

May 17, 1938.

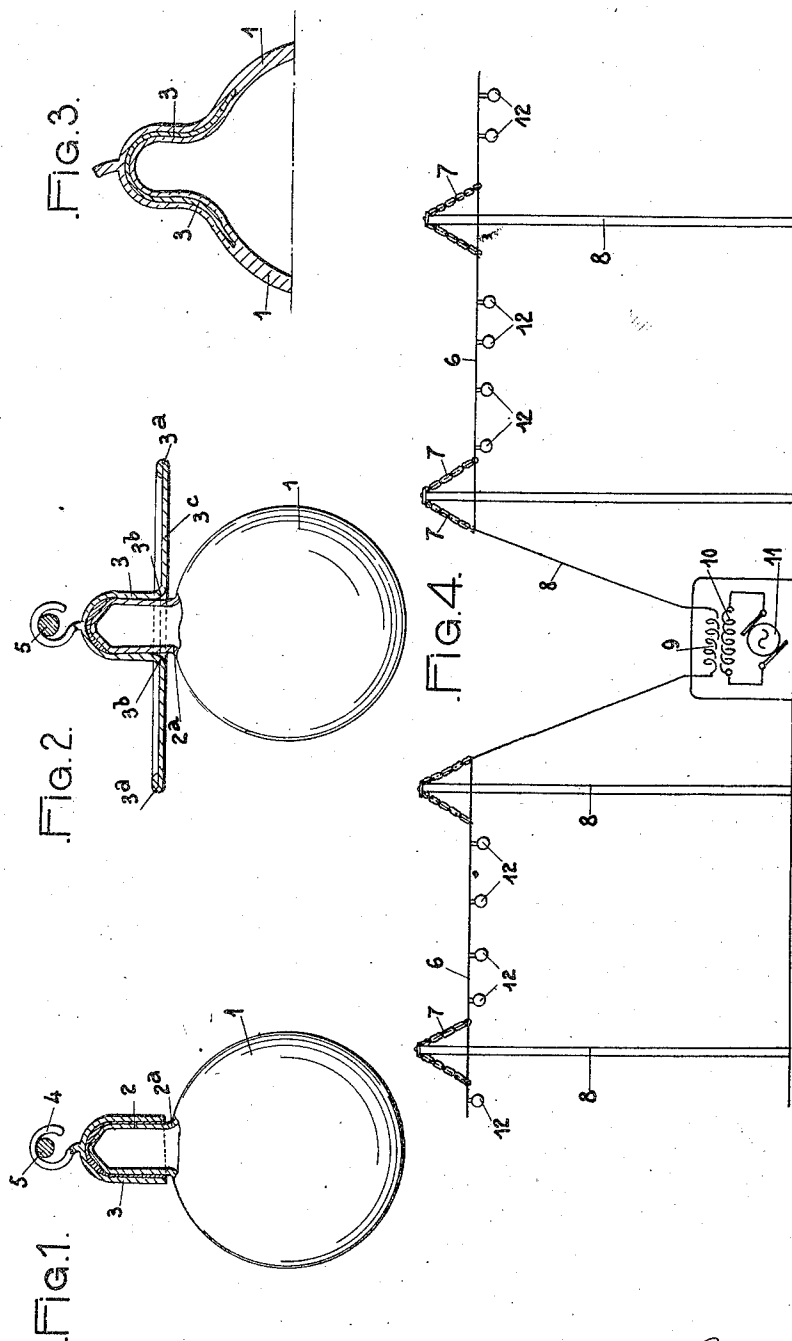
R. A. COUSTAL

2,117,544

LIGHTING BY SUSTAINED LUMINESCENCE

Filed Oct. 29, 1935

2 Sheets-Sheet 1



R. A. Coustal
INVENTOR

By: *Glascopp Downing & Leebold*
ATTYS.

May 17, 1938.

R. A. COUSTAL

2,117,544

LIGHTING BY SUSTAINED LUMINESCENCE

Filed Oct. 29, 1935

2 Sheets-Sheet 2

Fig. 5.

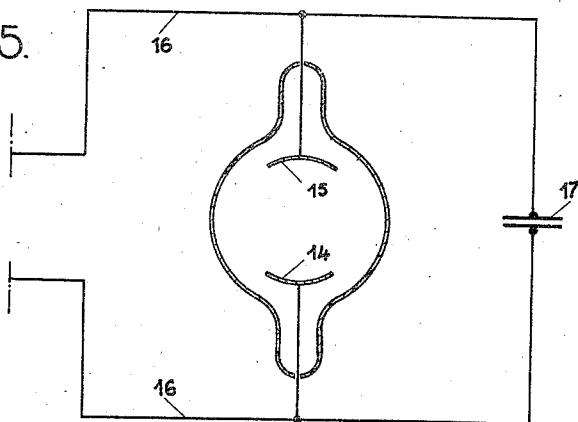


Fig. 6.

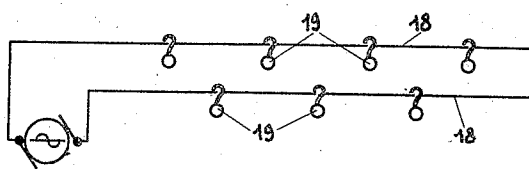


Fig. 7.

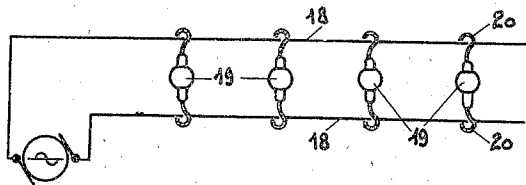


Fig. 8.

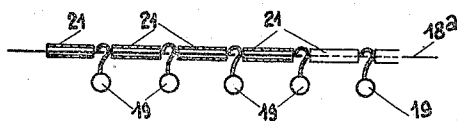


Fig. 9.

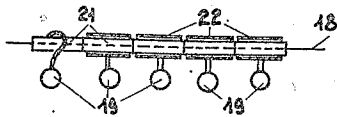
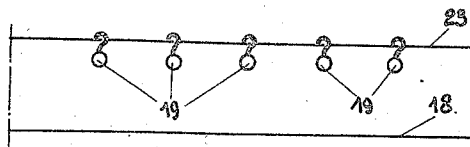


Fig. 10.



R. A. Coustal
inventor

By: *Glascock Downing & Seibold*
Attys.

UNITED STATES PATENT OFFICE

2,117,544

LIGHTING BY SUSTAINED LUMINESCENCE

René André Coustal, Saint-Maur, France, assignor to Société Anonyme Stella-Lux, Paris, France

Application October 29, 1935, Serial No. 47,326
In France October 29, 1934

1 Claim. (Cl. 176—122)

The present invention relates to the technics of lighting by means of materials the luminescence of which is electrically sustained, for instance by means of high frequency high voltage currents.

In this art, use is made of lamps constituted by glass bulbs containing a gas rarefied or cathodic vacuum and the inner face of which receives a layer of luminescent material.

By maintaining in the bulb a high frequency high voltage current, the luminescence of the layer of material is sustained.

The present invention concerns improvements in the technics of this lighting.

These improvements relate both to the manufacture of the lamps and to their supply or energization and their applications.

They are mainly characterized by the following points, applicable separately or in combination:

(a) The application of phosphorescent or fluorescent materials (particularly: zinc sulphide, calcium tungstate, uranyl salts, and the like employed separately or in mixtures) on the inner face of the bulb constituting the lamp, and in totality or in zones, is effected by moistening this face and by spraying on the moistened zone the luminescent material in powder form.

(b) The liquid for moistening the inner face of the bulb is distilled water.

(c) The liquid for moistening the inner face of the bulb is a solution of zinc chloride ($ZnCl_2$).

(d) After drying the luminescent powder, the bulb is connected to a source of vacuum and exhausted as perfectly as possible whilst the powder is freed from gases, either by moderate heating, or by intense energization at a high frequency, or again by both these means applied simultaneously.

(e) After the bulb has been exhausted, a rare gas, such as: helium, neon, argon, krypton or xenon, is introduced therein, whilst a high frequency high voltage current is sustained in order to control, according to the brilliancy of the lamp, the pressure of the rare gas introduced, this pressure being usually much lower than one millimeter of mercury. The lamp is subsequently sealed and provided with a conducting socket constituting an electrode-support.

(f) The lamps are constituted by spherical glass bulbs with a single electrode or suspension cap.

(g) For eliminating the localized brush discharges which in course of time cause the neck portion receiving the lamp cap to break, the said lamp cap is provided, at its lower part, with a flange which regularizes the distribution of the

electric field, promotes cooling and can eventually serve as lamp-shade.

(h) The metal cap of the lamp is secured to the neck portion of the glass bulb by direct adherence of a metal, such as tungsten, to the exclusion of any cement.

(i) The electrode of the lamp is constituted by a metal member embedded in the thickness of the glass of the neck portion of the bulb.

(j) The neck portion of the glass bulb is constituted by a quartz sleeve secured in position.

(k) For the lighting of roads for instance, the lamps are hung from or secured to a conducting wire supplied with high frequency high voltage current, preferably by means of a rotary current-generator giving a wave length of at least 6000 meters so as not to disturb wireless receptions.

(l) For indoor lighting the wires supporting and feeding the lamps are in the shape of aerials composed of multiple wires, arranged parallel to each other, or in fan-like fashion or otherwise, and supplied by a high frequency high voltage current-generator, or a rotary current-generator or a station provided with transmitting valves, or of the discharger or arc type, the tuning being effected by means of self-induction coils or of condensers.

(m) The lamps are fed by relaxation waves or oscillations and particularly by utilizing dynatrons, singing arcs, so called Crystadyne lay-outs or of the singing crystal type.

(n) When the lamps are hung from a conducting wire supplied as an aerial with high frequency high voltage current, the wire is surrounded by insulating sleeves, preferably made of quartz, isolantite or materials having equivalent properties, which sleeves can constitute mechanical stay members between two adjacent lamps.

The accompanying drawings illustrate, by way of example only, forms of construction of the improvements according to the present invention.

Figs. 1, 2 and 3 illustrate forms of construction of lamps according to the invention.

Fig. 4 is a diagrammatic view of a road lighting installation.

Figs. 5 to 10 illustrate wiring diagrams of lamps according to the invention.

The lamps according to the invention are constituted by a bulb made of glass or equivalent material, having a general spherical shape with a tubular neck portion which allows:

1°—The moistening of the inner surface of the bulb, either by means of distilled water, or by means of an aqueous solution of $ZnCl_2$, and on the totality or on certain zones only of this surface.

2°—The spraying, by means of an aerograph pencil or brush for instance, of luminescent materials, such as those indicated above, in the form of a fine powder, on to the moistened surfaces where they definitely adhere after drying.

3°—The exhaustion of the bulb and the introduction of a rare gas the pressure of which is determined by the brilliancy of the luminescent zones when the lamp is placed in a field of high frequency high voltage current.

Concerning the introduction, which is moreover optional, of rare gases into the bulb, it is to be noted that these gases do not intervene for producing a useful light, as is the case for lighting tubes (neon lamps for instance). They simply promote the appearance and sustinment of the phenomena energizing the materials the luminescence of which constitutes the only source of light.

As shown in Fig. 1, the bulb being sealed as usual for incandescent lamps, the neck portion 2 is covered with a metal cap sealed by means of a special cement and which constitutes an electrode and a means for securing the bulb on the supply wire. In the example of Fig. 1, the cap which, moreover, must be devoid of projections capable of producing losses of high frequency current, is provided with a hook 4 for hanging it from the supply wire 5. Other securing means, of the socket type for instance, can obviously be provided.

The material, the sustained luminescence of which produces the light, is practically of indefinite duration and the wear of the lamps is caused by deterioration of the bulb itself. Thus, in the form of construction shown in Fig. 1, the bulb may break at 2^a after a certain time. The breaking appears to be due to localized brush discharges which cause local heating up of the glass.

For remedying thereto, use may be made of the form of construction shown in Fig. 2, in which the cap 3 is provided, at its lower part, with a flange 3^c the periphery of which presents a rounded ledge 3^a in order to avoid losses of electric energy in the atmosphere. A rounded portion being also provided at 3^b and distant from the narrow portion 2^a of the neck, the localized brush discharges are thus eliminated, and, at the same time, it is possible to obtain:

A more regular distribution of the electric field producing and sustaining the luminescence,

A cooling of the cap which thus presents a large surface of contact with the atmosphere.

The upper portion of the flange 3^c being blackened and its lower face being polished, a lampshade is thus obtained.

In order to do away with cement ensuring the adherence of the cap 3 to the glass of the neck portion 2 and which, as it never constitutes an insulation, nor a perfect conductor, presents inconveniences, use may be made of the arrangement shown in Fig. 3, in which the metal of cap 3 is embedded in the glass of the neck portion 2 and of the bulb 1. Use can also be made of metals which, as tungsten for instance, adhere to glass and can constitute with the latter a real weld. The inner surface of cap 3 is coated with tungsten which, when in contact with glass, is welded to the latter.

For allowing the neck portion 2 to resist to the effects of temperature, it can be made of quartz and it can be welded, by known processes, to the glass which constitutes the bulb proper.

If for constructional requirements the cap is

to be sealed by means of cement, use can be made of the cement indicated hereinafter which behaves as a dielectric having but small losses in high frequency current.

This cement is constituted by an alloy of sulphur and paraffin and is composed for instance of 75 parts of sulphur and 25 parts of paraffin having a high melting point.

Lamps according to the invention can be used for lighting roads. In the installation diagrammatically illustrated in Fig. 4, wires 6 are supported, through the medium of insulating chains 7, by posts 8 arranged at intervals along a road and connected, at one end, to the secondary winding 9 of a Tesla transformer, the primary winding 10 of which is fed by a high frequency and high voltage alternator 11 giving, for instance, a wave length of 10 kilometers, the secondary winding being perfectly tuned. The lamps 12 are secured to wires 6 at any desired distance apart and give, for a reduced consumption of energy, a diffused light very pleasant to the eye.

The electric fields sustaining the luminescence are obtained by damped waves or by sustained waves.

Damped waves have the advantage, concerning the energization of lamps of the above type, of giving rise to high voltage peaks allowing utilization of a relatively reduced mean potential. On the contrary, the fluctuations due to the very nature of the current which is not sinusoidal, give rise to irregularities in the luminescence.

With sustained waves, a regular energization is obtained, but, on the other hand, the absence of voltage peaks necessitates the use of a higher supply mean potential.

For the purpose of deriving profit from the advantages of each of the modes of supply indicated above, without suffering from the inconveniences of the same, the invention concerns the new application, for feeding lamps of the type indicated, of relaxation waves or oscillations. These waves have voltage peaks and a regularity comparable to that of sustained waves, and, in any case, sufficient for preventing the production of fluctuations perceptible to the eye.

The invention includes in its scope any generating means suitable for the production of these relaxation waves and particularly the following:

Dynatrons

Singing arcs

So-called "Crystadyne" lay-outs, that is to say singing crystals, such as zincite.

Relating to these latter means, the invention concerns the new application of marcasite the properties of which, as far as the applicant is aware, have not been used in Crystadyne lay-outs.

Fig. 5 shows a generator for the production of relaxation oscillations. This generator is constituted by a valve having two inner electrodes 14 and 15 connected to the circuit 16 of a source of supply of high frequency high voltage current, on which electrodes is shunted a condenser 17.

Fig. 6 shows a feeder lay-out for feeding lamps 19. The latter are of the suspension hook type described above. They are hung from the wires of the feeders 18 and in electric contact with the same through the hook connected to their electrode.

In the lay-out of Fig. 7, the lamps 19 are interposed between the feeders 18, by two hooks 20, or securing means provided with suitable contacts and connected to the electrodes of the lamps.

In Fig. 8, an aerial wire or feeder 18^a is sur-

rounded by sleeves 21 made of quartz, isolantite or like material, which serve as mechanical stay members between two adjacent lamps 19 hung from the wire as the lamps 19 of Fig. 6. The losses of energy for the wires are thus reduced as explained above.

In Fig. 9, the lamps 19 are externally attached to the insulating sleeves 21 of Fig. 8, either by their suspension hook, or, preferably, by a conducting socket 22, in order to provide condensers allowing the aerial or wire 18 to be better defined.

In Fig. 10 the lay-out illustrated avoids an excessive coefficient of damping of the aerial circuit. At a certain distance from the supply wire, or from the feeder 18, is arranged a wire 23 parallel thereto and from which the lamps 19 are hung. The wire 23 is insulated at its ends or is connected as an aerial tuned on the wave of the aerial constituted by the supply wire. This tuning can be obtained either by the own wave length of the wire 18, or by connecting the latter

to a closed circuit comprising a capacity and a tuning self-induction coil, or again by earthing it, through a self-induction coil and a capacity.

What I claim as my invention and desire to secure by Letters Patent is:

In an installation for supplying lamps with electric energy, comprising a transparent bulb for visible radiation and coated with a layer of a solid luminescent or phosphorescent material, the said lamps comprising one or two electrodes, a free conducting wire, a source of electric energy connected to the said wire for producing outside the same a variable electric field, sleeves of insulating material surrounding the said wire, conducting sockets surrounding the said sleeves and connected to one of the electrodes, lamps rendered luminescent by the action upon the layer of luminescent or phosphorescent material of the electric field produced outside the said wire.

RENÉ ANDRÉ COUSTAL.