

United States Patent [19]

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[54] INCANDESCENT LAMP WITH INTERNAL FUSE

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[52] U.S. Cl. 315/74, 313/315

[51] Int. Cl. H01k 1/66

[58] Field of Search 315/74; 313/315

[56] References Cited

UNITED STATES PATENTS

3,211,942 10/1965 Wiley 313/315

3,211,943 10/1965 Cardwell 315/74 X
3,211,950 10/1965 Cardwell 315/74
3,346,768 10/1967 Patsch 315/74

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[57] ABSTRACT

An incandescent lamp having a coiled-coil filament connected to at least one formed spud, which is embedded in a pinch seal, contains at least one fuse member internal to the lamp envelope. The fuse member has a coiled portion which is connected to the spud and a leg portion which is connected to a lead-in conductor.

7 Claims, 3 Drawing Figures

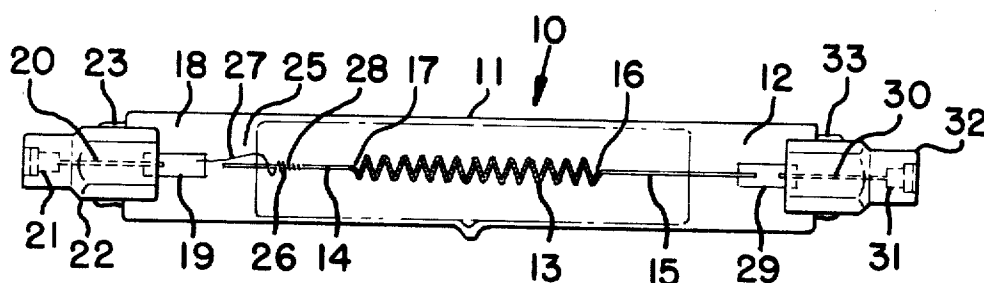


Fig. 1

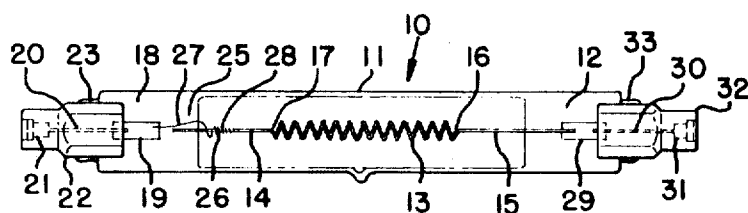


Fig. 2

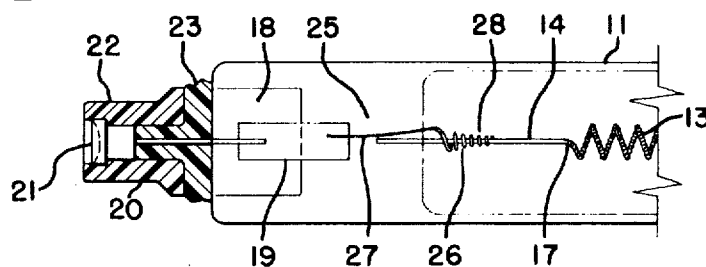
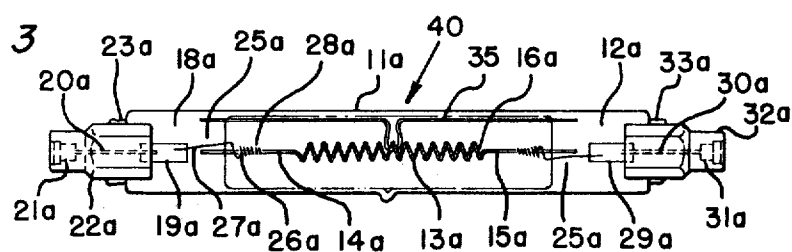


Fig. 3



INCANDESCENT LAMP WITH INTERNAL FUSE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates generally to incandescent lamps. More particularly, the invention relates to incandescent lamps having a fuse member internal to the lamp envelope.

2. Description of the Prior Art

It has been common practice to provide a fuse for certain high efficiency tungsten-halogen type lamps because these lamps have a tendency to develop an ionized arc which causes a flow of high current as is more fully described in Wiley U.S. Pat. No. 3,211,942. Two such fuse devices are described in Cardwell U.S. Pat. Nos. 3,211,943 and 3,211,950, assigned to the assignee of the present invention. Both fuse constructions referred to above are internal to the lamp envelope which means that any arc which occurs at lamp filament failure will be quenched inside the envelope.

By contrast, there are lamp constructions having external fuse designs such as illustrated in U.S. Pat. No. 3,274,426. The disadvantages of this type of construction are the number, complexity and expense of the parts which must be assembled and the necessity for the arc which commences inside the lamp to continue through the lamp pinch seal before it is interrupted by the fuse located in the base, external to the envelope.

Certain lamp applications require a very fine small diameter wire to make a coiled-coil. The same applications also require a small diameter wire fuse. Prior art fuse constructions mentioned above are not readily adaptable to these fine wire type lamps. Because of the delicate nature of the filament wire, it might easily break while in transit or during other handling. Furthermore, wire which is very thin does not lend itself for threading a fuse member onto a coiled-coil, such as an overwind, as shown in Cardwell U.S. Pat. No. 3,211,943.

Consequently, formed spuds, such as J-hooks or helispuds, are inserted into the ends of the coiled-coil to give stability to the fine wire filament. J-hook spuds or supports are more fully described in U.S. Pat. Nos. 3,441,772 and 3,441,776. These spuds are metal conductors with a curved portion which fits inside a portion of the first secondary turn of the coiled-coil or a primary leg. Although the formed spud is a good conductor and gives mechanical support to the filament, this construction has the disadvantage of conducting heat back into the seal area thereby causing foil shaling and other forms of seal failure. Another problem with formed spuds is because of their relatively large diameter the spud makes a good "electrode" to conduct the arc when the filament fails.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide a lamp with an internal fuse which will protect the lamp circuit from high amperage damage. A further object of the invention is to provide a fuse internal to the lamp envelope so that any arc may be terminated at the earliest possible moment. Still another object of the invention is to provide a fuse construction with a minimum number of parts and a minimum number of manufacturing steps to assemble the lamp. Yet another object of the invention is to provide an internally fused lamp with a formed spud construction which gives good me-

chanical support and precise location to the filament.

The objects of the invention are achieved by providing a lamp comprised of a vitreous envelope of glass or quartz having a pinch seal at least at one end thereof.

Contained within the envelope is a filament preferably of tungsten and preferably of the coiled-coil variety. At least one end of the filament is connected to a formed spud through the insertion of a curved end of the spud into a portion of the primary turn of the filament.

The other end of the formed spud is sealed into the pinch seal to prevent any movement. A fuse member containing a coiled portion and a leg portion is positioned on the spud by inserting a straight section of the spud into the coiled portion of the fuse and by attaching the coiled portion to the straight section by a process such as welding. The leg portion of the fuse is then attached to a lead-in conductor, a portion of which is usually a foliated piece of molybdenum. The lamp is then exhausted and filled with an inert gas and a halogen.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 of the drawing is a front elevation view of a lamp of the invention having one fuse;

FIG. 2 is a front elevation of a section of the lamp shown in FIG. 1; and

FIG. 3 is a front elevation view of another embodiment of the invention utilizing two fuses and a support.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1 of the drawing, lamp 10 is comprised of a tubular envelope 11 having pinch seals 12 and 18 at each end. Even though the preferred embodiment is shown as a double-ended lamp containing two pinch seals, it should be remembered that a single-ended lamp, one pinch seal, may also successfully utilize the invention. Coiled-coiled tungsten filament 13 is connected to formed spuds, helispuds, 14 and 15. These spuds are preferably made of tungsten. The spuds are inserted into the secondary turns of the filament, as shown at 16 and 17. The end of the spud is curved so that when it is inserted it will penetrate about one-half turn of the secondary coil.

Helispud 14 is sealed in insulating relationship to molybdenum foil 19 which is hermetically sealed in pinch seal 18. Molybdenum foil 19 is connected to outer lead 20 which makes electrical contact to a power source, not shown, through tab 21. Insulating base 22 is held firmly in place on pinch seal 18 by a quantity of cement 23.

At the other end of envelope 11, helispud 15 which is attached to coiled-coil 13 at location 16 is connected to foil 29 in pinch seal 12. Referring now to both FIGS. 1 and 2, fuse member 25 is comprised of coiled section 26 and leg portion 27. Coiled section 26 should have more than one turn of wire to facilitate supporting the formed spud and making electrical contact with it. Although not entirely necessary to practice the invention, several of the coiled segments are attached to the spud to further facilitate contact and support as shown at 28 in FIG. 2.

Leg portion 27 extends into pinch seal 12 and is attached to molybdenum foil 19. The foil in turn is connected to outer lead-in conductor 20 and tab 21. Insulating base 22 is attached to the tab and pinch seal by cement 23.

Test data from lamps of the construction illustrated in FIG. 1 indicates that lamps using a helispud and fuse member such as 25 have improved life over a construction which does not utilize the fuse but merely utilizes helispuds attached directly to foil leads. Most of the improvement appears to be due to the reduction in foil failures caused by excessive heat being conducted back to the foil from the relatively heavy helispud.

One of the lamp types used in testing is a 1,000-watt, 120-volt design known as a DXW. In this lamp, the fuse was made of tungsten wire with a 0.015-inch diameter, and it was attached as shown at 28 to a helispud of approximately 0.032-inch diameter. The particular fuses used had a minimum of five turns in the coiled section 26. With five turns, this allows welding of one or more turns to the spud but at the same time keeps a number of turns available if the welded turns would fracture due to tungsten embrittlement. The other turns could continue to support and make contact with the helispud.

A further improvement in lamp life was noticed when lamps similar to the construction of lamp 40, shown in FIG. 3, had two fused helispuded ends instead of one. The lamp shown in FIG. 3 is basically the same as that shown in FIGS. 1 and 2, and like parts are designated by like numerals except the numbers in FIG. 3 are followed by the letter *a*.

Coiled-coil 13*a* is connected to helispuds 14*a* and 15*a* through insertion of a curved portion of the helispuds into the secondary turns such as at 16*a*. The other ends of helispuds 14*a* and 15*a* are embedded in pinch seals 12*a* and 18*a* in insulating relationship to foil conductors 19*a* and 29*a*.

Fused members 25*a* are attached to the helispuds by welding, for example, at locations 28*a*. Coiled section 26*a* of the fuse is shown as having a plurality of turns generally more than five. Fuse legs 27*a* are attached to foil conductors 19*a* and 29*a* which in turn make electrical contact with tabs 21*a* and 31*a* through outer conductors 20*a* and 30*a*. Insulating bases 22*a* and 32*a* are held to the pinch seals and tabs by cement 23*a* and 33*a*. Coil support 35 is used to give the filament additional stability and to prevent sagging. The ends of the support are anchored in the respective pinch seals.

As indicated earlier, the presence of two fuses in the lamp improves the life over lamps using one or no fuses, presumably because foil seal temperatures are lowered and the probability of premature seal failure is greatly reduced.

A lamp construction using two fuses is desirable for

yet another reason. When two fuses are used, they are connected in series and therefore each fuse has only half the voltage across it. This in turn reduces the tendency of arcing at the fuse itself.

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

1. An electric incandescent lamp comprising an envelope of vitreous material having at least one pinch seal at one end of the envelope, an incandescible filament of the coiled-coil type made of fine wire connected at one end to a formed spud, said spud having its opposite end sealed in said pinch seal in insulating relationship to a lead-in conductor, and a fuse member electrically connected to the spud at one end and a lead-in conductor at the other end, said fuse member comprising a coiled portion fitted over the formed spud which is sealed in said pinch seal and a leg portion, said leg portion being attached to a foliated section of the lead-in conductor, said filament being unsupported by said fuse member.

2. An incandescent lamp as claimed in claim 1 wherein said coiled portion of said fuse has five or more turns.

3. An incandescent lamp as claimed in claim 1 wherein said coiled-coil filament is supported by a coil support which has its ends sealed in said pinch seals.

4. An incandescent lamp as claimed in claim 1 wherein said coiled portion of said fuse has more than one full wire turn.

5. An incandescent lamp as claimed in claim 1 wherein a part of said coiled portion of said fuse is attached to the formed spud.

6. An electric incandescent lamp comprising a tubular envelope of vitreous material having pinch seals at each end, an incandescible coiled-coil filament made of fine wire, said filament connected at each end to a formed spud, the opposite ends of the spuds being sealed in said pinch seals in insulating relationship to lead-in conductors, and fuse members connected to each spud at one end and a lead-in conductor at the other end, said lead-in conductor being hermetically sealed in said pinch seals, said fuse members comprising a coiled portion fitted over the spuds and a leg portion, said leg portion being attached to said hermetically sealed lead-in conductors, said filament being unsupported by said fuse members.

7. An incandescent lamp as claimed in claim 6 wherein said coiled-coil filament is supported by a coil support which has its ends sealed in said pinch seals.

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