April 16, 1935. S. DOBRUSSKIN 1,998,121

LUMINOUS DEVICE

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Fig. 1

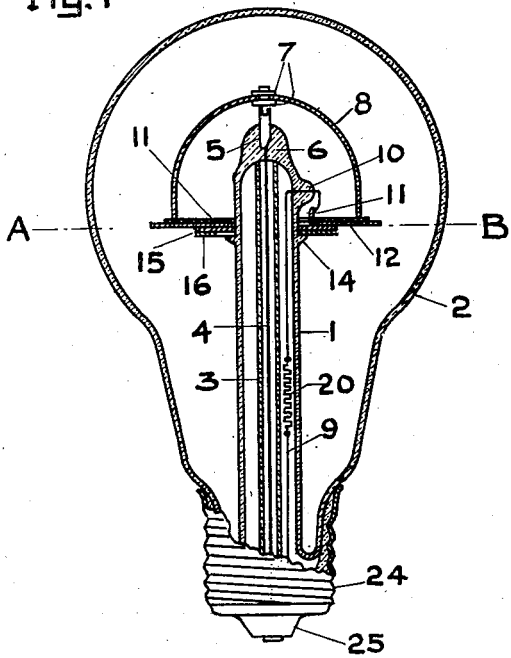


Fig. 4

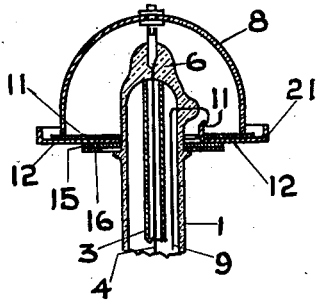


Fig. 8

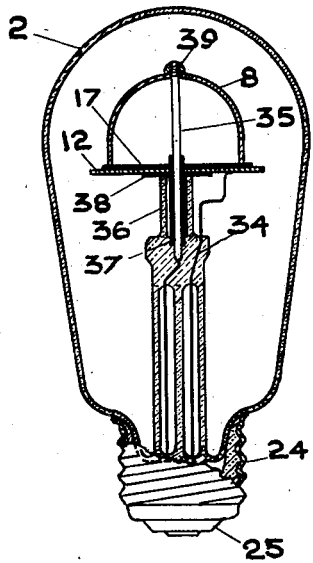


Fig. 2

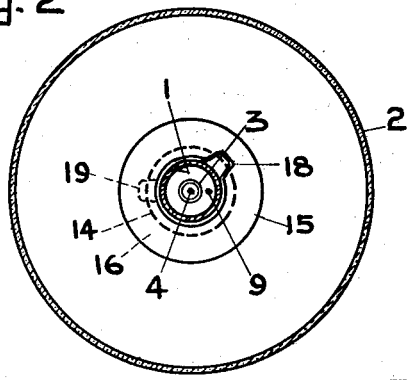


Fig. 3

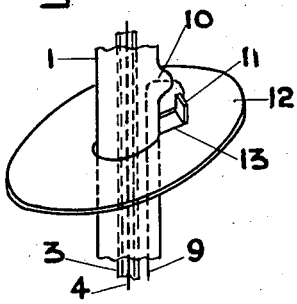
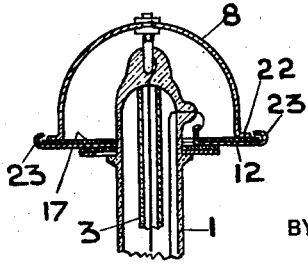


Fig. 5



INVENTOR
SEIWELI DOBRUSSKIN
BY Karl Ram
ATTORNEY

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Fig. 6

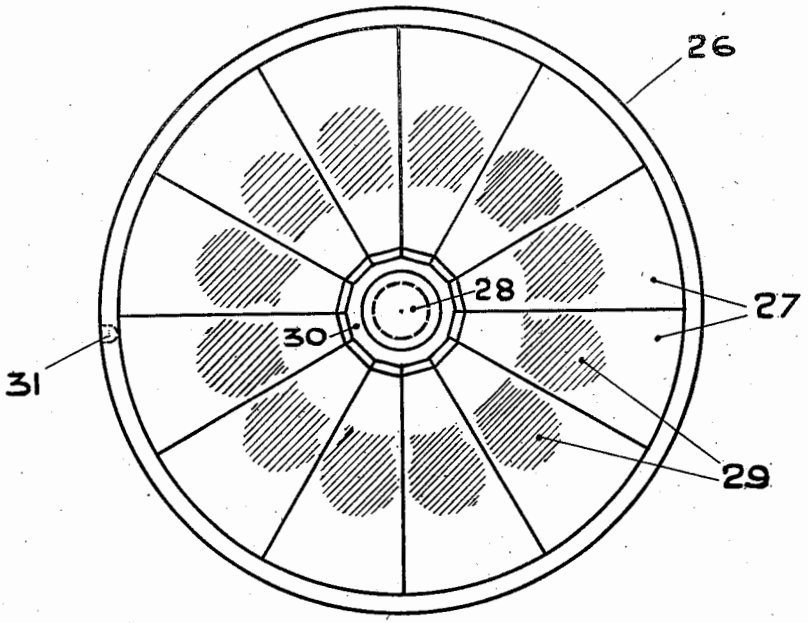
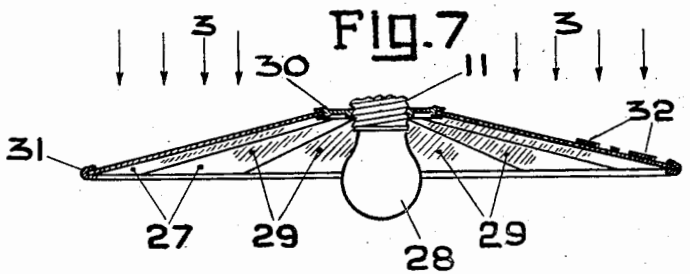


Fig. 7



INVENTOR
SAIWELI DOBRUSSKIN
BY Karl Rahl
ATTORNEY

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UNITED STATES PATENT OFFICE

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LUMINOUS DEVICE

Sajweli Dobrusskin, Berlin, Germany

Application November 8, 1932, Serial No. 641,719
In Germany December 14, 1931

11 Claims. (Cl. 176—122)

My invention relates to improvements in luminous devices, and more particularly in luminous electric discharge devices intended for advertising, signalling, or similar purposes, and having a luminous glowing layer designed to perform regular or irregular, in particular rotational, movements.

I have found, as described in my copending application, Serial No. 371,004, filed June 14, 1929, that with the proper construction and design of a luminous discharge device comprising essentially a pair of electrodes arranged in a bulb filled with a gaseous atmosphere of suitable composition and pressure and operated with a proper operating voltage and by limiting the negative glow produced over the surface of the negative electrode, such as by means of a suitable series resistance connected in one of the supply leads so as to extend over a portion only of the electrode surface, a regular or irregular movement of the partial glowing layer may be effected.

In one of the preferred embodiments for producing a rotary movement, the electrodes are of substantially symmetrical shape with regard to the intended axis of rotation of the partial luminous glow. This may be accomplished in an easy way by an annular electrode serving as the anode and a dome-shaped electrode serving as cathode, and arranged opposite the former.

It is an object of my invention to provide means in connection with a novel construction for a luminous discharge device of the character described, by which a moving or rotating glow is easily and reliably started and maintained.

Another object of my invention is to provide a novel construction for a luminous discharge device of the character described which is simple and easy to make and assemble and insures even and uniform operation, thus affording manufacture on a large scale and mass production basis.

Still a further object of my invention is to provide a reflecting means to be used in connection with a luminous device, especially for the type as described in the invention.

These and further objects as well as aspects of my invention will become more apparent from the following detailed description taken in reference to the accompanying drawings in which I have illustrated by way of example some embodiments of the novel construction of a luminous discharge device according to my invention. I wish it to be understood, however, that the description should be regarded as illustrative only of the broader features underlying the invention which, as will become obvious, is subject to various modifications coming within the scope of the invention as expressed in the appended claims.

The luminous discharge lamp in accordance with my invention, is primarily intended for advertising and signalling purposes, both for producing increased attraction and effectiveness and is designed to produce a luminous or glowing layer or layers when operated with the proper current or voltage, which layer or layers will perform regular or irregular visible movements, primarily a rotational movement, as in the case of symmetrical construction as outlined above. By means of lamps of this type, very peculiar and attractive light effects may be obtained with a very low consumption of electrical energy, thus decreasing materially the cost and expense of advertising.

The causes and physical phenomena underlying the movement of the glow are not as yet known definitely but are obviously due to either electromagnetic, electrostatic, or thermal forces. However, in order to produce a substantially regular, preferably rotational, movement, the construction of the discharge path between the cathode and anode should be substantially symmetrical with regard to a virtual axis of rotation of the glowing layer.

The effect of such a lamp may be furthermore increased materially in various manners, such as by mounting the lamp in a suitable reflector such as a hollow mirror reflector having a surface being either smooth or provided with projections and grooves, etc., or which may be preferably broken in a multiple manner for this purpose, as will be described hereinafter.

I have shown a few embodiments of the invention illustrated by the accompanying drawings in which:

Figure 1 represents a longitudinal section of a luminous discharge lamp according to the invention.

Figure 2 is a cross-section taken along the section line A—B in Figure 1.

Figure 3 shows a perspective partial view of the electrode construction.

Figures 4 and 5 illustrate partial sections of different electrode structures from Figure 1.

Figures 6 and 7 show a front view and cross-section, respectively, of a suitable reflector for a lamp especially of the type according to the invention.

Fig. 8 shows a modified construction of the lamp in the invention.

Similar reference numerals identify similar parts throughout the different views of the drawings.

Referring to Figure 1, I have shown a tube 1 inside the main bulb 2 housing the electrode structure and being filled with a gas of suitable composition and pressure, preferably a rare gas such as neon, helium, etc. The bulb 2 may consist of ordinary or colored glass. The tube 1 is sealed at its lower end to the bulb 2, being integral therewith and forming a re-entrant portion. Inside the tube 1 there is a tubing or

sleeve 3 consisting of insulating material such as of a ceramic material and surrounding a lead-in wire 4. The latter is connected to the central contact 25 of a standard screw type socket for the lamp. The upper end of the lead-in wire 4 is connected to a metal rod 5 sealed in a cap or head 6 of the glass tube 1. The metallic rod 6 is threaded at its upper end for carrying the electrode 8 which may be of bell-shape or dome-shape as shown, by means of threaded disk washers 7, allowing the fastening and the proper positioning of the electrode 8. The electrode 8 may be mounted in any suitable manner other than by the screw connection shown, as is understood, such as by riveting, welding, etc. The electrode 8 consists of a suitable sheet metal preferably of iron with a polished or oxidized surface or of highly polished aluminum or similar conducting material.

The other lead-in wire 9 connected to the screw contact 24 of the lamp socket is arranged outside of the insulating tube 3 and inside the glass tube 1. After the electrodes have been mounted, the upper end of the lead-in wire is passed in a gas type connection through the tube 1 as shown at 10, and inside the hollow electrode 8, as seen from the drawings. The outside end of this lead-in wire is then soldered or welded onto an upwardly bent tongue 11 obtained by a punching of the ring-shaped thin metal electrode 12 at its inner circumference.

In this manner, the notch 13, obtained by punching of the tongue 11, readily enables the sliding of the ring-shaped electrode 12 over the sealing projection 10 and its mounting on the glass tube 1, such as by an annular projection 14 of the glass tube 1 supporting the electrode 12 with insulating disks 15 and 16, preferably of mica or the like, interposed. The ring-shaped electrode 12 (anode) is furthermore insulated from the dome-shaped electrode 8 (cathode) by an insulating disk 17, preferably also consisting of mica and having its edge protruding beyond the dome or bell-shaped electrode 8.

In order to enable an easy assembly and mounting of the electrodes, the insulating disks 15 and 16 are provided with a notch 18 and 19, respectively, so as to enable their sliding over the sealing projection 10 of the glass tube 1. In order to cover each of these notches, especially the notch 13 of the electrode 12 for preventing interruptions and interference with the desired function of the lamp or its luminous glowing layer, respectively, the mica disks 15 and 16, or at least one of them, are displaced relatively to each other and with regard to the notch 13 of the electrode 12 in such a manner that both notches 18 and 19 no longer register with the notch 13.

In many cases it has been found advantageous or necessary for obtaining the desired movement of the luminous glowing layer, to connect a high resistance in series with the lamp, in which case one of the electrode lead-in wires itself may serve as such resistance or separate resistance, such as is shown at 20, may be inserted in one of the lead-in wires (lead-in wire 9) and thus structurally combined with the lamp itself, as shown.

In order to obtain or insure, respectively, the desired effect of a luminous rotary glow during the operation of the lamp, I have found it advantageous, besides the need for the distance between the electrodes being uniform at all points as obtained by a structure as described, that the design of the parts as well as of the pressure of the gas filling of a glow discharge lamp in combination with the prevailing operating current conditions should preferably be such that the luminous glowing layer produced around the dome or bell-shaped electrode 8 extends only up to the outer edge of the mica insulating spacing disk 17 between the electrodes, but does by no means extend beyond the outside edge of the electrode 11.

I have illustrated this in the drawing by the dotted lines intended to represent the depth of the glowing layer representing the negative glow on the electrode 8.

Referring to Figure 4, I have shown a modification of an electrode structure for a lamp of this type according to which the ring-shaped electrode 11 is provided with an upwardly bent edge 21 which has been found to insure increased effects and stability of operation.

Referring to Figure 5, this illustrates another modification of an electrode structure for a lamp according to my invention showing the dome-shaped electrode 8 provided with a small flange 22 and with an edge 23 of the ring-shaped electrode 12 bent around the mica spacing disk 17 and at a small distance from the flange 22 of the electrode 8.

In Figure 8 I have shown a modified construction of a lamp in accordance with my invention which is especially suited for large scale and commercial manufacture. Referring to this figure, I have shown a central metallic rod 35 sealed in a press 34 of the main bulb 2 of the lamp and serving as a connecting lead for the dome-shaped electrode 8 and as a mechanical support of the electrode structure. The rod 35 is surrounded by an outer sleeve 36, preferably of glass, sealed in and integral with the press 34. This sleeve serves for supporting the ring-shaped electrode 12 with insulating washers 38, preferably of mica or the like, being interposed. A further insulating sleeve consisting, for instance, of ceramic material closely surrounds the metal rod 35 extending through the central opening of the electrode 12 to sufficiently insulate the electrode 12 from the metal rod 35.

The remaining parts, such as mica disk 17 and electrode 8, are arranged in a similar manner as described in Figure 1; the electrode 8 having a central opening through which extends the upper threaded end of the rod 35 is placed in position and then screwed down against electrode 12 as by means of a nut 39. The electrode 12 is connected to the screw contact 24 through a lead 38 and electrode 8 to the central contact 25, similar as shown in Figure 1. The remaining features of this lamp are similar to the construction as shown in Figure 1.

In Figures 6 and 7 I have shown a reflector suited for use in combination with electric lamps, in particular for a luminous discharge device of the type as described above. When using this reflector in connection with a lamp according to the present invention, very attractive illuminating effects for advertising and display purposes are obtained, especially when a colored glass for the lamp is used. The surface of the reflector which, in order to secure the desired effect, is directed towards the observer, may consist of an integral, preferably broken, surface such as of metal or glass or may be comprised of a plurality of segments suitably assembled and mounted fixedly or exchangeably in a supporting frame. When using a reflector or reflector segments con-

sisting of glass, these may be made of transparent mirror elements carrying letters or other advertising material and being illuminated from behind.

Referring to the construction of a reflector shown in Figures 6 and 7, this comprises a plurality of conically arranged units **27** consisting of metal or of mirror glass to be further more illuminated from behind. The single electric lamp, such as a discharge lamp **28**, according to the present invention, arranged in the center is reflected by all of the individual units in a multiple manner so as to create the impression of a corresponding number of luminous elements **29** constantly rotating and thus producing remarkable attractive effects to the observer. The units **27** may be supported exchangeably, such as by supporting frames **30** and **31**.

I have furthermore indicated at **32**, letters or other advertising material arranged at the rear of the reflector, which in case that translucent material used for the mirror surface will appear to the observer when the reflector is illuminated from behind by a suitable additional source of light, as indicated by the arrows **33**.

What I claim is:

1. In a luminous discharge device, comprising a vessel filled with a gaseous atmosphere, a pair of coaxial electrodes within said vessel, being substantially symmetrical with respect to the common axis means for limiting the current supplying said electrode so that the glow does not occupy the entire electrode surface and rotates around the electrodes, and a disc of insulating material, separating said electrodes.

2. In a luminous glow discharge device, as described in claim 1, in which the edge of one of said electrodes protrudes beyond the edge of said other electrode by at least the amount of the thickness of the glowing luminous layer, covering said latter electrode.

3. In a luminous discharge device, comprising a vessel filled with a gaseous atmosphere, a first substantially flat electrode within said vessel, a second cooperating electrode within said vessel, said electrodes being mounted substantially symmetrically and coaxially with respect to a common axis, means for limiting the current supplying said electrode so that the glow does not occupy the entire electrode surface and rotates around the electrodes, and a disc of insulating material, separating said electrodes.

4. In a luminous discharge device, as described in claim 3, in which said flat electrode protrudes beyond the edge of said second electrode by at least the amount of the thickness of the luminous glowing layer produced on said second electrode.

5. In a luminous discharge device, comprising a glass bulb filled with a gaseous atmosphere, a first disc shaped positive electrode within said bulb, a second dome shaped negative electrode arranged in proximity to said first electrode, said electrodes being mounted substantially coaxially with each other, with said dome shaped electrode resting upon said first electrode, the edges of said disc shaped electrode protruding beyond the edge of said dome shaped electrode by at least the amount of the thickness of the negative luminous glowing layer produced on said dome shaped electrode, and means for limiting the glowing luminous discharge to extend over a restricted portion only of the surface of said dome shaped electrode.

6. In a luminous discharge device, as described in claim 5, in which said disc shaped electrode and said dome shaped electrode are separated by a mica disc, placed upon said disc shaped electrode.

7. A gas discharge lamp comprising a disc-shaped positive electrode; a dome-shaped negative electrode coaxial with and resting upon said positive electrode, an insulating separator disc between said electrodes, the edges of said positive electrode protruding beyond the base of said negative electrode, a central conducting supporting rod passing through an opening of said positive electrode and having its upper end connected to said dome-shaped electrode, and means for limiting the current to said electrodes so that the negative glow extends over a portion only of the surface of said negative electrode and rotates continually around the electrode surface.

8. A gas discharge lamp comprising a disc-shaped positive electrode, a dome-shaped negative electrode coaxial with and separated by a mica disc from said positive electrode, the edges of said positive electrode substantially protruding beyond the base of said negative electrode to an extent at least equal to the width of the negative glowing layer produced upon said negative electrode, a central conducting support passing through said positive electrode and having its upper end connected to said dome-shaped electrode, and means including a limiting resistance mounted in said lamp for limiting the current to said electrodes so that the glow occupies a portion of the electrode surface only and rotates continually around the electrodes.

9. An electric discharge device comprising a container, a cathode and an anode sealed therein; a gaseous atmosphere therein, said cathode being cup-shaped, said anode being a disc; the center thereof being in a longitudinal axis of said cup-shaped cathode; a thin plate of insulating material being interposed between said anode and cathode covering the open end of said cathode, the external wall of said cathode being provided with an oxidized surface.

10. An electric discharge device comprising a container; a cathode and an anode sealed therein; a gaseous atmosphere therein, said cathode being cup-shaped, said anode being a disc, the center thereof being in the longitudinal axis of said cup-shaped cathode, the diameter of said disc being greater than the largest diameter of said cathode; a thin plate of insulating material interposed between said anode and said cathode covering the open end of said cathode, the external wall of said cathode having an oxide coating thereon.

11. An electric discharge device comprising a container; a cathode and an anode sealed therein; a gaseous atmosphere therein, said cathode being cup-shaped and consisting of aluminum, said anode being a disc, the center thereof being in the longitudinal axis of said cup-shaped cathode; a thin plate of insulating material interposed between said anode and said cathode covering the open end of said cathode, the external wall of said cathode having a highly polished surface, and means for limiting the current to said electrodes so that the glow covers only a part of said cathode surface and moves continuously along the electrode.

SAJWELI DOBRUSSKIN.