

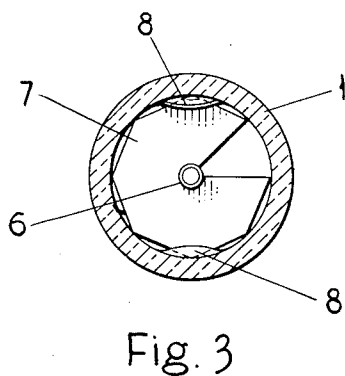
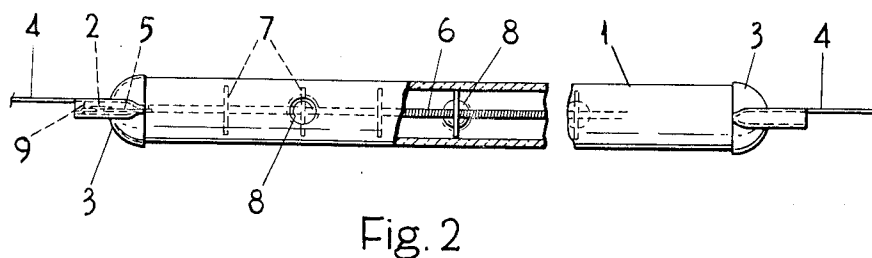
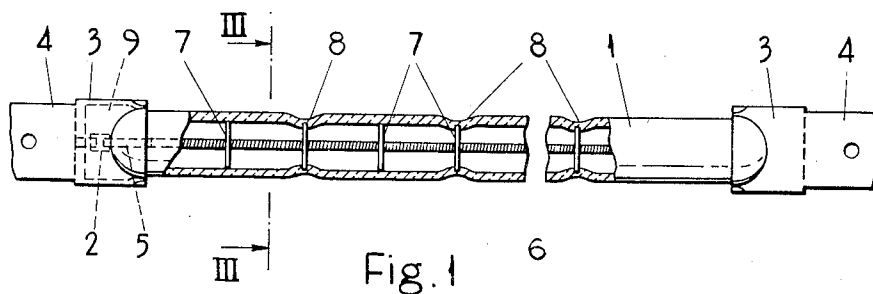
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DEVICES FOR PRODUCING LIGHT OR INFRA-RED RADIATION

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DEVICES FOR PRODUCING LIGHT OR INFRA-RED RADIATION

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This invention relates to devices for producing light or infra-red radiation, of the kind including an elongated helix of refractory metal, such as tungsten, which is supported within a closed vitreous envelope between current supply conductors sealed one through each end of the envelope and is spaced from the envelope wall by a plurality of refractory spacers arranged at approximately uniform intervals along the length of the filament. The invention is concerned more particularly, but not exclusively, with such devices in which the vitreous envelope is of quartz and which are intended primarily for heating purposes, which devices are usually designed to operate with a nominal wattage dissipation of 500 watts or more.

A device of the kind referred to might be, for example, a foot or more long and include spacers at about one inch intervals along the length of the filament.

The spacers can conveniently consist of discs of refractory metal, such as tantalum, having a radial slot of width, at least at the inner end of the slots, which is less than the outer diameter of the filament helix, each disc being fitted between adjacent turns of the helix so as to be substantially at right angles to its axis with the helix at the bottom of the slot.

Such devices have hitherto usually been operated with the envelope axis horizontal, since sagging of the filament leading to early failure of the device has occurred with vertical operation. Such vertical operation is, however, desirable for some purposes and the object of the invention is to provide an improved form of device in which the tendency of the filament to sag when the device is operated vertically is reduced.

According to the invention in a device of the kind referred to at least some of the said spacers are fixed in position within the envelope by being partly embedded in the envelope wall.

The partial embedding of the spacers in the envelope wall to hold them in a fixed position within the envelope reduces the tendency of the filament to stretch when operated vertically, and by a suitable choice of the number of the partly embedded spacers and of the spacing between them undue sagging of the filament in vertical operation can be avoided.

It will not usually be necessary for all the spacers to be secured to the envelope to prevent undue filament sagging in vertical operation, and the number required will depend on the dimensions of the device, including the filament dimensions and the total number and spacing of the spacers employed and also on the operating temperature.

The partial embedding of the spacers in the envelope wall can be effected by heating the envelope at regions adjacent to each of the appropriate spacers so as to produce a softening of the envelope at said regions and pressing the softened regions of the wall into contact with the edges of the spacers.

Preferably however the embedding of the spacers in the envelope wall is effected by a local heating of the envelope wall adjacent to each of the appropriate spacers whilst the pressure within the envelope is below the external atmospheric pressure so as to cause a local collapse of the wall on to the spacers under the external atmos-

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pheric pressure. Such a method is particularly suitable where the envelope is formed of quartz.

When, as is usually the case, the envelope of the completed device is evacuated or is filled with rare gas at a pressure less than atmospheric pressure the attachment of the spacers to the envelope can readily be effected by the latter method after the envelope has been sealed off.

One device in accordance with the present invention will now be described by way of example with reference to FIGURES 1 and 3 of the accompanying schematic drawing in which

FIGURES 1 and 2 represent two side views of the device in directions at right angles to each other, and

FIGURE 3 represents a transverse cross-section through the device in the plane III-III of FIGURE 1.

Referring to the drawing the device has a tubular quartz envelope 1 about 13 inches long and $\frac{3}{8}$ inch external diameter, the envelope, which is shown partly in section, being filled with argon at a pressure of about 600 mm. mercury, and being closed at each end by a pinch seal on to a molybdenum foil lead-in conductor 2 of known kind. The outer ends of the lead-in conductors 2 project from the pinched ends of the envelope and are connected to metal terminal caps 3 fitted over the ends of the envelope as shown, the terminal caps being of known kind carrying connecting strips 4, and each being held in position on the envelope by the pressing of the wall of the cap into engagement with the shoulders of the respective pinch 9. The inner end of each molybdenum foil lead-in conductor 2 is connected to a stouter strip of molybdenum 5 set into the quartz and protruding into the envelope for a distance of about $\frac{3}{8}$ inch along the axis of the envelope.

A helical tungsten filament 6 about 12.5 inches long extends between the strips 5 and is supported substantially coaxially within the envelope by fourteen tantalum disc spacers 7 (only some of which are shown), the discs being of the radial slotted type hereinbefore mentioned and being spaced at approximately equal intervals along the length of the filament 6.

The second, fourth, sixth, ninth, eleventh and thirteenth discs, counting from one end of the filament are held in position within the envelope in accordance with the invention by the partial embedding of these discs in the envelope wall as shown at 8.

This is effected, after the envelope has been evacuated, filled with rare gas filling and sealed off in known manner, by playing needle-pointed gas flames on to diametrically opposite points of the envelope wall adjacent to each of the appropriate discs until a local collapse of the wall on to the periphery of the disc takes place, each of these discs then being secured in position within the envelope by the embedding of two opposite parts of its periphery in the wall of the envelope.

The device, which is intended primarily for heating purposes, has a nominal wattage dissipation of 1 kw.

A further device in accordance with the invention, which is also intended primarily for heating purposes and which has a nominal wattage dissipation of 500 w., has a tubular quartz envelope approximately 7 inches long and $\frac{3}{8}$ inch external diameter closed at each end by pinch seal through which extends a molybdenum foil lead-in conductor as in the device previously described. The outer ends of the lead-in conductors are connected to a pair of terminal caps fitted on to the ends of the envelope, and their inner ends are connected to stout molybdenum strips set into the quartz and attached to the ends of a helical tungsten filament extending along the envelope. The filament is supported substantially coaxially within the envelope by seven tantalum disc spacers of the radial slotted type previously referred to spaced

at approximately equal intervals along the length of the filament.

The second, fourth and sixth discs counting from one end of the filament are held in position within the envelope by the embedding of diametrically opposite parts of the edges of the discs in the envelop wall, this being effected after the envelope has been sealed off by playing needle-pointed gas flames on appropriate parts of the envelope wall until a local collapse of the wall on the periphery of the discs takes place as in the case of the device previously described.

I claim:

1. An energy radiation device comprising a long tubular vitreous envelope closed at each end, a supply conductor sealed through each end of the envelope, an elongated helical filament of refractory material supported between said supply conductors, and a plurality of refractory spacers of disc form arranged at approximately uniform intervals along the length of the filament and supportingly engaging said filament to space the filament from the envelope wall, at least some of said spacers being partly embedded at their peripheries in the envelope wall and being thereby supported in fixed positions within the envelope.

2. A device according to claim 1 wherein the spacers

consist of refractory metal discs, and wherein diametrically opposite parts of the peripheries of at least some of the discs are embedded in the envelope wall.

3. A device according to claim 1 wherein the envelope is quartz.

4. A device according to claim 1 wherein the filament has a normal wattage dissipation of at least 500 watts.

5. A device according to claim 1 having an envelope wall locally collapsed onto at least two regions of the periphery of each of a plurality of the spacers, the collapsed wall parts closely engaging the respective regions of the spacers and holding them at fixed positions within the envelope.

References Cited in the file of this patent

UNITED STATES PATENTS

1,028,118	Knowles	June 4, 1912
1,107,650	Beuttell	Aug. 18, 1914
1,963,008	Weeks	June 12, 1934
2,007,922	Braselton	July 9, 1935
2,478,969	Ishler	Aug. 16, 1949
2,813,993	Fridrich	Nov. 19, 1957
2,910,605	Hodge	Oct. 27, 1959
2,945,978	Hodge	July 19, 1960