Feb. 25, 1958 W. W. KIRK 2,824,995

ELECTRIC INCANDESCENT LAMP

Filed Dec. 29, 1953

Fig. 1

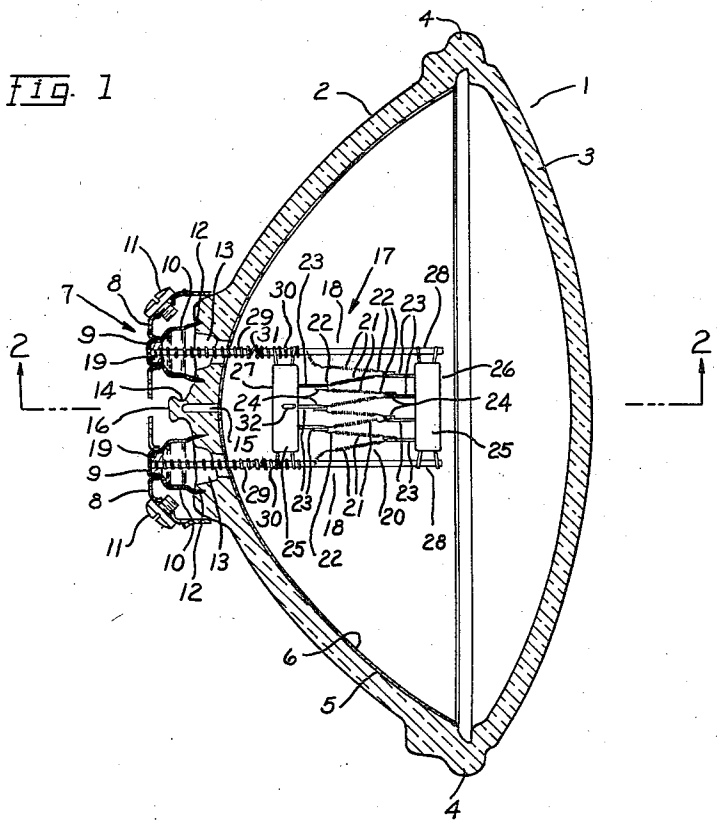


Fig. 2

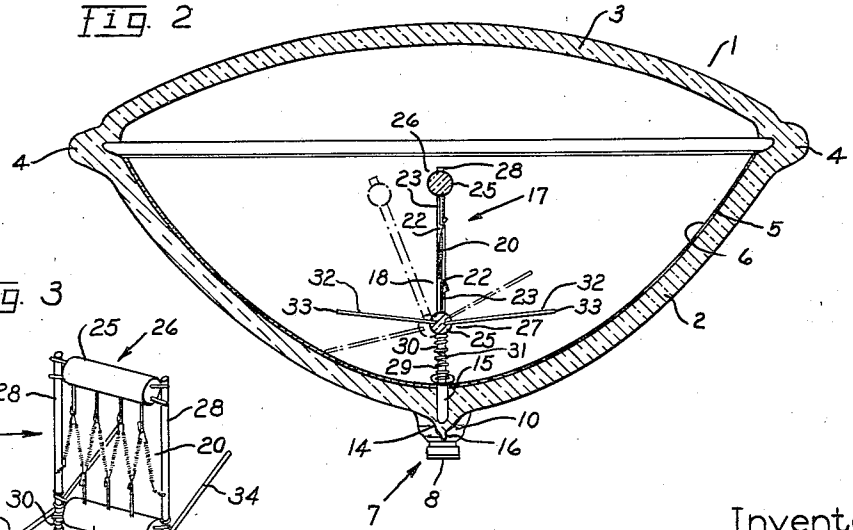
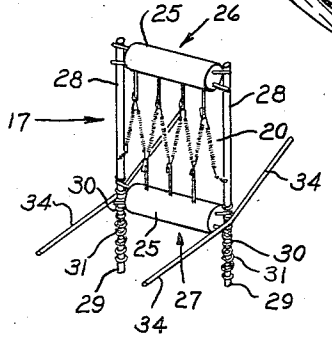


Fig. 3



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ELECTRIC INCANDESCENT LAMP

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7 Claims. (Cl. 313—271)

This invention relates to electric incandescent lamps in general, and more particularly to a mount construction therefor.

There are many so-called rough service applications where an electric incandescent lamp is subjected to considerable vibrations, jars or impacts, for instance in locomotive headlights, automatic mining machinery, earth moving equipment, tractors and other like equipment. In such cases, it is highly important that the filament or light source of the lamp be so supported that the forces developed by the vibrations or shocks be sufficiently dissipated in order to prevent distortion of the hot filament such as is apt to result in premature breakage or failure of the filament with consequent short lamp life.

One form of filament supporting arrangement which has been found to be eminently satisfactory for this purpose is disclosed and claimed in U. S. Patent No. 2,497,567, issued February 14, 1950, to J. E. Stone and assigned to the assignee of the present invention. In this particular supporting arrangement, the filament supporting end or section of a lamp mount employing a planar type filament mounted between and in the plane of a pair of lead-in wires is rendered flexible in all directions by forming each of the lead-in wires or inleads, inwardly of the lamp envelope, in two individual sections and electrically and mechanically connecting them together in longitudinally aligned and separated end-to-end relation by a coil spring or shock coil fitted over and bridging the gap between the separated ends of the two inlead sections and elastically gripping tightly the said inlead sections.

While such a shock mounting arrangement for the filament is satisfactory for moderate vibration and minor shocks, it has been found that under extreme shock conditions the entire lamp mount deflects laterally of the plane thereof to such an excessive extent as to cause a permanent set to occur in the shock coil. Such a permanent set not only leaves the filament of the mount off focus, where the mount is incorporated in a reflector type lamp, but also weakens the mount to further impacts.

It is an object of my invention, therefore, to provide an electric incandescent lamp having a flexible mount structure which will effectively withstand vibration and minor shocks and will not acquire a permanent displaced position when subjected to extreme shocks.

Another object of my invention is to provide an electric incandescent lamp having a filament supported therein in definite optical relation to a reflecting surface of the lamp by a flexible supporting arrangement which not only avoids the detrimental effects on the filament of lamp vibration and minor shocks but which will also maintain the position of the filament in its said optical relation to the reflecting surface even though the mount be subjected to extreme shocks.

In accordance with the invention, the lamp mount is provided with deflection-limiting means in the form of comparatively rigid but preferably yielding stop or bumper members extending laterally from the mount transversely

to the plane thereof, with their outer or free ends spaced a predetermined distance from but engageable with the associated sloping reflector surface of the lamp to thereby limit lateral deflection of the mount to an extent less than that which would otherwise cause it to acquire a permanent displaced position.

Further objects and advantages of my invention will appear from the following description of species thereof and from the accompanying drawing.

In the drawing, Fig. 1 is a sectional view of an electric incandescent lamp according to the invention;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1; and

Fig. 3 is a perspective view of a modified form of mount construction according to the invention.

Referring to the drawing, the invention is there shown as applied to an electric incandescent lamp of the sealed beam type disclosed in U. S. Patent 2,148,314, D. K. Wright, and comprising a sealed glass envelope or bulb 1 consisting of preformed pressed glass reflector and cover glass sections 2 and 3, respectively, sealed together at their peripheries by fusion, as indicated at 4. The inner surface 5 of the reflector section 2 is formed either of paraboloidal shape as shown, or of any other desired optical shape, and is provided with a reflecting coating 6 of aluminum, silver or other similar light-reflective material.

Mounted on the rear outer side of the reflector section 2 at the region of the apex or center thereof is a base structure 7 of the general type shown and described in U. S. Patent 2,272,512, Cotman, and comprising a pair of terminal contacts 8, 8 in form of metal straps or lugs which are suitably fastened, as by soldering for instance, to the closed nippled ends 9 of respective metal ferrules or thimbles 10, 10. The contact lugs 8, 8 are provided with screw terminals 11, 11 for connecting current supply wires thereto. The ferrules 10, 10 are formed of a suitable metal which will readily "wet" and adhere to the glass of the reflector section 2 and they are provided with skirt portions 12 which are feathered to knife edges embedded and fused in the glass of the reflector section 2 around respective openings or passageways 13 through the wall thereof. The envelope 1 is provided with an exhaust tubulation 14 communicating with the interior of the envelope through an exhaust opening 15 in the envelope wall at the apex of the reflector section 2. After exhaustion of the envelope through the tubulation 14 and, if desired, introduction of a suitable gas filling such as nitrogen or argon, the tubulation 14 is sealed or tipped-off as indicated at 16.

Mounted within the envelope 1 and supported solely from the metal ferrules 10 in spaced relation to the envelope wall is a lamp mount structure 17 according to the invention and comprising a pair of lead-in conductors or inleads 18, 18 secured at their outermost ends within the nipples 9 of the ferrules, as by solder 19 as shown. From the ferrules 10, the lead-in conductors 18 extend through the openings 13 in the wall of the reflector section 2 and into the envelope 1 in more or less parallel spaced relation and are connected at their innermost ends to the opposite ends of a filament 20 preferably in the form of a coiled wire of tungsten or other suitable refractory metal. The filament 20 is supported on the conductors 18 in a position symmetrically disposed with respect to the focus of the reflector section 2 and it comprises a plurality of more or less side-by-side coiled sections 21 joined by loops or bights 22 and lying in a plane approximately coinciding with that of the parallel lead-in conductors 18, 18. The filament 20 is connected at its ends to the conductors 18, 18 and is supported at the bights 22 by anchor wires 23 formed at one end with hooks 24 within which the filament bights 22 are hooked.

The other ends of the anchor wires 23 are embedded in the glass insulating members 25 of upper and lower bridges or cross bars 26 and 27, respectively, which are connected across the conductors 18, 18 to rigidly tie them together.

In accordance with the invention, the lead-in conductors or inleads 18, 18 are each comprised of two separate wire sections 28 and 29 (i. e., an inner section 28 and an outer section 29) yieldingly held together in separated end-to-end relation and electrically connected by a coil spring or wire shock coil 30 fitted over and elastically gripping tightly the contiguous portions of the conductor sections 28, 29. The wire shock coils 30 are made of a material, such as tungsten, molybdenum or spring steel for instance, which will not lose its temper or springy character at the high temperatures encountered during operation of the lamp, and they are formed to an inside diameter slightly smaller (i. e., 2 or 3 thousandths of an inch) than the diameter of the wire conductor sections 28, 29 so that they cannot be slipped over the said conductor sections but can only be fitted thereover by screwing the wire coils thereonto. In such manner, a firm and tight elastic grip of the wire coils 30 on the wire conductor sections is provided whereby the two separated sections 28, 29 of each conductor 18 are firmly held together in spaced end-to-end relation and a good electrical connection formed between the separated conductor sections and their interconnecting wire shock coils. The portions 31 of the wire shock coils 30 bridging the gap between the separated conductor sections 28 and 29, being free to flex or bend in any direction because of the absence of any stiffener or filler member therein, therefore provide a yieldable connection between the conductor sections 28, 29 which serves to impart flexibility in substantially all directions (i. e., 360° solid angle) to the filament-supporting end of the mount 17 whereby any vibrations or shocks to which the lamp may be subjected in service are effectively absorbed or cushioned by such yieldable connecting sections 31.

The characteristics of the coil springs 30 employed and the spacing of the conductor sections 28, 29 are so selected as to support the filament 20 firmly in place in the envelope 1 while imparting the desired degree of flexibility to the upper section of the mount to absorb the vibrations and shocks incident to the normal usage of the lamp without causing undue filament movement and resultant wavering of the light beam emitted by the lamp. In the specific case illustrated, the individual wire sections 28 and 29 of the lead-in conductors 18 are made of approximately 50 mil diameter nickel wire and are separated end-to-end a distance of approximately 2 mm., while the wire shock coils 30 are made of approximately 15 mil tungsten wire coiled to an inside diameter of approximately 48 mils.

To maintain the points of support of the filament in fixed relation to each other at all times independent of any unitary movement thereof due to lamp vibration or shock, the inner sections 28 of the conductors 18 are rigidly tied together and held in proper relation by the upper and lower bridges or cross bars 26 and 27. The mount structure according to the invention therefore includes as a part thereof a filament-supporting section or unit, comprising the inner conductor sections 28, the cross bars 26, 27 and the anchor wires 23, which holds the filament 20 in proper relation at all times and which is capable of moving as a unit, without relative movement between the filament and the adjacent supporting parts of the said unit, during vibration or other sudden movement of the lamp.

While the wire shock coils 30 are effectively prevented from moving or creeping along the conductor sections 28, 29 by reason of their tight elastic grip thereon, it is preferable to fixedly secure the said wire coils in place on the conductor sections. For this purpose the wire coils 30 may be made of sufficient length to extend over substantially the full length of the outer conductor sections 20 so as to be embedded in the solder mass 19 which anchors the said outer conductor sections in the ferrules 10, thus holding the wire coils in place on the outer conductor sections. The inner ends of the wire coils 30 may be fastened in place on the inner conductor sections 28 by extending the said coils underneath at least the nearest ones of the support wires 34 of the lower insulating bridge or cross bar 27 so as to be welded along with the said bridge support wires to the inner conductor sections.

In accordance with the invention, the mount structure 17 is provided with means for limiting the deflection thereof laterally of its plane to a predetermined degree less than that which would cause it to take a permanent set. The said deflection-limiting means comprises stop or bumper members of arm-like form on the mount which may conveniently comprise short lengths 32 of rigid but preferably slightly springy wire extending in opposite directions from the mount laterally of the plane thereof, with the free or outer ends 33 of the wire extensions spaced a predetermined distance from but engageable with the associated reflecting surface 6 of the lamp bulb 1 upon a predetermined amount of lateral deflection of the mount less than that which would cause the shock coils 30 to take a permanent set. The wire bumpers or stop arm members 32 may be secured to the mount 17 by embedding their inner ends in the glass insulator member 25 of the lower bridge or cross bar 27 of the mount. While I have shown in Figs. 1 and 2 only one limiting stop arm member 32 extending from each side of the mount, it will be obvious that two or more such limiting stop arm members 32 may be provided, if desired.

Fig. 3 illustrates an alternative manner of affixing the limiting stop or bumper arm members to the lamp mount 17. In this form of the invention, deflecting-limiting stop arm members 34, similar to the stop arm members 32 of Figs. 1 and 2, are secured in a suitable manner, as by welding for instance, to the inner lead-in wire sections 28, 28 of the mount instead of being secured to the glass insulator member 25 of the lower bridge 27 as in Figs. 1 and 2. As will be apparent from Fig. 3, in this modification of the invention two oppositely extending stop arm members 34 are provided on each of the inner lead-in wire sections 28 of the mount. If desired, the mount 17 may be provided with both forms of stop arm members 32 and 34 secured to the glass insulating member 25 of the lower bridge 27 and to the lead-in wire sections 28, respectively.

It will be apparent that when the lamp according to the invention is subjected to extreme shocks such as would ordinarily cause the lamp mount 17 to deflect laterally of the plane thereof to such an excessive degree as would cause the shock coils 30 to take a permanent set, the outer end extremities 33 of the stop or bumper arm members 32 or 34 will engage and ride a slight distance up the inclined reflecting surface 6 of the lamp bulb 1 to thereby provide a cushioned arresting of the deflecting movement of the mount, limiting its deflection to an extent less than that which would cause the shock coils 30 to take a permanent set. Such a cushioned arresting of the mount deflection therefore eliminates any harmful effects which a sudden or abrupt arresting of the mount deflection might have on the filament and the filament connections such as would result in a premature failure of the lamp.

Although a preferred embodiment of my invention has been disclosed, it will be understood that the invention is not to be limited to the specific construction and arrangement of parts shown, but that they may be widely modified within the spirit and scope of my invention as defined by the appended claims.

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

1. An electric lamp comprising an envelope at least a portion of which is radiation-transmissive, a filament in said envelope, inner lead-in conductors anchored to and supported from the wall of said envelope at one end only of the conductors and extending into the envelope from their wall anchorages in wholly spaced relation to the envelope wall and unengaged therewith to permit lateral deflection of the conductors within the envelope, said conductors being connected at their inner ends to said filament and including intermediate resilient portions deflectable laterally of the conductors but subject to a permanent set upon deflection beyond a predetermined amount, and stop means carried by the innermost portions of said conductors aand extending toward but terminating short of the wall of said envelope so as to be engageable therewith upon deflection of said intermediate and innermost conductor portions to a degree less than the said predetermined amount.

2. An electric lamp comprising an envelope at least a portion of which is radiation-transmissive, a filament in said envelope, inner lead-in conductors anchored to and supported from the wall of said envelope at one end only of the conductors and extending into the envelope from their wall anchorages in wholly spaced relation to the envelope wall and unengaged therewith to permit lateral deflection of the conductors within the envelope, said conductors being connected at their inner ends to said filament and including intermediate resilient portions deflectable laterally of the conductors but subject to a permanent set upon deflection beyond a predetermined amount, and bumper arms secured to and extending laterally from the innermost portions of said conductors toward but terminating short of the wall of said envelope so as to be engageable therewith upon deflection of said intermediate and innermost conductor portions to a degree less than the said predetermined amount.

3. An electric lamp comprising an envelope at least a portion of which is radiation-transmissive, a filament in said envelope, a pair of inner lead-in conductors anchored to and supported from the wall of said envelope at one end only of the conductors and extending into the envelope from their wall anchorages in approximately parallel relation and in wholly spaced relation to the envelope wall and unengaged therewith to permit lateral deflection of the conductors within the envelope, said conductors being connected at their inner ends to said filament and including intermediate resilient portions deflectable laterally of the conductors but subject to a permanent set upon deflecton beyond a predetermined amount, and bumper arms secured to and extending from the innermost portions of said conductors laterally of the plane thereof toward but terminating short of the wall of said envelope so as to be engageable therewith upon deflection of said intermediate and innermost conductor portions laterally of the plane thereof to a degree less than the said predetermined amount.

4. An electric lamp comprising an envelope at least a portion of which is radiation-transmissive, a filament in said envelope, lead-in conductors anchored to and supported from the wall of said envelope at one end only of the conductors and extending into the envelope from their wall anchorages in wholly spaced relation to the envelope wall and unengaged therewith to permit lateral deflection of the conductors within the envelope, said conductors each comprising separate inner and outer sections spaced apart end-to-end and the filament being supported from and electrically connected to said inner sections, bridge means insulatively and rigidly tying the said inner conductor sections together, said inner conductor sections and bridge means together providing a rigid support frame for said filament, a coil spring fitting over and gripping tightly the individual sections of each of said conductors and bridging the gap therebetween to yieldingly and electrically connect the said conductor sections together whereby to resiliently support the said filament support frame from the anchored outer conductor sections, and stop means carried by said filament support frame and extending toward but terminating short of the wall of said envelope so as to be engageable therewith upon deflection of said filament support frame to a predetermined amount less than that which would produce a permanent set in said coil springs.

5. An electric lamp of the character set forth in claim 4 wherein the said stop means comprises rigid arm members secured to the said bridge means and extending therefrom in approximately opposite directions laterally of the said filament support frame.

6. An electric lamp of the character set forth in claim 4 wherein the said stop means comprises a pair of rigid arm members secured to each of the said inner conductor sections and extending therefrom in approximately opposite directions laterally of the said filament support frame.

7. An electric lamp comprising an envelope having a concave reflecting wall portion and a radiation-transmitting portion, lead-in conductors anchored to and supported from the said concave wall portion of the envelope at one end only of the conductors and extending into the envelope from their wall anchorages in the same general direction and in wholly spaced relation to the envelope wall and unengaged therewith to permit lateral deflection of the conductors within the enevlope, said conductors each comprising separate inner and outer sections spaced apart end-to-end and the filament being supported from and electrically connected to said inner sections, bridge means insulatively and rigidly tying the said inner conductor sections together, said inner conductor sections and bridge means together providing a rigid support frame for said filament, a coil spring fitting over and gripping tightly the individual sections of each of said conductors and bridging the gap therebetween to yieldingly and electrically connect the said conductor sections together whereby to resiliently support the said filament support frame from the anchored outer conductor sections, and rigid but laterally yieldable stop arm members secured to said filament support frame and extending therefrom in approximately opposite directions laterally of the said filament support frame toward but terminating short of the said reflecting wall portion of said envelope so as to yieldingly engage therewith upon deflection of said filament support frame to a predetermined amount less than that which would produce a permanent set in said coil springs.

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