

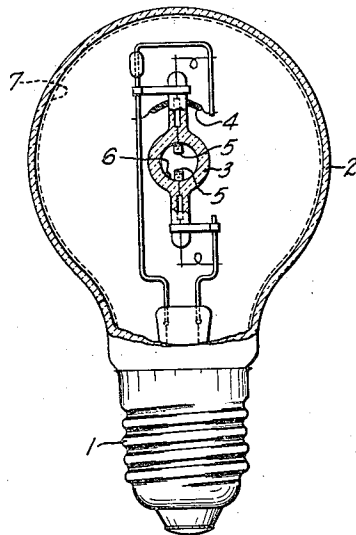
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J. KERN ET AL

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ELECTRIC LAMP

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Inventors:
Josef Kern,
Hermann Krefft,
by *John H. Anderson*,
Their Attorney.

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ELECTRIC LAMP

Josef Kern and Hermann Krefft, Berlin-Schoneberg, Germany, assignors to General Electric Company, a corporation of New York

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4 Claims. (Cl. 176—1)

The present invention relates to electric lamps generally and more particularly the invention relates to such lamps comprising an incandescent filament and a gaseous electric discharge device capable of operation on alternating current with a vapor pressure in the order of atmospheres.

Lamps of the above type are now known in the art which operate directly on commercial voltages and can be mounted in sockets used for incandescent lamps without external auxiliary apparatus. The practice in the art heretofore has been to operate the discharge device at a vapor pressure of about 1 to 8 atmospheres in series with an incandescent filament of such size that the main part of the line voltage is dissipated in the series filament. This proportioning between the voltage dissipated by the filament and that dissipated by the discharge is made necessary by the fact that the high pressure discharge device has a high reignition peak occurring in each half cycle of the alternating current and the fact that commercial current sources have unavoidable voltage fluctuations. Thus twice the voltage occurring at the electrodes is necessary for insuring reignition of the arc.

The object of the present invention is to provide an electric lamp of the above type which has a greater light output than those now known in the art. Another object of the invention is to provide a gaseous electric discharge lamp of the high vapor pressure type capable of operation on alternating current and which has a lower reignition voltage on each half cycle of the alternating current than those now known in the art. Still further objects and advantages of the invention will be apparent to those skilled in the art from the following detailed description thereof and from the appended claims.

We have discovered that the reignition voltage of discharge lamps of the above type decreases with increasing current and voltage gradient, that is, with increasing energy consumption per unit length of the arc path. We have utilized our discovery to provide a new kind of lamp of the above type.

The new lamp comprises a discharge device having a vitreous container of high softening point material, such as quartz, providing a spherical or keg shaped discharge chamber of 15 mm. or less inside diameter and having cooperating thermionic electrodes sealed therein. Said electrodes are separated a distance less than 5 mm. The discharge lamp is capable of operation with a vapor pressure greater than 25 at-

mospheres, a specific power consumption of more than 200 watts, preferably more than 300 watts, per centimeter of arc length and a specific wall load of more than 20 watts per square centimeter of the inner surface of the container. We prefer to mount the discharge lamp in a vitreous bulb provided with a screw base and to connect in series therewith an incandescible filament, also mounted in the bulb, said filament having a resistance value such that during the operation of the lamp the voltage drop across the filament is less than 45 per cent of the line voltage.

In the drawing accompanying and forming part of this specification an embodiment of the invention is shown in a front elevation, partly sectional view.

Referring to the drawing the electric lamp comprises a bulb 2 of vitreous material, such as glass, having a metal screw base 1 attached thereto and containing a high pressure metal vapor discharge lamp, an incandescible filament and current leads for said discharge lamp and said filament. The discharge lamp has a container 3 of vitreous material having a high softening point, such as quartz, providing a spherical discharge chamber of about 8 mm. inside diameter. Two cooperating electrodes 5 separated a distance of about 3 mm. are sealed into said container 3. Part of the current leads for said electrodes 5 are imbedded in the stems of the container 3 and comprise metal foil, such as molybdenum foil, as is well known in this art. Said electrodes 5 preferably consist of small, perforated tungsten shells, cone shaped in the direction of the discharge path and containing thorium oxide or zirconium oxide. Other types of activated electrodes known in the art, such as wire helices surrounding or impregnated with activating materials, are used when desired.

Said container 3 has therein a rare gas, such as argon, at a pressure of about 20 mm. When rapid heating of the device is desired to shorten the time required to attain operating equilibrium after starting the pressure of the gas is increased. A gas pressure of about 400 mm. is effective for this purpose though pressures lower than this are useful for the same purpose. A body of mercury 6 is present in said container in such amount that when the device is at operating equilibrium the vapor atmosphere is unsaturated, and has a pressure of about 130 atmospheres. The arc voltage increases with a rising vapor pressure to about 145 volts and the voltage drop across the filament 4 decreases to about 75 volts. Thus the

operating voltage of the high pressure discharge device is about 66 per cent of the supply voltage which is 220 volts. The lamp of the present invention thus has a higher light output than prior lamps of this type since the luminous efficiency of the discharge device is higher than that of the incandescent filament.

When the arc current is one-half ampere the wattage input is about 72.5 watts which is a specific wall load of about 36 watts per square centimeter of the inner surface of the container 3 and a specific power consumption of about 250 watts per centimeter of the length of the arc path.

The bulb 2 contains an inert gaseous atmosphere, such as a mixture of argon and nitrogen. When glare is to be avoided a light diffusing bulb 2 is preferred. When the considerable ultra violet light output of the discharge device is desired for utilization external to the lamp the bulb 2 is made of a vitreous material capable of transmitting such radiation. When the lamp is used for purposes of illumination we prefer to coat the inner surface of the bulb 2 with luminescent powder 7 or to make the bulb 2 of a luminescent glass.

When desired another series resistance of the type which automatically decreases in value during the starting period is mounted in the bulb 2 or in the base 1 to prevent excessive currents in the lamp when potential is first applied thereto. It will be understood, of course, that where prior devices for lowering the reignition voltage, such as auxiliary electrodes or electrically conducting strips, are used in the new lamp, the operating voltage of the discharge device can be increased still further.

While we have pointed out in the annexed claim certain novel features of the invention, it will be understood, of course, that various modifications and changes in the form and details of the lamp described above and illustrated in the drawing may be made by those skilled in the art without departure from the spirit and scope of the invention.

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

1. An electric lamp capable of operating on alternating current and comprising in combination a sealed bulb of vitreous material, gaseous electric discharge device and ohmic resistance means mounted in said bulb said means being connected in series with said device and constituting the sole ballast means therefor, said discharge device having a vitreous container providing a spherical discharge chamber which is not more than 15 mm. in diameter, a pair of spaced, cooperating electrodes sealed into said container and separated a distance of less than 5 mm. from each other, a starting gas and a quantity of vaporizable metal in said container, said discharge device being capable of operating with a vapor pressure of at least 25 atmospheres, a specific current load of more than 200 watts per centimeter of length of the arc path and a specific wall load of more than 20 watts per square centimeter of the inner surface of the container, the operating voltage of said device being more than 55 per cent of the voltage applied across the terminals of said lamp when said device is at operating equilibrium.

2. An electric lamp capable of operating on alternating current and comprising in combination a sealed bulb of ultra violet ray transmitting vitreous material, an incandescible fila-

ment and a gaseous electric discharge device mounted in said bulb, said filament being connected in series with said discharge device and constituting the sole ballast means therefor, said discharge device having an ultraviolet ray transmitting vitreous container providing a spherical discharge chamber which is not more than 15 mm. in diameter, a pair of spaced, cooperating electrodes sealed into said container and separated a distance of less than 5 mm. from each other, a starting gas and a quantity of mercury in said container, said discharge device being capable of operating with a vapor pressure of at least 25 atmospheres, a specific current load of more than 200 watts per centimeter of length of the arc path and a specific wall load of more than 20 watts per square centimeter of the inner surface of the container, the operating voltage of said device being more than 55 per cent of the voltage applied across the terminals of said lamp when said device is at operating equilibrium.

3. An electric lamp capable of operating on alternating current and comprising in combination a sealed bulb of vitreous material, an incandescible filament and a gaseous electric discharge device mounted in said bulb, said filament being connected in series with said discharge device and constituting the sole ballast means therefor, said discharge device having an ultraviolet ray transmitting vitreous container providing a spherical discharge chamber which is not more than 15 mm. in diameter, a pair of spaced, cooperating electrodes sealed into said container and separated a distance of less than 5 mm. from each other, a starting gas and a quantity of mercury in said container, said discharge device being capable of operating with a vapor pressure of at least 25 atmospheres, a specific current load of more than 200 watts per centimeter of length of the arc path and a specific wall load of more than 20 watts per square centimeter of the inner surface of the container, the operating voltage drop across said filament being more than 55 per cent of the voltage applied across the terminals of said lamp when said device is at operating equilibrium and luminescent material supported by said bulb.

4. An electric lamp unit comprising in combination, an ohmic ballast resistance means and a gaseous electric discharge lamp device connected in series therewith, said resistance means constituting the sole ballast for said device said discharge device having a vitreous container providing a spherical discharge chamber not more than 15 mm. in diameter, spaced, cooperating electrodes sealed into said container and separated a distance of less than 5 mm., a starting gas and a quantity of vaporizable metal in said container, said discharge device being capable of operating with a vapor pressure of at least 25 atmospheres, a specific current load of more than 200 watts per centimeter of length of the arc path and a specific wall load of more than 20 watts per square centimeter of the inner surface of the container, the reignition voltage of said discharge device being so low that the device is successfully operated even when the operating voltage thereof is more than 55 per cent of the voltage applied to said lamp unit when said device is at operating equilibrium.

JOSEF KERN.
HERMANN KREFFT.

CERTIFICATE OF CORRECTION.

Patent No. 2,275,768.

March 10, 1942.

3

JOSEF KERN, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 45, claim 3, for "drop across said filament" read --of said device--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of October, A. D. 1942.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.