

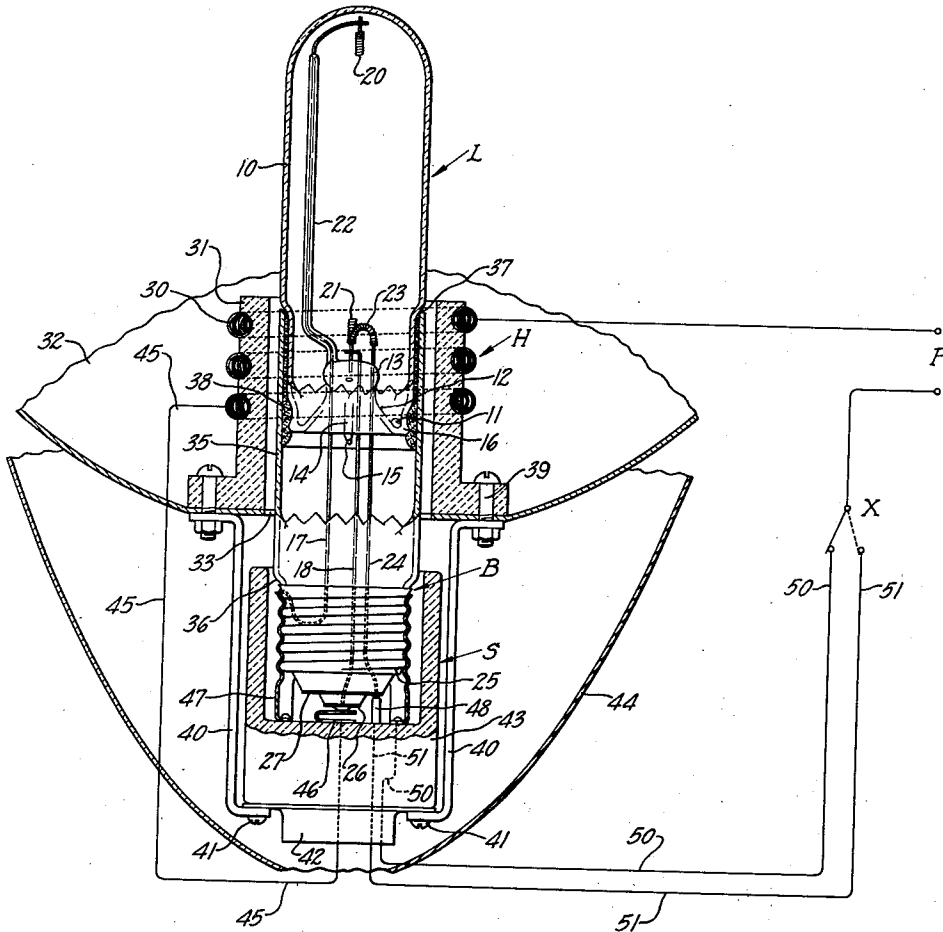
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DISCHARGE DEVICE

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DISCHARGE DEVICE

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This invention relates to discharge devices and associated heaters and ballasts, and is especially adaptable and advantageous for erythema ultra-violet metal-vapor lamps such as so-called sun lamps. For this purpose, the invention allows of doing away with costly accessories, such as ballasting transformers, and replacing them with inexpensive simple ballasts, even of pure resistance type; it allows of dispensing with the usual outer bulb or envelope used to filter the radiation from the discharge and to protect the discharge device proper from drafts or oxidizing influences; it allows of substituting cheaper glass (such as commonly used in the outer envelopes of "S4" sunlamps for example) for the relatively expensive fused quartz or "quartz glass" heretofore generally used for the discharge-envelopes of erythema lamps; and it permits making the envelopes with an ordinary stem type of end construction, instead of with the usual quartz seals, and on ordinary automatic lamp machines rather than by hand. Other features and advantages of the invention will become apparent from the description of a species or form of embodiment, and from the drawings.

The drawing shows a cross-section through an erythema discharge lamp unit conveniently embodying the invention, part of the lamp base appearing in side elevation, and also shows suitable circuit connections for the unit.

The discharge lamp L is here shown as of positive column type, with a short tubular envelope 10 that may contain metal such as mercury, for example, as the principal working substance, and usually also starting gas such as argon, or other inert or rare gas(es). The amount of mercury (indicated by a globule 11) is preferably so small that it is all vaporized during the operation of the lamp L, thus limiting the operating pressure to a desired value, such as one to two atmospheres absolute pressure, for instance.

At one end, the lamp envelope 10 has a conventional reentrant stem-and-flare construction 12 with an inlead seal press 13, and an exhaust tube 14 opening through the press and itself sealed off at 15. Accordingly, there is an annular dead space around the stem 12 inside the reduced neck end 16 of the envelope 10, as well as some dead space inside the tube 14, which is not adequately heated by the discharge, nor by radiation, convection, or conduction from the electrode means at this end of the envelope. Current leads 17, 18 extend in through the seal 13 and carry the main coacting discharge electrodes 20, 21, which are here shown as located in opposite ends

of the envelope 10, and of self-heating type. They may consist of tungsten activated with alkaline earth oxide, such as a mixture including barium and strontium oxides, for instance. The lead 17 is shown as extending through the discharge space to the electrode 20 remote from the stem 12, and as having an insulative sheathing 22 from the stem 12 along past the discharge gap between the electrodes 20, 21, this sheath being made, if desired, of heat-resistant glass like "Pyrex," for example. To facilitate starting the discharge, a specially heated tungsten electrode coil 23 (which may be activated with oxide(s) such as used for the electrodes 20, 21, though this is not necessary) is shown adjacent the electrode 21 at the stem end of the envelope 10, being connected between the corresponding inlead 18 and an additional lead 24 extending out through the seal 13. Outside the envelope 10, the leads 17, 18, 24 may be connected to suitable contacts on a lamp base B, here shown as substantially coaxial with the lamp L, and as of screw type somewhat like that in Patent No. 2,160,431 to Buser, with contacts in the form of a screw shell 25, a center or end contact 26, and an intermediate annular contact 27 also exposed and engaging endwise. Certain obvious peculiarities as regards the attachment of the base B to the lamp L will be explained hereinafter.

In accordance with the invention, an electric heater H which is also available as resistance for ballasting the lamp discharge is mounted around the envelope 10 to heat the dead space surrounding the stem 12, being here shown as a resistance coil 30 (of "Nichrome" wire, for example) wound in a helical groove of a refractory heat-diffusing hollow support 31. This support 31 may take the form of a flanged sleeve of heat-resistant electrical insulative material like lava or porcelain, and is shown as mounted adjacent the wall of a hollowed or concave reflector 32 associated with the lamp L and heater H, in alignment with a rear opening 33 in this reflector. Thus the part of the lamp envelope 10 around the discharge gap between the electrodes 20, 21 is left freely exposed and unheated externally. The heat of the heater H not only heats up the dead space around the stem 12 and in the exhaust tube 14 sufficiently to prevent condensation of mercury in these spaces, which are not heated adequately from the discharge in the lamp L, but may also supplement the heat from the lamp in warming the person or the body area exposed to the erythema ultraviolet radiation from the lamp, affording a beneficial infrared treatment as well as a com-

portable sense of warmth. Of these effects, the heating up of the dead space in the envelope 10 to obviate or revaporize mercury condensation is generally the more important, since it assures the intended pressure of mercury vapor in the envelope on which depends an adequate output of ultraviolet radiation of the desired wavelength.

While it is desired to maintain the stem end of the lamp envelope 10 at a sufficient temperature (approximating that of the rest of the envelope) by means of the heater H, it may be objectionable to subject the lamp base B and the coating socket structure S to such high temperatures; and to avoid this, provision is made to separate the base B proper from the stem end or neck 16 of the envelope 10. For this purpose, the base B is provided with an extension of its shell 25 in the form of a long skirt 35 rather larger than the shell 25. This skirt 35 may consist of a cylindrical glass sleeve having one end reduced at 36 to a neck that enters the base shell 25 and is secured therein by means of basing cement (not shown), and having its other end open to receive the usual reduced neck end 16 of the lamp envelope or bulb 10. The bulb neck 16 may be secured in the skirt by fusion to the latter as indicated at 37, or with suitable heat-resistant and heat-transmitting cement 38 (such as a high-temperature basing cement) filling the space between the neck 16 and the skirt, or both. Even disregarding the location of the heater H directly around the envelope neck 16, the skirt 35 is in heating relation to the envelope portion 16 and the heater H to the skirt 35. As shown, the base skirt 35 is so long as to extend out through the reflector opening 33, so that the base B proper and the socket S are altogether outside the zone of concentrated heat inside the reflector 32. In the present instance, the heater H is secured to the reflector 32 by screw bolts 39 taking through the flange of the heater support 31 and through the marginal flange of the reflector 32 around its opening 33. The socket S is shown connected to the heater support 31 (as well as to the reflector 32) by supporting means in the skeleton form of Z-bar clips 40 whose upper, forward end-feet take the bolts 39, and whose lower, rear end-feet take screws 41 which take through a metal base 42 associated with a porcelain shell 43 of the socket S, thus securing said base 42 and shell 43 together. In practice, of course, the socket S and associated parts at the rear of the reflector 32 may be enclosed in a suitable hollow sheet metal or other canopy, indicated at 44.

As diagrammatically indicated in the drawing, one end of the heater coil 30 is connected directly to one side of the main power supply circuit P, which may be either A. C. or D. C., while the other end of this coil 30 is connected by a circuit lead 45 to the socket contact 46 that coacts with the lamp base center contact 26 for the main lamp electrode 21. The socket contacts 47, 48 that coact with the base contacts 25 and 27 for the main and auxiliary electrodes 21, 23 are connected by circuit leads 50, 51 to a three-way switch X by means of which either lead 50, 51 may be electrically connected to the other side of the main power supply circuit P. Initially, in starting the lamp, the electrode 23 may be connected in circuit with the electrode 21 until it heats sufficiently to afford an ample supply of electrons for the discharge, and then the discharge may be thrown over to the electrode 21

by disconnecting the lead 51 from the circuit P at the switch X and connecting the lead 50 to said circuit P. In practice, of course, the switch X may be an automatic thermal switch of any suitable four-terminal type that will afford proper heating time for the electrode 21 before acting as described.

Besides the advantage of heating the stem end of the lamp envelope 10 adequately and thus allowing the envelope to be made of simple, inexpensive design and construction, and on ordinary automatic stem making and sealing-in machinery, my invention affords the advantage that the heater resistance 30 can readily be made of ample size to ballast the discharge properly and furnish all necessary heat without having to operate at a temperature which might abridge its length of service, and that the heater H is not structurally part of the lamp L, and hence does not become a loss when the lamp fails prematurely or otherwise, but may outlast a number of lamps. Furthermore, the stem end of the lamp envelope 10 is effectively heated without materially heating the base B, as would tend to be the case if the heater H were included in the lamp structure, whether within the stem 12, or in the base shell 25, or in a skirt extension of this shell corresponding to that at 35; on the contrary, the base B and the socket S may readily be located out of the zone of heat due to the lamp L and the heater H, as far and as effectively as desired. Equally, the main portion of the lamp envelope 10 around the discharge gap is left unobscured, unobstructed, and externally unheated, so that there is no danger of overheating and rupturing it locally anywhere, and no loss of the radiation from the discharge.

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

1. The combination with a high pressure discharge lamp having a reentrant stem and inlead seal at one end of its discharge envelope, of an electric heater surrounding the dead space of the lamp envelope around said stem for externally heating this dead space, though leaving exposed and externally unheated the envelope portion around the discharge gap of the lamp, and connected in series with the lamp for ballasting the lamp discharge.

2. The combination with a high pressure discharge lamp having a reentrant stem and inlead seal at one end of its discharge envelope, and also provided with a base for this end of said envelope, of an electric heater surrounding the dead space of the lamp envelope around said stem, to the exclusion both of said base and of the envelope portion around the discharge gap of the lamp.

3. The combination with a high pressure discharge lamp having a reentrant stem and inlead seal at one end of its discharge envelope, and also provided with a base having an extended skirt attached to this end of said envelope and in heating relation thereto, of an electric heater surrounding the base skirt, to the exclusion both of the base proper and of the envelope portion around the discharge gap of the lamp, for externally heating said skirt and the dead space of the lamp envelope around said stem.

4. The combination with an apertured hollow reflector and an associated lamp socket mounted externally of said reflector at its opening, of a high pressure discharge lamp in said reflector having a base in said socket and also having a reentrant stem and inlead seal at the based end

of its envelope, inside the reflector, and an electric heater in said reflector surrounding the dead space of the lamp envelope around said stem for externally heating this dead space, through leaving exposed and externally unheated the envelope portion around the discharge gap of the lamp.

5. The combination with an apertured reflector and an associated lamp socket mounted externally of said reflector at its opening, of a high pressure discharge lamp having a long-skirted base in said socket, and having a reentrant stem and inlead seal at its based end, inside the reflector, and an electric heater mounted in said reflector around said base skirt for externally heating said skirt and the dead space of the lamp envelope around its said stem, though leaving exposed and externally unheated the envelope portion around the discharge gap of the lamp,

and connected through one of the lamp socket contacts in series with the lamp for ballasting the lamp discharge.

6. The combination with a rear-apertured hollow reflector and an associated lamp socket to the rear of said reflector at its opening, with supporting means connecting said socket to said reflector, of a high pressure discharge lamp in said reflector having a base in said socket, and also having a reentrant stem and inlead seal at its based end, inside the reflector, and a resistance heater having a heat-diffusing supporting sleeve mounted in said reflector around the based end of the lamp for externally heating the dead space of the lamp envelope around its said stem, though leaving exposed and externally unheated the envelope portion around the discharge gap of the lamp.

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