Oct. 10, 1967 G. F. PATSCH 3,346,768

INCANDESCENT LAMP WITH A FUSE INTEGRAL WITH THE LEAD-IN STRUCTURE

Filed Oct. 29, 1964

Fig. 1.

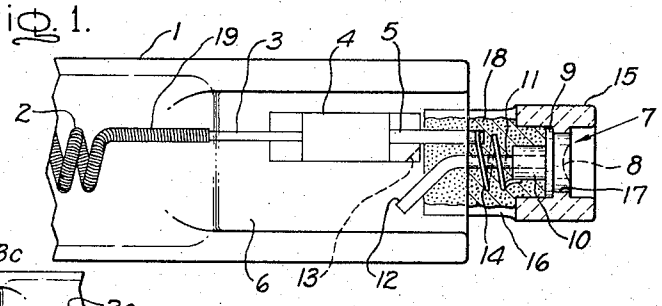


Fig. 6.

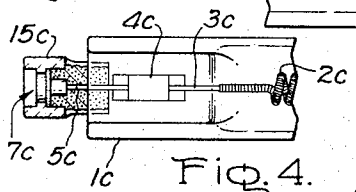


Fig. 4.

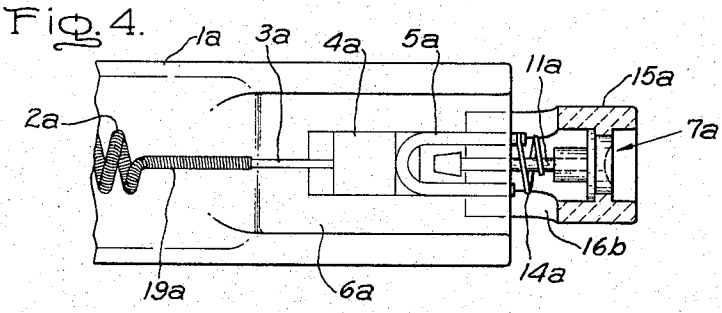


Fig. 5.

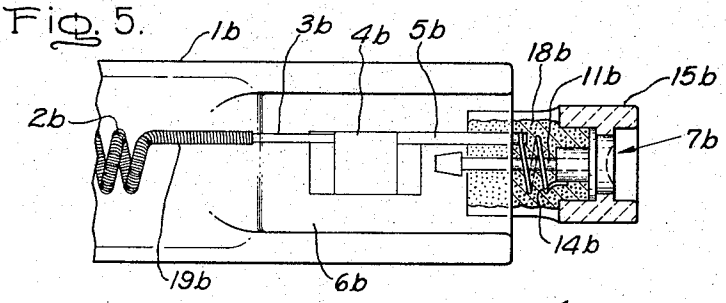


Fig. 3.

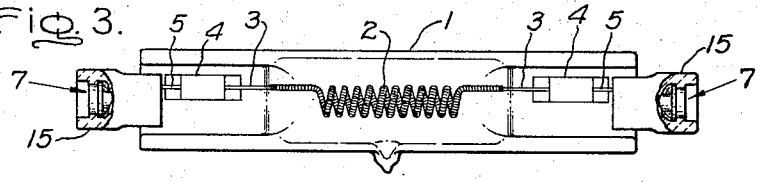
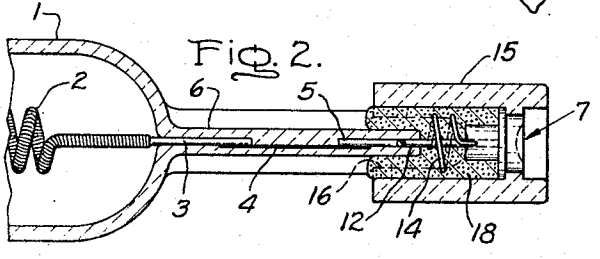


Fig. 2.



Inventor:
Glenn F. Patsch
by Otto Fischer
His Attorney

United States Patent Office 3,346,768
Patented Oct. 10, 1967

3,346,768

INCANDESCENT LAMP WITH A FUSE INTEGRAL WITH THE LEAD-IN STRUCTURE

Glenn F. Patsch, South Euclid, Ohio, assignor to General Electric Company, a corporation of New York

Filed Oct. 29, 1964, Ser. No. 407,480
9 Claims. (Cl. 315—74)

This invention relates generally to electric incandescent lamps, and more particularly to fuse structures incorporated in lamps.

Speaking generally, it is a common practice to incorporate a fuse in the structure of electric incandescent lamps in order to break the circuit upon flow of an abnormal current which may occur upon burn-out or breakage of the filament and formation of an arc. In the absence of a fuse the lamp may explode or cause fusion of parts of the lamp base and socket.

The present invention is especially concerned with an improvement in the fuse structure of certain types of double-ended lamps having a contact at each end which is usually supported from a rigid lead-in wire projecting outwardly from a pinch seal at each end of the lamp and which is usually recessed within an end of an insulating cylindrical shell supported from the pinch seal.

It is an object of the invention to provide a structure incorporating a fuse at one or both ends of the lamp while allowing very close tolerances on the overall length between the aforesaid end contacts. It is a further object to provide a structure which will permit the use of a fuse wire of considerable length in an unusually small space.

In accordance with one aspect of the invention, the aforesaid objects are achieved by supporting the end contact on a rigid member embedded in the pinch seal independently of the current carrying lead-in conductor and positioning the contacts independently of the length of the pinch seals, the end contact being connected to the filament by way of a fuse and a separate hermetically sealed lead-in conductor.

Further features and advantages of the invention will appear from the following detailed description of species thereof and from the drawing wherein:

FIG. 1 is a fragmentary side view, partly in section and on an enlarged scale, of one end of a lamp comprising the invention;

FIG. 2 is a longitudinal section through one end of the lamp;

FIG. 3 is a side view of the complete lamp of FIG. 1;

FIGS. 4 and 5 are views corresponding to FIG. 1 of modified forms of the invention; and

FIG. 6 is a side view of one lamp end having no fuse.

The lamp illustrated herein may be, for example, a so-called iodine-cycle type such as disclosed in Patent 2,883,571 to Fridrich and Wiley and having a base structure generally like that disclosed in Patent 3,001,096 to Mosby. To that end, the lamp shown in FIGS. 1 to 3 comprises a tubular envelope 1 of vitreous material such as fused silica or high melting point glass containing a filament 2, in this case a helical coiled coil of tungsten wire. The filament is supported at each end by an inner lead-in conductor portion 3, preferably of tungsten wire, which is welded to an extremely thin foil portion 4, preferably of molybdenum, to which is welded an outer lead portion 5 which may be of molybdenum. The foil portion 4 is hermetically sealed in a pinch seal portion 6 at the end of the envelope and it may be reinforced at its ends by thicker molybdenum foil pieces where it is welded to

the inner and outer lead portions 3 and 5. The envelope 1 may contain a filling of inert gas such as nitrogen, argon, krypton or xenon and a small quantity of a halogen, such as iodine, in accordance with the aforesaid Friedrich and Wiley patent.

At each end of the lamp is a contact member 7 which may consist of a generally cylindrical slug of nickel having a concave outer face 8 of spherical contour, and an enlarged flange 9 rearwardly of its front face, and a hollow cylindriral axial extension 10 projecting from its rear face.

In accordance with the invention, the contact member 7 is fixedly supported on one end of a rigid auxiliary support wire 11 having its other end embedded in the pinch seal 6. As illustrated in FIG. 1, the said other end 12 of the wire 11 is bent at an angle of approximately 45° for example, the bend being entirely within the boundaries of the pinch seal portion 6. The wire end 12 is thereby firmly anchored mechanically in the pinch seal 6 despite differences in coefficient of expansion of the wire and the material of the seal 6. The bend 12 also makes it possible to extend the foil 4 to a point close to the outer end of the pinch seal 6. The clearance between the foil 4 and the support wire portion 12 may be further increased by cutting away a corner of the foil as indicated by the dotted line 13.

In further accord with the invention, a fuse wire 14 is connected between the contact 7 and the outer portion 5 of the lead-in conductor. The said fuse wire may be of nickel, manganese-nickel or other suitable material well known in the art. It preferably surrounds the support wire 11 as at least a portion of a convolution or several coil turns.

The external members are enclosed in an insulating, preferably ceramic, cylindrical shell 15. The shell 15 has a diametral slot 16 to fit over the flat web portion of the pinch seal 6. It is also preferably provided with an internal shoulder 17 for abutting engagement with the flange 9 on the contact 7. The shell 15 is held in place by cement indicated by the numeral 18 and which secures it to the pinch seal 6 and which preferably substantially completely fills the shell to embed the fuse 14 and the contiguous wire members. The outer or end face 8 of the contact 7 is recessed within the shell 15 and is exposed therein for engagement with a socket contact member.

Prior to assembly of the contacts 7 at both ends of the lamp (FIG. 3) onto the support wires 11, the said wires (originally of excess length) are trimmed to an exact predetermined length so that the contacts 7 are spaced apart a definite overall distance entirely independent of the length of the envelope 1 including the pinch seals 6 which may vary somewhat in length.

In connection with the description of the FIGS. 4 and 5 modifications, the same reference numerals will be used for corresponding parts as in FIG. 1 with the addition of the letter *"a"* in FIG. 4 and the letter *"b"* in FIG. 5. In both cases, the rigid auxiliary support wire 11*a* or 11*b* is a straight wire and, for the purpose of providing a laterally deformed anchoring portion within the pinch seal 6*a* or 6*b*, its inner end 12*a* or 12*b* is of flattened spade shape. Also, in FIG. 4 the outer lead wire portion 5*a* is U-shaped with its bight portion welded to the foil 4*a*, and the inner lead portion 3*a* is welded to the center of the other end of said foil 4*a*.

The lead 5*a* and support wire 11*a*, as in FIG. 1, are initially long enough so that they can be held in place while the seal 6 is made, and are later cut off to suitable lengths as shown. The auxiliary supports 11*a* at both ends

of the lamp (as in FIG. 1) are cut to such a length that the final desired contact to contact length is attained when the contacts 7*a* are welded in place. One end of the coiled fuse wire 14*a* is welded to one leg of the outer lead 5*a*, and its other end is, in this case, welded to the auxiliary support 11*a*. The assembly is completed by cementing the ceramic shell 15*b* in place, the cement being omitted in this figure to more clearly show the adjacent structure.

In FIG. 5, the outer lead 5*b* is a straight wire welded to the upper edge of foil 4*b*, as is the inner lead 3*b*. The assembly of contacts 7*b*, fuses 14*b* and shells 15*b* is otherwise the same as in FIGS. 4 and 1.

The structure shown in FIG. 4 is symmetrical from the standpoint of longitudinal tension needed to stretch the filament 2*b*, as is always done just prior to completing the seals 6*a*, and it is particularly suited for use where the filament coil leg 19*a* extends along the axis of the filament 2*b*. The structure shown in FIG. 5 is advantageous when the filament coil leg 19*b* is coincident with a longitudinal element of the cylindrical envelope of the filament coil 2*b*, thereby avoiding twisting of the foil 4*b*.

It will be evident that in each of FIGS. 1, 4 and 5, the separate inner lead 3, 3*a* or 3*b* might be eliminated, and the coil leg 19, 19*a* or 19*b* extended into direct engagement with the respective foil 4, 4*a* or 4*b* and welded thereto.

It will also be understood that the pinch seals 6, 6*a* and 6*b* are preferably, but not necessarily, of the usual I-shaped cross section. It will also be noted that the diametral slot 16 in the shell 15 is sufficiently long to avoid abutting engagement with the end of the seal 6, its longitudinal position being determined by the contact 7 which is spaced a predetermined distance from the contact 7 at the opposite end of the lamp.

It will also be evident that the structure shown herein permits very close tolerances in contact to contact length since the auxiliary support wires 11, 11*a* or 11*b* at both ends of the lamp can be cut simultaneously, and the cut length is not dependent on the sealed envelope overall length. Also, the fuse wire 14, 14*a* or 14*b* can be of substantial length, for example 10 mm. in the small structures herein contemplated. The scale may be judged from an outside diameter of about one-half inch for the envelope 1 and nine thirty-seconds inch for the base shell 15.

Also, as shown in FIG. 6, one end of the lamp of FIGS. 1, 4 or 5 may be without a fuse. In this case, the contact 7*c* is carried by the rigid outer lead wire 5*c* extending from the foil seal conductor portion 4*c*. By trimming the wire 5*c* at the same time as the auxiliary support wire 11, 11*a* or 11*b* at the other end, an exact predetermined spacing is achieved between the contact 7*c* at one end and the contact 7, 7*a* or 7*b* at the other end of the lamp.

The FIG. 1 construction has the added advantage that the outer end of the foil 4 is brought closer to the outer extremity of the pinch seal 6. Since, in operation of the lamp, there is always a temperature gradient along the length of the seal 6 with the lower temperatures toward the outer end, bringing the end of the molybdenum foil 4 nearer the outer end lowers its temperature. It is thereby less likely that the safe limit of about 350° C. with respect to oxidation of the foil will be exceeded.

It will also be evident to those skilled in the art that other changes, modifications or revisions may be made within the spirit and scope of the invention as defined by the appended claims.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. An electric incandescent lamp comprising a sealed envelope having a pinch seal, a filament in said envelope, a lead-in conductor having at least a portion thereof hermetically sealed in said pinch seal portion and one end electrically connected to said filament, a contact member at the exterior of said pinch seal, a rigid auxiliary support wire member carrying said contact member at a fixed predetermined position and having a portion thereof

embedded in and supported from said pinch seal in insulated relationship to said lead-in conductor, and a fuse wire member at the exterior of said pinch seal electrically connected at one end to said contact member and at its other end to said lead-in conductor.

2. A lamp as set forth in claim 1 including a base shell of insulating material supported from said pinch seal and from said contact member and enclosing the aforesaid members at the exterior of said pinch seal while leaving exposed at least a portion of said contact member.

3. A lamp as set forth in claim 1 wherein said fuse wire is in the form of at least a partial convolution surrounding said auxiliary support wire whereby to be of extended length in a small space.

4. A lamp as set forth in claim 1 wherein said auxiliary support wire is bent within said pinch seal and in a direction away from said lead-in conductor.

5. A double-ended electric incandescent lamp comprising a hermetically sealed envelope having pinch seals at opposite ends thereof and containing a filament, a pair of contact members at the exterior of respective said pinch seals, rigid wire members carrying respective said contact members in predetermined overall spaced relationship and having portions thereof embedded in and supported from respective said pinch seals, conductor means electrically connecting each end of said filament with the associated contact member, at least one of said conductor mens including a length of fuse wire at the exterior of the adjacent pinch seal and a seal conductor portion separate from the adjacent rigid wire member and hermetically sealed in the associated pinch seal in electrically insulating relationship from the said adjacent rigid wire member.

6. A lamp as set forth in claim 5 including a base shell of insulating material supported from each said pinch seal and from the associated contact member and enclosing the fuse wire and the portions of said rigid wire members at the exterior of the respective pinch seals while leaving exposed at least a portion of the associated contact member.

7. A double-ended electric incandescent lamp comprising a hermetically sealed envelope having pinch seals at opposite ends thereof and containing a filament, a pair of contact members at the exterior of respective said pinch seals, rigid auxiliary support wires carrying respective said contacts in predetermined overall spaced relationship and having portions thereof embedded in and supported from respeltive said pinch seals, and conductor means electrically connecting an end of said filament with the associated contact member and including a length of fuse wire at the exterior of each said pinch seal and a seal conductor portion hermetically sealed in the associated pinch seal, said seal conductor portion being electrically insulated from the associated auxiliary support wire.

8. A lamp as set forth in claim 7 including a base shell of insulating material supported from each said pinch seal and from the associated contact member and enclosing the aforesaid fuses and support wires at the exterior of the associated pinch seal while leaving exposed at least a portion of the associated contact member.

9. A double-ended electric incandescent lamp comprising a hermetically sealed envelope having pinch seals at opposite ends thereof and containing a filament, a pair of contact members at the exterior of respective said pinch seals, rigid wire members carrying respective said contact members in predetermined overall spaced relationship and having portions thereof embedded in and supported from respective said pinch seals, conductor means at one end of the lamp electrically connecting the adjacent one end of the filament with the associated contact member directly through the associated rigid wire member by way of a seal conductor portion

hermetically sealed in the associated pinch seal, and another conductor means at the other end of the lamp electrically connecting the adjacent other end of the filament with the associated contact member and including a length of fuse wire at the exterior of the associated pinch seal and a seal conductor portion separate from the adjacent rigid wire member and hermetically sealed in the said associated pinch seal in electrically insulated relationship from the said adjacent rigid wire member.

References Cited

UNITED STATES PATENTS

3,211,943	10/1965	Cardwell	315—74 X
3,211,950	10/1965	Cardwell	315—74
3,274,426	9/1966	Scoledge et al.	315—74 X

JAMES W. LAWRENCE, *Primary Examiner.*

C. CAMPBELL, JR., *Assistant Examiner.*