April 30, 1957 G. A. WISWELL 2,790,933

FLASHING INCANDESCENT LAMP

Filed Dec. 21, 1953

Fig. 1.

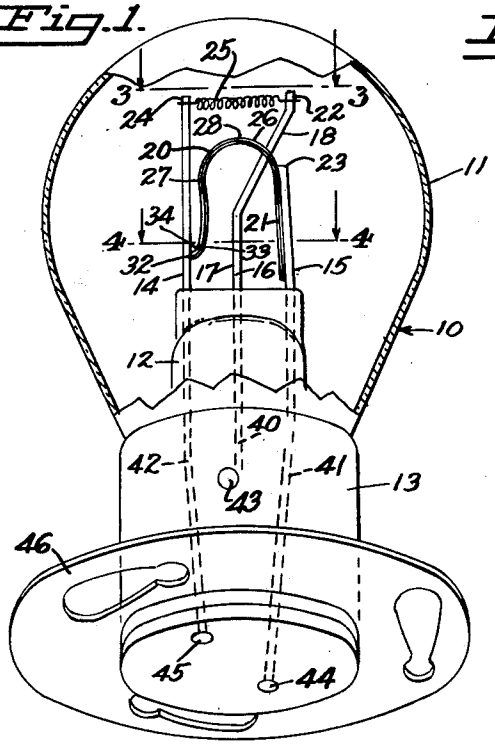


Fig. 2.

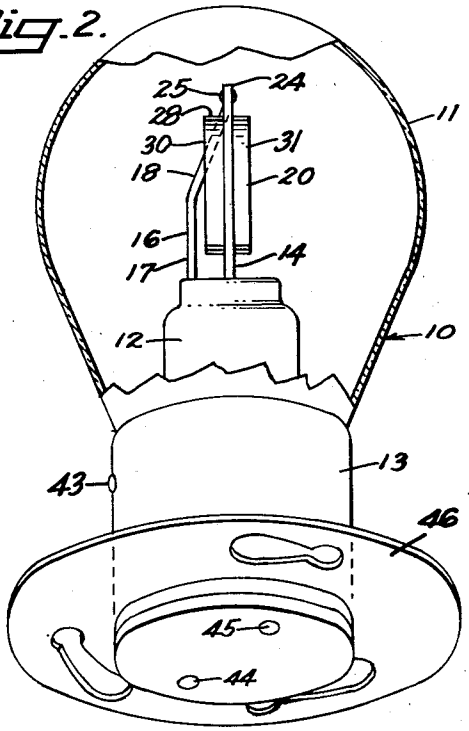


Fig. 3.

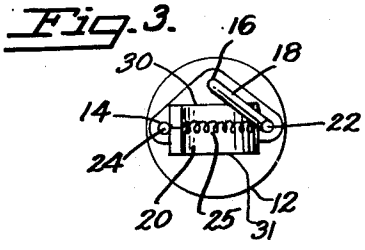


Fig. 4.

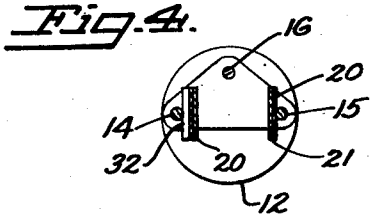


Fig. 5.

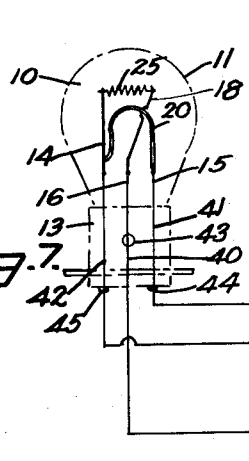


Fig. 6.

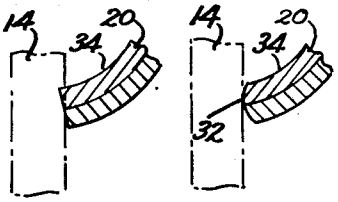
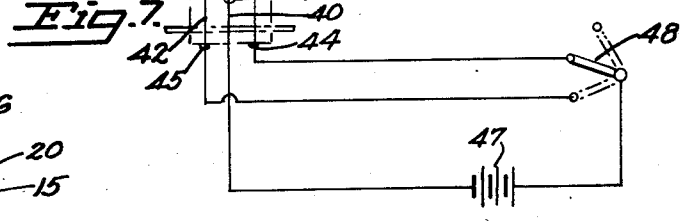


Fig. 7.



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2,790,933

FLASHING INCANDESCENT LAMP

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Application December 21, 1953, Serial No. 399,215

6 Claims. (Cl. 315—72)

This invention relates to improvements in incandescent lamps of the type employing the so-called "bi-metal strip," a composite strip made up of two metal strips secured together face to face, each strip being made from a different metal and having a different temperature coefficient of expansion, so that changes in temperature bend the composite strip back and forth to make and break the electrical connection to the lamp filament.

Flashing incandescent lamps of this general type are old, but the present invention has solved several important problems which have heretofore prevented their wide use. This invention presents, for the first time, a rugged and practical lamp that is capable of being used in such applications as highway warning lamp assemblies where rigorous specifications are laid down by the state highway departments. For example, it is a common requirement for such lamps that the light come on at regular intervals averaging once per second and produce substantial illumination each time. It is also a requirement that the lamp be able to stand up under the type of treatment to be expected from use on a highway. It is also essential that the lamp be capable of manufacture in large quantities with a small number of rejections for non-uniformity, because the lamp must be competitive in price with other types of highway warning lamps.

My invention replaces the old-fashioned oil flame devices, such as lanterns and flare pots, and other types of electric warning lamps. It may be used to identify excavations, as where ditches are dug across a road, to mark construction features such as bridge repairs which cannot otherwise be seen at night, and to give warnings preceding and following wrecked trucks and automobiles so that the other cars on the highway will not run into them and cause additional accidents.

Flare pots and lanterns were unsatisfactory because they were often blown out or over by strong winds, quenched by strong rains, or put out by being knocked over. If the flame was not extinguished when a pot or lantern was blown or knocked over, the burning flame tended to start fires. Also, the expense of keeping them refueled was great.

Other warning means have been tried, some of them using electric lights and batteries. Those with ordinary flashers tended to exhaust the battery too quickly. Others, including those where a condenser built up a charge from a dry cell battery and then discharged through a flashing lamp, gave too faint a light and too brief a flash. All of them were difficult to maintain and complicated to service, and most of them involved intricate or delicate parts. Also, most of them proved to be unreliable because of the effect of weather conditions on the mechanisms.

It was heretofore believed that flasher lamps of the bi-metal type were unsuitable because of the difficulty of obtaining large numbers of lamps with uniform characteristics and because of the delicacy which was heretofore believed to be inherent with this type of lamp. Manufacturers had long declared that the lamps heretofore available were useless in these applications, in spite of the fact that the action of bi-metal strips to make and break electric currents has been known for years. It

is illustrated by the Miller Patent No. 884,514 of April 14, 1908, where such a strip was used to turn a light bulb on and off. However, Miller used an electric heater independent of the lamp filament, and his structure was not at all practical for the uses which I have indicated.

The Putt Patent 1,994,620 of March 13, 1935, employed a bi-metal element to break a circuit and utilized the heat from the lamp filament to operate the bi-metal strip. However, with Putt's structure the tolerances in manufacture are so close and the delicacy of the parts so great that it is almost impossible to turn out a flasher lamp that will stand up to highway warning conditions, and it is certainly impossible to make one which can be manufactured in quantity to the rigid specifications of uniformity. Putt placed his bi-metal strip on a plane perpendicular to the vertical plane of the filament. This would appear, at first glance to be natural and the best way to dispose the elements. However, I have discovered that this structure makes Putt's lamp completely impractical. Moreover, the shape of Putt's bi-metal element has proved to be defective both for making contact and for true stability.

Since Putt, other inventors have attempted to devise bi-metal-operated flashing lamps, and have received such patents as Nothstine 2,044,256, June 16, 1936; Davis, Jr. 2,235,360 of March 18, 1941, and 2,442,845 of June 8, 1948; and MacGregor 2,361,485 and 2,361,486, both of October 31, 1944. None of these provided anything better than Putt, so far as application to satisfactory highway warning lamps is concerned. Many of them utilized flat bi-metal strips instead of curved ones and therefore obtained very poor mechanical advantage as well as poor contact action. Those using curved strips still failed to solve the problem of how to get uniform, standardized, high quantity production and the problem of how to obtain ruggedness. They all failed to stand up under hard use.

I have solved the above problems, which have existed in this art for the past twenty or thirty years and which were not solved by the patents enumerated above. My solution involves placing a wide, generally U-shaped, arcuate strip of bi-metal generally in the same vertical plane as the lamp filament, with its arc portion generally parallel to the lamp filament (speaking from a mechanical standpoint, not parallel in the sense of an electric circuit). By having the filament lie directly over and parallel to the top arc of a wide bi-metal strip, the tolerances need not be so close as where the filament and bi-metal strip extend in directions perpendicular to each other, and very uniform results can readily be obtained in quantity production.

In addition to providing the parallel mounting of the bi-metal strip with the lamp filament, I have achieved stability of the lamp as a whole by a novel mounting of the rigid end of the bi-metal strip so that a substantial linear portion thereof is supported by a stocky metal post member to which it is welded or fused. This eliminates the danger of the bi-metal strip breaking off or failing to keep contact at its stationary end, as did the strips shown by the patents which have been listed above.

A further feature which has very important results is that the free end of the bi-metal strip is provided with a reverse curve portion near its moving end, so that, instead of relying for contact on a rather long blunt surface, contact is made by an edge, providing a microscopic, sliding shoe action. This achieves precise timing with a minimum amount of delicacy and is adapted to precision quantity production.

Another important feature of the invention is that the contact edge is beveled or honed to give very accurate contact action.

Another feature is that the shape of the strip provides great mechanical advantage. The length of the moving contact leg of the strip is approximately twice the radius of the arc, or greater. This enables a relatively small amount of mechanical energy to produce a clean make and break, and also permits wider manufacturing tolerances.

A further novel feature of the invention is the provision of an internal circuit by which the lamp can be made to operate either as a flasher lamp or as a steady light, simply by throwing a terminal switch outside the lamp.

Still other objects and advantages of the invention will appear from the following detailed description given in accordance with 35 U. S. C. 112 but without the intention of narrowly limiting the invention to all of the specific details which will be described in the embodiments set out below.

In the drawings:

Fig. 1 is a view in perspective looking at the lamp from slightly below the base, with most of the globe portion broken away to show the disposition of the filament and the bi-metal strip inside the lamp.

Fig. 2 is a view similar to Fig. 1 but with the lamp rotated ninety degrees to the right.

Fig. 3 is a plan view taken along the line 3—3 in Fig. 1.

Fig. 4 is a view in section taken along the line 4—4 in Fig. 1.

Fig. 5 is an enlarged view in detail and partly in section of the contact area of the moving leg of the bi-metal strip in the lamp of Fig. 1, before honing.

Fig. 6 is a view similar to Fig. 5 after the end of the moving leg has been honed.

Fig. 7 is a circuit diagram showing how the same lamp may be used to give either a steady light or a flashing light.

Figs. 1–7 illustrate a preferred flasher lamp **10** embodying the principles of the invention. The lamp **10** includes a glass envelope **11** welded to a glass stem press **12** which is cemented to a flanged metal base **13**. In the stem press **12** are mounted the lower ends of three posts **14**, **15**, and **16**. The post **14** preferably extends up vertically straight to a relatively high level. The post **15** lies directly opposite the post **14** and extends up vertically, but for a much shorter distance. A curved bi-metal strip **20** has its stationary leg **21** brazed or welded to the post **15**, the weld preferably extending along a considerable distance and the rigid leg **21** being flat and rectilinear for that purpose.

The post **16** is preferably located about equidistant from the posts **14** and **15** so as to form a third point of an isosceles triangle. The post **16** has a short straight, vertical portion **17**, above which is an inclined portion **18** that extends up for the rest of its height, to a point **22** almost as high as the post **14**. An important feature of the lamp is that the upper end **22** of the post **16** is approximately directly above the upper end **23** of the post **15** and lies substantially at the same height as the upper end **24** of the post **14**.

Connecting the upper ends **22**, **24** of the posts **14** and **16** is the lamp filament **25**. The filament **25** thus lies above and substantially in an extension of the plane connecting the posts **14** and **15**. The posts **14**, **15**, and **16** may be made from the same metals normally used in light bulbs such as stainless steel alloys or copper alloys. The filament **25** may be made from tungsten, also as in ordinary bulbs.

The bi-metal strip **20** when looked at from the side as in Fig. 1 is generally arcuate, with variations which will be noted later. As already stated, the stationary leg **21** is substantially linear along the vertical plane, and is welded or brazed to the post **15** preferably for substantially the whole distance which the post **15** extends above the stem press **12**. Adjacent the upper end **23** of the post **15**, the bi-metal strip **20** has an arc portion **26**, curved approximately 180°, its radius R being less than half the length of the free or moving leg **27**. It will be observed that the strip **20** is flat and much wider than the filament **25**. It lies in or very close to the same vertical plane as the filament **25**, and the arc portion **26**, or the horizontal plane tangent to it at the highest part **28** of the arc **26**, is generally parallel to the filament **25**. Therefore the strip **20** is responsive to all of the heat which the filament **25** puts out. The location of the filament **25** toward either side edge **30** or **31** of the bi-metal strip **20** will not substantially affect the operating characteristics of the lamp, and this is an important feature of this invention. While it has been stated that the arc top **28** and filament **25** are parallel, this should not be taken too literally, for the filament **25** may extend at some slight angle with respect to the side edges **30**, **31** of the strip **20**, so long as it does not have any substantial portion extending beyond these side edges **30**, **31**. Also the filament **25** may lie on somewhat of a slope with respect to the base plane of the lamp, and this will not substantially affect the operation, because of the generally parallel location, with the filament **25** extending along the same general direction as the side edges **30**, **31** of the bi-metal strip **20** and spaced above the strip at a distance which is readily standardized between the tops **22**, **24** of the posts **15** and **16**.

Normally, when the lamp is cold, the lower edge **32** of the free leg **27** of the strip **20** contacts the post **14**. When current is turned on, it will pass through the post **15** and strip **20** to the post **14** and will light the filament **25**. As the filament **25** is hot, it heats the bi-metal strip **20**, causing the leg **27** to be retracted from the post **14**, breaking contact. When the strip **20** cools, contact is again made. This invention includes novel structural features that aid in making this contact and in providing uniform and foolproof and make-and-break characteristics. These features are very important in making it possible to produce a quantity item with satisfactory uniformity. For one thing, the free leg **27** of the curved strip **20** is not linear as was the stationary leg **21**, but is curved in slightly at **33** and then curved out again at **34** so that the edge **32** becomes a protruding lip. This reverse curve feature serves to amplify somewhat, the mechanical advantage obtained by having the moving leg **27** substantially longer than the radius R of the arc **26**, but even more important it serves to make contact between an edge **32** and the post **14** instead of between a blunt surface and the post. A blunt surface, as shown in the prior art, tended to warp somewhat in use and was sometimes already warped when installed (the warping not being detectable by the naked eye). My contact edge **32** has proven substantially uniform. Contact may be improved by honing the outer edge **32** slightly so as to produce the convex beveled edge shown in Fig. 6, instead of the ragged rectangular edge shown in Fig. 5.

In order for the same lamp to obtain either intermittent or steady operation all three posts **14**, **15**, **16** are provided with lead wires **40**, **41**, **42** respectively, which extend out through the stem press **12**. The lead wire **40** extends from the post **16** to a soldered contact point **43** in the metal base **13**, and is electrically in contact with the metal flange **46**. The lead wire **41**, the one leading from the post **15**, goes down through the base **13** to a contact **44** insulated from the base **13**. Normal (intermittent) operation is obtained by placing current across the terminals **43**, **44** (or across the flange **46** and the terminal **44**, which is the same thing). The third lead wire **42** extends from the post **14** out through the base **13** to a contact **45** insulated from the base, and when voltage is placed between the contact **45** and the flange **46**, the operation is steady.

When the contacts **43**, **44** are placed across a battery **47** or other source of electric current, the current flows from the contact **44** into the post **15**, passes through the

bi-metal strip **20** to the post **14**, goes up the post **14**, and through the filament **25** to the post **16**, and then passes down to the other contact **43** and the flange **46**. The current which lights the globe and produces the warning light simultaneously heats the filament **25**, and this heat affects the bi-metal strip **20** causing it to curve, so that its end **32** is retracted from the post **14**, breaking contact with the post **14** and thereby interrupting the current. When the current is so interrupted, there is no load on the battery, and this is an important point for highway warning systems. The actual lighting time may be about two or three tenths of a second for each second, which means that the lamp is lighted only about two or three tenths of the time it is in use instead of placing a constant strain on the battery.

When a switch **48** is thrown, the current flows between the posts **14** and **16**, and the filament **25** is lighted steadily. The bi-metal strip **20** then conducts no electricity and is completely removed from operation.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

1. An incandescent flasher bulb including in combination with an envelope, a stem press, and a metal base; three metal posts extending up into said envelope from said stem press, there being a first vertical post, a second shorter vertical post, and a third post with a lower vertical portion and an upper inclined portion terminating at a point substantially directly above the upper end of said second post and approximately on the same level as the upper end of said first post, said second and third posts having electrical leads out from the stem press; a lamp filament connecting said third and first posts at their upper ends; an arch-shaped bi-metal member in substantially the same vertical plane as said filament and comprising a flat strip with a stationary leg secured rigidly to said second post, an arched portion extending toward said first post, and a movable leg adapted to make intermittent contact with said first post.

2. An incandescent flasher bulb including in combination with an envelope, a stem press, and a metal base; three metal posts extending up into said envelope from said stem press, there being a first erect post extending vertically upwardly; a second erect post extending vertically upwardly for a shorter distance than said first post, and a third post extending upwardly vertically for approximately the same distance as said second post and then extending at an angle to a point where it is substantially directly above the upper end of said second post and is approximately on a level with the upper end of said first post; a lamp filament connecting said third and first posts at their upper ends; an arch-shaped bi-metal member in substantially the same vertical plane as said filament and comprising a flat strip with a stationary leg secured rigidly to said second post, an arched portion extending above said second post and toward said first post and a movable leg having a recurved end portion adapted to make intermittent contact with said first post; and electrical leads to said second and third posts.

3. An incandescent bulb adapted to give an intermittent light or a steady light, including in combination a glass envelope; a glass stem press; a metal base; three posts secured in said stem press and extending up into said envelope, there being a first vertical post, a second shorter vertical erect post, and a third post with a lower vertical portion and an inclined upper portion, its upper end lying substantially directly above the upper end of said second post and approximately on a level with the upper end of said first post; a filament connecting the upper ends of said third and first posts; an arcuate bi-metal strip lying generally in the same vertical plane as said filament, said strip having a planar stationary leg secured to said second post, an arc portion extending thereabove and out toward said first post, and a depending free leg twice as long as the diameter of the arc portion having a recurved end portion with a honed edge adapted to make intermittent contact with said first post; and lead wires, one to each of the three posts, whereby the light will be intermittent when the second and third posts are connected across a source of electric current and will be steady when the first and third posts are so connected.

4. An incandescent bulb adapted to give a flashing light, including in combination a glass envelope; a glass stem press; a metal base; three posts secured in said stem press and extending up into said envelope, there being a first vertical post, a second shorter vertical erect post, and a third post with a lower vertical portion and an inclined upper portion, its upper end lying substantially directly above the upper end of said second post and approximately on a level with the upper end of said first post; a filament connecting the upper ends of said third and first posts; an arcuate bi-metal strip lying generally in the same vertical plane as said filament, said strip having a planar stationary leg secured to said second post, an arc portion extending thereabove and out toward said first post, and a depending free leg adapted to make intermittent contact with said first post; and lead wires, one to each of the second and third posts.

5. An incandescent bulb adapted to give a flashing light, including in combination a glass envelope; a glass stem press; a metal base; three posts secured in said stem press and extending up into said envelope, there being a first vertical post, a second shorter vertical erect post, with an electric lead wire extending therefrom through said base, and a third post also with an electrical lead through said base and with a lower vertical portion and an inclined upper portion, its upper end lying substantially directly above the upper end of said second post and approximately on a level with the upper end of said first post; a filament connecting the upper ends of said third and first posts; and an arcuate bi-metal strip lying generally in the same vertical plane as said filament; said strip having a planar stationary leg secured to said post, an arc portion extending thereabove and out toward said first post, and a depending free leg at least twice as long as the diameter of the arc portion, having a recurved end portion with a honed edge adapted to make intermittent contact with said first post.

6. An incandescent flasher bulb comprising a closed envelope with a pair of posts supporting a filament; a bi-metal arched strip mounted below and close to in the same general vertical plane as said filament and responsive to direct radiation therefrom along a substantial area, said strip having a stationary leg and also having a movable leg curved in the opposite direction from the curve of the arch and terminating in a honed edge adapted for intermittent contact with one said post so that the pressure of said movable leg on said post can be regulated by adjusting the curve of said movable leg and so that an accurate sharp contact with said post is obtained; and electrical leads to the other said post and to said strip stationary legs so that the current flow is completely interrupted and the lamp draws no current when said contact is broken.

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