Dec. 14, 1943. I. H. VAN HORN 2,336,903

CUTOUT FOR ELECTRIC LAMPS

Filed May 24, 1943

Fig. 1.

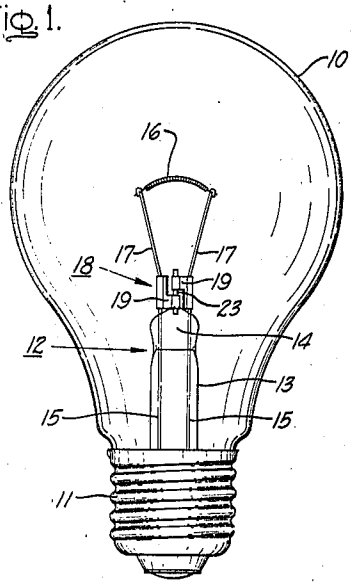


Fig. 2.

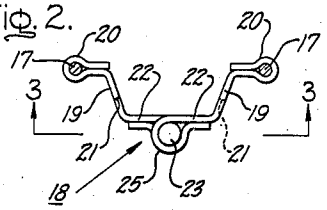


Fig. 3.

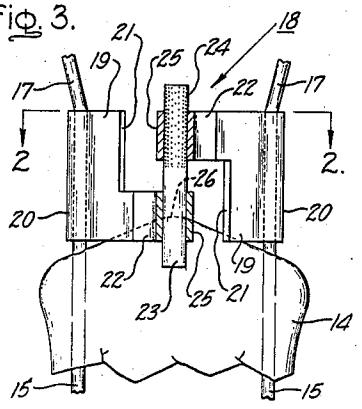
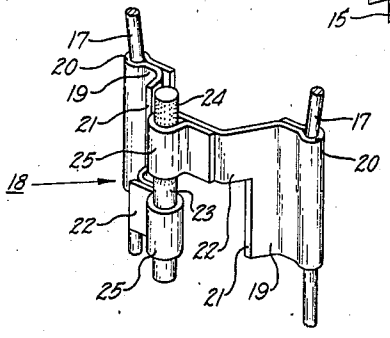


Fig. 4.



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UNITED STATES PATENT OFFICE

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CUTOUT FOR ELECTRIC LAMPS

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5 Claims. (Cl. 315—75)

My invention relates in general to series electric incandescent lamps and other similar electrical devices comprising a filament or other electric energy translation element mounted in a glass enclosure such as a bulb. More particularly, my invention relates to cutouts for such series lamps and devices which operate to preserve the electrical circuit through the lamp or device, upon failure of the filament or other element thereof, so that the other devices in the series circuit will continue to operate.

Cutout constructions for series lamps have been proposed heretofore in which the inner lamp leads are formed with closely spaced portions which are bridged by a film cut out element. With such a cutout construction, when the lamp filament fails during operation, an arc usually forms between one end of the broken filament and one of the inner leads. Such arc then melts back the said inner lead in the form of a ball until either the ball contacts the other inner lead so as to short-circuit the lead-in wires, or until the heat of the arc is sufficient to break down the insulating film on the cutout element.

Occasionally, however, such cutout constructions fail to operate in the intended manner. Thus, under certain conditions of service which may develop after failure of the lamp filament, an arc may form between the closely spaced portions of the lead-in wires which arc, because of the small arc gap and therefore the small amount of wattage involved, posseses insufficient heat to effect the breakdown of the insulating film on the cutout element with the result that the arc continues to persist. Because of the inherent tendency of arcs to wander, the persisting arc may then travel past or beyond the cutout element to a point intermediate the cutout and the stem press where the arc gap is of greater length, as a result of which the arc may then possess sufficient heat to melt away one or the other of the lead-in wires at a point between the stem press and the cut-out and thus render the cutout structure wholly inoperative. The arc may then continue down into the stem press and lamp socket, resulting in extinguishment of the circuit and possibly a damaged socket.

One object of my invention is to provide a cutout for an electric lamp or similar device which is simple in construction and positive in operation.

Another object of my invention is to provide a cut-out construction for an electric lamp or similar device which will operate to preserve the electrical circuit through the lamp, upon failure of the filament thereof, under practically all conditions which may develop within the lamp.

Still another object of my invention is to provide, for an electric lamp or similar device, a cutout construction of positive operating characteristics which does not require the forming of the inner lamp lead-in wires to a special shape.

A further object of my invention is to provide a cutout construction for an electric lamp or similar device which is capable of supporting an arc, and thus preserving the electrical circuit through the lamp, for an indefinite period of time.

Further objects and advantages of my invention will appear from the following description of a species thereof and from the accompanying drawing in which:

Fig. 1 is a front elevation of an electric incandescent lamp provided with a cutout structure according to my invention; Fig. 2 is a plan view on an enlarged scale of the cutout structure of the lamp shown in Fig. 1; Fig. 3 is a vertical section on the line 3—3 of Fig. 2; and Fig. 4 is a perspective view of the cutout structure comprising my invention.

Referring to the drawing, the electric incandescent lamp there shown comprises a glass bulb 10 having a base 11 secured thereto and a mount structure 12 sealed therein. The said mount structure comprises a re-entrant glass stem 13 having a press portion 14, a pair of lead-in wires 15, 15 sealed in the press portion 14 of the stem and connected to the terminals of the base 11, and an electric energy translation element or filament 16 connected to the inner ends of the lead-in wires 15. The inner portions 17 of the lead-in wires, immediately inward of the stem press 14, extend more or less parallel to one another and are spaced the usual distance apart (in the lamp shown, around $\frac{5}{16}$'' or thereabouts).

Mounted on the inner leads 17, immediately adjacent the stem press 14, is a cutout structure 18 according to the invention. The said cutout structure comprises a pair of like metal holder clips or stampings 19 formed from suitable strip material and securely fastened to the inner leads 17, at opposite points thereon, with their flat or planar surfaces extending vertically. For this purpose, one end of each stamping 19 is formed with a vertically-extending loop or eye portion 20 which extends the full vertical length of the stamping and which is pinched

tightly around the inner lead 17 to thereby securely fasten the stamping or clip in place on the said inner lead. The other end of each stamping 19 is notched, as indicated at 21, to provide an extension or ear 22 of reduced vertical extent. The stampings or clips 19 are mounted on the inner leads 17, one in an inverted position with respect to the other, so as to vertically space the extensions, one above the other, a slight distance apart such as, for instance, $\frac{1}{16}$ inch or thereabouts.

Carried by the metal holder clips 19 and connecting the extensions 22 thereon is a film-type cutout element 23 preferably in the form of a short length of aluminum wire having a coating 24 of aluminum oxide extending over at least a portion of its length, preferably over the upper half or so as shown in the drawing. The insulating film or coating 24 is of such a character as will not break down at or somewhat above the operating voltage of the individual lamp elements in the series, but which will break down at a voltage appreciably above the operating voltage of the individual lamp elements, such as the full line voltage across the series circuit. Thus, where a group of twenty lamps designed to operate at 30 volts are connected in series across a 600-volt current supply, the insulating film 24 on the cutout element 23 is preferably of such a character as will not break down below 40 volts or thereabouts.

The cutout element 23 may be fastened in place on the metal clips 19 in any suitable manner which will insure the insulation of the inner leads 17 from one another by the oxide coating 24 on the cutout element. Preferably, however, the free ends of the ears or extensions 22 on the clips 19 are formed into loops or eyes 25 which are vertically aligned with one another. The wire cutout element 23 extends through the eyes 25, and the said eyes are pinched or closed around the wire element to thereby securely fasten the latter in place within the metal clips 19. The wire cutout element 23 is preferably disposed within the aligned loops or eyes 25 with the coated end portion 24 thereof positioned within one of the eyes and the bare or uncoated end thereof positioned within the other of said eyes. Only the eye 25 enclosing the uncoated end of the wire cutout element is pinched tightly thereonto to hold the wire element in place within the metal clips 19. The other eye 25 enclosing the coated end of the wire cutout element is merely closed loosely therearound so as not to scratch or otherwise injure the oxide coating 24 and thus cause a premature breakdown of the cutout.

To enable the application of the cutout structure 18 to lamps provided with a glass arbor extending inwardly from the stem press 14 between the inner leads 17, and further, to compensate for variations in the spacing of the inner leads 17 of different lamps, those portions of the metal clips 19 between the inner leads 17 are preferably offset laterally from the plane of the inner leads, as by bending the metal clips or stampings 19 into a modified Z-shape as viewed in plan (Fig. 2). Such lateral offsetting of the clips 19 thus provides clearance for the glass arbor with which the lamp may be provided.

The metal clips 19 should be of such proportions and of such material as to readily support for an indefinite period of time, without melting, any arc that may form therebetween during lamp service. In other words, the metal clips 19 should possess sufficient heat-dissipating capacity to remain stable under all arcing conditions within the lamp. For this purpose, the metal clips 19 should be made of a good heat-conducting metal such as nickel, iron or nickel-plated iron (preferably nickel) and of sufficient mass to support an arc without melting. Thus, for lamps designed to operate at around 30 volts at 1.5 amperes or so, the clips 19 may be made of 0.012" thick nickel strip around ¼" or so in width with the ears or extensions 22 thereof around $\frac{3}{32}$" or so in width.

In operation, the cutout 18 will not function as long as the filament 16 remains intact, inasmuch as the oxide film 24 on the cutout element 23 acts as an insulator at the normal operating voltage of the lamp. However, if the filament 16 fails when cold (i. e., when the lamp is not in operation), the cutout element 23 then operates when the circuit switch is subsequently closed. The full voltage of the line being then impressed across the film cutout element 23, the insulating film 24 thereon is punctured and a conductive path thus provided between the lead-in wires 15, 15. This allows the other lamps of the series to light up and at the same time shows up the defective lamp.

Should the filament 16 fail when hot (i. e., during operation of the lamp), an arc forms between the broken filament and one or the other of the inner leads 17. This arc then melts the said inner lead back in the form of a molten ball as a result of which the arc travels down to the cutout structure 18 and effects, in the great majority of cases, the breakdown of the insulating film 24 on the cutout element 23. In the event the arc should fail to so break down the insulating film 24 on the cutout element 23, the arc will then persist between the metal clips 19, particularly between the closely adjacent loops or eyes 25 of the said clips. Because of the adequate heat-dissipating capacity of the metal clips, however, the said clips will therefore support the arc therebetween for an indefinite period of time without melting or becoming otherwise damaged. Furthermore, because of the relative closeness to one another of the eyes 25 on the metal clips 19, the arc will tend to persist therebetween rather than travel down or past the cutout structure 18 and onto those exposed portions of the inner leads 17 intermediate the stem press 14 and the metal clips 19 where it might melt away one or the other of the inner leads 17 at such point and thus render the cutout structure 18 wholly inoperative. To further guard against such a condition arising, the metal clips 19 are mounted on the inner leads 17 as close as possible to the stem press 14 so as to leave as little as possible of the inner leads exposed between the stem press 14 and the metal clips 19. The lateral offsetting of the metal clips 19 between the inner leads 17 is of particular utility in this connection inasmuch as it permits the metal clips to be mounted on the inner leads below the top or crown 26 (Fig. 3) of the stem press 14 and immediately adjacent the point on the stem press where the said leads extend therefrom so that there are very little, if any, exposed sections of the inner leads intermediate the stem press and the metal clips 19 to which sections the arc can strike.

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

1. An electric incandescent lamp comprising a bulb, a filament disposed within said bulb, a pair

of lead-in wires extending into said bulb and connected to said filament, a pair of metal holders secured one to each of said lead-in wires and having portions closely spaced from one another, and a film cutout element carried by said holders and in contact therewith, said holders being constructed and arranged to support, for an indefinite period of time without melting, any arc that may form within the lamp during service upon failure of the filament thereof.

2. An electric incandescent lamp comprising a bulb having a re-entrant stem provided with a press portion, a filament disposed within said bulb, a pair of lead-in wires sealed in the stem press and having inner lead portions extending into the bulb from the said stem press and connected to said filament, a pair of metal holders secured one to each of said inner leads at points thereon as close as possible to said stem press and having portions closely spaced from one another, and a film cutout element carried by said holders and in contact therewith, said holders being constructed and arranged to support, for an indefinite period of time without melting, any arc that may form within the lamp during service upon failure of the filament thereof.

3. An electric incandescent lamp comprising a bulb having a re-entrant stem provided with a press portion, a filament disposed within said bulb, a pair of lead-in wires sealed in the stem press and having inner lead portions extending into the bulb from the said stem press and connected to said filament, a pair of metal holders secured to and enclosing appreciable lengths of said inner leads immediately adjacent said stem press and having portions closely spaced from one another, and a film cutout element carried by said holders and in contact therewith, said holders being constructed and arranged to support, for an indefinite period of time without melting, any arc that may form within the lamp during service upon failure of the filament thereof.

4. An electric incandescent lamp comprising a bulb, a filament disposed within said bulb, a pair of lead-in wires extending into said bulb and having inner lead portions connected to said filament, a pair of strip-like metal holders of appreciable width secured one to each of and along said inner leads and having extensions closely spaced from one another and provided with aligned loops, and a film cutout element extending through and in contact with said loops, at least one of said loops being pinched tightly around said cutout element to thereby support said cutout element in place within said loops.

5. An electric incandescent lamp comprising a bulb, a filament disposed within said bulb, a pair of lead-in wires extending into said bulb and having inner lead portions connected to said filament, a pair of strip-like metal holders of appreciable width secured one to each of and along said inner leads and having extensions closely spaced from one another and provided with aligned loops, and a film cutout element carried by and in contact with said holders, said cutout element comprising an elongated body of aluminum extending through and in contact with said loops, the portion of said cutout element within one of said loops having a coating of aluminum oxide thereon and the portion of said cutout element within the other of said loops being free of such coating, said one loop being only loosely clamped and said other loop being tightly clamped around the cutout element.

IRVING H. VAN HORN.