Dec. 16, 1952 A. M. HAGEMAN ET AL 2,622,222

INFRARED HEATING AND COOKING LAMP

Filed April 27, 1951

Fig. 1.

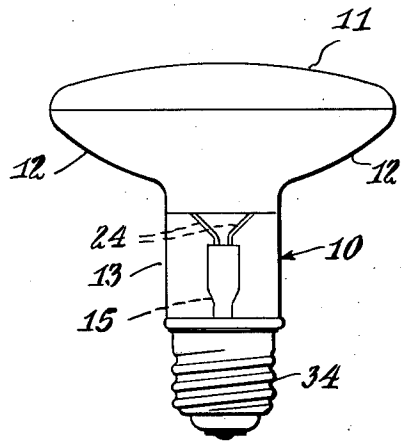

Fig. 2.

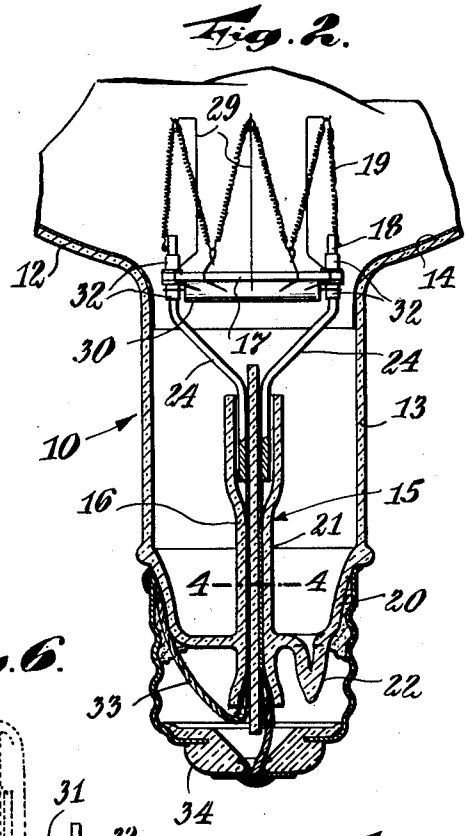

Fig. 3.

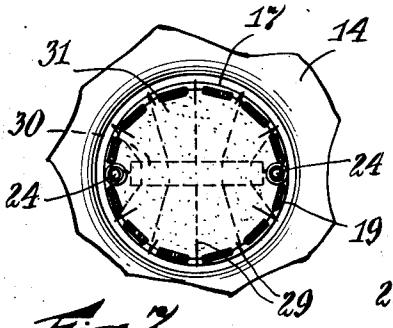

Fig. 6.

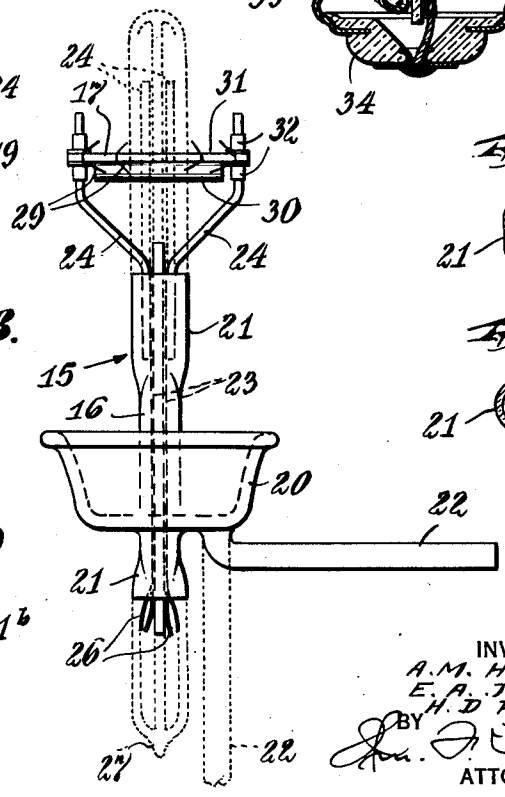

Fig. 4.

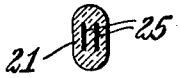

Fig. 7.

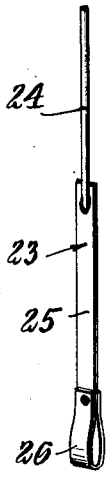

Fig. 8.

Fig. 5.

Fig. 9.

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INFRARED HEATING AND COOKING LAMP

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6 Claims. (Cl. 313—114)

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This invention relates to lamps and, more particularly, to infra-red heating and cooking lamps.

A possibility in the present design of electric cooking ranges is the substitution of infra-red heating and cooking lamps for the conventional resistance-type heating plates. The advantages of the cooking lamp are more rapid heating, as as well as visual indication to the user of the stove that the source of heat is alive. Another advantage of the cooking lamp is the ease of replacement by the user of the stove.

Disadvantages in the use of the cooking lamp, as a replacement for a resistance-type heating plate, lie in the high cost of manufacture of such a lamp due to the large and expensive graded seals used to join the "Vycor" or quartz bulb to a conventional relatively softer glass, such as "Nonex," stem, and the increased length of said lamp over that of the flat heater plate. Further, due to the excessive amounts of heat conducted along the filament leads and through the relatively soft glass stem, the oxide bond between the lead and the glass press deteriorates and leaker failures result. The extremely high temperatures throughout the lamp, resultant of normal operation, cause internal strains in the graded seal and occasional leaker failures due to graded seal cracks.

Hence, it has been found advantageous, according to our invention, to provide a cooking lamp of all "Vycor" or all quartz construction, insofar as bulb and attendant stem and tubulation are concerned.

"Vycor" is the trade name for a good grade of Corning high silica glass, comprising approximately 96% silica, 3% boron oxide and the balance aluminum oxide, with impurities including traces of sodium oxide and arsenic oxide.

A filament mount comprising a "Vycor" stem and tubulation is sealed to the neck of the "Vycor" bulb. This stem has a flared dish hermetically sealed about a partitioned tubing shrunken down onto the thin molybdenum-ribbon sections of the three-piece filament leading-in conductors, and a "Vycor" exhaust tubulation suitably affixed through the bottom side wall of the dish to allow evacuation of the lamp interior. During the sealing of this mount into the bulb neck, the application of less heat than in the conventional graded seal eliminates the vaporization of silica as "smoke" from the neck and dish and the condensation of said "smoke" on the nearest adjacent cooler portion of the interior wall of the bulb.

Due to increased heat carrying capacity of the ribbon type lead-in conductor, and to the lack of

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the conventional oxide bond between the conductors and conventional press, said bulb to dish seal may be made closer to the filament heat source and a shorter lamp results.

In its general aspect, the present invention has the object of overcoming the aforementioned disadvantages of the prior art graded seal cooking and heating lamps.

Specifically, an object of the present invention is the elimination of the large and expensive graded seal between the "Vycor" bulb and the relatively softer glass stem.

Another and specific object is the elimination of the relatively soft glass stem.

An additional object is the elimination of leakage paths through the stem due to overheating.

Another object is elimination of the strain and resultant cracks in the graded seal between the bulb neck and stem.

A further object is a cooking lamp of all "Vycor" construction which is suitable for sustained high temperature operation.

An additional object is an all "Vycor" cooking and heating of short overall length and reduced cost.

A still further object is the elimination of silica "smoke" condensation on the bulb interior.

Other objects and advantages of the invention will appear to those skilled in the art to which it appertains as the description proceeds, both by direct recitation thereof and by implication from the context.

Referring to the accompanying drawing, in which like numerals of reference indicate similar parts throughout the several views:

Fig. 1 is an elevational view of an all "Vycor" cooking lamp;

Fig. 2 is a sectional view of such a lamp;

Fig. 3 is a plan view of the lamp with the bulb broken away to show the filament;

Fig. 4 is a horizontal sectional view of the shrunken-down partitioned tubing on the line IV—IV of Fig. 2;

Fig. 5 is a horizontal sectional view of the partitioned tubing on the line IV—IV of Fig. 2, before leading-in conductors are sealed therein;

Fig. 6 is a side elevation of the all "Vycor" stem of the cooking lamp;

Fig. 7 is an elevational view of the filament leading-in conductor;

Fig. 8 is a view similar to Fig. 5, showing a partitioned tubing for use with three filament leading-in conductors;

Fig. 9 is a view similar to Fig. 5, showing a

partitioned tubing for use with four filament leading-in conductors.

In the specific embodiment of the invention illustrated in the drawing, the reference numeral 10 designates a "Vycor" envelope or bulb in general of a cooking lamp. While "Vycor" has been selected for illustrative purposes, the invention is not to be understood as restricted to employment with "Vycor," but may be used with other high melting point vitreous material such as quartz. The bulb comprises a dome-like end portion 11 which curves outwardly for greater strength, a reflector portion 12 of general parabolic configuration, and a cylindrical neck portion 13 which extends downwardly below the reflector portion 12.

The inner surface of the portion 12 is coated with a reflector film 14 of an evaporated metal such as gold, silver or aluminum. The metal to be deposited on the reflector surface is juxtaposed within a suitable tungsten filament within the bulb and after being vaporized in a protective atmosphere by the filament heat, condenses on the surface. Gold, because of its relatively higher coefficient of reflection of light energy of the infra-red wavelengths, is usually employed. During the metal evaporation process, the bulb 10 is in an inverted position. The end portion 11 is masked by a lawyer of finely divided glass beads of desired depth and neck 13 is masked by a suitable closed end cylindrical shield.

For sealing within the bulb 10, there is provided, as shown in Fig. 2, element mount 15. This mount 15 comprises a "Vycor" stem 16 on which are mounted and secured the filament support assembly 18 and filament 19.

"Vycor" stem 16, as shown in Fig. 6, consists of a flared dish 20, hermetically sealed to a coaxial partitioned tubing 21 and an appropriate exhaust tubulation 22. Within partitioned tubing 21 are, suitably in this showing, two three-piece leading-in and supporting conductors 23. Each of these conductors 23, as shown in Fig. 7, consists of an inner refractory lead wire 24, suitably molybdenum, for joining to filament 19, a thin non-oxidized moylbdenum ribbon 25 of rectangular cross section, approximately .0006'' thick and ⅛'' wide, for sealing into the partitioned tubing 21 and an outer molybdenum lead ribbon 26, approximately .005'' thick and ⅛'' wide, for positioning the conductors during sealing to tubing 21. At one end of ribbon 25, lead wire 24 is attached, as by spot welding thereto, while at the other end, ribbon 26 is formed into a loop and secured as by welding with the extremity of ribbon 25 therebetween.

To fabricate stem 16, as shown particularly in Fig. 6, the loop formed by outer ribbon 26 of each conductor 23 is cut suitably in half to form a V diverging away from the axis of conductor 23. These conductors are inserted into the partitioned tubing 21 and held in the desired position in the tubing by the V shaped ribbons 26 which press against the partition and inner wall of the tubing. The end of tubing 21 nearest the extremity of inner wires 24 is closed off and the opposite end of tubing 21 evacuated by suitable means such as a pump (not shown) and tipped off as at 27. Heating tubing 21 to approximately its melting point along its length juxtaposed with respect to the moylbdenum ribbons 25, causes atmospheric pressure to collapse the outer wall of the tubing onto the partition and hermetically seal and embed the ribbon therebetween. The uncollapsed ends of tubing 21 are cut off to the desired length exposing lead wires 24 and outer ribbons 26. To prevent arcing between the conductors 23, the partition is allowed to extend a suitable distance beyond the cut-off outer wall on each end of tubing 21, as shown in Fig. 2.

To complete "Vycor" stem 16, flared dish 20 having tubulation 22 affixed near the periphery of its bottom side wall, is sealed coaxially to the tubing 21 a suitable distance from the lower end of the shrunken portion of said tubing.

To form filament or element mount 15, inner lead wires 24 are first bent outward from axis of the stem 16, and then vertically upward parallel to the axis to receive filament support assembly 18. This assembly consists of reflector disc 17 of slightly less diameter than the neck 13 of bulb 10, and a plurality of refractory filament support wires 29 each having one end embedded in the arbor extension 30 on the underside of disc 17.

The supoprt wires 29 extend radially outward along the undersurface of disc 17 and upward parallel to the stem axis through suitable slots arranged in equispaced circular sequence in the periphery of the disc.

Reflector disc 17 and arbor extension 30 are desirably made of Corning "Multiform glass. "Multiform" is the trade name for powdered hard glass in a paraffin binder, molded by pressure to the desired form, and heated to remove the binder and to frit together the glass particles. The upper surface of disc 17 is coated with an evaporated reflector film 31, suitably the same as reflector film 14 of bulb 10, to increase its reflection properties and reduce the heating of the stem 16.

Disc 17 has two suitable holes near its periphery through which inner lead wires 24 of conductors 23 pass. It is desirably affixed to said lead wires by two pairs of flat-flanged refractory metal eyelets 32 which are attached, as by spot welding, to said wires and have their flanges respectively in flatwise engagement with the top and bottom surfaces of said disc.

It will be understood that at the points on the upper surface of reflector disc 17 where the filament support wires 29 project through the slots in the disc, and where the flanges of the eyelets 32 grip the disc surface, the metallic reflector film 31 is removed, as by scraping, from a suitable area surrounding said points of contact to prevent electrical contact between supports 29 and eyelets 32 and resulting filament shorting.

In the usual manner, filament mount 15 is completed by mounting filament 19 on the extremities of inner lead wires 24 and support wires 29, as shown in Figs. 2 and 3. Filament 19, suitably a refractory metal such as tungsten, is a coiled sectional filament in a saw-tooth-like circular arrangement and having its two symmetrical sections in electrical parallel.

Filament mount 15 is sealed to the neck 13 of "Vycor" bulb 10 in the protective atmosphere of argon, flowing through tubulation 22 and into the bulb interior, to protect the molybdenum parts from oxidation. Less heat is applied for this seal than in the conventional graded seal case and silica "smoke" on the bulb interior is eliminated.

After the usual exhaust which may comprise baking, sintering the filament, final evacuation, and tip off at 35, outer lead wires 33 are affixed, as by welding, between the V-shaped sides of

outer ribbons 26 of conductors 23. One outer lead wire is connected, as by arc welding, to the shell of a suitable base 34 and the other lead wire is similarly connected to the center contact of said base.

In some cooking lamps a wider heating temperature range is desirable and an additional leading-in conductor 23 to the two section filament 19 is provided so that the two filament sections may be operated individually, or together in series, or in parallel at either 110 or 220 volts alternating current. When such a filament 19 requiring three leading-in conductors is employed, the tri-partitioned tubing 21a, as shown in Fig. 8, is employed in fabricating stem 16.

To give still wider heating temperature range an auxiliary smaller concentric filament 19a (not shown) may be employed, thereby requiring a fourth leading-in conductor 23. In this case partitioned tubing 21b, as shown in Fig. 9, may be used for conducting the four conductors 23 through the envelope to the bulb interior.

Thus it will be seen from the foregoing description that our invention has overcome the disadvantages of the prior art graded seal cooking and heating lamps. Specifically, our invention has eliminated the large and expensive graded seal and the relatively softer glass stem. The attendant cracks in the graded seal and the creation of leakage paths through the stem due to overheating an oxide bond have been removed.

An all "Vycor" cooking lamp has been provided which is practical for sustained high temperature operation. The formation of silica "smoke" condensation on the bulb interior during the sealing of said lamps has been eliminated.

Although a preferred embodiment of our invention has been disclosed, it will be understood that modifications may be made within the spirit and scope of the appended claims.

We claim:

1. A high melting point vitreous cooking and heating lamp comprising: a high melting point vitreous envelope and an element mount; said envelope having a dome-like end portion, a reflector portion of general parabolic configuration having on its inner surface a metal reflector film, and a cylindrical neck portion depending below said reflector portion; said element mount having a filament support assembly, a filament, and a high melting point vitreous stem; said stem comprising a flared high melting point vitreous dish of outside diameter to fit said neck, a coaxial high melting point vitreous partitioned tubing extending hermetically through said dish a suitable distance on the vacuum side of said stem, and a plurality of leading-in and supporting conductors for said filament, said conductors having non-oxidized metallic strips hermetically sealed and embedded in said tubing.

2. An all "Vycor" cooking and heating lamp comprising: a "Vycor" envelope and an element mount; said envelope having a dome-like end portion, a reflector portion of general parabolic configuration having on its inner surface a metal reflector film, and a cylindrical neck portion depending below said reflector portion; said element mount having a filament support assembly, a filament, and a "Vycor" stem; said stem comprising a flared "Vycor" dish of outside diameter to fit said neck, a coaxial "Vycor" partitioned tubing extending hermetically through said dish a suitable distance on the vacuum side of said stem, and a plurality of leading-in and supporting conductors for said filament, said conductors having non-oxidized metallic strips hermetically sealed and embedded in said tubing.

3. An all quartz cooking and heating lamp comprising: a quartz envelope and an element mount; said envelope having a dome-like end portion, a reflector portion of general parabolic configuration having on its inner surface a metal reflector film, and a cylindrical neck portion depending below said reflector portion; said element mount having a filament support assembly, a filament, and a quartz stem; said stem comprising a flared quartz dish of outside diameter to fit said neck and a coaxial quartz partitioned tubing extending hermetically through said dish a suitable distance on the vacuum side of said stem, and a plurality of leading-in and supporting conductors for said filament, said conductors having non-oxidized metallic strips hermetically sealed and embedded in said tubing.

4. A high melting point vitreous cooking and heating lamp comprising: a high melting point vitreous envelope and an element mount; said envelope having a dome-like end portion, a reflector portion of general parabolic configuration having on its inner surface a metal reflector film, and a cylindrical neck portion depending below said reflector portion; said element mount having a filament support assembly, a filament, and a high melting point vitreous stem; said stem comprising a high melting point vitreous flared dish of outside diameter to fit said neck and a coaxial high melting point vitreous partitioned tubing extending hermetically through said dish a suitable distance on the vacuum side of said stem, and leading-in supporting conductors for said filament, said conductors having non-oxidized metallic strips hermetically sealed and embedded in said tubing; said filament support assembly comprising a "Multiform" reflector disc of slightly less diameter than said neck coaxially on said conductors and having on its upper surface a metal reflector film and on its lower surface an arbor extension, and a plurality of refractory metal filament supports; said supports each having one end embedded in said extension and the other end for supporting said filament.

5. An all "Vycor" cooking and heating lamp comprising: a "Vycor" envelope and an element mount; said envelope having a dome-like end portion, a reflector portion of general parabolic configuration having on its inner surface a metal reflector film, and a cylindrical neck portion depending below said reflector portion, said element mount having a filament support assembly, a filament, and a "Vycor" stem; said stem comprising a flared "Vycor" dish of outside diameter to fit said neck and a coaxial "Vycor" partitioned tube extending hermetically through said dish a suitable distance on the vacuum side of said stem, and a leading-in supporting conductor for said filament, said conductors having non-oxidized metallic strips hermetically sealed and embedded in said tube; said filament support assembly comprising a "Multiform" reflector disc of slightly less diameter than said neck coaxially on said conductors and having on its upper surface a metal reflector film and on its lower surface an arbor extension, and a plurality of refractory metal filament supports, said supports having one end embedded in said extension and the other end for supporting said filament.

6. An all quartz cooking and heating lamp comprising: a quartz envelope and an element mount; said envelope having a dome-like end portion, a reflector portion of general parabolic

configuration having on its inner surface a metal reflector film, and a cylindrical neck portion depending below said reflector portion; said element mount having a filament support assembly, a filament, and a quartz stem; said stem comprising a flared quartz dish of outside diameter to fit said neck and a coaxial quartz partitioned tube extending hermetically through said dish a suitable distance on the vacuum side of said stem, and a plurality of leading-in supporting conductors for said filament, said conductors having non-oxidized metallic strips hermetically sealed and embedded in said tube, said filament support assembly comprising a "Multiform" reflector disc of slightly less diameter than said neck coaxially on said conductors and having on its upper surface a metal reflector film and on its lower surface an arbor extension, and a plurality of refractory metal filament supports, said supports having one end embedded in said extension and the other end for supporting said filament.

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