

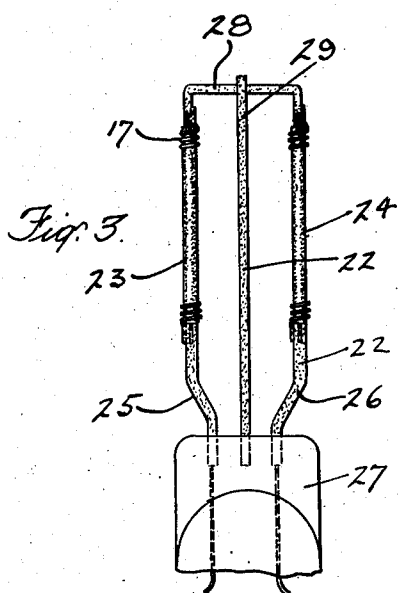
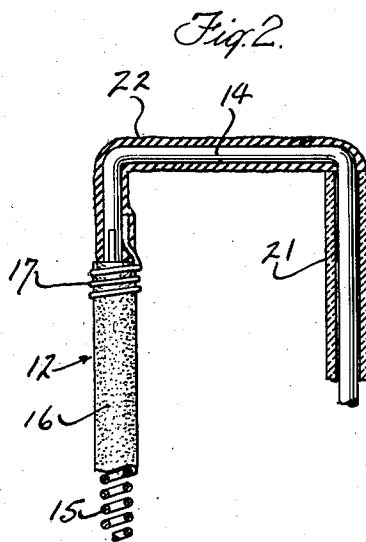
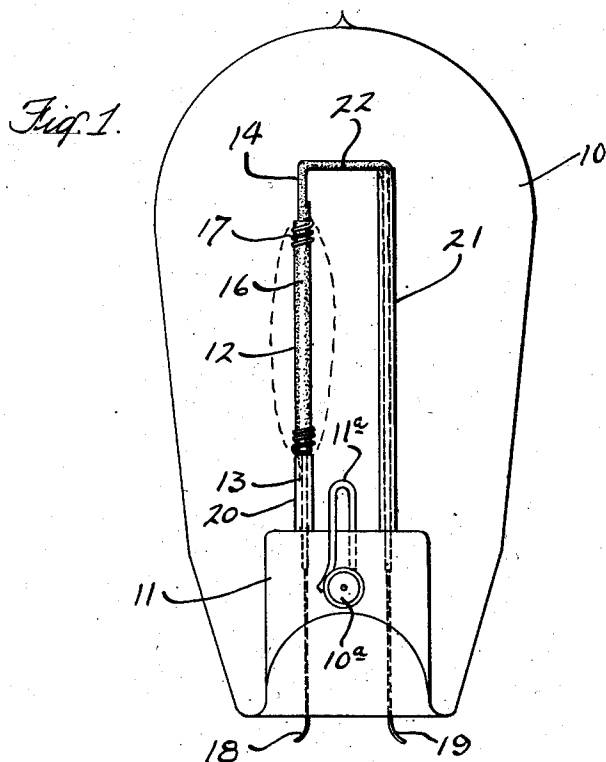
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MOUNTING OF ELEMENTS IN RADIATION DEVICES

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MOUNTING OF ELEMENTS IN RADIATION DEVICES

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3 Claims. (Cl. 176—1)

This invention relates to radiation devices and particularly to a means and a method for mounting radiation elements in such devices. This application is a continuation in part of my co-pending application Serial No. 490,583, filed October 23rd, 1930.

One of the objects of the invention is to provide a radiation device in which the means supporting the radiation element are insulated from the atmosphere surrounding the element.

Another object of the invention is to provide a radiation device with means to prevent short circuiting through the space between the high potential support rods of the radiation elements.

Other objects of the invention and objects relating to the method of applying the insulation material will be apparent as the description of the invention proceeds.

The invention has been illustrated in the accompanying drawing in which:

Fig. 1 is a side elevational view of an electric radiation device embodying the invention;

Fig. 2 is an enlarged sectional view of the upper end of the element and support rod of Fig. 1 showing the manner of insulating it; and

Fig. 3 is the element structure of another type of radiation device showing a different form of insulation.

In my application entitled Electrical discharge device Serial No. 459,048, filed June 3rd 1930, I have described a radiation device in which an electron emitting element is heated to electron emitting temperature in the presence of an ionizable gas under certain pressures less than atmospheric whereupon the gas in the vicinity of the element appears to be ionized and forms a conducting path for current which flows through the gas thereby causing an illumination of the gas which takes the form of a halo of intense illumination around the element. When such a device is used with voltages in the neighborhood of 110 volts I have found that there is a tendency for an arc to form between one end of the electron emitting element and one of the support rods having the opposite potential, due, no doubt, to the fact that the breakdown potential of the gas across the gap is less than the potential applied to the parts in question and this arc is apt to cause a rupture of the element thereby rendering the device inoperative. The present invention intends to overcome this difficulty permitting the use of voltages as high as 110 volts without danger of injuring the radiation element.

Referring now more specifically to the draw-

ing a lamp operating on the principles described in the above mentioned application is shown in Fig. 1 and comprises an envelope 10 fused to the usual press 11 which extends upwardly inside of the envelope for supporting the various elements of the device. An electron emitting element 12 may be supported at its lower end upon a support rod 13 which is sealed in the press 11 and at its upper end upon a support rod 14 which extends rearwardly and is bent downwardly to be also sealed in the press 11.

The electron emitting element may be any of the types shown and described in the above mentioned application and is shown in Fig. 1 for illustrative purposes as comprising a coil 15 of a refractory wire such as tungsten, molybdenum, nichrome, or tantalum coated with electron emitting material 16 which may be any of the well known materials used for that purpose such as the oxides of the alkaline earth group of metals or various combinations of such oxides mixed with a suitable binder to hold the material upon the surface of the wire. Or the emitting material may be incorporated in the metal of the wire such as the well known thoriated tungsten wire which is made by treating tungstic acid and thorium nitrate.

If desired additional small coils 17 of the same or other refractory wire may be provided at the ends of the element 12 to carry the additional current flowing through the gas when the element is energized. The wires forming these coils should have a diameter sufficient to carry the additional current and prevent overheating of the adjacent insulation but should not be large enough so that they tend to cool the ends of the element and they may be coated with electron emitting material or not as desired. The ends of the coils may be welded to the support rods alongside of the ends of the elements 12. Leading-inwires 18 and 19 may be connected respectively to the support rods 13 and 14 for making the electrical connections outside of the device.

The support rods 13 and 14 where they are spaced from the press 11 may be surrounded if desired by tubes 20 and 21 respectively of insulating material such as glass, quartz, isolantite, or lavite, which should preferably be fused to the press 11 to prevent any path for the current from either of the support rods to the surrounding gas adjacent the press. The remainder of the support rods, as the horizontal portion of the rod 14, may be coated with an insulating compound which besides having a high degree of insulation should also be capable of degasifi-

cation and of adhering closely to the rod. This material may be such as is described in the application of Samuel Ruben entitled Heater element and method of preparing it, filed October 9, 1929, Serial No. 398,550, which comprises finely divided aluminum oxide mixed with a solution of a small amount of aluminum chloride dissolved in water. When this mixture is spread upon the wire and heated in an oxidizing atmosphere the aluminum chloride takes on oxygen with the evolution of chlorine gas and forms aluminum oxide similar to the main body of the material. However this chemically formed aluminum oxide is in such fine particles that it enters the crevices in the larger particles of aluminum oxide forming the main body of the insulator and acts as an intergrain cement binding these particles closely together and causing the mass to adhere closely to the wire upon which it is mounted. When the chemical action is completed the entire mass becomes aluminum oxide and an insulating material so that there are no inert or inactive particles present. This greatly improves the insulation quality of the material.

In applying such an insulation material to the support rods of a radiation device it is preferable that the press 11 with the support rods and elements be heated in an oxidizing atmosphere first to effect the chemical change in the coating and then degasified before the press is inserted in the envelope as it is difficult to raise the temperature of the supports during the exhausting process of the envelope sufficiently to drive out occluded gases in the insulating coating.

The envelope 10 may be filled with an inert gas preferably one of the monatomic gases such as argon, neon, helium, krypton, and xenon or mixtures of such gases at a pressure in the neighborhood of 200 mm. of mercury although this pressure may be varied depending on the effect desired as the size of the halo produced appears to be dependent upon the pressure, decreasing as the pressure is increased and increasing in size as the pressure decreases. Also, if desired, to increase the conductivity of the gas or to produce color effects a metal vapor or vapors may be introduced into the envelope such as the vapors of mercury, caesium, calcium, rubidium, or cadmium. Such vapors may be introduced by providing a small pressed metal container 10a in which may be placed a salt such as a chloride of the metal desired and a small piece of magnesium or calcium.

The container 10 may be mounted by means of a support wire 11a which may be sealed in the press 11 between the two support rods 13 and 14. After the envelope is sealed off if the container 10a is heated as by external bombardment the magnesium or calcium will combine with the salt of the metal forming magnesium or calcium chloride and liberating the free metal which is thrown off in vapor form where it condenses on the inner walls of the envelope to be vaporized again when the device is heated in use.

The radiation device as constructed in Fig. 1, with the degasified coating 22 on the horizontal portion of the support rod 14 and the insulating tubes 20 and 21 in place on the vertical portions of the support rods, may be connected to a vacuum pump and an oven placed over it in the usual manner to raise the temperature thereof to between 350 and 400° C. or to as high a temperature as the glass will stand without softening. A current may be run through the filament at this

time to heat it to a red heat at a temperature of about 600° C. and the heat and exhausting is continued until there is no more gas in the envelope as is evidenced by a lack of fluorescence when high tension current from an induction coil is directed against the walls thereof. Current may then be increased through the filament so that the temperature thereof may be slowly raised until it is about 800° C. with a bright red color. This drives out the binder in the electron emitting material and other occluded gases.

When again no more gas is found in the bulb the oven may be raised and the filament heated for a moment to about 1200° C. or slightly less, the pump being connected all this time to maintain a high vacuum. The pump may be then shut off and the filament current turned off and a small amount of an inert gas such as neon at about ½ mm. pressure may be admitted to the bulb and the current turned on again and gradually increased. Spots of localized discharge will then appear having a reddish color and will gradually spread until a diffused glow completely fills the bulb. This process appears to activate the electron emitting coating and should be maintained until the discharge is uniform throughout the entire bulb which usually takes less than ten minutes when the activation is completed. During this time the current on the filament should not be raised too high so that the coating will not be destroyed or thrown off from the filament.

If white discharge spots appear on the filament or support rods it is an indication that there are more gases or vapors in the bulb and the bulb should again be exhausted and the whole process of activation repeated.

When the activation is completed the filament temperature may be raised for a moment to about 1400° C. then the vacuum pump again connected and the gas pumped out to remove any undesirable gases which have been thrown off during the activation process. At this time a high vacuum in the neighborhood of .5 micron should preferably be obtained.

The filament circuit may then be disconnected, the pump turned off, and about 50 mm. of neon gas admitted into the bulb followed with about 150 mm. of argon. The bulb may then be sealed off and is ready for use after flashing the magnesium to provide the metal vapors if such are desired. A small quantity of magnesium may be flashed if desired when metal vapors are not used to clean up the gases in the bulb.

When the leading-in wires 18 and 19 are connected in a circuit the temperature of the electron emitting element 12 is raised to electron emitting temperature whereupon the gas in the vicinity of the element is ionized and the halo effect described above is obtained. Inasmuch as the support rods are protected by the insulation coating or tubes there is no danger of a short circuit through the conductive gases between two points on the support rods or between the element and one of the support rods.

In Fig. 3 a modified form of the radiation device of Fig. 1 is shown wherein a pair of electron emitting elements 23 and 24 are mounted at their lower ends upon two support rods 25 and 26 respectively which are sealed in the press 27. The upper ends of the elements may be mounted upon a cross member 28 which is in turn attached to a central support rod 29 sealed in the press 27. The additional coils 17 as described above may also be used to carry the excess current when the elements are energized. In this construction all

of the support rods are shown coated with the insulating coating 22 applied in the manner indicated above, the insulating tubes being omitted.

While the invention has been shown in connection with a specific type of radiation device it is evident that any type of device may have parts thereof protected with the insulating means described above.

Many modifications of the invention may be resorted to without departing from the spirit thereof, and I do not therefore desire to limit myself to what has been specifically shown and described except as such limitations occur in the appended claims.

What I claim is:

1. In a radiation device an envelope, an ionizable gas within said envelope, a radiation element containing an oxide of the alkaline earth metals and constituting the sole source of the discharge of the device within said envelope, means to support said element, containing an oxide of the alkaline earth metals and a coating of insulating material upon said supporting means, and additional means for preventing excessive heating of said coating material adjacent the radiation element.

2. In a radiation device an envelope, an ionizable gas within said envelope, a radiation element containing an oxide of the alkaline earth metals, said element constituting the sole source of the discharge of the device, support rods for said element, a coating of insulating material closely adherent to said support rods and covering all exposed parts thereof, said element and support rod forming a series electrical conductor in said envelope, and relatively short open-ended coils secured to the ends of said element to prevent excessive heating of the element ends and adjacent insulation.

3. In a radiation device an envelope, a radiation element containing an oxide of the alkaline earth metals, an ionizable gas within said envelope, means to support said element, containing an oxide of the alkaline earth metals and an insulating coating upon and completely covering said supporting means and open-ended coils attached to the ends of said element, said element constituting the sole source of the discharge of the device.

CHESTER H. BRASELTON.