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M. E. MACKSOD

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COMBINATION INCANDESCENT AND ULTRAVIOLET LAMP

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Fig. 1

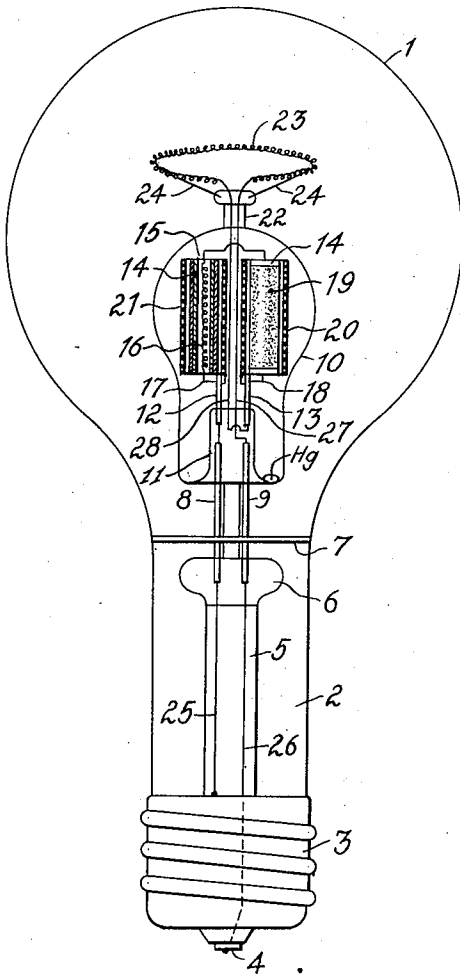


Fig. 2

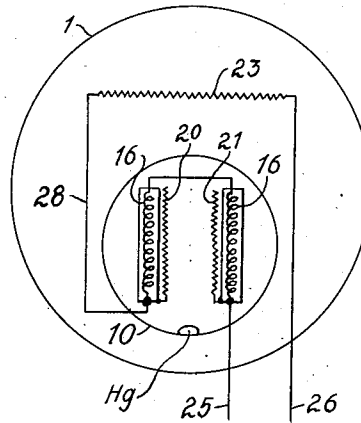


Fig. 3

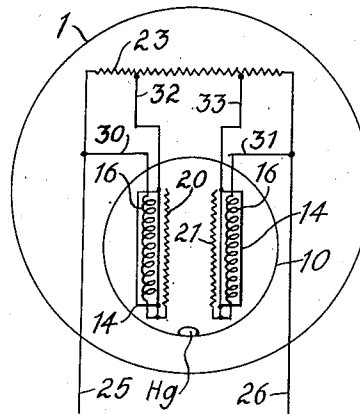
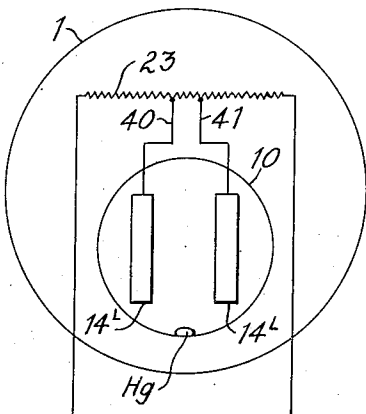


Fig. 4



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COMBINATION INCANDESCENT AND
ULTRAVIOLET LAMP

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3 Claims. (Cl. 176—1)

This invention relates to improvements in combination incandescent and ultraviolet lamps.

One of the objects of this invention is to provide in a single structure an incandescent lamp for illuminating purposes and an ultraviolet lamp for therapeutic purposes.

Another object of this invention is to provide in a single structure an incandescent lamp, and either a gaseous or vapor discharge lamp, for the purpose of producing a highly efficient white light combining the wide bands of spectrums obtainable from both lamps, and causing the unit lamp to have a continuous spectrum, thereby improving its qualities of illumination.

An object of this invention is to provide devices of this nature in combination which may be operated from the ordinary 110 volt lighting circuit, either of the A. C. or D. C. type.

A still further object of this invention is to provide the incandescent lamp not only for the purpose of producing light, but for providing infrared or heat rays in mixture with the ultraviolet rays to improve its therapeutic value.

A still further object of this invention is to provide the incandescent lamp in such relationship with the ultraviolet lamp that the heat generated by the incandescent lamp will aid in starting the ultraviolet lamp into operation.

A still further object of this invention is to provide an ultraviolet light source within several vessels transparent to ultraviolet rays to the substantial exclusion of the rays of shorter wave length at the lower end of the spectrum which have little therapeutic value and are probably harmful.

A still further object is to provide a device of this type in which the light source becomes incandescent instantaneously upon energization.

A still further object of this invention involves a construction in which a portion of the voltage drop in the high resistance incandescent filament is employed to establish a potential difference between the electrodes in the mercury vapor chamber.

A still further object is to provide means for utilizing the voltage drop and resistance of the incandescent filament to build up the current flow in the mercury vapor arc.

A still further object of this invention is to utilize the incandescent filament as the current limiting means for limiting the current in the mercury vapor arc.

These and many other objects, as will appear from the following disclosure, are secured by means of this invention.

This invention resides substantially in the combination, construction, arrangement and relative location of parts, all as will appear more fully in the following specification, taken in connection with the patent drawing.

Referring to the drawing—

Figure 1 is a side elevational view of the device of this invention showing parts thereof in cross section;

Fig. 2 is a diagrammatic illustration of the circuit arrangement of this device;

Fig. 3 is a diagrammatic illustration of a modified form of circuit arrangement;

Fig. 4 is a diagrammatic illustration of a still further modification.

It is common practice in employing a mercury vapor arc lamp as a source of ultraviolet rays as a therapeutic agent to employ a current limiting device in order to prevent the current flow through the arc increasing above desired and safe values. With the present invention the current limiting device is in the form of an incandescent filament, which, in addition to its current limiting function, has the additional functions of producing useful light and providing heat for starting the mercury vapor arc. It is quite obvious that if an incandescent lamp can be provided in combination with a source of ultraviolet rays it would have great utility.

The present invention combines in one structure suitable for operation from the ordinary 110 volt lighting circuit of either the A. C. or D. C. type a source of light and a source of ultraviolet rays, producing as a result for therapeutic purposes not merely ultraviolet rays but in addition infrared or heat rays which are considered to be essential in attaining the full benefits of the ultraviolet ray.

The invention will now be described in detail in connection with the drawing. The device comprises a suitably shaped vessel or bulb 1 having the neck 2 mounted in a base 3. At 4 is the center contact which, in conjunction with the metal base 3, forms the terminals for the device. The vessel 1 has a re-entrant stem 5 terminating in a press 6 from which projects the standards or supports 8 and 9. Mounted on the supports 8 and 9 is a second vessel or tube 10 having a hollow re-entrant stem 11. The vessels 1 and 10 are, of course, preferably made of a glass which is transparent to both visible light and ultraviolet rays. There are a number of known forms of glass of this type, most of which are sold under trade names. However, by way of example, quartz glass or a quartz base glass is suitable for this

purpose since it will transmit both visible light and ultraviolet light to the exclusion of the light of shorter wave length at the lower end of the spectrum which is considered to be harmful, or at least of no therapeutic value.

At 7 is an insulating spacer and support mounted in the neck of the vessel 1 through which the standards 8 and 9 pass. This insulating spacer also acts as a wall to prevent the transmission of heat from the main vessel which, in accordance with standard practice, contains argon, at a suitable pressure with which is preferably mixed, likewise in accordance with standard practice, a small amount of an inert gas, such as nitrogen.

Extending from the re-entrant stem 11 of the vessel 10 are two metal standards or supports 12 and 13. Mounted on these supports are the electrodes of the mercury vapor lamp. These electrodes comprise cylinders or sleeves 14 of a suitable metal, such as nickel, upon the outer surface of which has been deposited a coating 19 of electron emitting material in accordance with well known practice in the vacuum tube art. Mounted within the sleeves 14 are tubes 15 of some suitable insulating material, such as a ceramic insulator, within the bores of which are mounted the coiled resistance heaters 16. The heater, of course, need not be coiled but may be straight filament wires of any suitable material, and, indeed, may assume any convenient form. The lower ends of the heaters are connected by the leads 17 and 18 to the conducting standards 12 and 13, respectively. At 20 and 21 are perforated sleeves, grids or mesh cylinders which surround the sleeves 14 in close proximity thereto. These grids 20 and 21 act as electrodes and are connected respectively to the standards 13 and 12.

At 22 is an insulating support extending from the top of the vessel or tube 10 and suitably shaped and positioned to support on the radiating arms 24 an incandescent filament 23 which is constructed in accordance with the well known practice in the incandescent lamp art and herein shown as being of the coiled type. One terminal of the filament 23 is connected by wire 27 to the conducting support 9 which in turn is connected by wire 28 to the center contact 4 at the base. The other terminal of the filament 23 is connected by wire 28 to the conducting support 13. The other conducting support 12 is connected to conducting support 8, which in turn is connected by the lead 25 to the conducting metal base 3 thus completing the energizing circuit for the filament.

Within the vessel 10 is a small drop of mercury, indicated by the symbol Hg. Likewise within the vessel 10 is placed a small amount of an inert gas, such as argon, neon, krypton and the like. When the lamp is cold the pressure of the gas within the vessel 10 may be of the order of half a millimeter or more.

Fig. 2 illustrates diagrammatically the circuit arrangement of parts, as illustrated in Fig. 1. As shown, the lead 26 is in direct connection with one end of the filament 23. The other end of this filament is connected by wire 28 to one end of one heating coil 16, which in turn is connected to one end of the other heating coil 16, which is finally connected to the other lead 25. As indicated in Fig. 2 the metal sleeve 14 is connected to the lower end of the heater coil 16 and to the grid electrode 20. In a similar way the lower

end of the right hand heater coil 16 is connected to its sleeve 14 and to its associated grid, 21.

In the operation of the device, when current is turned on it will flow in series through the heaters 16 and the incandescent filament 23. The heaters are proportioned in resistance to the filament 23 so that it will be energized sufficiently to give off useful light but will not be at its maximum incandescence at the start. As the heater coils 16 heat up, the coating 19 on the sleeves 14 will begin to emit electrons. These electrons will be drawn towards one or the other of the grids 19, depending upon which is more positive than the other. When energized with direct current one grid will, of course, always remain positive with respect to the other, but on the other hand when energized with alternating current the grids will be alternately positive with respect to each other. The potential impressed upon these grids will be represented by the voltage drop between the ends of the heater coils 16 since the grids are connected thereto as previously described. Thus the emitted electrons will be attracted to the more positive grid and their velocity will be sufficient to ionize the inert gas content of the vessel 10. In the meantime mercury vapor will begin to be liberated within the vessel 10 due to the heat supplied both from the heater coils 16 and particularly from the large incandescent filament 23. The ionization of the inert gas within the vessel 10 will aid in the development of ionization of the mercury vapor and this process will continue to build up until the mercury vapor within the vessel 10 glows or until a mercury vapor arc is formed. This discharge will occur between the grid electrodes 20 and 21.

At this point it should be noted that the grid electrodes are not absolutely essential since the discharge could occur between the coated metal sleeves 14. These grid electrodes are preferably used, however, to prevent the discharge between the coated electrodes, thereby increasing the life of the coatings 19 which otherwise would be rapidly destroyed. When the mercury vapor arc has been fully built up it will provide a relatively low resistance current path between the grid electrodes 20 and 21, thereby effectually short-circuiting the heating coils 16. As a result the current will then flow (referring to Fig. 2) through the lead 25 to grid 21, thence through the mercury vapor arc to grid 20 and from grid 20 through lead 28 to the incandescent filament and back to the return side of the circuit through lead 26.

As a result, the heating coils 16 will be short-circuited and the mercury vapor discharge will be self-sustaining. At the time that the heating coils 16 are cut out of circuit the filament 23 will come to full incandescence. The lamp is now generating both visible light and ultraviolet light so that a person sitting under it will be able to utilize them both.

In the arrangement shown in Fig. 3 the outer and inner vessels 1 and 10 are employed as before. Within the inner vessel the electrodes are constructed as before, comprising metal sleeves 14 which may be coated with an electron emissive material, grids 20 and 21, and heating coils 16, all of which are electrically connected together as shown. The unconnected ends of the coil 16 are shunted across the leads 25 and 26 by the leads 30 and 31, respectively. The metal sleeves 14 are connected across a portion of the filament 23 by the leads 32 and 33 which also comprises a part of the shunt circuit of the heating coils 16. 75

As before, there is mercury in the vessel 10. In this case the potential difference between the grid electrodes 20 and 21 is provided by the potential drop of the portion of the filament 23 connected between the leads 32 and 33. When the mercury arc forms between the grid electrodes the portion of the filament 23 between the leads 32 and 33 is shunted out of circuit.

With this arrangement, since the filament 23 is of very high resistance material, only a very small portion thereof is necessary to give the required potential difference between the grid electrodes. The result is, therefore, that when this portion of the filament 23 is short-circuited the illumination from the filament as a whole is not materially decreased. Of course, in addition, the resistance of the coils 16 must be properly proportioned with respect to the resistance of filament 23 so when they are cut out of the circuit by the mercury arc discharge the brilliance of the filament will not change materially.

The arrangement of Fig. 4 is a somewhat simplified arrangement in which the electrodes 14' within the vessel 10 are, in this case, in the form of solid metal rods which are shunted across a portion of the filament 23 by the leads 40 and 41 to provide the necessary potential difference between the electrodes to cause the device to operate. In this case the shunted portion of filament 23 is cut out of circuit when the low resistance mercury arc discharge builds up between the electrodes. Here, again, the brilliance of the filament does not materially change because of the relatively small portion of it which is cut out of circuit. The rods 14' need not necessarily be but preferably are coated with an electronically active coating.

For a gas pressure of the order of half a millimeter or more within the vessel 10 it is only necessary to provide a potential difference between the electrodes 20 and 21 of the order of about 15 volts. As is well known by those skilled in this art, the necessary potential will vary with the spacing of the electrodes, the construction of the grids, the gas pressure in which they are immersed, and the nature of the gas employed. All of these variable factors are well known by those skilled in the art and do not need to be detailed here.

It is also within the scope of this invention to employ in the discharge portion of the apparatus other metal vapors than those of mercury. For example, sodium or potassium vapor may be em-

ployed in the vessel 10 in place of the mercury. With this arrangement the incandescent filament still acts as a current limiting device, as a light source, and as a heat source. The spectrum of a metal vapor of this type has no known therapeutic value but is of great value as a light source. Such a light source, particularly when generated from sodium vapor, has an intensity approximately four times greater than any other known light source. It is, therefore, within the scope of this invention to employ the general principles thereof in connection with sodium and potassium vapors to provide an efficient light source.

From the above description it will be apparent that this invention resides in certain principles of construction and operation which may be embodied in other physical forms by those skilled in the art without departure therefrom.

I do not, therefore, desire to be strictly limited to the disclosure as given for purposes of illustration, but rather to the scope of the appended claims.

What I claim and seek to secure by United States Letters Patent is:

1. An electric lamp of the class described comprising an outer bulb having a filament of substantial length and high resistance therein, an inner tube having an ionizable gas content, and electrodes in said inner tube connected to said filament at points spaced substantially equal distances from and within its ends.

2. An electric lamp comprising an outer bulb having a filament mounted therein and an energizing circuit for the filament, an inner tube having an ionizable gas content, electrodes mounted in the tube and connected at spaced points to the filament, and heater coils for the electrodes shunted across a part of the filament circuit, a substantial portion of the filament being excluded from the electrode circuit.

3. An electric lamp comprising an outer bulb having a filament mounted therein and an energizing circuit, an inner tube having an ionizable gas content, electrodes mounted in the tube and connected at spaced points to the filament to shunt out a relatively short portion thereof when an arc discharge is in operation between the electrodes, heater coils for the electrodes, and circuits therefor in which is included the electrode connections, a substantial portion of the filament being excluded from the heater coil circuits.

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