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2,813,993

ELECTRIC LAMP OR SIMILAR DEVICE

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Fig. 1

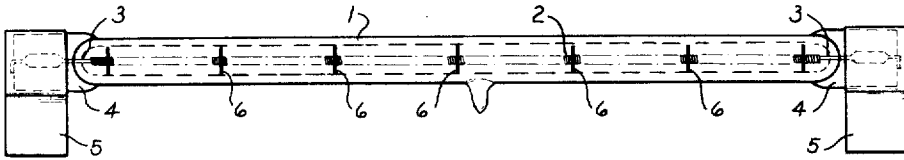


Fig. 2

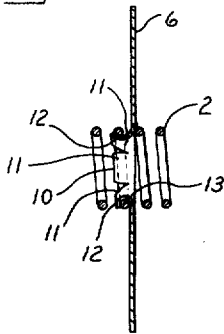


Fig. 3

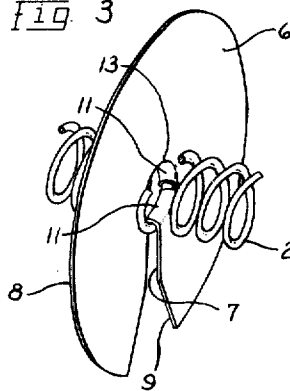
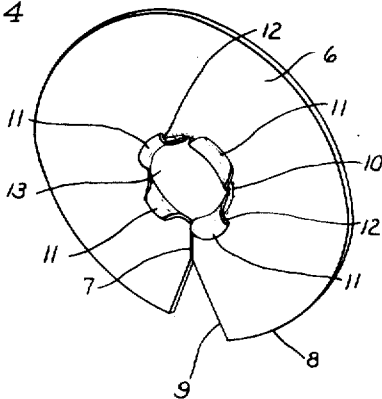


Fig. 4



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ELECTRIC LAMP OR SIMILAR DEVICE

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Application September 17, 1954, Serial No. 456,831

4 Claims. (Cl. 313—279)

This invention relates to electric devices, such as electric incandescent or heat lamps and similar devices, which are capable of transforming electric energy into radiant energy and which comprise a sealed envelope enclosing an electric energy translation element such as a filament. More particularly, my invention relates to a filament support for such devices.

In infrared ray generating devices or heat lamps of the general type disclosed and claimed in co-pending application Serial No. 376,042, Foote et al., filed August 24, 1953, and comprising a thin tubular quartz envelope having a coiled tungsten filament extending longitudinally therethrough, it is customary practice to provide one or more auxiliary supports for the filament at one or more points along its length and engageable with the inner wall of the envelope to maintain the filament positioned more or less axially of the tubular envelope. Heretofore, such auxiliary filament supports have generally been in the form of wire spirals surrounding the filament, the small diameter end of the wire spiral being closed or coiled around the filament coil to thereby hold it in place thereon. The formation and mounting of such wire spiral type supports, however, is a slow and expensive operation, and the mechanism customarily employed for winding the wire spirals ordinarily requires considerable maintenance. Moreover, where the wire spirals are formed of tantalum wire, in accordance with the invention disclosed and claimed in the aforesaid co-pending Foote et al. application Serial No. 376,042, the wire spirals are in such case subject to the disadvantage of creep, i. e., high temperature flow or distortion thereof, at the normal high operating temperatures of the lamp, resulting in the sagging of the wire spirals with consequent sagging of the filament coil against the quartz envelope, thereby causing lamp failures.

It is an object of my invention to provide a simple and easily fabricated and mounted auxiliary support for a coiled filament of an electric lamp or similar device.

Another object of my invention is to provide an electric heating device of the character described having a tantalum auxiliary filament support which is stronger than the wire spiral type supports heretofore in general use and which is substantially free from creep at the normal operating temperatures of the device.

Briefly stated, in accordance with one aspect of the invention, an auxiliary support for a coiled linear filament of an electric lamp or similar device is constituted of a thin wafer or disc of refractory metal which is disposed transversely between two successive coil turns of the filament, with the filament wire passing through a passageway or slit in the wafer, and is pierced interiorly of the filament coil to form a short collar portion projecting a short distance through and engaging the adjacent coil turn of the filament coil to thereby lock the support wafer in place on the coil against lateral disengagement therefrom as well as against rotative movement thereon.

Further objects and advantages of my invention will

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appear from the following detailed description of a species thereof and from the accompanying drawing.

In the drawing,

Fig. 1 is an elevation of an electric infrared ray generating or heating device according to the invention and provided with an auxiliary filament support comprising the invention;

Fig. 2 is a sectional view, on a greatly enlarged scale, through one of the auxiliary filament supports and the associated filament of the heating device shown in Fig. 1;

Fig. 3 is a perspective view, also on an enlarged scale, of the auxiliary filament support and the associated filament; and

Fig. 4 is a perspective view, on an enlarged scale, of the auxiliary filament support showing the coil-engaging collar side thereof.

Referring to Fig. 1, the invention is there shown as applied to an infrared ray generator or heating device of the general type disclosed and claimed in the aforesaid Foote et al. application Serial No. 376,042 and comprising an elongated tubular envelope 1 which may either be of clear (crystal) fused quartz or translucent (sand) fused quartz, or of a quartz-like glass such as that commercially known as Vycor and containing approximately 96% quartz. The quartz tube or envelope 1 is of relatively small diameter and it contains a filling of rare gas, such as argon, krypton or xenon, at a pressure of around one atmosphere. In the case of the particular heating device illustrated, the envelope has an inside diameter of the order of, for example, from 7–8 millimeters and an outside diameter of the order of from 9–10 millimeters.

Mounted within and extending approximately axially of the tubular envelope 1 throughout substantially the full length thereof is a coiled linear filament 2 of tungsten or other refractory metal wire, designed to operate at a temperature of from 2400° K. to 3000° K. The filament 2 is suitably connected at its opposite ends to lead-in conductors 3 suitably sealed through flattened end press or seal portions 4 of the tubular envelope 1 to form gas-tight joints therewith. The filament 2 is initially placed under tension when it is mounted or sealed into the envelope 1 in order to compensate for its thermal expansion and insure that it remains in a straight line in the tubular envelope. Exteriously of the end press portions 4 of the envelope, the lead-in conductors 3 are suitably connected to flattened metal sleeve bases 5 which are clamped around the flat pinch seals or press portions 4 of the envelope. The said bases 5 may be of the general type disclosed and claimed in co-pending U. S. application Serial No. 347,590, W. F. Hodge, filed April 8, 1953, now forfeited, and assigned to the assignee of the present invention.

The elongated filament 2 is supported in place within the tubular envelope 1, at spaced points along its length and in spaced relation to the envelope wall, i. e., extending more or less axially of the tubular envelope, by a plurality of supplementary or auxiliary supports 6 of slightly smaller diameter than the inside of the envelope. These auxiliary filament supports are formed of a suitable highly refractory metal such as tantalum, tungsten or molybdenum, for example. However, in the case of the particular infrared ray heating device illustrated, it is preferable to form the auxiliary filament supports 6 of tantalum, in accordance with the invention disclosed in the previously mentioned co-pending Foote et al. application Serial No. 376,042, the tantalum supports in such case acting as getter bodies which serve to prevent the blackening of the envelope of the heating device during the operation thereof.

In accordance with the invention, the auxiliary filament supports 6 are in the form of thin wafers or discs which

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are preferably formed and mounted in place on the filament coil 2 in the manner disclosed and claimed in my co-pending application Serial No. 456,674, filed of even date herewith. To permit such positioning of the filament support discs 6 concentrically with respect to the filament coil 2, each disc 6 is provided with a passageway or opening in the form of a radial slit 7 which extends inwardly of the disc from its outer peripheral edge 8 and through which slit the filament wire passes, as shown in Fig. 3. The slit 7 extends inwardly of the disc 6 a sufficient distance to permit the concentric positioning of the disc relative to the filament coil 2, with the filament wire received or caught in the slit. To facilitate the insertion of the wire of the filament coil 2 into the slit 7, the outer end of the slit is flared outwardly as indicated at 9 to thereby catch the filament wire and guide it into the slit proper upon insertion of the disc (or of a metal strip from which the disc is subsequently punched) into the filament coil.

The filament support discs 6 are held or locked in place on the filament coil 2, against lateral displacement or disengagement therefrom as well as against rotation thereon, by short collar-like portions 10 which project from one side of each disc a short distance through the interior space of the filament coil and engage with the inner side of the adjacent coil turn thereof. As shown, the collar portions 10 are of slightly smaller outside diameter than the inside diameter of the filament coil 2. The collar portions 10 are preferably formed on the disc 6 in the manner disclosed in my aforesaid co-pending application Serial No. 456,674, i. e., by piercing the disc 6, or a metal strip out of which the disc is punched, with a pointed piercing tool or mandrel inserted in the filament coil, while the said disc or metal strip is positioned in place in the filament coil 2, the piercing tool preferably having a pyramidal pointed piercing end in the case of the larger size filament coils having an inside diameter greater than 15 mils, for example. When formed by such a pyramidal pointed piercing tool, the locking collars 10 are of furcated or split character, each collar 10 being composed of a plurality of tongues or tabs 11, as shown in Figs. 2 and 4, which are laid open by the pyramidal pointed piercing tool during the disc or metal strip piercing operation. The internal strain produced in these tongues or tabs 11 by the working of the metal during the piercing operation causes the tongues to curl outwardly to a slight extent, as indicated at 12. As a result, the tongues 11 partially wrap themselves around and grip the inner side of the adjacent coil turn of the filament, as shown in Fig. 2, thereby producing a secure fastening or attachment of the disc to the filament coil 2 which not only locks the disc in place thereon against lateral disengagement therefrom but also against rotative displacement or screw-threading movement therealong. The forming of the collar portions 10 by a piercing operation such as described above results in the formation of a circular aperture 13 in the disc 6 located at the center thereof and bordered by the collar portion 10.

The auxiliary filament supports 6 comprising my invention are easily and quickly fabricated and mounted in place on the filament 2, as disclosed in my said co-pending application Serial No. 456,674, and they are securely locked in place on the filament coil 2 against lateral disengagement therefrom. Of most importance, however, is the fact that because of the stronger geometry of a disc-shaped support such as is encompassed by the invention, as compared to the wire spiral type supports heretofore in common use, the tantalum disc supports 6 of my invention are substantially free of creep and resultant sagging at the normal operating temperatures of heat lamps. As a result, there is much less likelihood, with the auxiliary

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supports 6 of my invention, of the filament sagging against the wall of the envelope 1 during service and thereby causing lamp failures. Also, the disc-type support of my invention is much less subject to tilting on the filament coil such as would further contribute to the sagging of the filament coil. Because of their above-mentioned characteristics, disc-type supports according to the invention will support a filament coil substantially in a straight line and in place within a lamp envelope.

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

1. In combination, a lamp filament of helically coiled refractory metal wire and supplementary support means engaging the filament coil intermediate its ends and comprising a metallic disc disposed transversely of the coil between adjacent turns thereof, said disc having an aperture therein and an opening immediately adjacent said aperture, a portion of the wire in the said adjacent turns of the coil extending through said opening, said disc having a collar portion at the margin of said aperture within the interior of the coil and engaging a coil turn at one side of the disc to secure the disc to the coil.

2. In combination, a lamp filament of helically coiled refractory metal wire and supplementary support means engaging the filament coil intermediate its ends and comprising a metallic disc disposed transversely of the coil between adjacent turns thereof, said disc having a central aperture therein and a radial slit extending from the aperture to the outer edge of the disc, a portion of the wire in the said adjacent turns of the coil extending through the portion of said slit contiguous to said aperture, said disc having a collar portion at the margin of said aperture within the interior of the coil and engaging a coil turn at one side of the disc to secure the disc to the coil.

3. In combination, a lamp filament of helically coiled refractory metal wire and supplementary support means engaging the filament coil intermediate its ends and comprising a metallic disc disposed transversely of the coil between adjacent turns thereof, said disc having an aperture therein and a furcated collar portion at the margin of said aperture within the interior of the coil and engaging and curled partially about a coil turn at one side of the disc to secure the disc to the coil.

4. In combination, a lamp filament of helically coiled refractory metal wire and supplementary support means engaging the filament coil intermediate its ends and comprising a metallic disc disposed transversely of the coil between adjacent turns thereof, said disc having a central aperture therein and an opening immediately adjacent said aperture, a portion of the wire in the said adjacent turns of the coil extending through said opening, said disc having a radial slit extending from the aperture to the outer edge of the disc, a portion of the wire in the said adjacent turns of the coil extending through the portion of said slit contiguous to said aperture, said disc having a furcated collar portion at the margin of said aperture within the interior of the coil with the tabs of the furcated collar portion engaging and curled partially about a coil turn at one side of the disc to securely lock the disc to the coil.

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