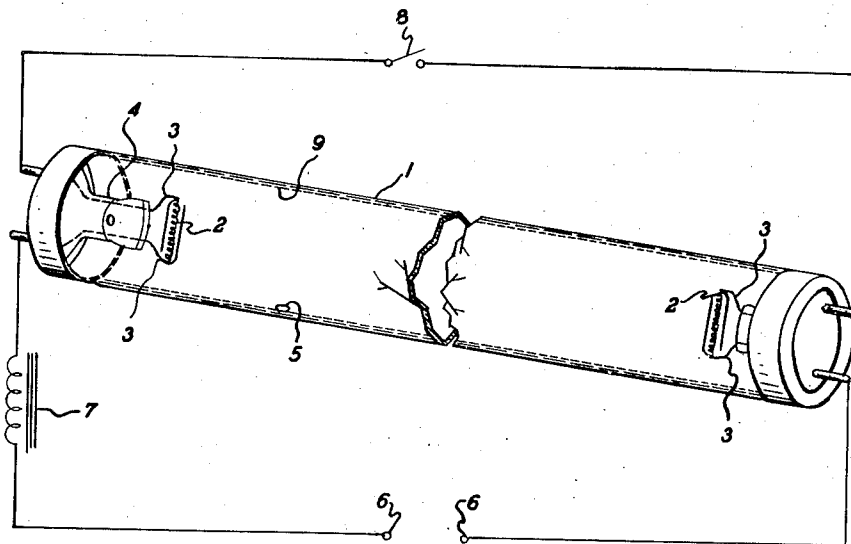


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ULTRAVIOLET RAY GENERATOR

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ULTRAVIOLET RAY GENERATOR

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Our invention relates generally to ultraviolet ray generators, and it is an object of our invention to provide an efficient source of ultraviolet radiations of two kinds. More particularly, it is an object of our invention to provide such a device which will produce a large quantity of so-called "germicidal" radiations of short ultraviolet wave length along with a high quantity of "erythema" or "health rays" of middle ultraviolet wave length, thereby providing one device which will serve the double purpose of destroying germs and bacteria to prevent diseases as well as furnishing the health promoting erythema radiations also referred to as vitamin D producing radiations.

Another object is to provide a device which will produce both germicidal and erythema radiations in any desired ratio or proportion at high efficiencies.

Another object is to produce such radiations from a gaseous electric discharge device operating at low temperatures in the neighborhood of human body temperature.

Further objects and advantages of our invention will appear from the following description of a species thereof.

The drawing is a perspective view of a device comprising our invention.

Referring to the drawing, the device comprises an elongated tubular envelope 1 which is made of special ultraviolet transmitting glass capable of transmitting the short ultraviolet radiations including the 2537 Å. resonance radiations of mercury vapor. A suitable glass for this purpose is a borosilicate glass known as No. 9741 manufactured and sold by the Corning Glass Works of Corning, New York. The device otherwise resembles a conventional commercial fluorescent lamp. At each end of the envelope 1 there is an electrode 2 preferably of the activated thermionic type comprising a coiled coil of tungsten wire coated with a suitable electron emissive material such as alkaline earth oxide. The electrodes are connected at their ends to leading-in wires 3 which extend through the usual glass stems 4 sealed to the ends of the envelope 1. The envelope contains a small quantity of mercury 5 and a suitable gas, such as argon at a low pressure, for example about 5 mm. The device may be operated from any suitable source of potential at a low current density so correlated to the surface area of the envelope that it will maintain a positive column discharge between the electrodes 2 at a suitably low temperature and corresponding low pressure of the mercury vapor for producing a large quantity of radiations of 2537 Å. The operating tem-

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perature range of the device is preferably about 100 to 120° F., with a mercury vapor pressure of the order of 10 microns, although this range may be varied somewhat. Under these conditions a very high proportion (over 90%, for example) of the generated ultraviolet is concentrated at the 2537 Å. line.

The device may be operated from a source of potential 6, 6, such as the ordinary 110 volt 60 cycle line, in series with a choke coil 7 suitably proportioned to properly limit the current. We have illustrated a conventional fluorescent lamp circuit including a switch 8 connecting the electrodes 2 in series for starting the device, the said switch being first closed to connect the electrodes 2 in series across the line for preheating and then opened to cause the discharge to start.

The interior of the envelope 1 is provided with a coating 9 of fluorescent material or phosphor which is capable of efficiently transforming radiations of 2537 Å. wave length generated by the discharge into middle ultraviolet radiations in the erythema range of about 2800 to 3200 Å. One phosphor having those characteristics and which we at present prefer is the thallium-activated calcium orthophosphate disclosed and claimed in the copending application of Willard A. Roberts, Serial No. 488,885, filed May 28, 1943, and in the copending application of H. C. Froelich, Serial No. 608,487, filed August 2, 1945. The phosphor coating 9 is applied in such manner that it will not absorb and transform all the radiations of 2537 Å. emitted by the discharge, but will permit a large proportion of those radiations to be transmitted through the envelope 1 without transformation or conversion. Although this effect may be produced by coating only part of the envelope 1 with a normal thickness of the powdered phosphor 9, we prefer to coat the entire internal surface of the envelope 1 with an abnormally thin coating which will absorb and transform some of the radiations emitted by the discharge but will permit a large quantity of those radiations to pass through the envelope without transformation. By varying the thickness of the coating or by varying the area of the envelope coated, or both, we may obtain any desired ratio of germicidal and erythema radiations from the device, with a preponderance of either type of radiation. We have found it desirable at the present time, for such applications as the irradiation of poultry, to proportion the coating in such manner that of the germicidal and erythema ultraviolet radiations emitted exteriorly of the lamp, about 60 to 90 per cent are the short radia-

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tions of 2537 A. wave length, and about 40 to 10 per cent are in the middle ultraviolet range of 2800 to 3200 A. The preferred proportion is about 75 per cent germicidal and 25 per cent erythema ultraviolet.

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

1. An ultraviolet ray generator comprising a gaseous electric discharge device of the low pressure mercury vapor type which during operation emits a preponderance of germicidal ultraviolet radiations of 2537 A. wavelength, said device comprising an envelope of material pervious to ultraviolet radiations including those of 2537 A. wavelength, and a coating on said envelope of fluorescent material consisting of thallium-activated calcium phosphate which is capable of converting radiations of 2537 A. wavelength to ultraviolet radiations of longer wavelength including the erythema range of about 2800 to 3200 A. wavelength, the said coating being proportioned in such relation to the area of the envelope that the said germicidal and erythema radiations are emitted externally of the device in the ratio of about 60 to 90% germicidal and 40 to 10% erythema radiations.

2. An ultraviolet ray generator comprising a gaseous electric discharge device of the low pressure mercury vapor type which during operation emits a preponderance of germicidal ultraviolet radiations of 2537 A. wavelength, said device comprising an envelope of material pervious to ultraviolet radiations including those of 2537 A. wave-

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length, and a coating on said envelope of fluorescent material consisting of thallium-activated calcium phosphate which is capable of converting radiations of 2537 A. wavelength to ultraviolet radiations of longer wavelength including the erythema range of about 2800 to 3200 A. wavelength, the said coating being proportioned in such relation to the area of the envelope that the said germicidal and erythema radiations are emitted externally of the device in the ratio of about 75% germicidal and 25% erythema radiations.

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