July 29, 1969 W. E. KOTSCH 3,458,756

INCANDESCENT FLASHER LAMP HAVING A CUTOUT MEMBER CONNECTED IN PARALLEL WITH THE FILAMENT

Filed June 12, 1967

Fig. 1.

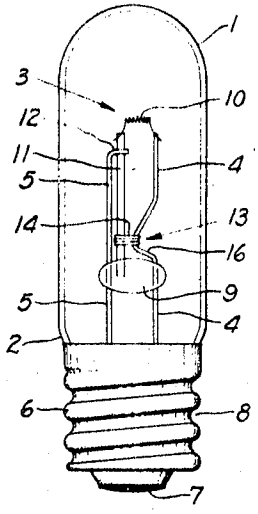


Fig. 2.

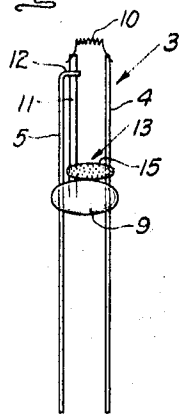


Fig. 3.

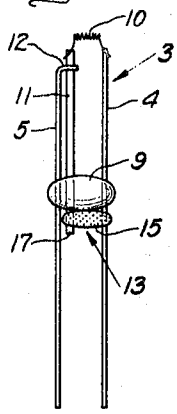


Fig. 4.

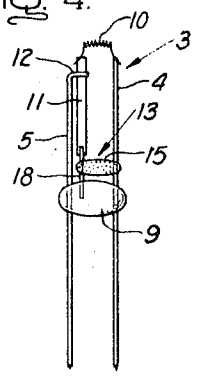
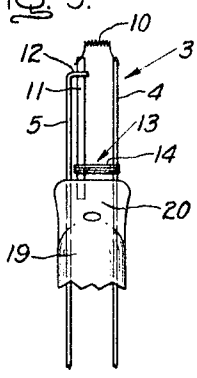


Fig. 5.



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INCANDESCENT FLASHER LAMP HAVING A CUT-OUT MEMBER CONNECTED IN PARALLEL WITH THE FILAMENT

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U.S. Cl. 315—65 9 Claims

ABSTRACT OF THE DISCLOSURE

An incandescent flasher lamp of the type having a normally closed thermostatic switch, and having its filament effectively connected across one of the lead-in conductors and the bimetallic element of the thermostatic switch, has a cutout member connected in parallel with the filament and effectively connected across the bimetallic switch element and the said conductor so as to be activated on failure of the filament to thereby maintain continuity of the circuit through the lamp but inoperative not only as long as the filament remains intact but also on interruption of the circuit through the filament by the thermostatic switch.

Background of the invention

Field of the invention.—This invention relates to incandescent lamps, and more particularly to an intermittently operated or automatic flashing lamp wherein the filament is automatically energized intermittently.

Description of the prior art.—Incandescent flasher lamps are known at present in which a bimetallic element is provided in the lamp envelope in a position extending adjacent the filament so as to be heated thereby and arranged in the circuit to the filament in such a manner that, when the lamp is first connected to a source of electric power, the circuit through the lamp is complete and the filament is energized but when the filament heats up, the bimetallic element is also heated and deflects so as to break the circuit and deenergize the filament, the sequence of operations thereafter being repeated automatically as long as the lamp is connected to the source of electric power.

Such incandescent flasher lamps have been commonly employed in conventional series type Christmas lighting string sets as a control lamp for intermittently flashing all the series-connected lamps in the string set. The other lamps in the series circuit are customarily provided with automatically operating cutouts so that in the event a filament burns out in one of the lamps, the cutout in the defective lamp will become activated so that the remaining lamps in the series circuit will remain lighted. As the controlling lamp in the series lighting circuit, it is preferable that the flasher lamp also be provided with such an automatic cutout in order to assure the continued operation of the other lamps in the series circuit should the filament of the flasher lamp burn out or otherwise fail.

It has been previously proposed to provide incandescent flasher lamps with a cutout means operative to maintain the electrical circuit through the lamp on failure of the

filament thereof. In such prior flasher lamp constructions, however, the cutout means have been connected directly across the two leading-in conductors of the lamp. With such a construction, the cutout will be activated if the full line voltage of the series circuit is impressed across the cutout during the off or dark cycle of the flasher lamp. Should this occur, the controlling flasher lamp in the series circuit then would be no longer operative to flash the other lamps in the series circuit.

Summary of the invention

It is an object of the invention to provide an incandescent flasher lamp which will effectively and repetitively operate to intermittently flash all the other lamps in a series lamp circuit in which it is connected and which will also maintain continuity of the electrical circuit to the other lamps in the series circuit in the event of failure of the flasher lamp filament.

Another object of the invention is to provide an incandescent flasher lamp having a cutout means which will operate to maintain continuity of the electrical circuit through the lamp in case of failure of the filament thereof but which will not become activated during the off cycle of the lamp in the normal flashing operation thereof.

Briefly stated, in accordance with one aspect of the invention, a flashing lamp having a normally closed thermostatic switch comprising a bimetallic element normally connected in series with the filament of the lamp, is provided with a cutout means which is arranged in the lamp so that it will be activated and form a shunt circuit across the filament only on failure of the filament and will be automatically disconnected along with the filament from the power supply to the lamp during the off cycle thereof. The cutout is thus prevented from being activated during the off cycle which, if it occurred, would render the lamp inoperative.

Further objects and advantages of the invention will appear from the following detailed description of species thereof and from the accompanying drawing.

Brief description of the drawing

In the drawing:

FIG. 1 is an elevation, on an enlarged scale, of an incandescent flasher lamp comprising the invention.

FIG. 2 is an elevation, on an enlarged scale, of a modified form of mount structure for an incandescent flasher lamp according to the invention, embodying a different type of cutout means.

FIG. 3 is an elevation, on an enlarged scale, of another modified form of mount structure for an incandescent flasher lamp according to the invention illustrating a different mounting arrangement for the cutout means thereof.

FIG. 4 is an elevation, on an enlarged scale, of still another modified flasher lamp mount structure according to the invention illustrating another mounting arrangement for the cutout means thereof, and

FIG. 5 is an elevation, on an enlarged scale, of a further flasher lamp mount structure according to the invention illustrating a different form of glass support member for the lead-in conductors and bimetallic switch element of the mount structure.

Description of the preferred embodiments

Referring to FIG. 1, the incandescent flasher lamp there illustrated comprises a sealed glass envelope or bulb **1** provided with a neck portion **2**. Sealed into the bulb **1** by the well-known butt-seal method is a lamp mount **3** comprising a pair of lead-in conductors or wires **4, 5** which are sealed through the wall of the bulb neck **2** through the butt-seal thereof. Exteriorly of the bulb **1**, the lead-in conductors **4, 5** are electrically connected, as by soldering, to the metal side shell contact **6** and the metal end contact eyelet **7**, respectively, of a conventional type lamp base **8** suitably secured to the bulb around the neck **2** thereof, as by conventional basing cement. The lead-in conductors **4, 5** may be made of any suitable material. However, in the case of the particular butt-seal type lamp illustrated, designed for operation at relatively low voltage, for instance, less than 20 volts and preferably around 7 volts, the lead-in conductors **4, 5** are preferably made of silver-plated Dumet wire having a diameter of approximately 10 mils, for instance.

Interiorly of the bulb **1**, the lead-in conductors **4, 5** extend from the butt-seal in spaced and more or less parallel relation to each other in the direction of the bulb axis, as shown, and they are rigidly tied together and held in such spaced relation by an insulating bead or support member **9** of glass or other suitable insulating material which is fused to the lead-in conductors at a point spaced inwardly of the bulb from the butt-seal thereof.

Disposed within the bulb **1** and supported on the mount structure **3** therein is an incandescent body or light source comprising an electrical energy translation element or filament **10** preferably in the form of a wire coil of tungsten or other suitable refractory metal. One end of the filament **10** is electrically connected to the inner end of one of the lead-in conductors, i.e., lead-in conductor **4**, in a suitable manner, preferably by being clamped thereto. The other end of the filament **10** is eletcrically connected in a suitable manner to the free end of an electrically conductive support comprising a bimetallic element or strip **11**, preferably by being clamped to the flexing free end of the bimetallic element. The other end of the bimetallic element **11** is embedded in the glass support member or bead **9** to rigidly anchor and support the bimetallic element in place on the mount structure **3**. The bimetallic element **11** may be of any commercially available type, although for a relatively low operating voltage type of lamp such as illustrated, designed to operae at a voltage of, for example, 7 volts or thereabouts, the bimetallic element **11** is preferably composed of laminations consisting, respectively, of a copper layer and a nickel-steel layer such as that commercially known as "Invar." As shown, the bimetallic element **11** is embedded in the glass bead or support member **9** at a point between, and in insulated relation to, the two lead-in conductors **4, 5** passing therethrough, with the flat sides of the bimetallic element disposed approximately in the plane of the said lead-in conductors **4, 5**. The bimetallic element or strip **11** extends inwardly of the bulb **1** from the glass bead or support member **9** in the general direction of the lead-in conductors **4, 5**, as shown in FIG. 1, so as to locate its free or flexing filament-supporting end adjacent the inner end of the other or contact lead-in conductor **5**, with the copper face of the bimetallic element presented to and disposed opposite the inner end of said conductor **5**.

The bimetallic element **11** constitutes the movable contact member of an automatically operating thermostatic switch within the lamp bulb **1** for intermittently making and breaking the electrical circuit to the lamp filament **10**, the other or stationary contact member of the thermostatic switch being constituted by the lead-in conductor **5**. For such purpose, the inner end of the contact lead-in conductor **5** is bent to form a contact leg portion **12** which extends transversely to and across the bimetallic element **11** near its flexing free end and contacts that side thereof which flexes away from the conductor **5** when the bimetal is heated. During the manufacture of the lamp mount structure **3**, the contact leg **12** of the lead-in conductor **5** is pressed against the facing side of the bimetallic element **11** so as to have a predetermined initial contact pressure thereagainst when the bimetallic element is in its unheated and therefore unflexed state.

To improve the efficiency of heat transfer from the filament **10** to the bimetallic element **11**, as well as away therefrom, the bulb **1** is filled with a small amount of a suitable inert gas such as nitrogen, hydrogen, or helium, for example. The gas convection currents which are set up in the bulb during the operation of the lamp then act to transfer the heat to the bimetallic element, as well as away therefrom, by convection. While the pressure of the inert gas filling in the lamp bulb **1** is not critical and may be any pressure up to atmospheric, for practical purposes the filling gas pressure may range from 5 to 100 millimeters of mercury, and preferably from about 20 to 40 millimeters of mercury.

The flasher lamp construction as thus far described is in general similar to, and possesses the manufacturing and operating advantages of the flasher lamp described and claimed in my U.S. Patent 2,901,667, dated Aug. 25, 1959, and assigned to the assignee of the present invention.

When the incandescent flasher lamp shown in FIG. 1 is first placed in operation by connecting it across a source of electrical power, the bimetallic element **11**, being initially in contact with the contact leg **12** of the lead-in conductor **5**, completes the electrical circuit through the filament **10**, causing the latter to become incandescent. The resulting heat generated by the energized filament **10** is then transferred to the bimetallic element **11** by conduction, radiation and convection, causing the bimetallic element to eventually flex away from and disengage the stationary contact leg **12** of the conductor **5**, thereby interrupting the electrical circuit to the filament **10**. Because of the resulting deenergization of the filament **10**, the heat stored in the bimetallic element **11** is then dissipated therefrom, aided by the gas convection currents within the bulb, as a result of which the bimetallic element cools and returns to its original position in contact with the stationary contact leg **12** of the lead-in conductor **5**, thus automatically completing the circuit once again through the filament **10** and automatically initiating a new cycle of operation which thereafter is repeated until the lamp is disconnected from the source of electric power.

To maintain continuity of the electrical circuit through the lamp in the event the filament **10** should fail, the lamp according to the invention is provided with cutout means **13** which is nonconductive at or somewhat above the normal operating voltage of the lamp when connected in the series circuit, but which will break down and become electrically conductive upon application thereacross of an abnormal voltage appreciably above the operating voltage of the lamp, such as the full line voltage across the series circuit. This latter condition occurs when the filament **10** of the series-connected lamp fails. The cutout means **13** may be any of the usual forms commonly employed for such purpose heretofore in conventional type incandescent lamps. Thus, it may be a film type cutout such as constituted by aluminum ribbon or wire **14** having a thin insulative film or coating of aluminum oxide thereon, as illustrated in the forms of the invention shown in FIGS. 1 and 5. This insulating oxide coating may be formed electrolytically or by other well-known methods. Anodized aluminum is a preferred form of film type cutout material, the anodized surface of the aluminum constituting an insulating film of aluminum oxide. Alternatively, the cutout means **13** may be of the paste type as illustrated by the bead **15** of cutout material in the modified forms of the invention shown in FIGS. 2, 3 and 4. Such paste type cutouts are conventionally comprised of oxidized particles of aluminum or iron bound together into a paste by a suitable binder, such as by a silicone or other suitable type resin, for instance.

In accordance with the invention, the cutout means **13** of the lamp is arranged therein so that it will form a shunt circuit across the filament **10** on activation of the cutout but will be automatically disconnected along with the filament **10** from the power supply to the lamp by the opening of the bimetallic switch element **11** on each off or dark cycle of the flasher lamp. To this end, the cutout means **13** is effectively connected across the lead-in conductor **4** and the bimetallic element **11** of the lamp, in parallel circuit with the filament **10** thereof. Thus, each time the electrical circuit through the filament **10** is interrupted by the opening of the bimetallic switch element **11** during the normal operation of the lamp, the cutout **13** is also disconnected from the power supply to the lamp at the same time. As a result, the full line voltage of the series circuit is not impressed across the cutout **13**, during each off or dark cycle of the lamp, such as would normally cause the premature activation of the cutout **13**. The flasher lamp according to the invention thus remains completely operative, and will repeatedly perform its intended function of intermittently making and breaking the electrical circuit therethrough, so long as the filament **10** of the lamp remains intact. In contrast thereto, if the cutout **13** were connected directly across the two lead-in conductors **4, 5** of the lamp, the full line voltage would be impressed across the cutout on the initial interruption of the electrical circuit through the filament **10** by the bimetallic switch element **11**. The cutout **13** in such case would then become prematurely activated and electrically conductive, thereby forming a shunt circuit across the filament such as would then render the lamp thereafter inoperative for its intended purpose as a flasher lamp.

Though the cutout **13** according to the invention is arranged so as to be entirely disconnected from the power supply to the lamp during each off or dark cycle of the lamp, it nevertheless still functions to form a by-pass circuit through the lamp in the event the filament **10** should fail for some reason or other. In such event, since the bimetallic switch element **11** is of the normally closed type, the full line voltage of the series circuit is then impressed across the cutout **13**, thereby causing the activation thereof so as to become electrically conductive and thus complete an electrical circuit through the lamp. The remaining lamps in the series circuit, rather than being extinguished, are therefore kept lighted until such time as a properly operating replacement flasher lamp can be substituted for the inoperative lamp.

In the particular form of the invention as shown in FIG. 1, the cutout means **13** is comprised of one or more turns (three turns in the particular case illustrated) of anodized aluminum wire wrapped tightly around and bridging the lead-in conductor **4** and the bimetallic element **11** at a region near the anchored end of the bimetallic element in the glass bead **9**. The anodized or oxidized surface of the aluminum wire forms the insulating film or coating of the cutout means **13**. As shown, the wire conductor **4** may be formed with a V-bend or loop **16** therein extending toward the bimetallic element **11** within the bottom of which loop the wire cutout **13** is wound to thereby hold it in place on the wire conductor **4** against movement longitudinally thereof.

FIG. 2 illustrates a modified form of the invention wherein the cutout means **13** is of the paste type as described hereinabove and constituted of a bead **15** composed of an admixture of oxidized particles of iron and a suitable binder, for instance a silicone resin such as that commercially known as SR32 made by applicant's assignee, General Electric Company. As shown, the bead type cutout means **15** is located immediately contiguous the glass tie bead **9** so as to be as close as possible to the anchored end of the bimetallic element **11** where the deflection movement thereof is a minimum, thereby avoiding the likelihood of the bead **15** being flaked off the bimetal or being cracked by the deflection of the bimetal.

In the modified form of the invention shown in FIG. 3, the end of the bimetallic element **11** anchored in the glass tie bead **9** extends completely through the glass bead **9** and projects beyond the underside thereof, and the paste type cutout bead **15** is connected across the wire conductor **4** and the anchored end portion **17** of the bimetallic element which projects from the underside of the glass tie bead **9**. Since, with this modified construction, the projecting anchored end portion **17** of the bimetallic element **11** remains substantially stationary at all times and does not undergo any deflection movement during the operation of the lamp, there is therefore no tendency for the cutout bead **15** to be flaked off the bimetallic element **11**, and thus rendered inoperative, during the normal operation of the lamp.

Instead of the bimetallic element **11** itself being embedded and anchored at one end in the glass tie bead **9** as in the forms of the invention shown in FIGS. 1–3, it may be fixedly secured at its anchored end in a suitable manner, as by welding for instance, to one end of a short support wire **18** which is embedded and anchored at its other end in the glass tie bead **9**, as shown in FIG. 4. The cutout means **13** in such case may then be conveniently connected across this support wire **18** and the lead-in conductor **4**, as shown. This construction is of particular advantage where the cutout means **13** employed is of the paste type as described hereinabove, inasmuch as the support wire **18** is a fixed member which does not deflect during the operation of the lamp and therefore would not cause the cutout bead **15** to be flaked off the support wire **18** and thus rendered inoperative.

Although the invention is illustrated in FIGS. 1–4 as applied to lamps of the so-called butt-seal type employing a glass bead type lamp mount, it should be understood that the invention is applicable as well to lamps of the conventional flange seal type employing a glass stem tube **19**, as shown in FIG. 5, which is sealed into one end of the lamp bulb **1** and extends inwardly thereof and terminates at its inner end in a flattened stem press portion **20** through which the lead-in conductors **4** and **5** are sealed. The bimetallic switch element **11** is also embedded and anchored at one end in the stem press **20**. The stem press **20** thus serves as a glass support member which supports both the lead-in conductors **4, 5** as well as the bimetallic element **11**.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An incandescent flasher lamp comprising a sealed glass envelope having a glass support member therein, a pair of lead-in conductors sealed into said envelope and anchored in said glass support member, an electrically conductive support in said envelope anchored adjacent one end in said glass support member and comprising a bimetallic element having a free end in normal pressure contact with one of said conductors but adapted to flex away and disengage therefrom when heated, a filament in said envelope connected at one end to the free end of said bimetallic element and at its other end to the other one of said conductors, and cutout means connected across said conductive support and said other lead-in conductor, said cutout means being normally nonconductive but capable of breaking down so as to become electrically conductive upon application of an abnormal voltage thereacross.

2. An incandescent flasher lamp as specified in claim **1** wherein the said conductive support consists in its entirety of the said bimetallic element.

3. An incandescent flasher lamp as specified in claim **1** wherein the said cutout means is comprised of a metal conductor having an insulative oxide film thereon.

4. An incandescent flasher lamp as specified in claim **1** wherein the said cutout means is comprised of anodized aluminum.

5. An incandescent flasher lamp as specified in claim **1** wherein the said cutout means consists of a bead com-

prised of an admixture of oxidized iron powder and a resin binder.

6. An incandescent flasher lamp as specified in claim 1 wherein the said glass support member comprises a glass bead bridging said conductors interiorly of said envelope and holding them in place in spaced apart relation.

7. An incandescent flasher lamp as specified in claim 6 wherein the said conductive support consists in its entirety of a bimetallic element and the said cutout means is connected across the said conductive support and the said other conductor at a region thereof immediately contiguous the said glass bead.

8. An incandescent flasher lamp as specified in claim 7 wherein the end of said bimetallic element anchored in said glass bead extends completely therethrough and projects therefrom and the said cutout means is connected across the said other conductor and the said projecting end portion of the anchored end of said bimetallic element.

9. An incandescent flasher lamp as specified in claim 1 wherein the said conductive support comprises a rigid support wire embedded in said glass support member and a bimetallic element rigidly fastened at one end to said support wire, and said cutout means is connected across the said rigid support wire and the said other conductor.

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U.S. Cl. X.R.

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