

March 9, 1965

S. I. SLATER
LIGHT DIMMING SWITCH

3,173,031

Filed March 19, 1962

2 Sheets-Sheet 1

FIG. 1

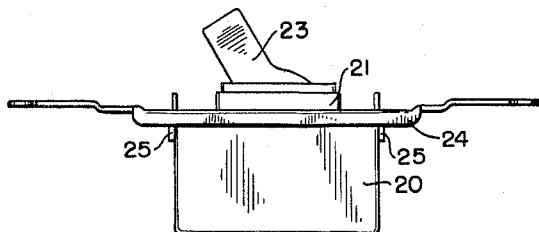


FIG. 2

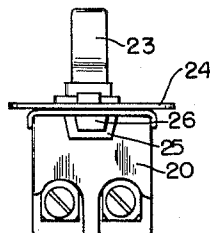


FIG. 3

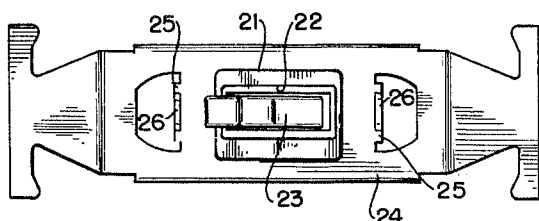


FIG. 6

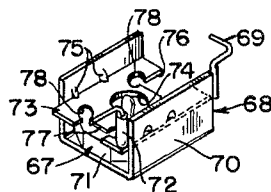


FIG. 7

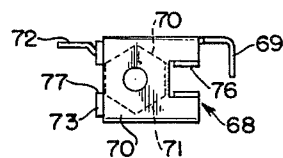


FIG. 5

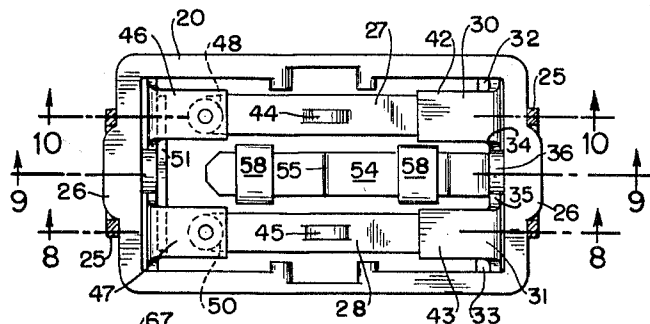
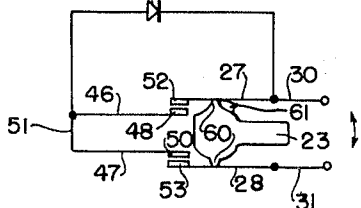


FIG. 4



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FIG. 8

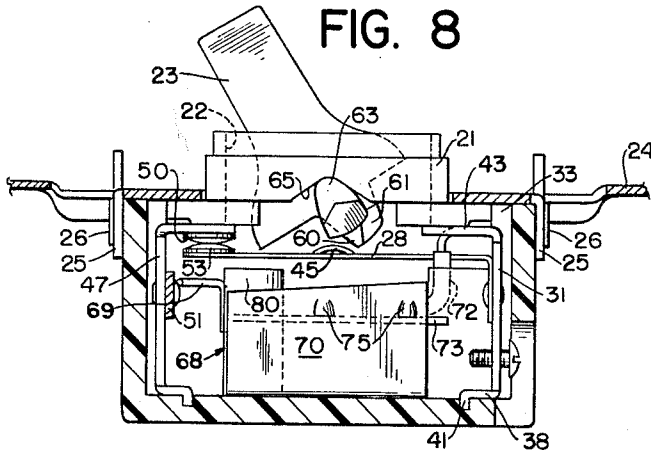


FIG. 11

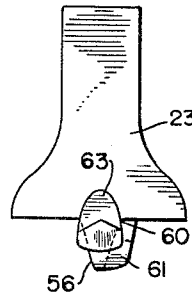


FIG. 9

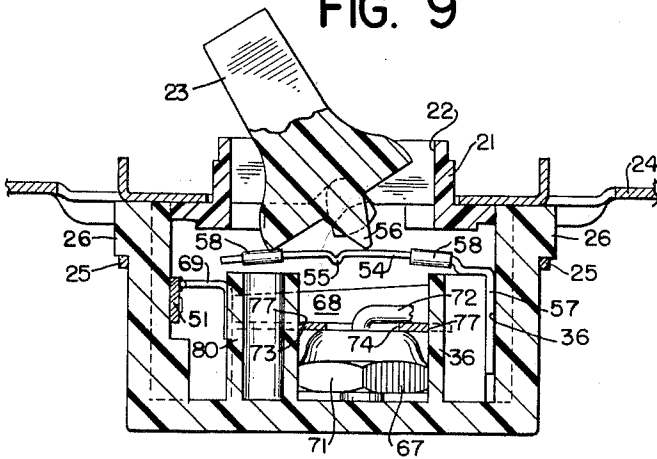


FIG. 12

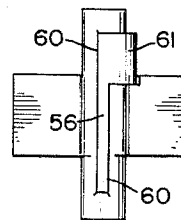


FIG. 10

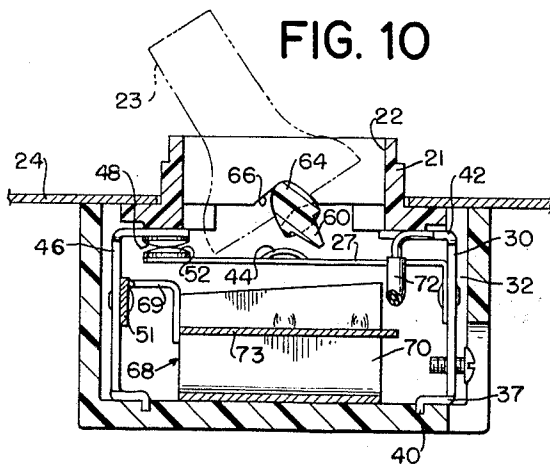
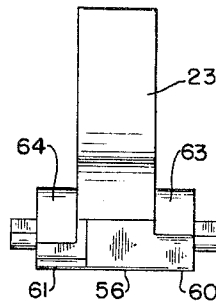


FIG. 13



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3,173,031

LIGHT DIMMING SWITCH

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Filed Mar. 19, 1962, Ser. No. 180,447
8 Claims. (Cl. 307-146)

This application is continuation-in-part of my prior application Serial No. 5,000 filed January 27, 1960, and now Patent No. 3,037,146.

The present invention relates to a switching means for operating the ordinary single filament lamp to produce two levels of illumination.

More particularly the invention relates to such a switching means which includes a diode half-wave rectifier which may be connected in series with the lamp filament to reduce the power consumption in the filament and thereby reduce the light output therefrom.

The present invention provides a switching means such as described above which is extremely compact and, in fact, is so arranged that the entire switching mechanism including the diode is placed in the same housing as has heretofore been used for a simple double-pole, single-throw, on-off switch.

Additionally, the switch of the present invention provides a heat sink whereby the heat developed in the diode when the diode is in circuit is dissipated thereby extending the life of the diode and making it possible to utilize the arrangement in connection with a higher wattage lamp than would otherwise be the case.

This application differs from my prior application primarily in the fact that the diode is connected to be shunted out and therefore the two pairs of switch contacts are arranged to be both open, one closed or both closed rather than both open, one closed or the other closed.

It is an object of the invention to provide a simple, compact switch structure for operating a single filament lamp at two levels.

It is another object of the invention to provide such a switch structure which includes in a single small housing both the actual switch elements and a diode half-wave rectifier.

It is still another object of the invention to provide such a switching structure which likewise includes within a single small switch housing readily mounted in the ordinary outlet box a heat sink for dissipating heat from the diode.

It is a still further object of the invention to provide such a dimming switch construction wherein elements of a common form of single-throw double-pole switch are utilized as the switching elements and provide for three positions in the dimmer switch, namely, an "off" position, a high position, and a low position.

It is a still further object of the invention to provide a switch in which the three positions are those in which both contact pairs are open, one contact pair is closed and both contact pairs are closed. In the latter two of these situations the diode is in circuit with the lamp or load and the diode is shunted and the lamp or load directly across the power source, respectively.

Other objects and features of the invention will be apparent when the following description is considered in connection with the annexed drawings, in which,

FIGURE 1 is a side elevational view of a switch in accordance with my invention shown complete with its mounting strap;

FIGURE 2 is an end elevational view of the switch of FIGURE 1;

FIGURE 3 is a top plan view of the switch of FIGURES 1 and 2;

FIGURE 4 is a schematic wiring diagram of the switch of FIGURES 1 through 3;

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FIGURE 5 is a top plan view similar to FIGURE 3 but to an enlarged scale and with the mounting strap, operating handle and cover removed;

FIGURE 6 is a perspective view of the heat sink for the diode showing the heat sink removed from the housing and showing the diode in place in the heat sink;

FIGURE 7 is a bottom plan view of the heat sink and diode assembly of FIGURE 6;

FIGURE 8 is a vertical cross-sectional view of the switch of my invention, the view being taken on the plane of the line 8-8 of FIGURE 5;

FIGURE 9 is a view similar to FIGURE 8, the figure however being taken on the plane of the line 9-9 of FIGURE 5;

FIGURE 10 is another view similar to FIGURE 8, but taken on the plane of the line 10-10 of FIGURE 5;

FIGURE 11 is an enlarged end elevational view of the switch handle;

FIGURE 12 is a bottom plan view of the switch handle of FIGURE 11; and

FIGURE 13 is a side elevational view of the switch handle of FIGURE 11.

Referring now to the drawings and particularly to FIGURES 1 through 3, there is shown at 20 a housing which includes the switch elements as will be later described. The housing 20 is closed at the top by means of a cover 21 having an opening 22, FIGURE 3, through which the operating handle 23 of the switch protrudes. The cover 21 is held in position by means of a mounting strap 24 which is fixed to the housing by means of the cooperating ears 25 (bent off from strap 24) and projections 26 on the housing 20. It will be understood that the housing 20, cover 21 and operating handle 23 are formed from electrically insulating material.

Referring now to FIGURES 5 and 8 through 10, it will be seen that the insulating housing 20 is formed with a number of grooves, bosses, etc. into which the switch contacts and other operating parts are placed in order to hold these parts in proper relationship one to another as will be described hereinafter. These parts will also be given the same reference numbers in the schematic wiring diagram of FIGURE 4 as in the other figures so that their circuit relationship may be readily understood.

A pair of movable contact members 27 and 28, FIGURES 5, 8 and 10, extend horizontally across the upper end of the housing 20. Each of these contact members is bent over at its right hand end as seen in FIGURES 8 and 10 and the bent over portion connected to a terminal strip, the terminal strip cooperating with movable contact 27 being designated 30 and that cooperating with movable contact 28 being designated 31.

The terminal strips 30 and 31 are held in position by means of ribs 32 and 33 formed on the interior walls of the housing 20 and by grooves 34 and 35 formed in the outer walls of upstanding generally square hollow boss 36. In addition, the terminal strips 30 and 31 are provided with bent over portions 37 and 38, a portion of each of which seats on the bottom of the wall of the housing 20 and an additional portion of each of which extends into a depression in that bottom wall as shown at 40 and 41 of FIGURES 10 and 8 respectively. Moreover, each terminal strip 30 and 31 has a right angle bend at the top thereof forming the portions 42 and 43, these portions being held downwardly in position by means of the cover 21 as is clearly seen in FIGURES 8 and 10.

Each movable contact 27 and 28 is provided adjacent the center thereof with a bent up portion respectively designated 44 and 45, which portions cooperate with depending portions of the operating handle 23 in a manner which will shortly be described.

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Mounted at the opposite or left hand of the housing 20 in a manner similar to the mounting of terminal strips 30 and 31 are the terminal strips 46 and 47, each of which bears a contact button 48 and 50 respectively, on a portion thereof which is bent off at right angles to the body of the respective terminal strip. Terminal strips 46 and 47 are joined by a bridging member 51 so that these two terminal strips are electrically one.

Mounted at the left end of each of the movable contact members 27 and 28 are contact buttons 52 and 53 respectively, these contact buttons cooperating with, that is, making contact with the buttons 48 and 50 respectively when the particular movable contact is in its operated position.

A resilient detenting member 54 is mounted between the switch movable contacts 27 and 28 as seen in FIGURE 5, this detenting member being provided with a detenting notch 55 near the center thereof which detenting notch cooperates with the pointed central portion of a projection 56 formed on the bottom of the operating handle 23. Detenting member 54 is mounted in the position mentioned by means of a right angle bent off portion 57 which extends into grooves in the interior wall of the upstanding hollow boss 36 as shown particularly in FIG. 9. Mounted on the detenting member 54 adjacent each end of the horizontal portion thereof are insulating pieces 58 which may be small pieces of rubber tubing.

Returning now to the mode in which the operating handle causes the movable contacts 27 and 28 to make or break contact between contact buttons 48, 52 and 50, 53, reference is made particularly to FIGURES 4, 8, and 10 through 13. Operating handle 23 is provided with a projecting rib 60 which acts as a camming surface and has formed thereon an additional camming projection 61. Camming rib 60 cooperates with the struck-up and bent-up portions 44 and 45 of movable contact members 27 and 28 while camming projection 61 cooperates with the struck-up portion 44 of movable contact member 28 only. Thus when the switch handle is rocked to the position shown in FIGURE 8 (downwardly in FIGURE 4), contact is made between contact buttons 50 and 53 due to one end of camming rib 60 moving out of contact with portion 45. At the same time contact buttons 48 and 52 are closed due to the fact that the other end of camming rib 60 disengages from struck-up portion 44. In the center position in which projection 56 of the rib 60 engages notch 55 of the detenting member 54 both pairs of contacts 48, 52 and 50, 53 are separated. When the switch handle is rocked to its right hand position (upper position FIGURE 4) the contacts 50, 53 again come into engagement whereas contacts 48, 52 are opened due to engagement of cam 61 with portion 44. The rocking movement of handle 23 is made possible by providing upwardly facing projections 63 and 64 on the ends of the rib 60 which projections cooperate with grooved cut-out portions 65 and 66 of the cover 21.

The structure thus far described is a slight modification of the three-way switch currently marketed by the Slater Electric & Mfg. Co. under its catalog No. 613. The slight modification mentioned consists in providing the detenting member 54 with the notch 55 and providing the handle 23 with the cooperating projection 56 whereby the handle may be placed in a center position in which both contacts are open and in changing the camming surfaces.

Essentially the same switch elements are also utilized to provide a single-pole, single-throw switch (by omitting one movable contact member and its cooperating stationary contact), a double-throw, single-pole switch (by arranging a pair of camming projections on the same side of the handle center line) and a four-way switch (by adding a second set of bridged contacts and utilizing the three-way switch handle). The variations of the switch structure mentioned above are known respectively as catalog Nos. 610, 612 and 614. Although the switch operating handle as described causes both contact pairs to

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open when in its center position, it will be obvious that it is not essential that contact pair 48, 52 be opened in this position since these contacts are in series with contacts 50, 53 and the circuit is thus broken at the latter contacts at this time.

Referring now to FIGURES 6 and 7, there is shown in these figures the manner of mounting a diode 67, see also FIGURE 9, in a heat dissipating element or heat sink generally designated 68. This mounting provides a manner in which the heat generated in the diode can be dissipated through the housing 20 to the atmosphere thereby permitting a smaller diode to be used with a lamp of a particular wattage.

The heat sink 68 comprises a strip of copper 70 which is bent into the form of a U. Diode 67 (which has an outer conductive casing 71 forming one of the circuit connections for the diode and a central insulating portion at its upper edge through which a lead 72 forming the other circuit connection for the diode is led), is mounted upon the base of the U or channel shaped copper strip 70 and is held in place by means of a rectangular plate 73 formed preferably of spring brass material. Plate 73 is provided with an aperture 74 through which the upper lead 72 of the diode extends. This plate bears against the upper edges of the diode and holds it against the bottom of the channel 68, the plate being held in position by means of its own resiliency in cooperation with internally extending bosses 75 formed in the upstanding walls of the copper strip 70.

Plate 73 has generally rectangular notches 76 and 77 stamped therefrom. These notches have apertures 78 at their corners, the notches likewise being stamped therefrom, the apertures extending into the corners whereby the three sides of the notches are rendered flexible. The base of the channel member 70 is provided with a notch similar to notch 76 and in alignment therewith.

The entire heat sink assembly is inserted in the housing, the sides of the notches 76 and 77 respectively engaging a hollow cylindrical post 80 formed integrally with the housing 20 and the hollow generally square boss or post 36. Since the notches 76 and 77 are made slightly undersize, it will be seen that the sharp edges of these notches prevent removal of the heat sink assembly and thus once the assembly has been positioned in the housing with the base of the channel-shaped copper strip 70 in firm engagement with the interior base of the housing 20, it is held firmly in this position.

The central conductor 72 of the diode 67 is connected to switch terminal 30 as for example by soldering. A conductor 69 is soldered at one end to one of the upstanding walls of the U-shaped strip 70 and at its other end to the terminal 46. Since, as has been stated, the base of diode 67 is held in firm contact with the base of channel strip 70, an electrical connection is formed from one terminal of the diode to the terminal 31 of the switch.

As stated hereinabove, the channel shaped strip 70 is formed of copper which is a highly heat conductive material and therefore heat generated by the diode 67 is transmitted to the strip 70 and through it to the housing. The material of housing 20, although not as highly heat conductive as copper, is nevertheless of heat conductive material and thus heat is transferred through the housing walls to the surrounding atmosphere.

In addition to the fact that the base of the strip 70 is seated firmly against the interior base of the housing, a large portion of the upstanding side walls of the channel 70 also bears against the interior walls of the housing, thus of course increasing the rate of heat transfer from the diode.

From the above it will be seen that my invention provides a dimmer switch utilizing a diode which is extremely compact and which provides for an "off" position together with a "high" position in which the full alternating current wave is applied to the external load

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which is usually a single filament lamp and a low position in which one-half of the alternating current wave is applied to the lamp load. Furthermore, despite the small bulk of the switch, the diode is provided with a heat sink to assure that the diode can operate at its rated capacity without exceeding the temperature corresponding thereto.

As indicated hereinabove, the wattage of a lamp utilized with the switch is limited by the capacity of the diode which is in turn related to the rate at which heat can be dissipated from the diode. With the heat sink hereinabove described, the lamp of maximum wattage, which may be employed as a load, is 300 watts. However, by increasing the heat dissipation properties of the switch housing the maximum lamp wattage may be increased.

While I have described preferred embodiments of the invention, it will be understood that I wish to be limited not by the foregoing description, but solely by the claims granted to me.

What is claimed is:

1. A dimming switch for a single filament electric lamp comprising, in combination; a housing; a pair of stationary contacts mounted in said housing; a pair of movable contacts also mounted in said housing, each one of said pair of movable contacts cooperating with a respective one of said pair of stationary contacts; a single selectively positionable operating member cooperating with said movable contacts to maintain at least one thereof out of contact with its respective stationary contact in one position, to engage said one of said movable contacts with its respective stationary contact in a second position, and to engage both said one and the other of said movable contacts with their respective stationary contacts in a third position, a direct electrical connection between the contacts of one of said pairs of contacts, a diode rectifier mounted in said housing, said diode rectifier having two terminals, one of said terminals being connected to said other movable contact and the second of said diode terminals being connected to the respective stationary contact, and two external circuit terminals, one on each of the contacts of the other of said pairs.

2. A light dimming switch as claimed in claim 1 characterized in that said operating member comprises a three-position lever for positioning said movable contacts and further characterized by detenting means to hold said lever in its center position.

3. A dimming switch for a single filament electric lamp comprising, in combination; a housing; a pair of stationary contacts mounted in said housing; a pair of movable contacts also mounted in said housing, each one of said pair of movable contacts cooperating with a respective one of said pair of stationary contacts; a single selectively positionable operating member cooperating with said movable contacts to maintain both thereof out of contact with their respective stationary contacts in one position, to engage one of said movable contacts with its respective stationary contact in a second position, and to engage both said one and the other of said movable contacts with their respective stationary contacts in a third position, a direct electrical connection between the contacts of one of said pairs of contacts, a diode rectifier mounted in said housing, said diode rectifier having two terminals, one of said terminals being connected to said other movable contact and the second of said diode terminals being connected to the respective stationary contact and two external circuit terminals one on each of the contacts of the other of said pairs.

4. A light dimming switch as claimed in claim 3 characterized in that said opening member comprises a three-position lever for positioning said movable contacts and further characterized by detenting means to hold said lever in its center position.

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5. A dimming switch for a single filament electric lamp comprising, in combination; a housing; a pair of stationary contacts mounted in said housing; a pair of movable contacts also mounted in said housing, each one of said pair of movable contacts cooperating with a respective one of said pair of stationary contacts; a single selectively positionable operating member cooperating with said movable contacts to maintain at least one thereof out of contact with its respective stationary contact in one position, to engage said one of said movable contacts with its respective stationary contact in a second position, and to engage both said one and the other of said movable contacts with their respective stationary contacts in a third position, a direct electrical connection between the contacts of one of said pair of contacts, a diode rectifier mounted in said housing, said diode rectifier having two terminals, one of said terminals being connected to said other movable contact and the second of said diode terminals being connected to the respective stationary contact, two external circuit terminals, one on each of the contacts of the other of said pairs, a heat dissipating member mounted in said switch housing in intimate contact with the interior surface thereof, and means mounting said diode in intimate contact with said heat dissipating member.

6. A light dimming switch according to claim 5 wherein said selectively positionable operating member comprises a pivotally mounted lever having camming surfaces adjacent said pair of movable contacts.

7. A dimming switch for a single filament electric lamp comprising, in combination; a housing of generally rectangular cross-section; a pair of stationary contacts mounted at one end of said housing, said contacts being directly electrically interconnected; a pair of movable contacts extending in parallel relationship longitudinally of said rectangular housing and adjacent the open top thereof, one of said movable contacts cooperating with each of said stationary contacts; an operating member oscillatably mounted above said movable contacts for oscillation about an axis transverse to said movable contacts; said operating member cooperating with said movable contacts to maintain said movable contacts in position out of contact with said stationary contacts when said operating member is in a central position, to engage one of said movable contacts with its cooperating stationary contact in one extreme position of oscillation of said operating member, and to engage both said one and the other of said movable contacts with their respective cooperating stationary contacts when in the other extreme position of oscillation; a diode rectifier having two terminals and comprising an integral conductive housing portion; a heat dissipating member mounted in said switch housing beneath said movable contacts and in intimate contact with the interior surface of said switch housing; means mounting said diode rectifier with its heat conductive housing portion in contact with said heat dissipating member; and means connecting one of said diode terminals to said other of said movable contacts and the second of said diode terminals to the respective stationary contact.

8. A light dimming switch as claimed in claim 7 wherein said switch operating member bears camming surfaces on the portion thereof adjacent said movable contacts, said camming surfaces bearing against said movable contacts to cause them to move into and out of engagement with their cooperating stationary contacts, said operating member being of electrically insulating material.

References Cited by the Examiner

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75 LLOYD McCOLLUM, *Primary Examiner.*

**UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION**

Patent No. 3,173,031

March 9, 1965

Saul I. Slater

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 4, for "in" read -- is --; line 71, for "opening" read -- operating --; column 6, line 54, for "contacts" read -- contact --.

Signed and sealed this 24th day of August 1965.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents

**UNITED STATES PATENT OFFICE
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