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I. NAXON

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ULTRA VIOLET LAMPS

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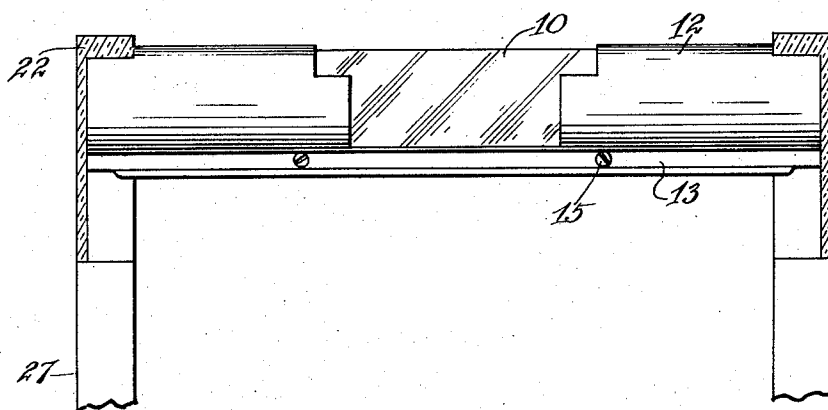


Fig. 1

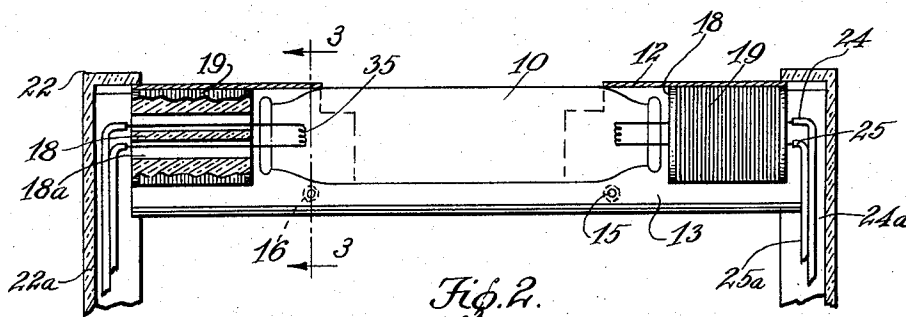


Fig. 2.

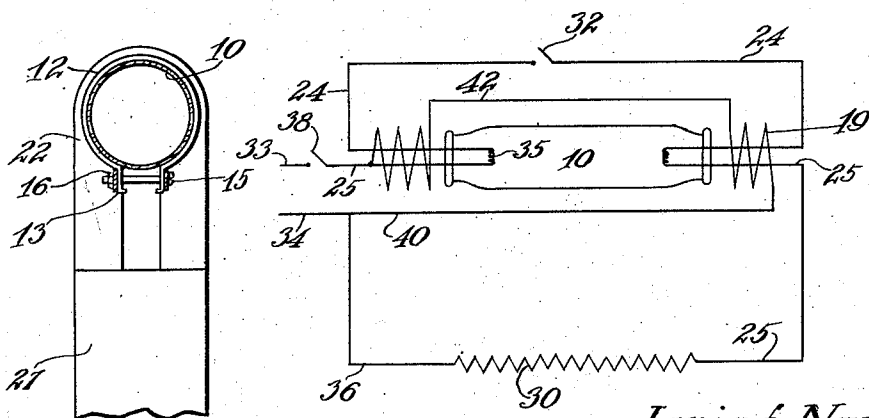


Fig. 3.

Fig. 4.

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ULTRA VIOLET LAMPS

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9 Claims. (Cl. 315—46)

My invention relates to ultra violet lamps employed for therapeutic purposes, and more particularly to the portable type of lamp which is mounted in a light stand and can be carried to a convenient place of use.

A simple form of the lamp mentioned is illustrated in Patent No. 2,625,670 and features a glass tube containing opposed arc electrodes fed by conductors entering the ends of the tube. An external ballast resistance is connected in series with the electrode conductors; and these also feed filaments adjacent to the electrodes for starting the arc. A button-type starting switch is also incorporated in one of the electrode conductors. Thus, to put the lamp into operation the starting switch is closed, this action energizing the filaments to become heated and emit the necessary electrons to ionize the atmosphere in the tube and cause the arc to form between the electrodes. As this action establishes the desired current flow across the arc, the starting switch is opened to render its branch of the circuit inactive.

One object of the present invention is to depart from the use of heating coils enveloping the electrode portions of the tube or located in the zone of the latter.

Another object is to depart from the use of external heating coils running parallel to and lengthwise of the entire tube and unnecessarily heating the central portion of the same.

A further object is to provide a heating source for the electrode environment which is independent of the ballast requirements of the electrode.

Another object is to provide a heating source whose wattage value can be calculated to impart the most favorable heating function for the electrodes for operating purposes.

With the above objects in view, and others which will become apparent from the description to follow, a better understanding of the invention may be had by reference to the accompanying drawing, in which—

Fig. 1 is an elevational view of the novel lamp, partly broken away;

Fig. 2 is a similar view of the upper part of the lamp partly in section and showing internal parts;

Fig. 3 is a section on the line 3—3 of Fig. 2; and

Fig. 4 is a diagram of the electric circuit employed by the lamp.

In the operation of mercury arc lamps which generally employ a rarefied gas and mercury vapor mixture as the ionizable medium, it has been found necessary to provide a ballast resistor connected in series with the main electrodes as a current-limiting device, since once the arc is formed through the rarefield media the resistance of the lamp becomes greatly reduced. In ultra violet lamps of the past the value requirement for the ballast resistor, due to the high cold-resistance and the comparatively low hot-resistance of the lamp after the arc is struck, is such that the wattage, consumed by the ballast alone is several times that needed to heat and operate the mercury vapor tube. Therefore, when such ballasts are em-

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ployed to heat the electrode portions of the lamp, the heat developed is far more than four times the wattage needed to heat such electrode portions. Among the disadvantages resulting from such practice is the excessive and wasteful heat developed adjacent to the ends of the lamp.

In order to depart from the above deficiencies, I have found it of advantage to thermally separate the ballast from the lamp tube and provide independent external heaters for its electrodes. By this arrangement a combination of values is obtainable wherein the wattage dissipated by the electrode heaters can be sufficiently below one-fourth of that dissipated by the ballast resistor, permitting the heater to be made sufficiently neat and compact for a more efficient and stable thermal relationship between the heaters and the electrodes than could be obtained if the heaters themselves were designed to also carry the ballast load. Besides, because of the absence of excess heat with my low-wattage heaters I do not have to deliberately lose heat through the use of exposed or inefficient coils which are more susceptible to external influences, such as drafts, since my heaters do not need to be designed openly to let excess heat leak out.

The present invention embodies that type of enclosed arc source of ultra violet radiations in which, when the arc is first struck and the tube is relatively cold, the arc is started as a comparatively low-pressure device. Thereafter, with the heat developed by the electrodes and by the arc itself, coupled with the supplemental heat provided by external heating means, the tube mercury content is further vaporized and its gas expanded to function at higher-operating pressures.

In accordance with the foregoing, specific reference to the drawing indicates the mercury vapor tube at 10, the same being of the conventional elongated design employed in ultra violet lamps. In the present case the tube is encased in the medial portion of a metallic jacket 12 which is wrapped snugly around the tube to terminate with opposed angle flanges 13 having the function of a clamp. Thus, bolts 15 and nuts 16 are applied by way of these flanges to draw the jacket into firm thermal and mechanical engagement with the tube.

It is also the function of the jacket 12 to encase a pair of insulation spools 18—preferably of ceramic material—at locations shortly beyond the tube 10, as shown in Fig. 2, the clamping adjustment of the jacket serving to fix the positions of the spools as stated. The spools are wound with heating coils 19.

The ends of the jacket 12 are fitted frictionally into arch-shaped insulation receptacles 22 which may be of the same material as the spools 18. These have spaced longitudinal bores 18a for the passage of conductors 24 and 25 from the mercury vapor tube 10. On issuing from the spools these conductors enter the receptacles 22 and are trained downwardly as shown at 24a and 25a in channels 22a in the inner sides of the receptacles to enter side pieces or posts 27 forming parts of the lamp frame. The jacket 12 is cut away in the region opposite the tube electrodes 35 and the arc space between them in order that the uninterrupted emission of the violet rays from the tube may occur when the lamp is in action.

The electric circuit of the lamp is more fully illustrated in the diagram of Fig. 4. This figure shows that the conductors 24 join to receive a starting switch or button 32. While one conductor 25 connects with one end of the ballast resistor 30, the other conductor 25' receives one lead 33 of the current-supply line, such lead incorporating a main switch 38. The other supply lead 34 connects by way of a conductor 36 with the other end of the ballast resistor 30.

The heating coils 19 receive current independently of the ballast-arc circuit, being series-connected directly across the supply line. Thus, the coil circuit commences with a conductor 40 from the current-supply lead 34 to the outer end of one coil. From the inner end thereof a conductor 42 extends to the inner end of the other coil; and the outer end of the other coil connects with the tube conductor 25 on the load side of the switch 38.

With the lamp wired as described, it is apparent that the closing of the main switch 38 will put the heating coil circuit into operation. It is however important that the electrodes 35 be energized, as stated before, this being done by temporarily closing a push button switch 32. The heating of the tube and its gas and mercury content in the region of the electrodes is not done directly by heating coils or elements, but by divisions of the tube jacket 12. When the remotely-located coils 19 become heated by the closing of the main switch 38, the aforesaid divisions of the jacket 12—which are of a metal or alloy having high thermal conductivity—receive the heat of the coils by their intimate wrapping contact with the same. This thermal conductivity is several times that of the air space ordinarily used. The heat therefore flows to the inner portions of the jacket divisions and is transmitted to the tube 10 by their wrapped engagement therewith. After the arc is struck between the electrodes, and the heat transfer between heaters 19 and the electrode portions of the tube is built up through the medium of the conducting jacket, the internal pressure of the tube will increase until—after a period of from 1 to 4 minutes—the tube will function at a comparatively high pressure after the operational temperature is attained.

In the operation of a tube of the above type the filament electrodes may be coated with any suitable emitter, so that closing of the starter button 32 causes the filaments to glow to the extent that upon opening the starter, the filaments will be sufficiently hot to emit electrons directly across the gaseous discharge path between the electrodes. The arc thus takes over, and the discharge continues across the tube, being limited only by the value of the ballast resistor. Meanwhile, the end portions of the tube become heated by the small heating coils, causing added vaporization of the mercury content and expansion of the entire gaseous content, thus increasing the pressure within the tube to the proper value for operation.

It is now apparent that the novel mercury vapor lamp contains values departing from former lamps of the same type. First, no heating coils are employed in direct association with the tube electrodes, in the zone thereof, or wound around the tube in order to heat the same. Further, the heating source for the electrode environment is independent of the ballast requirements of the electrodes. Further, the independent nature of the heating source makes it possible to operate it at electrical values which are most favorable to impart proper starting and particularly more desirable operation. Further, the set of cylindrical electrode heaters are located beyond the tube, where they can be of the same or a lesser diameter, forming a tube-heater combination which is in one even length and neat. Further, the aforesaid tube-heater combination makes it possible to bridge the heaters and the

electrode portions of the tube with a single-piece metallic heating as well as mechanically protecting jacket. Further, the extended clamping factor of the jacket combines its heat-conducting property with wrapping engagement around the tube and heaters for the efficient retention and transmission of heat within the tube-heater combination.

I claim:

1. A mercury vapor tube having electrodes in its ends, external electric heater elements disposed endwise beyond said tube, and a member of high thermal conductivity associated with said heater elements and formed to conduct heat longitudinally of said tube to the electrode portions thereof.

2. The structure of claim 1, said member comprising jackets surrounding end portions of said tube.

3. The structure of claim 1, said heater elements comprising coils of a diameter coextensive with that of the tube, and said member comprising jackets surrounding said coils and end portions of said tube.

4. The structure of claim 1, said heater elements comprising coils of a diameter coextensive with that of the tube, and said member comprising metallic jackets extending along said coils and end portions of said tube and closely wrapped around the same.

5. The structure of claim 1, said heater elements comprising coils of a diameter coextensive with that of the tube, and said member having end portions extending along the tube and coils, such unit being opened opposite the active tube area to expose the same between said end portions for the emission of ultra violet rays.

6. In the operation of a mercury vapor tube requiring a series-connected current-limiting ballast resistor to dissipate a predetermined wattage, said resistor spaced from thermal relation with said tube, separate heating means disposed in intimate thermal relation with said tube for heating the same to a required operational temperature, the wattage of the last-named heating means being sufficiently below the wattage of the first-named resistor to prevent the former from overheating the tube above said required operational temperature.

7. In a mercury vapor tube requiring a series-connected current-limiting resistor to dissipate a predetermined wattage, heating means comprising such a resistor spaced from thermal relation with said tube, and separate heating means disposed in intimate thermal relation with said tube for heating the same, the wattage of the second-named heating means being less than the wattage of the first heating means.

8. The structure of claim 6; the wattage of the last named heating means being substantially below one-fourth of the wattage of the first named resistor.

9. The structure of claim 7; the wattage of the last named heating means being substantially below one-fourth of the wattage of the first named resistor.

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