Nov. 24, 1936. K. R. BEYMER 2,061,824

LUMINOUS DEVICE

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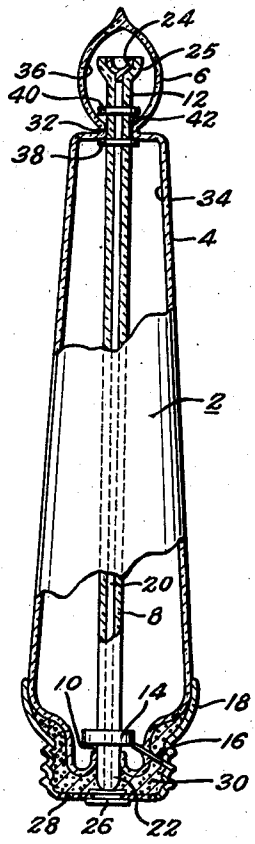


Fig. 1.

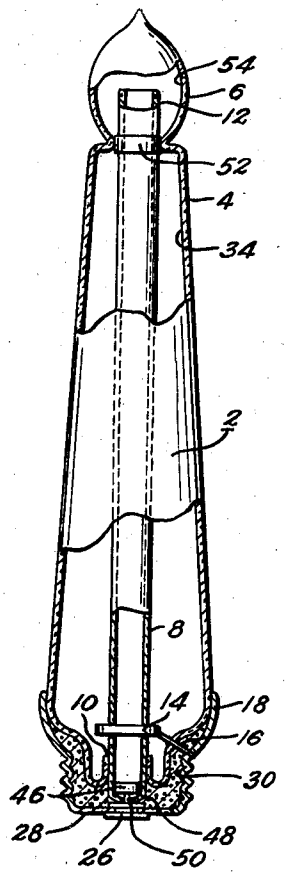


Fig. 2.

Fig. 3.

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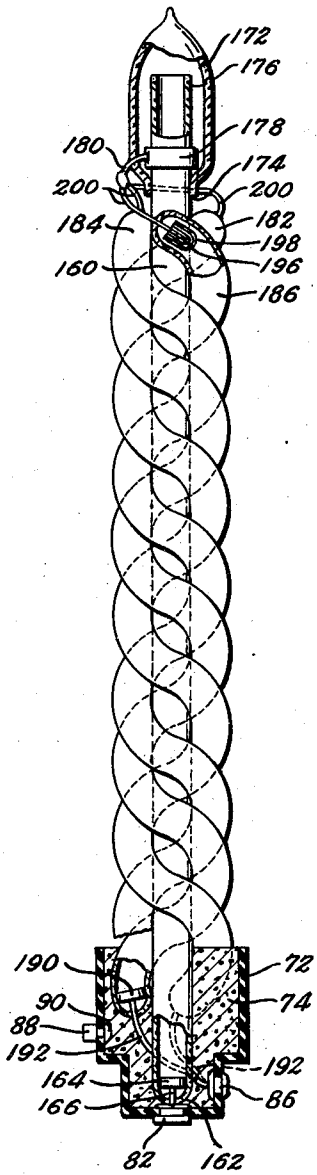


Fig. 4.

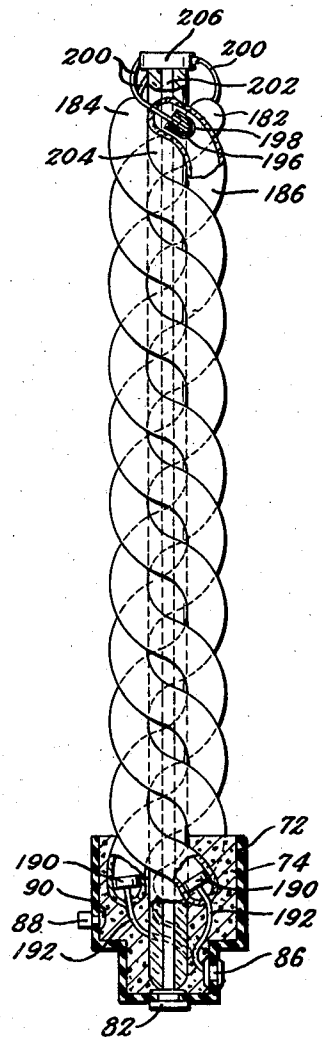


Fig. 5.

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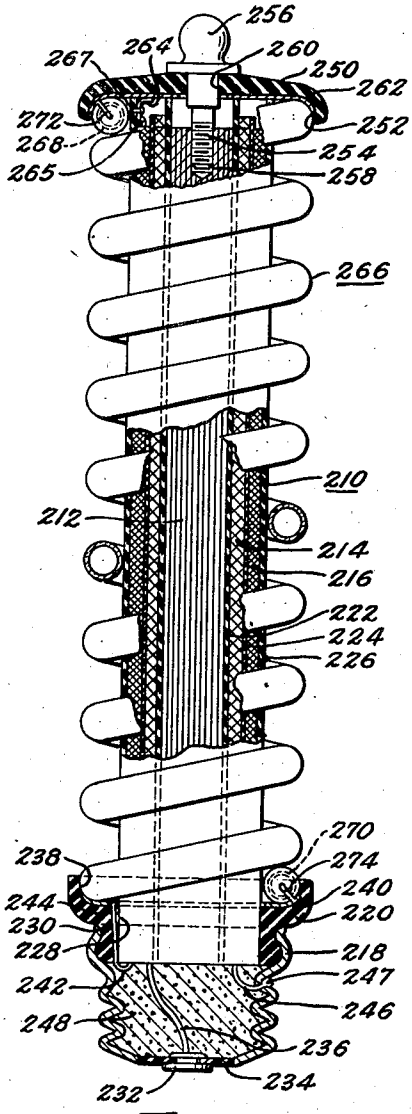


Fig. 6.

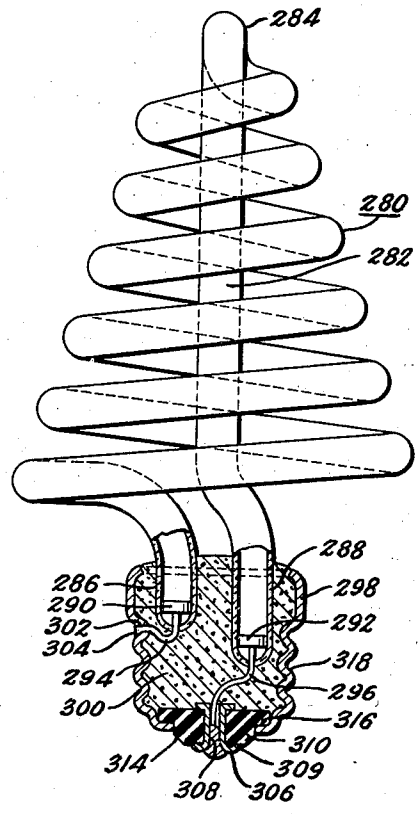


Fig. 7.

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2,061,824

LUMINOUS DEVICE

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Application June 9, 1933, Serial No. 675,102

11 Claims. (Cl. 176—122)

This invention relates to luminous devices, and more particularly to luminous devices embodying glow lamp principles and suitable for household as well as commercial use.

An object of this invention is to provide a luminous device particularly adaptable to household and ornamental use. This object is accomplished by providing a luminous device that has an ornamental shape, emits light of a desirable color for ornamental use and has a base which can be easily and quickly inserted or attached to a convenient household receptacle.

Another object of this invention is to provide a luminous device that is inexpensive to manufacture and particularly inexpensive to operate. This obect is accomplished by providing a gaseous discharge tube luminating device of simple construction that requires low operating power.

Another object of this invention is to provide a luminous device that emits a glowing light.

Another object of this invention is to provide a luminous device that emits a soft glowing light in a combination of colors.

Another object of this invention is to provide a luminous device that emits a glowing light and has sections or parts from which different colors of light are emitted. This object is accomplished by providing a gaseous discharge tube luminous device having a plurality of separate sealed discharge chambers, which chambers have different gases sealed therein.

Another object of this invention is to provide a luminous device having an improved electrode therein that causes the discharge or glow to substantially fill the receptacle or tube, even to the end portions thereof surrounding the electrodes. This object is accomplished by providing a gaseous discharge tube having electrodes located near the ends thereof, which electrodes have a coating of insulation covering the surface thereof that faces toward the other electrode through the discharge path.

Other objects and advantages of this invention will be apparent from the accompanying specification and drawings wherein preferred forms of the present invention are clearly illustrated and described.

In the drawings:

Fig. 1 is an elevation of one form of the present invention, with parts thereof shown in section.

Fig. 2 is an elevation of a form of the present invention similar to that shown in Fig. 1, with parts thereof shown in section.

Fig. 3 is an elevation of a substantially complete unit embodying a modified form of the present invention, with parts thereof shown in section.

Figs. 4 and 5 are elevations of modified forms of the present invention with parts thereof shown in section.

Fig. 6 is an elevation of a substantially complete unit embodying a modified form of the present invention, with parts thereof shown in section.

Fig. 7 is an elevation of a modified form of the present invention with parts thereof shown in section.

With particular reference to Figs. 1 and 2, a sealed receptacle or tube 2, preferably made of glass, is in substantially the form of a candle and flame having a candle portion 4 and a flame portion 6. A tubular insulating barrier wall 8, also preferably made of glass, is sealed into the receptable 2 at one end thereof, such as at 10, and extends through the candle portion 4 and has a portion 12 projecting into the flame portion 6. A ring-like electrode 14 is mounted outside of the barrier wall 8 and within the receptacle 2 near one end thereof, and has a connecting lead 16 electrically connected thereto and projecting through the receptacle 2 and sealed into the wall of that receptacle. One end of the candle portion 4 of the receptacle 2 is mounted in a suitable base 18, which base is preferably made of metal so as to form one terminal of the device and to which the connecting lead 16 is connected.

In the form shown in Fig. 1, an electrode 20 extends through the tubular insulating barrier wall 8 and a connection thereto is sealed into an external end 22 of the wall 8, and a substantially cup-shaped portion 24 of the electrode 20 on the end thereof, and within the flame portion 6, has its outside walls covered by a flared portion 25 of the barrier wall 8 so that the discharge follows around the flared portion, and tends to more nearly fill the flame portion 6. A terminal 26 is insulatingly secured to the base 18 through an insulating member 28, and is electrically connected to the electrode 20. A space 30 intermediate the base 18 and the receptacle 2 is preferably filled with a suitable insulating compound or cement. The receptacle 2 is sealed to the insulating barrier wall 8, as at 32, intermediate the candle portion 4 and the flame portion 6, thus forming sealed compartments 34 and 36 within the candle and flame portions respectively. Electrodes 38 and 40, preferably ring-like in form, are mounted on the insulating barrier wall 8 in the candle and flame portions respectively, and are electrically connected by a suitable connecting lead 42 that is sealed into the juncture

between the receptacle 2 and barrier wall 8. The sealed compartments 34 and 36 preferably contain different rarefied gases so as to produce different colors when a discharge occurs between the electrodes therein.

In the form shown in Fig. 2, an electrode 46 is mounted in a sealed end 48 of the tubular insulating barrier wall 8 and has a connected lead 50 electrically connected thereto that is sealed into the wall 8 and connected to a suitable terminal 26. The terminal 26 is insulatingly mounted to the base 18 through an insulating member 28 and forms the other external connecting terminal for the device. A space 30 intermediate the base 18 and the receptacle 2 is preferably filled with a suitable insulating compound or cement. An electrode member 52, that is preferably ring-like in form, is sealed to the insulating barrier wall 8, and also to the receptacle 2 intermediate the candle and flame portions 4 and 6 respectively. Hence, separately sealed compartments 34 and 54 are formed within the candle portion 4, and the flame portion 6 and barrier wall 8, respectively. The compartments thus formed are preferably filled with different rarefied gases, so as to produce different colors when a discharge occurs between the electrodes therein. It is understood that electrodes such as 38 and 40 of Fig. 1 having a connector such as 42 therebetween are equally well suited to the device shown in Fig. 2. It is also understood that the shape or form of the electrodes in either of the devices may be varied or changed without departing from the spirit of the invention herein disclosed.

With particular reference to Fig. 3, a continuous sealed receptacle or discharge tube 60 has a portion 62 that is preferably substantially straight, and has a substantially reverse bend therein such as at 64, and the remainder of the tube is entwined or wound around the portion 62 in a substantially serpentine or spiral form so that the sealed ends 66 and 70 are mounted in a suitable base 72 that is preferably made of insulating material, and are preferably sealed therein with a suitable sealing compound or cement 74. A connector 80 is electrically connected to an electrode 78 and to a suitable terminal 82 that is mounted in the insulating base member 72, and is sealed into the wall of the receptacle or tube 60. A connecting lead 84 provides an electrical connection between an electrode 76 and a suitable terminal 86 that is preferably secured to a side portion or wall of the base 72. The discharge tube or receptacle 60 is preferably made of glass and contains a rarefied gas, which gas is selected to produce the desired color.

A bayonet prong or stud 88 is preferably mounted on a side wall of the base 72 and secured thereto by riveting such as at 90 or by other suitable means. The bayonet prong 88 engages a catch portion 92 in a slot 94 provided in a socket portion 96 of a suitable mounting base 98. The base 98, shown in this figure, represents one form of base that is, or may be, adapted to provide a suitable mounting for the luminous devices disclosed herein. This base 98 preferably has a concave portion 100 within the confines of which a suitable transformer 102 is mounted, and which transformer is adapted to step-up the line voltage to a value sufficiently high to cause a glow or discharge within the tube.

The transformer 102 has a core 104 and windings 106, and is preferably secured to a cover member 108 that is preferably made of insulating material. The transformer 102 is preferably secured to the base 108 by a band 110 that extends over the transformer and is secured to lug members 112 by screws 114 or other suitable fastening means. A leaf spring contact 116 engages the terminal 86 and is secured to a lug 118 by a rivet or other suitable fastening means 120, and is properly spaced or positioned by washers 122. The lug 118 is preferably formed from the band 110. Another contact 124 is preferably urged against the terminal 82 by a spring or resilient member 126. The contact member 124 projects through the end of, and is guided by a substantially cup-shaped member 128 having a flange portion 130 that is secured to the base 108 by rivets 132 or other suitable fastening means. The spring 126 engages a shoulder portion 134 of the contact 124 and the base 108 to urge the contact 124 into engagement with the terminal 132. A connecting lead 136 extends through an aperture 138 in the substantially cup-shaped member 128 and provides a connection between the transformer 102 and the contact 124. A connecting lead 140 provides a connection between the transformer 102 and the contact 116. Connecting wires 142 and 144 extend through a grommet 146 that is mounted in an aperture 148 in the base 98, and provide a connection between the transformer 102 and a suitable source of potential. The cover member 108 fits into a groove 150 in the base 98 to hold the cover member in place. A handle member 152 is secured to the base 98 to simulate a candle holder.

A cover 154 preferably in the form of a candle and flame, is preferably made of glass, and is preferably coated so as to diffuse the light. The cover 154 fits into an opening 156 in the base 98 and rests against a ledge or shoulder portion 158. This form of cover is preferable for the forms of luminous devices shown in Figs. 3, 4 and 5.

With particular reference to Fig. 4, a substantially straight discharge tube 160 is sealed at one end such as at 162, and has an electrode 164 mounted therein near the sealed end 162. A lead 166 is sealed into the end 162 of the tube 160 and extends therethrough to provide an electrical connection between the electrode 164 and a suitable terminal 82. The terminal 82 is mounted in a base member 72 that is preferably made of insulating material. A tip 172, preferably larger than the tube 160 is sealed over an open end 176 of the tube 160 as at 174, so that the open end 176 projects into the tip 172. The tube 160 having a sealed end 162 and the tip 172 sealed thereto thus form a sealed discharge tube or compartment, and an electrode 178 preferably ring-like in form, is mounted outside of the tube 160 and within the tip 172. The electrode 178 thus forms a second electrode for the discharge tube thus formed. A lead 180 is sealed into the tip 172 and extends therethrough, and is electrically connected to the electrode 178.

A plurality of discharge tubes such as 182, 184 and 186 are entwined or formed around the tube 160 in a substantially spiral or serpentine form and extend from near or adjacent the tip 172 preferably to within the base 72. The ends of the tubes, 160, 182, 184 and 186 are preferably sealed into the base 72 by a suitable sealing compound or cement as at 74. Electrodes such as 190 are mounted in the ends of the tubes 182, 184 and 186, and have leads such as 192 electrically connected thereto and sealed into and extending through the sealed ends of those tubes for making connections to a common terminal 86 that is preferably mounted on a side wall of the base 72

and secured thereto by riveting or other suitable means. Electrodes 196, preferably cup-shaped in form, and having an insulating coating on the outer surface thereof such as 198, are mounted in the other ends of the tubes 182, 184 and 186 on connecting leads 200 that extend through the sealed ends of the tubes and are sealed therein. The leads 200 provide an electrical connection between the electrodes 196 and the electrode 178 through the lead 180. The tubes 160, 182, 184 and 186, and the tip 172 are preferably made of glass, and contain rarefied gases which produce a desired color combination. The luminous device thus formed may be mounted in a base such as that shown in Fig. 3, and a bayonet prong or stud 88 projects from the side wall of the base 72 and is secured thereto by riveting such as 90 or other suitable fastening means. This prong provides a catch for holding the device in a socket such as that shown in Fig. 3.

With particular reference to Fig. 5, reference numerals similar to those used in Fig. 4 refer to similar parts, that perform similar functions to those of Fig. 4. The principal differences in the devices shown in Figs. 4 and 5 being that in the device shown in Fig. 5, a connecting member 202 extends through a substantially straight insulating tube 204 and has a connecting member 206 secured to one end thereof, and the other end thereof is connected to the terminal 82. The leads 200 are electrically connected to the connected member 206.

With particular reference to Fig. 6, a transformer 210 having a laminated core 212, and primary and secondary windings 214 and 216 respectively, is secured to a preferably metallic base 218 through an annular member 220 that is preferably made of insulating material. Layers of insulating material 222, 224 and 226 such as paper or cardboard are preferably provided between the core 212 and primary winding 214, primary 214 and secondary 216, and over the outer surface of the secondary winding 216, respectively. The insulating member 220 has an aperture 228 therein, into which the transformer 210 fits, and preferably has a grooved or detented portion such as 230 on the outer surface thereof into which the base 218 is formed to hold that base in place. A terminal 232 is insulatingly mounted to the base 218 through an insulating member 234 that is secured to the base 218, and has a connecting lead 236 electrically connected thereto and to one end of the primary winding 214 to provide an electrical connection therebetween. The other end of the primary winding 214 is connected through a lead 246 to the base 218 by soldering as at 247. The insulating member 220 preferably has a recessed portion 238 in one surface thereof, and has a preferably annular terminal member 240 mounted within that recessed portion, preferably so as to be flush with the surface of the recessed portion. A connecting lead 242 is electrically connected to the terminal 240, and preferably extends through an aperture 244 in the insulating member 220, and is connected to one end of the secondary winding 216. A space 248 between the end of the transformer 210 and the base 218 is preferably filled with a suitable sealing compound or cement.

A cap member 250, preferably made of insulating material, and having a recessed portion 252 is secured to the end of the transformer 210 opposite the base 218 by a screw 254, that has a knob 256 on the end thereof, and is threaded into an aperture 258 in the core 212. The screw 254 extends through an aperture 260 in the cap member 250. The knob 256 is preferably made of insulating material. A preferably annular terminal member 262 is mounted in the recessed portion 252 of the cap 250, preferably so as to be flush with the surface thereof, and covers the major portion of the surface of the recessed portion 252 so that it makes contact with a contact member 264 that is connected to the other end of the secondary winding 216 through a lead 265. The contact member 264 is secured to the outer layer of insulating material 226 by a rivet 267, or other suitable fastening means.

A sealed discharge tube 266 is formed into a substantially spiral form so as to preferably conform closely to the outer surface of the transformer 210, and extends between the insulating member 220 and the cap 250. Electrodes 268 and 270 are mounted in the ends of the tube 266, and have connecting leads 272 and 274 respectively, electrically connected thereto and sealed into and extending through the tube 266 so as to provide electrical connections between each of those electrodes and their respective terminals 262 and 240. The tube 266 is preferably made of glass, and preferably contains a rarefied gas to provide the desired color or illumination.

With particular reference to Fig. 7, a sealed glow or discharge tube 280 has a substantially straight portion 282 and has a bend therein as at 284 with the remainder of the tube formed around the portion 282, preferably in a substantially conical spiral form. End portions 286 and 288 of the tube 280 are preferably formed so as to extend substantially parallel and in close proximity to each other. Electrodes 290 and 292 are mounted in the portions 286 and 288 of the tube 280, preferably near the ends thereof, and have connecting leads 294 and 296 respectively, electrically connected thereto in extending through and sealed into the tube. The portions 286 and 288 of the tube are mounted in a preferably metallic base 298, and the space 300 around the portions 286 and 288, and within the base 298 is preferably filled with a suitable sealing compound or cement. The connecting lead 294 preferably extends through an aperture 302 in the base 298 and is electrically connected thereto by soldering as at 304. The connecting lead 296 is electrically connected to a terminal 306, preferably by soldering as at 308, which terminal is insulatingly secured to the base 298 through an insulating member 310. The terminal 306 is mounted in an aperture 312 in the insulating member 310, and secured therein by riveting or rolling the edge thereof as at 309, or by other suitable fastening means. The insulating member 310 extends into an aperture 314 in the base 298, and has a shoulder portion 316 that rests against the inner surface of the base 298. The base 298 preferably has threads formed thereon, as at 318, to adapt the base to be screwed into a suitable receptacle. The tube 280 is preferably made of glass, and has a rarefied gas therein that provides the desired color or illumination, and the portion 288 of the tube is preferably offset from the portion 282 in a direction away from the portion 286 so as to provide a better balance and support for the tube in the base 298.

In the operation of these discharge tubes, the terminals thereof are connected to a source of potential sufficiently high to cause a discharge or glow therein. The tubes are preferably of a type having the air pumped therefrom so as to pro-

duce a vacuum therein, and which after evacuation have any suitable gas, such as neon or argon, introduced therein to produce the desired color or illumination. In tubes such as those shown in Figs. 1 and 2, the candle and flame portions thereof preferably have different kinds of gas therein to produce different colors in those portions. The form shown in Fig. 2 requires a somewhat higher terminal voltage since the discharge cap in the form shown in Fig. 2 is substantially twice as long as that of the form shown in Fig. 1.

In the form shown in Fig. 3, the luminous device operates in a manner similar to the other forms shown. However, it is particularly adapted to be covered by a suitable cover such as **154**, which cover is preferably frosted or has a coating thereon to diffuse the light. The diffusing coating or surface may also act as a color filter to produce a desired and novel color effect.

The base shown in Fig. 3 is adapted to fit a base such as that illustrated on the luminous devices of Figs. 3, 4 and 5. However, it can, very well, be adapted to receive luminous devices having bases such as those shown on the luminous devices in Figs. 1 and 2. This base provides a housing for the transformer that provides the high voltage for the luminous device from a usual alternating current source, as well as a support for the luminous device.

The devices shown in Figs. 4 and 5 have a plurality of discharge departments provided by the different sealed tubes, and are preferably adapted to be utilized with a cover such as **154** of Fig. 3. The different discharge compartments of these devices preferably contain different kinds of gases so as to produce a novel color effect, particularly when the colors are diffused or filtered by a coating on the cover. The tube shown in Fig. 4 requires a greater terminal voltage due to the added discharge path through the tube **160** and tip **172**.

Electrodes such as **196** in Figs. 4 and 5 are preferable when it is desirable to have the discharge go clear to the end of the tube in which the electrode is mounted. The insulating coating **198** on the outer surface of the electrode causes the discharge to follow around the outer surface of the electrode to the inner surface thereof, and thereby causes the discharge to go substantially to the end of the tube.

The forms shown in Figs. 6 and 7 are preferably adapted to be used where more illumination is desired. The unit shown in Fig. 6 provides a luminous device complete with a step-up transformer therefor, so that the base thereof may be screwed into a suitable receptacle and operated by connection to a conventional source of alternating current. The luminous device may be removed from the transformer by removing the screw **254** and cap **250**, and slipping the luminous device axially from the transformer. The knob **256** on the screw **254** is preferably made of insulating material so that it may be touched without danger of shock, and the cap **250** is preferably made of insulating material, and preferably covers the terminal member **262**. The form of unit shown in Fig. 6 is particularly adaptable to applications where it is desirable to utilize a shade with the unit, since the shade may be secured thereto by the screw **254**.

From the foregoing description of the structure and operation of the luminous devices herein described and shown, it is apparent that in at least one aspect the present invention comprises a luminous device comprising a substantially tubular insulating barrier wall **8** in Figs. 1 and 2 and **160** of Fig. 4, a tip portion **6** of Figs. 1 and 2 and **172** of Fig. 4 covering the end of the barrier wall and sealed thereto to provide a discharge chamber, means **4** of Figs. 1 and 2 and **182**, **184** or **186** of Fig. 4 providing a second discharge chamber surrounding said barrier wall, an electrode **24** and **14** of Fig. 1, **46** and **14** of Fig. 2 and **164** and **196** of Fig. 4, in each of said discharge chambers, means **26** and **28** of Fig. 1, **26** and **28** of Fig. 2 and **32** and **86** of Fig. 4 for making electrical connections to the electrodes, and means **38**, **40** and **42** of Fig. 1, **52** of Fig. 2 and **178**, **180** and **200** of Fig. 4 for electrically connecting the discharge chambers.

Although the invention illustrated and described represents preferred forms or embodiments, others may be used, all coming within the scope and spirit of the claims which follow.

What is claimed is:

1. A luminous device comprising, in combination, a sealed receptacle having a plurality of separate sealed compartments; an insulating tubular wall extending into adjacent compartments and open to one of the compartments and sealed with respect to the other of said adjacent compartments; an electrode mounted in said receptacle outside of said barrier wall; a second electrode within the barrier wall; means conductively connecting the adjacent compartments; and means provided for connecting the electrodes to a source of potential.

2. A luminous device comprising, in combination, a sealed receptacle having a plurality of separate sealed compartments; a tubular insulating wall sealed at one end and extending through one of said compartments and into another of the compartments; a first electrode within the barrier wall; a second electrode mounted outside the barrier wall and within one of the compartments near the sealed end of the barrier wall; auxiliary electrodes mounted outside the barrier wall in each compartment and electrically connected to each other; and means for connecting the said first and second electrodes to a potential source.

3. A luminous device comprising, in combination, a sealed receptacle having a plurality of sealed compartments; an insulating barrier wall sealed at one end and extending through one of the compartments and opening into an adjacent compartment to form a plurality of sealed discharge chambers; a plurality of electrodes in each of the discharge chambers to provide discharge paths therebetween in each of said chambers; and means for connecting electrodes in the discharge paths to a source of operating potential.

4. A luminous device comprising, in combination, a sealed receptacle having a plurality of sealed compartments; an insulating barrier wall sealed at one end and extending through one of the compartments and into another of the compartments; a first electrode within the barrier wall and extending coaxially therewith through one compartment and into the other; a second electrode near one end of the barrier wall and within one of the compartments; electrically connected electrodes outside of the barrier wall and within the compartments; and means for connecting the first and second electrodes to a source of potential.

5. A luminous device comprising, in combination, a sealed receptacle in substantially the form

of a candle and flame and having candle and flame portions, the candle and flame portions being sealed from each other to provide separate discharge compartments; a barrier wall extending through the candle portion and into the flame portion, one end thereof being sealed; a first electrode within the barrier wall; a second electrode outside the barrier wall and within the candle portion; means providing conductive connection between the candle and flame portions; and means for connecting the first and second electrodes to a source of potential.

6. A luminous device comprising, in combination, a sealed receptacle having a plurality of sealed compartments; an insulating barrier wall sealed at one end and extending through one of the compartments and into another of the compartments; a first electrode within the barrier wall and extending coaxially therewith through one compartment and having a portion extending into another of said compartments, said portion having only an end surface exposed; a second electrode near one end of the barrier wall and within one of the compartments; electrically connected electrodes outside of the barrier wall and within the compartments; and means adapted to connect the first and second electrodes to a source of potential.

7. A luminous device having substantially the form of a candle and flame and comprising, in combination, a substantially tubular insulating barrier wall, a tip portion in substantially the form of a flame covering the end of said barrier wall and sealed thereto to provide a separate sealed discharge chamber, means providing a second separate discharge chamber surrounding said barrier wall, an electrode in each of said discharge chambers, means for making electrical connection to said electrodes, and means for electrically connecting the discharge chambers.

8. A luminous device in substantially the form of a candle and flame and comprising, in combination, a substantially tubular insulating member sealed at one end and having a substantially flame shaped tip portion sealed thereto to form a sealed discharge chamber, means providing a second sealed discharge chamber surrounding a portion of the tubular member, electrodes within the discharge chambers, and means for making electrical connections to the electrodes.

9. A luminous device in substantially the form of a candle and flame, having separate sealed candle and flame portions and comprising, in combination, an insulating wall extending through the candle portion and into the flame portion; a first electrode near the end of the insulating wall and within the flame portion, said electrode having a side portion covered by the insulating wall and an end portion uncovered; a connecting lead sealed into the insulating wall and connected to said first electrode; a second electrode outside of the insulating wall and within the candle portion; means providing conductive connection between the candle and flame portions; and means including said connecting lead for connecting the first and second electrodes to a source of potential.

10. A luminous device in substantially the form of a candle and flame having separate sealed compartments and comprising, in combination, an insulating wall surrounded circumferentially and axially by one of the compartments; a first electrode within one of the compartments and having side portions covered by the insulating wall and having an end portion uncovered; a connecting lead sealed into the insulating wall and connected to said first electrode; a second electrode in another of said compartments; means providing electrically conductive connection between the separate sealed compartments; and means including said connecting lead for connecting the first and second electrodes to a source of potential.

11. A luminous device having separate sealed compartments and comprising, in combination, a first electrode within one of the sealed compartments, said first electrode having an outer portion covered by an insulating wall and a surface uncovered, said surface that is uncovered facing in such a direction that the discharge travels around the insulating wall; a second electrode within another of the sealed compartments; means electrically connecting the sealed compartments; and means for connecting the first and second electrodes to a source of potential.

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