Sept. 10, 1946. W. B. MOREHOUSE 2,407,379

COMBINATION BACTERICIDAL AND ILLUMINATING LAMP

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Fig. 1

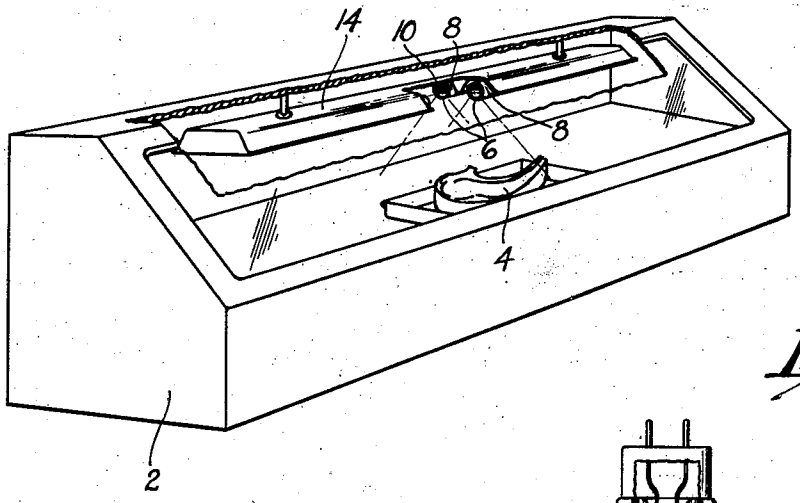


Fig. 2

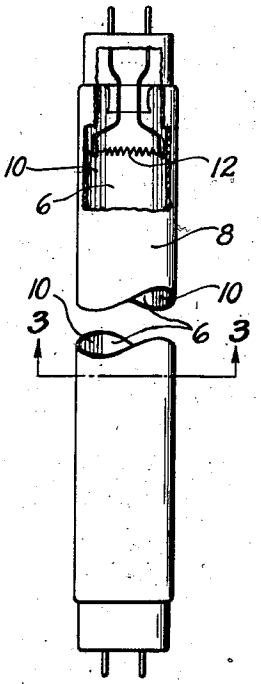
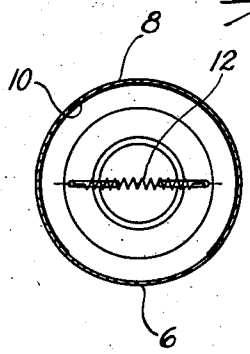


Fig. 3



INVENTOR
Walter B. Morehouse
BY David Rines
ATTORNEY

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COMBINATION BACTERICIDAL AND ILLUMINATING LAMP

Walter Bertram Morehouse, Auburndale, Mass.

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9 Claims. (Cl. 176—122)

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The present invention relates to lamps, and more particularly to ultraviolet bactericidal lamps and lamps employed for illumination purposes.

Ultraviolet lamps are used for a number of purposes, among them sterilization. When provided with an interior fluorescent coating, they are employed for illumination. The sterilizing or bactericidal lamps give off but little illumination. The fluorescent illuminating lamps, on the other hand, have little or no bactericidal or sterilizing effect.

An object of the invention, therefore, is to provide an ultraviolet lamp that shall produce both illuminating and bactericidal rays. Other and further objects will be explained hereinafter and will be particularly pointed out in the appended claims.

The invention will now be explained more fully in connection with the accompanying drawing, in which Fig. 1 is a perspective, partly broken away, of a store showcase provided with the present invention, in preferred form; Fig. 2 is an elevation of a lamp embodying the invention, upon a larger scale; and Fig. 3 is a section upon a still larger scale, the section being taken upon the line 3—3 of Fig. 2, looking in the direction of the arrows.

Ultraviolet rays have been used in refrigerated display cases or showcases 2 containing meats and other foods 4 to sterilize the air contained in the showcases by killing the bacteria in that air. It has heretofore been necessary, however, to mount in the showcases additional incandescent lamps to illuminate the contents of the showcases. According to the present invention, no such additional illuminating lamps are at all necessary, though they may be employed, if desired. The ultraviolet rays may still travel through a portion 6 of the ultraviolet lamp-bulb envelope that is transparent to these rays for bactericidal purposes. Another portion 8 of the the lamp, however, is coated uniformly on its interior surface with a fluorescent substance 10 that emits visible light when impinged upon by the ultraviolet rays. The coating may be constituted of a suitable fluorescent powder or powders that will produce visible light of the desired color when impinged upon by the ultraviolet rays.

Those ultraviolet rays that strike the coated portion 8 will be converted into visible light through fluorescence. Those ultraviolet rays, on the other hand, that pass through the clear portion 6 of the bulb may be used for sterilizing or other purposes. A combination lamp is thus produced that contains within itself both illuminating and sterilizing or other properties. No additional incandescent lamps for illuminating the contents of the showcase 2 are needed, though they may, of course, be used, if desired.

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The lamp may be of the ultraviolet positive-column mercury-vapor-discharge type containing, in addition to the mercury, an inert gas or a mixture of rare gases, at low pressure. The gases may include argon, neon, xenon, krypton and nitrogen. The pressure may, for example, be from 5 to 30 millimeters of mercury. The mercury may be replaced by any other desired metallic vapor capable of generating, upon a discharge therethrough, ultraviolet light of the desired wavelength. To attain this end, the envelope of the lamp bulb may be constituted of any suitable ultraviolet-transmitting glass.

For sterilizing, the 2537 Angstrom unit wavelength has been found to be the most effective, but for other purposes, other wavelengths may be preferable. Some well-known glasses will transmit down to 2200 Angstroms, and others down to 1800 Angstroms. Different grades of ultraviolet-transmitting glasses, moreover, will transmit different proportions of the desired wavelength. It is well to choose a glass that transmits the greatest proportion of the 2537 Angstroms for sterilizing purposes, or other desired wavelength for other purposes.

The lamp may contain coated or uncoated oppositely disposed iron, carbon or other metal or non-metal electrodes of any desired type, cold or hot, between which the discharge passes through the lamp. The electrodes are illustrated as in the form of coated tungsten or other coiled filaments 12, which may be heated to an electron-emitting temperature by passing an electric current therethrough. In the latter case, as will be obvious, the drop across the filament may be utilized to produce a discharge between two points to aid in starting the device on a low alternating voltage of 110 or 220 volts or less.

It is not essential that any particular part of the bulb be coated with the fluorescent substance 10, and any particular part be left clear. Any desired proportion of any desired part of the bulb envelope may be coated or left clear, depending upon the relative amounts of visible illumination and ultraviolet light required. By employing different coated and uncoated portions and proportions, different arrangements may be effected so as to bring about any desired combination of ultraviolet rays and visible light of any desired color. The color of the visible light, indeed, may be so chosen as to offset or compensate for the

blue color of the mercury discharge, or to produce any desired lighting effect. The lamps may be of any desired length and diameter, and of any desired shape. If the bulb is substantially cylindrical, as illustrated, the uncoated and the coated portions 6 and 8 may be disposed longitudinally of the wall of the bulb. The lower longitudinally disposed clear uncoated portion 6 is shown subtending an angle of about 60 degrees at the axis of the cylinder, but this angle may be larger, even up to about 180 degrees, or even more. More or less than half of the inside surface of the cylindrical wall, therefore, may be coated, on the upper side 8 of the bulb, with the desired fluorescent powder 10, the remaining lower portion 6 of the wall of the envelope being left clear throughout the length of the bulb, in order to sterilize the air throughout the showcase 2 underneath the bulb.

The higher up in the showcase 2 that the bulb is positioned, of course, the greater the space of the showcase that is irradiated by the ultraviolet rays. This, however, leaves but a very small portion at the top of the showcase to receive the illuminating rays from the upper coated portion 8 of the bulb. A reflector 14 is therefore positioned above the bulb adjacent to the coated portion 8 for reflecting the luminescent rays downward upon the contents of the showcase 2. The same reflector 14 may, if desired, contain several of the bulbs; two are illustrated in Fig. 1.

Of course, cases may arise where it is preferred to reflect the ultra-violet rays. In that event, the uncoated portion 6 of the bulb would be the upper portion of the bulb near the reflector and the coated portion 8 would be the lower portion of the bulb. The reflector will then reflect the ultraviolet light. A reflector would then be employed that efficiently reflects ultraviolet light.

Modifications will occur to persons skilled in the art, and all such are considered to fall within the spirit and scope of the invention, as defined in the appended claims.

What is claimed is:

1. A combined bactericidal-and-illuminating lamp comprising a bulb and means for generating sterilizing ultra-violet rays within the bulb, the bulb having a wall a portion of which is transparent to the sterilizing ultra-violet rays generated within the bulb, the bulb being adapted to be positioned with the said portion of the wall so disposed in a region that the ultra-violet rays may travel through the said portion of the wall into the region to sterilize the region, and a portion of the wall being coated with a substance that when impinged upon by the ultra-violet rays will produce luminescent rays that may travel through the first-named portion of the wall to illuminate the region.

2. A combined bactericidal-and-illuminating lamp comprising a bulb and means for generating sterilizing ultra-violet rays within the bulb, the bulb having a substantially cylindrical wall a longitudinally disposed portion of which is transparent to the sterilizing ultra-violet rays generated within the bulb, the bulb being adapted to be positioned with the said portion of the wall so disposed in a region that the ultra-violet rays may travel through the said portion of the wall into the region to sterilize the region, and the remainder of the wall' being coated with a substance that when impinged upon by the ultra-violet rays will produce luminescent rays that may travel through the said portion of the wall to illuminated the region.

3. A combination bactericidal-and-illuminating lamp for sterilizing and illuminating a space in which the lamp is disposed comprising a bulb and means for generating sterilizing ultra-violet rays within the bulb, the bulb having a wall a portion of which is transparent to ultraviolet rays including 2537 Angstrom-unit wavelength generated within the bulb in order that the rays may travel through the bulb into the space to sterilize the space and a portion of which emits luminescent rays.

4. In a unitary bactericidal and illuminating lamp having a bulb, the combination of means for generating therein and emitting through a predetermined wall portion of the bulb ultra-violet rays which are predominately bactericidal, means for converting energy of the generated rays into visible illumination on the bulb wall, the converting means and the predetermined wall portion being so located as to produce a selected regional correlation between the said emitted rays and the illumination.

5. A combination bactericidal-and-illuminating lamp for sterilizing and illuminating a space in which the lamp is disposed comprising a bulb and means for generating sterilizing ultra-violet rays within the bulb, the bulb having a wall a longitudinally disposed portion of which is transparent to ultraviolet rays including 2537 Angstrom-unit wavelength generated within the bulb in order that the rays may travel through the bulb into the space to sterilize the space and the remainder of which is coated with a substance that, when impinged upon by the rays, produces luminescent rays to illuminate the space.

6. A combination bactericidal-and-illuminating lamp for sterilizing and illuminating a space in which the lamp is disposed comprising a bulb and means for generating sterilizing ultra-violet rays within the bulb, the bulb having a substantially cylindrical wall a longitudinally disposed portion of which is transparent to ultraviolet rays including 2537 Angstrom-unit wave length generated within the bulb in order that the rays may travel through the bulb into the space to sterilize the space and the remainder of which is coated with a substance that, when impinged upon by the rays, produces luminescent rays to illuminate the space.

7. A combined bactericidal-and-illuminating lamp comprising a bulb and means for generating sterilizing ultra-violet rays within the bulb, the bulb having a substantially cylindrical wall a longitudinally disposed portion of which is transparent to sterilizing ultra-violet rays generated within the bulb, the bulb being adapted to be positioned with the said portion of the wall so disposed in a region that the ultra-violet rays may travel through the said portion of the wall into the region to sterilize the region, and the remainder of the wall being coated with a substance that when impinged upon by the ultra-violet rays will produce luminescent rays that may travel through the said portion of the wall to illuminate the region, the angle subtended at the axis of the cylinder by the longitudinally disposed portion being not more than about 180 degrees.

8. A combined bactericidal-and-illuminating lamp comprising an ultra-violet positive-column-discharge lamp containing an inert gas at relatively low pressure, and means for producing a discharge through the lamp to generate sterilizing ultra-violet rays, the lamp having a wall a portion of which is transparent to the sterilizing ultra-violet rays generated within the bulb, the

bulb being adapted to be positioned with the said portion of the wall so disposed in a region that the ultra-violet rays may travel through the said portion of the wall into the region to sterilize the region, and a portion of the wall being coated with a substance that when impinged upon by the ultra-violet rays will produce luminescent rays that may travel through the first-named portion of the wall to illuminate the region.

9. A combined bactericidal-and-illuminating lamp comprising an ultraviolet positive-column-discharge lamp containing mercury vapor, and means for producing a discharge through the lamp to generate sterilizing ultra-violet rays, the lamp having a wall a portion of which is transparent to the sterilizing ultra-violet rays generated within the bulb, the bulb being adapted to be positioned with the said portion of the wall so disposed in a region that the ultra-violet rays may travel through the said portion of the wall into the region to sterilize the region, and a portion of the wall being coated with a fluorescent substance that when impinged upon by the ultra-violet rays will produce luminescent rays that may travel through the first-named portion of the wall to illuminate the region.

W. B. MOREHOUSE.