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2,797,363

ELECTRIC DISCHARGE LAMP

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Fig. 1.

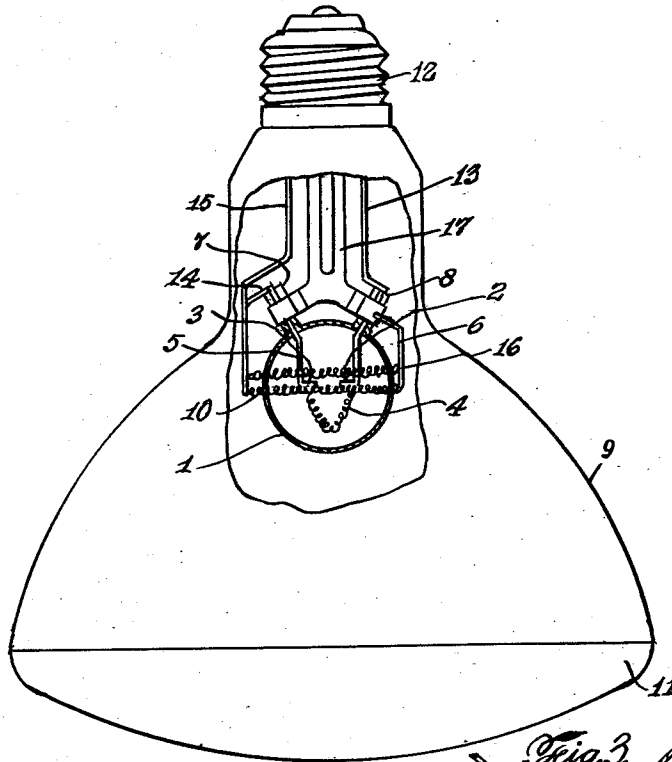


Fig. 2.

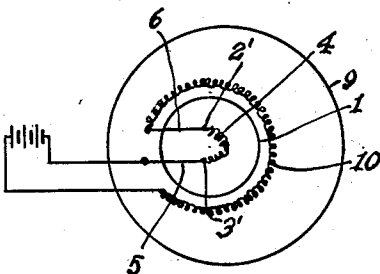
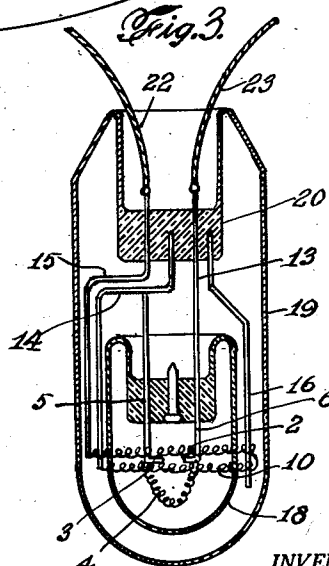


Fig. 3.



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ELECTRIC DISCHARGE LAMP

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6 Claims. (Cl. 315-49)

The present invention deals with an electric discharge lamp and more particularly with an electric discharge lamp having improved radiation characteristics.

Various attempts have been made to provide electric discharge lamps having improved radiation characteristics and particularly radiation characteristics simulating sunlight for application in the tanning of human skin.

Although the well known mercury vapor arc lamps produce ultraviolet radiations effective for tanning, the emission of the mercury vapor alone is deficient in the infrared and thereby does not produce such composite radiations of ultraviolet and infrared as would simulate sunlight for tanning purposes. The mercury vapor lamp even though color corrected by the addition of other gases and vapors or supplemented by incandescent filaments still lack sufficient radiation in the red end of the spectrum.

Infrared radiation when available at sufficient intensity and absorbed by the skin produce the sensation of warmth, increase the blood flow to the skin by dilating the capillaries and small superficial blood vessels, and stimulate perspiration. These are all factors which are favorably for tanning production by radiations in the ultraviolet portion of the spectrum.

It is an object of the present invention to provide a light source in a concentrated form and emitting radiations simulating sunlight.

It is another object of this invention to provide a lamp for emitting composite radiations including radiations in the infrared portions of the spectrum which consists of black body type radiations supplemented by an intense line spectrum emission of an ionizable gas whereby a more sunlike infrared emission is obtainable than from incandescent elements alone.

It is a further object of this invention to provide a lamp for producing radiations from an incandescent element and an ionizable gas in an arc and cooperating to produce a light which is sunlike in quality.

It is a still further object of this invention to provide a lamp for cosmetic tanning of live human skin wherein radiations are produced in the long-wave length ultraviolet and the blue end of the visible spectrum together with visible and infrared radiations in abundance to provide for heating of the skin tissues and increase blood flow to the skin, whereby tanning production of the skin is accelerated.

Other objects and advantages of the present invention will become apparent from the description hereinafter following and the drawings forming a part hereof, in which:

Figure 1 illustrates a partly elevational and partly sectional view of a lamp according to the present invention,

Figure 2 is a schematic view of the electrical circuitry, and

Figure 3 illustrates a modification of the invention.

The invention relates to a gaseous discharge lamp and incandescent lamp combination as a lamp unit for the production of radiations from combined light sources

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each dependent upon the other for energization and emitting predominantly infrared radiations with sufficient long ultraviolet to produce tanning of the human skin under the influence of the infrared radiations thereby substantially simulating the tanning effect of natural sunlight.

The lamp unit of the present invention produces radiations in the spectral range between 2980 and 4400 angstroms with radiation between 2980 and 3200 angstroms being present as a small fraction of the total radiation output, whereby erythema production is accompanied with pigmentation of the skin as a result of radiations between 2980 and 3200 angstroms and whereby the radiation in the spectral range between 3200 and 4400 angstroms effect darkening of the pigmentation for desirable cosmetic tanning of the skin.

Figure 1 shows a preferred form of lamp unit according to this invention and comprising a hermetically sealed light transmissive bulb 1 composed of fused quartz and the like ultraviolet and infrared transmissive materials, and containing at least a pair of spaced electrodes 2 and 3 with an electrical conductor 4, such as a resistance or incandescent filament, bridging the spaced electrodes or otherwise in an effective parallel electrical circuit with the arc established between the electrodes. The electrodes may be in a number of forms depending upon the power rating of the lamp and upon the supply voltage upon which it is to operate and these electrodes are spaced apart in order that during operation of the lamp an arc may form between them. For example, the electrodes may be just straight wires as illustrated by Figure 1 and of adequate current carrying capacity when the current is less than 10 amperes and the supply voltage is less than 115 volts at 60 cycles alternating current.

For higher current lamps, e. g. over 10 amperes it may be desirable to employ in addition to such wires, coils supported on the wires or cores to dissipate heat from the electrodes as illustrated by electrodes 2' and 3' of Figure 2. The electrode material may be tungsten, or tantalum, or such materials with activation materials associated therewith. For example, the activation material may be thorium or the oxides of thorium and barium, but plain tantalum or tungsten are preferred.

The above mentioned electrode spacing depends upon the available voltage for starting the lamp, the pressure of the gas filling in the arc bulb and the application for which the lamp is employed. With 115 volts 60 cycle A. C. supply, the arc gap may be less than one millimeter for a lamp designed for illumination of microscopes, etc., and several millimeters, e. g. 5 millimeters, when the lamp is employed for cosmetic tanning purposes. The electrodes and bridging filament are connected in parallel and to an external electrical circuit by the lead-in members 5 and 6 hermetically sealed through the wall of the arc tube 1 by means of hermetically sealing members 7 and 8, such as ordinarily employed for high pressure sealing of input leads through an arc vessel envelope.

The electrodes are bridged by an electrical resistance or incandescent filament 4, which is at all times in the electrical circuit and which during operation of the arc is in parallel electrical circuit with said arc. Switches or means for disconnecting the bridging filament during some stage of operation of the lamp are not used. This resistance 4 when heated by the passage of electric current ionizes the gas by thermal ionization, which enables an arc to be established between the electrodes. After start, the resistance continues to be heated by the passage of current and contributes infrared radiations of long wave length to the sum total of radiations and thus serves as one of the light sources in the lamp structure.

The second light source in the lamp structure is the arc. The arc is initiated and operates in a gaseous atmosphere consisting of xenon. The xenon gas is employed

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either as a spectroscopically pure gas or may contain not more than 5% of other rare gases such as krypton or argon. These latter gases may be added to facilitate starting for conditions of low supply voltages or long arc gaps. After start the discharge is almost completely in the xenon gas. The gaseous content filling the arc bulb is at pressures from 0.1 to 50 atmospheres at 25° C. Preferably, xenon pressure is between 0.5 to 2 atmospheres at 25° C. when the lamp is to be started under low voltage conditions, for example 110 volts. When auxiliary starting circuits are employed for ignition at higher voltages, the lamp may contain xenon up to 50 atmospheres pressure.

The efficiency of light production by xenon increases rapidly with increase in pressure. In the operating gas pressure ranges employed in accordance with this invention, radiation efficiency follows closely the gas pressure. Thus for the same current the lamp wattage in the arc and the radiation output are doubled when pressure is doubled.

For 115 volt operation an arc gap of 1 millimeter and a xenon gas filling of 1 atmosphere at 25° C., the operating pressure will become about 3 atmospheres as a result of the temperature effect in accordance with Boyle's law.

In accordance with Figure 1, the arc bulb 1 hereinabove described is supported in an outer envelope 9, which is transparent to the infrared, visible and long wave length ultraviolet radiations. This outer envelope may be a component of a screw-type base lamp readily applicable for use with ordinary type electrical sockets. This outer envelope also contains electrical resistance element 10, that is an incandescent resistance or filament of tungsten, or a wire-wound heater coil, or a bar resistance element of equivalent function. In all instances the resistance 10 produces heat to increase the temperature of the xenon gas, and therefore the pressure of the gas. The heater source also contributes infrared radiations, and thus acts as another supplemental infrared source to the infrared radiations of the xenon gas. Electrically, the resistance 10 is in series connection with the electrode bridging filament 4 and the arc established in the xenon gas between electrodes and serves as a ballast for the arc.

The outer bulb 9 may be provided with a reflector, for example an illuminizing reflector 11 on the inside of the glass and a screw base 12 as above mentioned so that when all electrical elements are properly proportioned, the lamp may be then attached directly to a supply socket for which it is rated.

One of the leads 6 passing through a sealing member or projection 8 is connected directly to a conductor wire or rod 13 in electrical connection with the base 12 and the other lead 5 passing through a sealing member or projection 5 is connected to a conductive wire or rod 14, which supports an end of the incandescent resistance member 10. The resistance 10 passes substantially around the bulb 1 and is connected to conductor 15 electrically connected with the base 12 so that conductors 13 and 15 are in series connection with sources of radiation hereinabove set forth. In order to provide for secure positioning of the resistance 10 with respect to the bulb 1, the resistance 10 is further supported by means of a supporting wire or rod 16 or the like, insulated from the circuit, to a main arc vessel insulated support 17 secured to the seal projections 7 and 8 as illustrated.

Figure 2 illustrates schematically the series relationship between the sources of radiation including the electrodes 2' and 3'.

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Figure 3 illustrates a modification of the structural aspects of the arc vessel 18 and the outer bulb 19 and differing from Figure 1 in that the inner bulb 18 is made for lower xenon gas pressure and of substantially tubular form as is the outer bulb 19. Otherwise, the sources of radiations including the arc vessel 18 are supported directly by the conductors 13 and 15 sealed through the reentrant lamp stem 20, and the supporting rods or wires 16 and 21 secured to the lamp stem 20 and insulated from the electrical series circuit energizing the composite lamp assembly. The conducting leads 13 and 15 are further connected to conductors 22 and 23 which may be suitably connected to a source of voltage for energizing the lamp.

Essentially, this lamp comprises a resistance element in series electrically with an arc in xenon gas which arc is bridged by a second resistance element.

What we claim is:

1. An electric lamp comprising in combination inner and outer light transmissive envelopes, an ionizable atmosphere and at least a pair of spaced electrodes in said inner envelope, an incandescent filament bridging said electrodes, an incandescent resistance member outside of said inner envelope and within said outer envelope, means for energizing said resistance member and said incandescent filament, said ionizable atmosphere consisting of xenon with not more than 5 percent of another rare gas.
2. An electric lamp comprising in combination a light transmissive discharge vessel containing an ionizable atmosphere, at least a pair of spaced electrodes in said discharge vessel, an incandescent filament bridging said electrodes, an incandescent resistance member outside of said arc vessel in electrical series connection with said filament and electrodes, an outer light transmissive envelope containing said resistance member and said discharge vessel, said ionizable atmosphere consisting of xenon with not more than 5 percent of another rare gas.
3. An electric lamp according to claim 2, comprising means for supporting said resistance member and said discharge vessel in said outer envelope.
4. An electric lamp according to claim 2, wherein said ionizable atmosphere is at a pressure between 0.1 and 50 atmospheres at 25° C.
5. An electric lamp according to claim 2, wherein said electrodes comprise a metallic core having a metallic winding thereon.
6. An electric lamp comprising in combination a light transmissive discharge vessel containing an ionizable atmosphere, at least a pair of spaced electrodes in said discharge vessel, an incandescent filament bridging said electrodes, a resistance member outside of said arc vessel in electrical series connection with said filament and electrodes, an outer light transmissive envelope containing said resistance member and said discharge vessel, said ionizable atmosphere consisting of xenon with not more than 5 percent of another rare gas, an arc between said electrodes, said arc and resistance member emitting composite radiations.

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