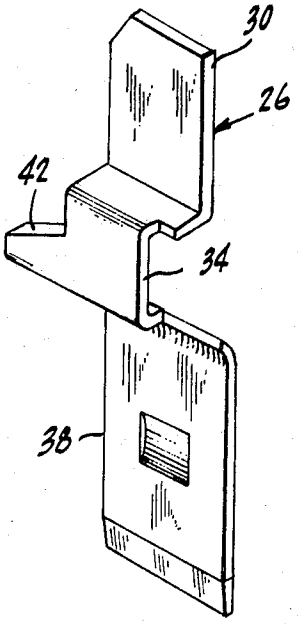


Fig. 9.

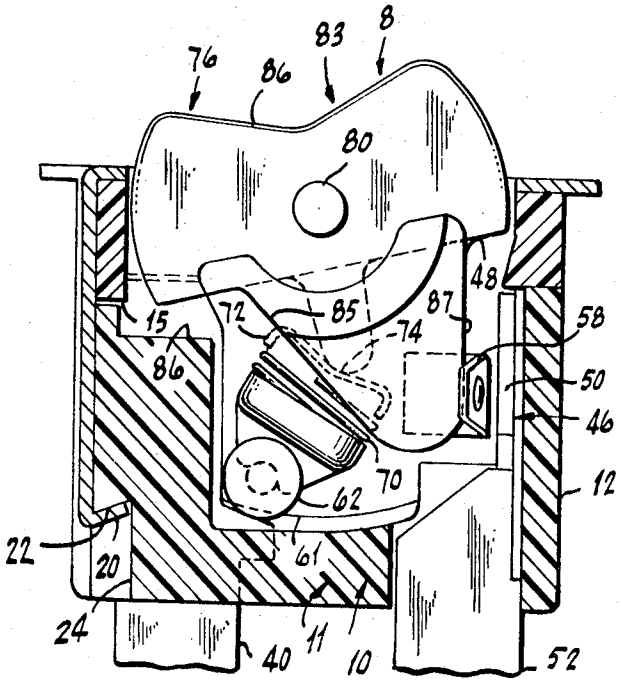


Fig. 2.

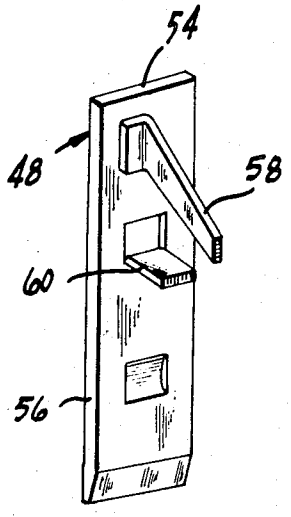


Fig. 8.

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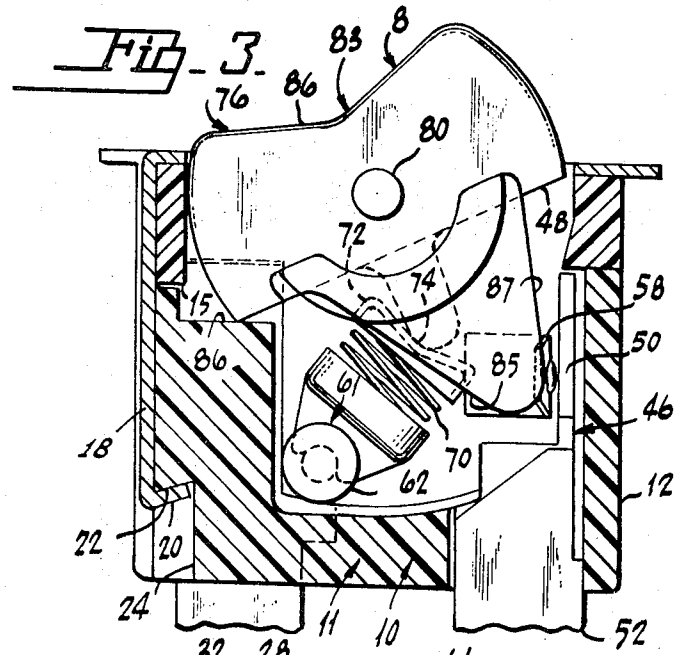
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Fig. 3.



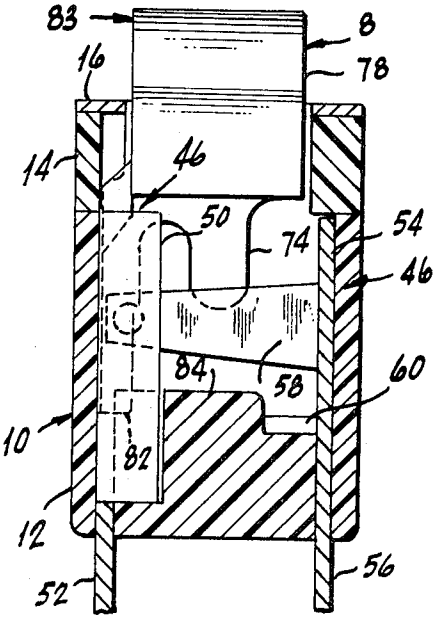


Fig. 5.

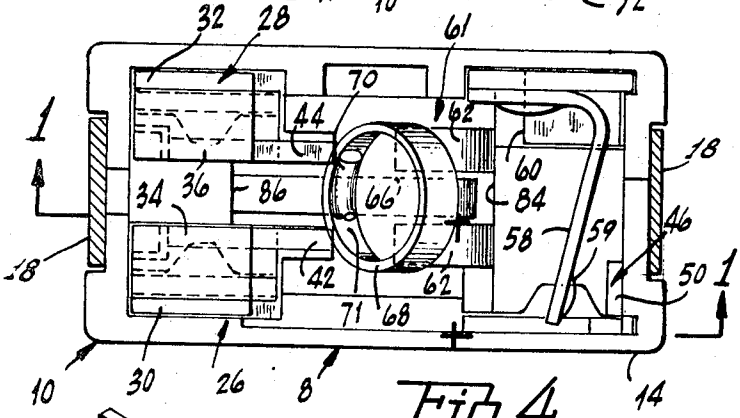


Fig. 4.

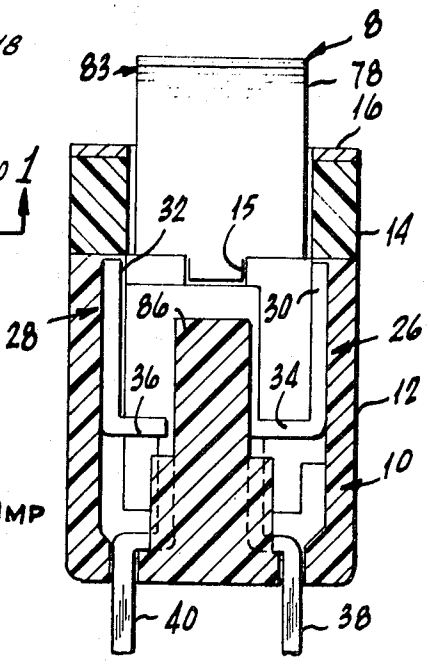


Fig. 6.

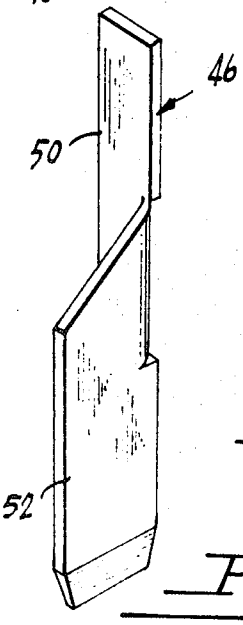


Fig. 7.

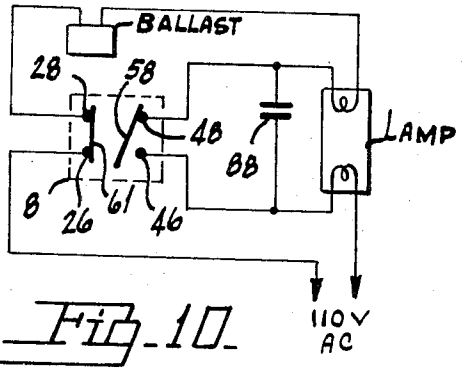


Fig. 10.

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3,542,975

SWITCH, ESPECIALLY USABLE AS A STARTER AND CONTROL SWITCH FOR FLUORESCENT LAMPS

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Int. Cl. H01h 9/26
U.S. Cl. 200—5 10 Claims

ABSTRACT OF THE DISCLOSURE

A switch especially for use as a control for fluorescent lamps, but not limited to that use, utilizes toggle-action mechanism of the over-center spring type. When a handle is rocked enough to move the spring over-center, the mechanism takes over from the user to snap a roller contact to or from a maintained circuit-closing position. With the contact in this position, the handle can be momentarily rocked beyond the point at which it comes to rest, to momentarily close a circuit between an auxiliary set of contacts.

BACKGROUND OF THE INVENTION

Field of the invention

The invention pertains to the electrical switch art, in particular to the construction of so-called snap switches of the toggle-acting type incorporating an over-center spring and an oscillating main contact, in association with auxiliary contact and terminal means actuable to circuit-closing position responsive to manual operation of a handle momentarily, beyond the ordinary limits of the travel of the switch mechanism.

Description of the prior art

The invention relates to an electrical switch designed primarily, though certainly not necessarily, as a starter and control device for fluorescent lamp. Switches of this type are old per se, being in effect a combination of a single-pole line control switch, and a momentary contact switch. The combination of the two types of switches into a single unit was conceived long ago for the purpose of precluding the need for an automatic fluorescent starter and starter socket, desirably reducing initial costs and eliminating the need for replacing automatic starters.

In use of a switch of this type, the main or line contacts are operated to a circuit-closing, "on" position. The auxiliary contacts are then momentarily closed by the user until both ends of the lamp glow, after which the switch handle is released and the lamp lights.

Typically, switches of this type utilize a handle of the "push on, push off" type. Or, the switch may be a pull type, operated by a chain.

The "feel" of switches of the type described above leaves something to be desired, often requiring excessive pressure or pulling force. And, the construction of switches used for this purpose has been rather bulky, and often undesirably complex.

Some efforts hvae been made in the prior art to change manual fluorescent starter-control switches, to eliminate or at least reduce many of these undesirable characteristics. Thus, in Patent No. 2,649,511 issued to E. G. Gaynor on Aug. 18, 1953, there is disclosed a switch of the pivoted or toggle type handle, for this purpose. This approach, while possibly presenting some advantages over the commonly used "push on, push off" type of switch, does not offer a complete solution to the problems fo complex construction, delicately shaped components the dimensions of which are hard to hold in production, excessive operating pressure, and excessive length or width of the switch body.

Of importance, in this regard, is the provision of a switch that has the further desirable characteristic of lending itself to modular arrangements, in which a number of wiring devices can be snapped into a single mounting frame on the panel of an electric stove or other appliance in any desired number or relative arrangement of such devices. The switches of the prior art have not been specifically designed as modular members, as distinguished from the present invention, which aims to eliminate this problem along with the others previously noted.

Summary of the invention

Summarized briefly, the invention includes a rectangular body compactly designed to take up minimium space, not only with respect to the length and width of the body, but also with respect to its depth when installed, ready for use.

Within the body there are, at opposite ends thereof, first and second pairs of terminals, each of which is combined, within the housing, with a contact.

Mounted in the housing is a toggle type mechanism preferably incorporating a rocker handle, and further including a compression-type, over-center spring, and roller contact on the lower end of the spring. By light pressure on the rocker handle, the user moves the mechanism to a position in which the spring travels over-center, after which the spring takes over and drives the roller contact into and out of engagement with the contacts of one pair of the terminals. Thus, in this respect, the switch is a single-pole, on-off switch desirably incorporating a fast make and break.

With the switch mechanism in the "on" position, the handle can be rocked beyond the point at which it comes to rest, in such a way that an arm on the handle biases a leaf spring contact to a position bridging the other terminals, thus providing a momentary closure of the lamp filament heating circuit.

The construction is such that by elimination of the second set of terminals and their associated leaf spring contact, the switch can be used as an ordinary single-pole, on-off switch.

Brief description of the drawing

FIG. 1 is a longitudinal sectional view taken substantially on line 1—1 of FIG. 4 through a switch according to the present invention, wherein the mechanism is in the "maintained off" position thereof;

FIG. 2 is a sectional view similar to FIG. 1 in which the mechanism has been operated to its "maintained on" position;

FIG. 3 is a view similar to FIG. 1 in which, with the mechanism in the "maintained on" position thereof, the handle has been rocked to a momentary position to bridge a second set of terminals;

FIG. 4 is a horizontal sectional view substantially on line 4—4 of FIG. 1, with the cover plate, the upper portion of the body and snap action mechanism removed;

FIG. 5 is a transverse sectional view substantially on line 5—5 of FIG. 1;

FIG. 6 is a transverse sectional view substantially on line 6—6 of FIG. 1;

FIG. 7 is a perspective view of a combination contact and terminal of the second set operable in the "momentary on" switch position;

FIG. 8 is a perspective view of the other combination contact and terminal operative in the "momentary on" switch position;

FIG. 9 is a perspective view of a combination contact and terminal of the set operative in the "maintained on" switch position; and

FIG. 10 is a wiring diagram of a typical lamp circuit in which is incorporated a switch according to the present invention.

Description of the preferred embodiment

A switch according to the present invention has been generally designated **8** in the figures of the drawing, and includes a rectangular housing generally designated **10**. Housing **10** comprises an electrically insulative body **11** preferably moulded from a thermosetting plastic material, such as general purpose phenolic, and composed of separately formed lower and upper portions **12, 14** respectively. The lower body portion **12** can appropriately be considered as being of rectangular configuration with an upwardly opening recess for the switch mechanism, while the upper portion **14** seats upon the upper edge of the lower portion, and is formed as a rectangular frame serving to extend the side wall of the lower portion in an upward direction. At opposite ends, the upper portion **14** of the body is formed with depending tongues **15** engaging complementary recesses of the lower body portion for the purpose of aligning the lower and upper body portions in proper order.

Housing **10** further includes a metal cover plate **16**, seating upon the upper portion **14** of the body, and formed at opposite ends with the elongated end tongues **18**, the lower extremities **20** of which are clinched about recessed shoulders **22** of the lower body portion **12**, to hold the components of the housing assembled with each other and the switch mechanism.

Shoulders **22** are formed as the inclined inner walls of downwardly opening recesses **24** externally formed in lower body portion **12** at opposite ends thereof.

Designated generally at **26, 28** are oppositely but identically formed combination contacts and terminals. These include, at their upper ends, retaining portions **30, 32** respectively bearing against the respective side walls of the lower body portion **12** (see FIG. 6), and limited against upward movement by the bottom surface of the upper body portion **14**. Intermediate their ends, terminals **26, 28** are formed with laterally inwardly offset intermediate portions **34, 36** respectively which in turn merge, at their lower ends, into elongated, depending, flat terminal blades **38, 40** commonly known as male tabs.

Integrally formed upon and projecting forwardly from the offset intermediate portions **34, 36** are contacts **42, 44** respectively, the top surfaces of which decline in a forward direction as seen from FIG. 1.

It will be noted at this juncture that in place of the male tabs **38, 40**, other types of well known terminal formations could be provided. For example, solder lugs could be employed, or alternatively, terminations could be provided in the form of screw terminals or wire leads.

At the opposite end of the housing, there are mounted in the body a second set of combination contacts and terminals generally designated **46, 48**. These are shown per se in FIGS. 7 and 8, and as will be noted, these differ from one another in construction. Thus, the combined contact and terminal generally designated **46** includes, at its upper end, a fixed contact element **50**, lying in a plane extending transversely of the switch housing and disposed in contact with the inner surface of the front end wall of the lower body portion **12**. In the assembled condition of the switch, the upper body portion **14** limits the terminal **46** against upward movement.

At its lower end, terminal **46** is provided with a male tab **52** bent at right angles to the plane of the contact element **50**, and formed in the illustrated example as a male tab similar to the male tabs **38, 40**. Again, any type of termination can be employed, as described above in reference to the terminals **26, 28**.

Referring now to FIG. 8, the combined contact and terminal generally designated **48** includes, at its upper end, a retaining or upper portion **54**, engaged against the

adjacent side wall of the lower body portion **14**, and having its top edge abutting against the underside of the upper portion **12** of the body.

The upper portion **54** merges into a depending terminal portion **56** in the form of a male tab transversely aligned with a male tab **52**, but adapted to be formed, as described above, as any suitable type of termination as required.

Welded or otherwise fixedly connected at its inner end to the upper portion **54** of terminal **48** is a movable contact element **58**. This is in the form of a spring leaf, progressively reduced in width in a direction toward its distal end, and formed at its distal end with a rounded protuberance **59** adapted to engage the contact element **50**. The movable contact element **58**, normally, is disposed as in FIG. 4, out of engagement with the fixed contact element **50**. However, against the inherent spring tension thereof, the contact element **58** can be deflected to a position, as shown in FIG. 3, wherein it is in electrical engagement with the fixed contact element **50**, thus to bridge the second set of terminals **46, 48**.

Lanced out of the material of the upper portion **54** of contact-terminal **48** is a laterally inwardly projecting stop lug **60** engaging against the bottom wall of the lower body portion **14** of housing **10** to limit downward movement of the contact-terminal when it is inserted in the body.

An operating mechanism of the over-center spring type includes an electrically conductive roller contact generally designated **61**, comprising a first movable contact means. Roller **61** is formed, at opposite ends thereof, with enlarged circular heads **62** rolling upon the bottom surface of lower body portion **12**, said heads being connected by a shank **64** of a diameter reduced in respect to the heads.

As seen from FIG. 1, roller **61** is adapted to roll upon a surface **65** of the lower body portion **12**, which surface is curved upwardly in a direction toward the front end of the housing, said surface being otherwise flat and horizontally disposed. An integral guide rib **66** extends longitudinally centrally of the housing, as seen from FIGS. 1 and 4, and is straddled by the roller contact.

Also as seen from FIG. 1, the top surface of rib **66** parallels the surface **65** upon which the heads **62** roll.

When the roller contact moves toward the opposite extreme limit of its travel shown in FIG. 2, heads **62** move out of contact with surface **65**, riding upwardly upon the inclined top surfaces of contacts **42, 44** of the contact-terminals **26, 28** respectively.

A roller contact carrier **68** is biased into engagement with shank **64** by a compression, coil spring **70** the lower end of which seats in an upwardly opening spring retainer cup **71** of the carrier. The carrier is of moulded plastic material, and is formed with a depending, diametrically extending rib **69** the lower end of which is formed with a shallow, curved, downwardly opening notch receiving shank **64**.

At its upper end, spring **70** bears in a downwardly opening spring cap **72** of inverted cup shape, having a depressed top surface receiving the lower, rounded end of a finger **74** integrally formed upon the bottom surface of a moulded plastic rocker handle generally designated as **76** formed with a body **78** the opposite sides of which are provided with laterally outwardly extending trunnions **80**. Trunnions **80** bear in suitable bearing recesses provided in the opposite side walls of the upper portion **14** of the body of the housing, whereby the handle may be rocked between its opposite extreme maintained positions shown in FIGS. 1 and 2 respectively, and may be rocked beyond its FIG. 2 position to its lamp-starting position shown in FIG. 3.

Also integrally formed upon the handle is a flat actuator portion or arm **82**, adapted to deflect the movable contact element **58**, from its normal position shown in FIGS. 1 and 2 to its operating position shown in FIG. 3. Arm **82** is at one side of the handle body **78** as shown in FIG. 5, extending downwardly from said body in laterally

spaced relation to centrally disposed finger **74**, in close proximity to the inner surface of the adjacent side wall of the housing.

Handle **78**, cup **72**, spring **70**, carrier **71**, and roller contact **61** together constitute a switch mechanism, generally designated **83**, of the snap action, over-center, compression spring type.

Integrally formed in the lower body portion **12** of the housing are front and rear stops **84**, **86** respectively. These engage the roller contact in the opposite extreme positions thereof shown in FIGS. 1 and 2, to limit the movement of said roller contact in opposite directions.

As seen from FIG. 1, arm **82** is formed with downwardly converging rear and front edges **85**, **87** respectively. In the FIG. 1 "off" position of the switch mechanism, edge **85** engages against the forward edge of the upper, retaining portion **30** of contact-terminal **26**, to limit rocking movement of handle **76** in one direction. In the FIG. 2 "maintained on" position of the mechanism, front edge **87** engages against but does not deflect the distal end of movable contact **58**, the spring tension of which is greater than the force of spring **70**. Thus, the rocking movement of the handle in opposite directions under the force of spring **70** is limited by engagement of the actuator arm against contact-terminal **26** and contact **58**, which constitute stops for limiting the handle movement under these circumstances.

OPERATION

In use, the switch would be wired in a fluorescent lamp circuit of conventional configuration, shown in FIG. 10, in the same manner as conventional fluorescent starter-control switches not in use.

In such a circuit, contact-terminals **26**, **28** are in series connection with the usual ballast. As is customary, a condenser **88** is connected across the opposite ends of the lamp, and the starter "momentary on" contact-terminals **46**, **48** are also in circuit across the ends of the lamp.

With the switch so connected, the lamp will be off when roller contact **61** is out of engagement with contact-terminals **26**, **28**, as in FIG. 1. As previously noted, movable contact element **58** is tensioned to normally remain out of bridging engagement with contact-terminals **46**, **48**.

When the lamp is to be turned on, the user rocks the handle from the FIG. 1 to the FIG. 2 position. This rocking movement of the handle causes the spring **70** to be placed under increased compression by finger **74**, which carries the upper end of the spring over-center in respect to the contact **61**. The stored-up energy of the spring is relieved at this time, with the contact **61** thus being snapped, as the spring expands, to its other extreme position shown in FIG. 2. This closes a circuit across the contact-terminals **26**, **28**.

With the rocker handle now in the FIG. 2 position, the user further rocks the handle in the same direction beyond its "maintained on" position shown in FIG. 2, as a result of which edge **87** of actuator arm **82** biases the distal end of the contact element **58** into engagement with contact-terminal **46**.

The handle is now in the position thereof shown in FIG. 3, and it will be observed that it can be moved to and held in this position only by positive pressure of the user's finger. When said pressure is released, the heating circuit of the lamp, momentarily closed by bridging of the contact-terminals **46**, **48**, is again open. Thus, the user merely rocks the handle from "off" to "on" position, and then further rocks the handle to the FIG. 3 position until both ends of the lamp glow, after which the user releases the handle so that it may be biased by element **58** back to its FIG. 2, "maintained on" position as the lamp lights.

In this construction, it may be noted, the switch can be assembled also as single-pole, on-off switch by leaving out contact-terminals **46**, **48** and by using a lower body portion of the housing modified by eliminating the slots normally accommodating contact-terminals **46**, **48**.

Or, the switch can be assembled as a normally off, "momentary on" switch by leaving out the terminals **26**, **28** and by using a lower body portion modified to eliminate the slot for the terminals **26**, **28**. Then again, the switch might be used as a double-pole, "on-on" switch wherein the roller contact, in the FIG. 1 position therein, would be in engagement with a set of front terminals, while engaging the rear terminals **26**, **28** in the other extreme switch position.

I claim:

1. A switch comprising:

(a) a housing;

(b) a handle mounted therein for movement through center between maintained first and second positions, located at opposite sides of center, said handle being formed with a contact actuator portion;

(c) first and second pairs of terminals within the housing, one of said pairs being located at one side and the other pair being located at the opposite side of center, the terminals of each pair being formed separately from and being spaced from the terminals of the other pair;

(d) first contact means operated by the handle from an inoperative position to a position bridging the terminals of the first pair, responsive to movement of the handle in one direction, from its first to its second positions; said handle being movable in the same direction to a momentary third position beyond the second position thereof with said contact means remaining in their terminal-bridging position; and

(e) second contact means in the form of a contact element shifted by said actuator portion from a normally inoperative position to a position bridging the terminals of the second pair in response to said movement of the handle to its third position.

2. A switch as in claim **1** wherein said contact element is in the form of a spring leaf disposed in the path of said actuator portion of the handle for deflection thereby to terminal-bridging position when the handle is moved to its third position.

3. A switch as in claim **2** wherein said pairs of terminals are mounted at opposite ends of the housing with the terminals of each pair spaced transversely of the housing, said element extending transversely of the housing between the terminals of the second pair.

4. A switch as in claim **3** wherein said handle is rockably mounted in the housing with the actuator portion shifting longitudinally of the housing into and out of a spring-leaf-deflecting position in response to the rocking of the handle beyond its second position.

5. A switch as in claim **4** wherein said actuator portion is an arm depending from the handle at one side thereof, said contact means comprising a roller extending transversely of the housing wholly out of the path of said arm in all positions to which the handle is moved, said roller engaging stops at opposite ends of the housing in the first and second positions of the handle.

6. A switch comprising:

(a) a housing;

(b) a snap-action switch mechanism therein of the toggle type operable between first and second maintained position and including:

(1) a pivoted handle,

(2) an over-center compression spring engaged at one end by the handle, and

(3) contact means on the other end of the spring;

(c) a first pair of terminals mounted in the housing, said contact means being moved out of and into position bridging said terminals in response to operation of said mechanism from its first to its second position, said handle being movable to a momentary position with the contact means remaining in its terminal-bridging position;

(d) a second pair of terminals mounted in said housing; and

(e) a movable contact element engaged by a portion of the handle in the momentary position thereof for correspondingly momentary positioning of said element in bridging relation to the terminals of the second pair.

7. A switch as in claim **6** wherein said first and second pairs of terminals are disposed at opposite ends of the housing, said housing including a stop engaging the contact means at a location intermediate said pairs of terminals in the first position of said mechanism.

8. A switch as in claim **7** wherein the housing includes a second stop engaging the contact means in the second position of the mechanism with the contact means in engagement with the terminals of the first pair.

9. A switch as in claim **8** wherein the handle, when pivoted in a direction to operate said mechanism to its first position, is rockable to its momentary position in the same direction beyond the position assumed thereby in said first position of the mechanism.

10. A switch as in claim **9** wherein said spring, in the first position of the switch mechanism, resiliently and yieldably restrains the handle against movement to its momentary position.

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U.S. Cl. X.R.

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