March 19, 1963 J. J. ZECCA ETAL 3,082,349

FILAMENT CONNECTION FOR ELECTRIC LAMPS

Filed March 18, 1960

FIG. 1.

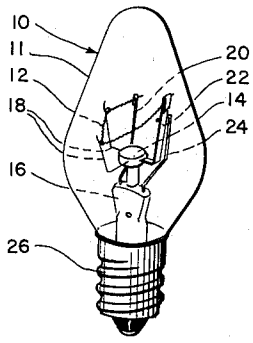


FIG. 2.

FIG. 3.

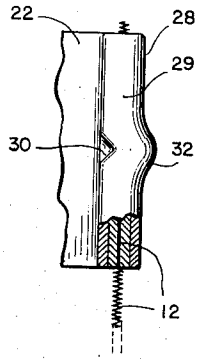


FIG. 6.

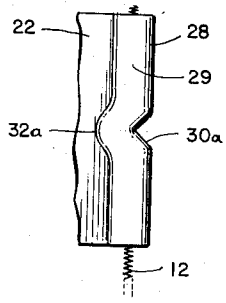


FIG. 4.

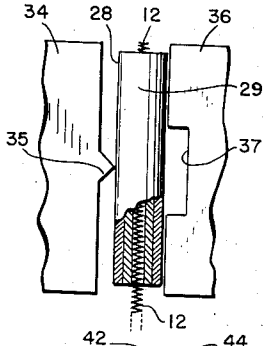


FIG. 5.

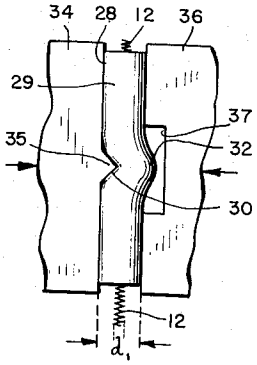
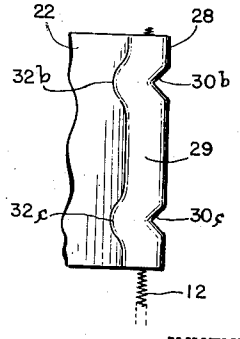


FIG. 7.



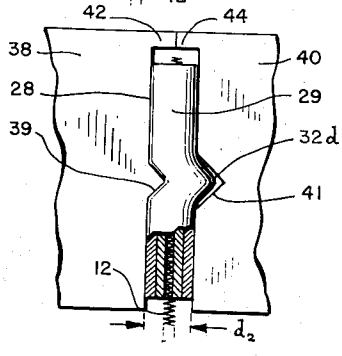


FIG. 8.

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FILAMENT CONNECTION FOR ELECTRIC LAMPS

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This invention relates to electric lamps and, more particularly, to an improved filament connection for a flashing incandescent lamp.

Recently there has been developed and marketed a so-called "flashing" incandescent lamp wherein the filament is intermittently energized and de-energized by means of a bimetallic element that is attached directly to one end of the filament and adapted, in response to changes in the filament temperature, to switch the filament into and out of the circuit. The bimetallic member is in the form of a flat strip that is free to flex and is so disposed that when thermally actuated it makes-and-breaks contact with one of a pair of lead-in conductors sealed into the lamp. The other end of the filament is connected to the other of said conductors and the filament is thus periodically lighted by the action of the bimetal to produce a scintillatnig or flashing effect that is useful in decorative lighting and for warning and advertising purposes. A lamp of the aforesaid character and the resultant advantages over the prior art flashing arrangements are described in detail in U.S. Patent No. 2,901,667 dated August 25, 1959.

For reasons of economy and simplicity of construction the filament is connected to the free end of the bimetallic strip by means of a clamp that is formed on the end of the strip and closed around the filament. While this type of connection effects the juncture of the aforesaid members without soldering or welding, it presents a serious problem in that the bimetallic clamp tends to flex and open up when cooled or heated, depending upon whether the end of the strip is bent toward the side of the bimetal that has the higher or lower coefficient of expansion. As a result, the filament gradually becomes loose within the clamp as the latter flexes with changes in temperature and may eventually drop out of the clamp and render the lamp inoperative.

It is accordingly the general object of the present invention to provide a flashing incandescent lamp that can be economically manufactured and will have a long useful life.

A more specific object is the provision of a connection joining the filament and bimetallic element of a flashing incandescent lamp or the like which can be quickly and inexpensively fabricated and maintains the aforesaid members securely interlocked one with another throughout the useful life of the lamp.

A better understanding of the invention will be obtained by referring to the accompanying drawing wherein:

FIG. 1 is a perspective view of a flashing incandescent lamp that incorporates the improved filament connection of this invention;

FIG. 2 is a perspective view on a greatly enlarged scale of the bimetallic member and associated portions of the filament and lamp stem;

FIG. 3 is an enlarged plan view of the filament connection shown in FIG. 2, a part of the bimetallic clamp being broken away to illustrate the manner in which the filament is partly collapsed by and locked within the clamp;

FIGS. 4 and 5 are plan views illustrating the initial and final steps, respectively, in closing and crimping the

bimetallic clamp with a pair of specially shaped jaws in accordance with this invention;

FIGS. 6 and 7 are plan views of other types of clamps according to the invention; and

FIG. 8 is a view corresponding to FIG. 5 but illustrates another type of clamping apparatus and clamp configuration.

While the invention may be advantageously employed to join various types of elements one of which is heat sensitive, it is especially adapted for use in connecting the bimetallic member of a flashing incandescent lamp to the filament thereof and has accordingly been so illustrated and will be so described.

In FIG. 1 there is shown a flashing incandescent lamp **10** which comprises an envelope **11** having a filament **12** sealed therein that is supported in the desired configuration by a plurality of supports **18**, a lead-in conductor **20** and a bimetallic member **22**. The aforesaid supports and bimetallic member are embedded in and insulated from one another by a button **14** formed on the end of a vitreous support such as a re-entrant glass stem **16**. As shown, the filament **12** is connected at one end to the lead-in conductor **20** and at its opposite end to the bimetallic member **22** which member is normally disposed in pressure contact with another lead-in conductor **24**. Both of the aforesaid conductors are, in turn, sealed through the stem **16** and connected with a base **26** attached to the sealed end of the envelope **11**.

As shown more clearly in FIG. 2, the bimetallic member **22** comprises a flat strip of dissimilar metals such as a layer of nickel-steel alloy known in the art as "Invar" and a layer of copper or silver, which layers are bonded together. The bimetallic strip is disposed in heat-receptive relationship with the filament **12** and is adapted in response to changes in the temperature thereof to flex and intermittently connect the filament to the lead-in conductor **24**, thereby periodically completing the circuit and producing the desired flashing of the filament. Flashing incandescent lamps of this type are well known in the art and are described in detal in the aforesaid U.S. Patent No. 2,901,667.

As shown in FIG. 2, the filament **12** is connected to the bimetallic member **22** by means of a flat clamp that is closed around and firmly grips the end of the filament. The aforesaid clamp is formed by bending the free end of the bimetallic strip back upon itself into a hook of the proper dimensions that is of U-shaped configuration when closed. Since the clamp **28** is fabricated from bimetallic material it is heat sensitive and inherently tends to open up when heated or cooled. It will tend to open when heated if the end of the bimetal strip is bent toward the metal layer that has the higher coefficient of expansion, that is, if the clamp **28** is formed in a manner such that the higher coefficient metal comprises the inner surface of the clamp. conversely, if the relationship of the metal layers is reversed or if the end of the strip is bent in the opposite direction, then the high expansion metal will form the outer surface of the clamp and the latter will close tightly when heated and tend to open up when cooled. In either case, the clamp **28** flexes with changes in temperature and tends to open up thereby enabling the filament **12** to work free and even eventually fall out of the clamp resulting in premature failure of the lamp.

The aforesaid difficulty is very conveniently and inexpensively remedied according to the present invention by deforming or crimping the clamp **28** either during or after it is closed around the inserted section of the filament **12**. More specifically, the clamp **28** (as shown in FIGS. 2 and 3) is deformed to provide an indent or groove **30** in one of its faces and a protuberance or rib **32** in its opposite face, said groove and rib being aligned one with another

and together constituting a "corrugation," so to speak, that extends longitudinally from the bend **29** of the clamp, preferably to the end of the bent-over segment of the strip and at least to a point beyond the innermost part of the clamped-in section of the filament **12**. The clamp **28** is thus rigidified for a sufficient portion of its length and in such a direction that the overlapped end segment of the bimetal strip **22** is prevented from flexing and thus maintained in anchored relationship with the filament **12**.

Preferably, the clamped-in section of the filament **12** is disposed to nest within and lie parallel to the bend **29** of the clamp **28** and the pressure applied to the clamp during the closure thereof is controlled to only partly collapse the clamped-in section of the filament, as shown in FIGS. 2 and 3, respectively. However, the filament **12** will remain firmly anchored within the clamp **28** even if it is not located within the bend **29**, providing it is located between portions of the clamp that are stiffened by the groove **30** and rib **32** and is disposed transverse thereto and, thus, to the direction of stiffening.

As shown in FIGS. 4 and 5, the aforesaid closing and crimping of the clamp **28** can be very readily accomplished by means of a pair of clamping jaws **34** and **36**, one of which has a wedge-shaped projection **35** on its work face and the other of which has a generally rectangular relief cavity or channel **37** therein. The remaining portions of the work faces of the jaws are flat so that when the jaws are advanced toward one another by a suitable actuating means (not shown) and spaced apart a predetermined distance d_1 as shown in FIG. 5, the clamp **28** will be simultaneously closed around and partly collapse the included section of the filament **12** and the aforementioned groove **30** and rib will be stamped therein.

By reversing the position of the jaws **34** and **36** or the clamp-and-filament assembly when placed therebetween, the clamp **28** will be crimped in the opposite direction thereby providing a groove **30***a* and rib **32***a* that are directed inwardly toward the stem **14**, as shown in FIG. 6.

If a greater degree of stiffening is desired, matching sets of grooves **30***b* and **30***c* and ribs **32***b* and **32***c* may be provided to form a pair of parallel spaced corrugations as shown in FIG. 7.

In FIG. 8 there is shown a modified set of clamping jaws **38** and **40** wherein the relief channel **41** is of wedge-shaped configuration and aligned with but slightly larger than the wedge-shaped projection **39** provided on the work face of the other jaw. Thus, the stiffening rib **32***d* as formed by these jaws is somewhat more pronounced and more sharply defined than when a rectangular channel **37** is employed as above-described.

The clamping jaws **38** and **40** are also provided with stops **42** and **44** at one end which coact to limit the inward travel of the jaws and provide a predetermined spacing d_2 between the jaw faces so as to effect the desired closure of the clamp **28** without crushing the included section of the filament.

It will be recognized from the foregoing that the objects of the invention have been achieved by providing a mechanical and electrical connection between a bimetallic heat-sensitive member and a filament which connection is not only simple and inexpensive to make but securely anchors the members together despite subsequent heating or cooling of the bimetal.

While several embodiments of the invention have been illustrated and described, it will be understood that various modifications in the configuration and the arrangement of parts can be made without departing from the spirit and scope of the invention.

We claim:

1. A filament connection comprising a wire filament, and a bimetallic member having a flat clamp formed at one end that is closed around and grips said filament, said clamp having a deformation in at least one of its exterior faces that extends transversely of the clamped-in section of said filament and longitudinally of said clamp and thereby rigidifies said clamp and prevents it from opening under varying temperature conditions, whereby said clamp is rendered less sensitive to variations in temperature and is maintained in mechanical and electrical engagement with said filament even when the latter is energized.

2. A filament connection as set forth in claim 1 wherein both exterior faces of said clamp have deformities that are aligned with one another and constitute a crimp that extends longitudinally of the clamp from the bend thereof.

3. In a flashing incandescent lamp containing an elongated bimetallic member attached to said filament and operable in response to variations in its temperature to effect the periodic energization and de-energization thereof, a flat clamp formed on the end of said bimetallic member that is closed around and grips said filament and effects the connection thereof with said bimetallic member, the clamped-in section of said filament extending transversely of said bimetallic member and clamp, and said clamp having an indent in one of its exterior faces that extends longitudinally of said clamp from the bend thereof to a point beyond at least the innermost part of the clamped-in section of said filament, whereby said clamp is rigidified along a direction transverse to the clamped-in section of said filament and maintained in interlocked relationship therewith under varying temperature conditions.

4. A bimetallic clamp and filament connection as set forth in claim 3 wherein said clamp has a protuberance in its other exterior face that is aligned with said indent and together therewith forms a corrugation that extends longitudinally from the bend of said clamp beyond and transversely of the clamped-in section of said filament.

5. In a flashing incandescent lamp containing a coiled filament and a flat bimetallic strip attached to said filament and operable in response to variations in temperature to effect the periodic energization and de-energization thereof, a U-shaped clamp on the end of said bimetallic strip comprising a bent-over end segment and the adjoining overlapped segment of said strip that are compressed one against the other and grip said filament thereby effecting the connection thereof with said bimetallic strip, said clamp having an indent in one of its exterior faces and a matching protuberance in its opposite exterior face that are aligned one with another and constitute a corrugation that extends longitudinally from the bend of said clamp to the end of the bent-over end segment of said strip and thus rigidifies said clamp, the clamped-in section of said filament being located substantially within the bend of said clamp and extending transversely of the aforesaid corrugation, whereby said filament section is locked within and in electrical engagement with said clamp despite changes in the temperature thereof.

6. A filament connection comprising a wire filament and a bimetallic member having a clamp at one end that is closed around and grips said filament, said clamp having a deformation in its exterior surface that rigidifies and prevents the clamp from opening under varying temperature conditions.

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