Dec. 3, 1940. P. M. VAN ALPHEN ET AL 2,223,470

GASEOUS ELECTRIC DISCHARGE LAMP DEVICE

Filed Nov. 16, 1937 2 Sheets-Sheet 1

Fig. 1

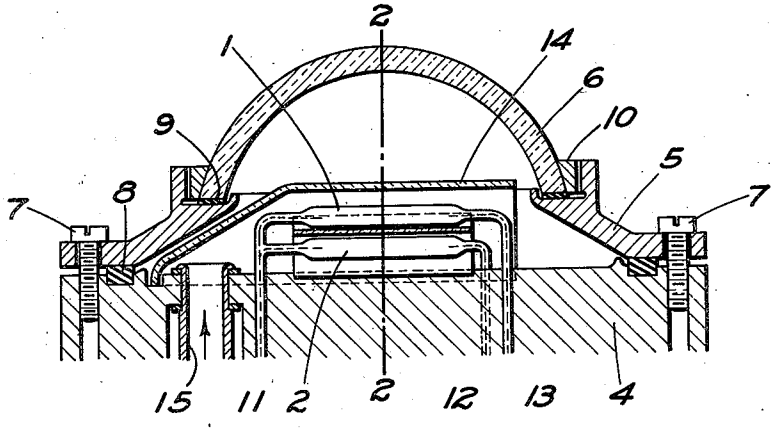
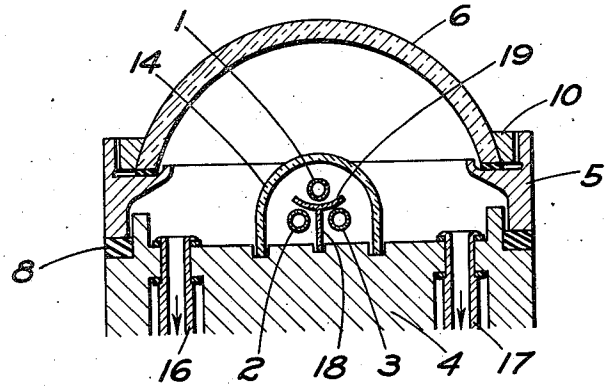


Fig. 2



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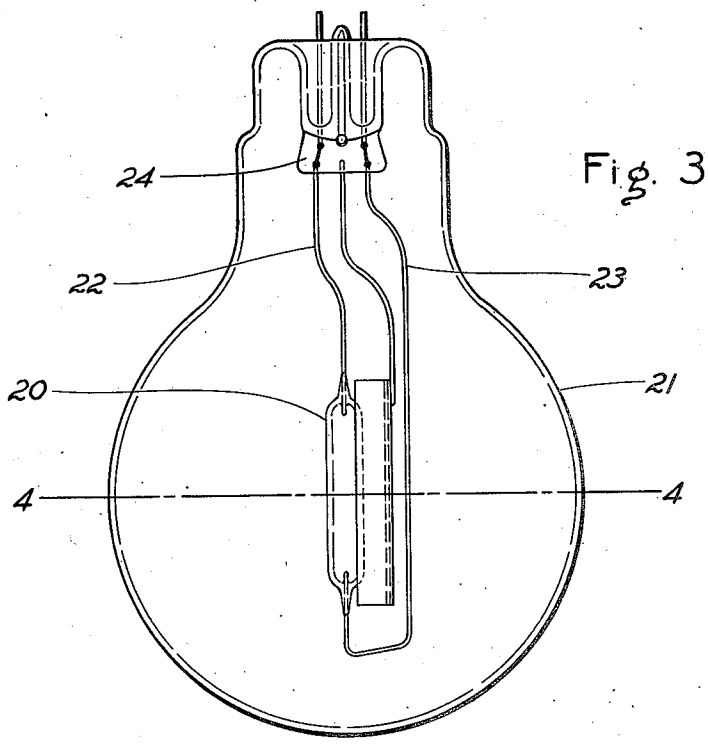

Fig. 3

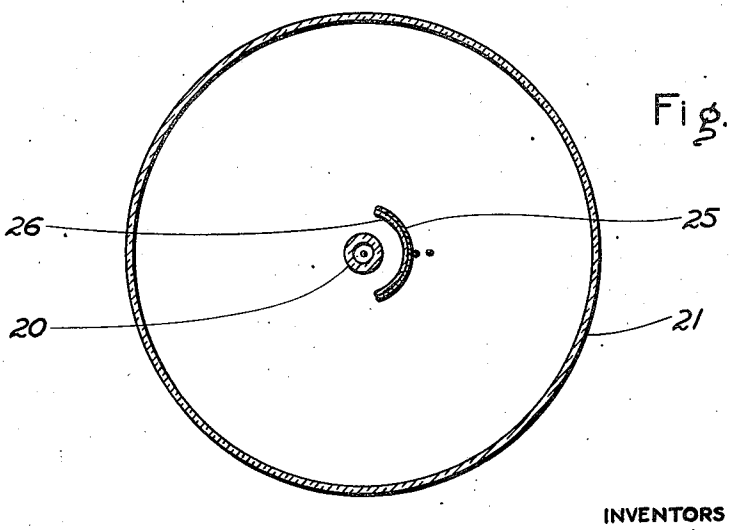

Fig. 4

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GASEOUS ELECTRIC DISCHARGE LAMP DEVICE

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Application November 16, 1937, Serial No. 174,860
In Germany November 27, 1936

6 Claims. (Cl. 250—86)

The present invention relates to gaseous electric discharge lamp devices generally and more particularly the invention relates to mercury vapor discharge devices capable of operation at vapor pressures in the order of atmospheres. Such devices are now known in the art and are of the air cooled or liquid cooled type. Both types are efficient light sources of high surface brightness useful in the illuminating arts generally and particularly in the picture projection field. The structural details and operating characteristics of discharge lamp devices of this type are described in co-pending application, Serial Number 46,952, filed October 26, 1935.

The containers of such devices are usually made of quartz to withstand the elevated container temperatures during the operation of the device. The light emitted by the device is rich in visible rays and rays of shorter wave length, such as ultra-violet rays. In order to increase the real or the apparent light source it is desirable to mount two or more of such devices in closely spaced positions or to mount a reflector adjacent one of such lamp devices. In such arrangements part of the rays emitted by the other lamp devices or reflected by the reflector strike the lamp container and give up their energy thereto.

Theoretically the input of electrical energy into the lamp device could be reduced and the efficiency thereof increased by taking advantage of the energy input into the lamp by the rays from the associated elements. We have observed, however, that when this is done the operating life of the device is reduced to such an exent that it far outweighs any advantage resulting from the increase in efficiency.

The object of the present invention is to increase the efficiency of lamp units of the above type without reducing the long useful operating life of the lamp device. Still further objects and advantages attaching to the device and to its use and operation will be apparent to those skilled in the art from the following particular description.

We have discovered that the above object is attained when an ultra-violet absorbing medium is interposed between the lamp devices or between the lamp device and the reflector. Preferably the ultra-violet absorbing medium is of such nature that it also absorbs the shorter wavelength, visible rays, such as the violet and blue rays. A filter which does not transmit rays having a wave-length shorter than 4500 Å. is preferred because the maximum increase in the life of the lamp is then obtained. While any suitable substance having the desired light transmitting characteristics may be used we prefer a glass filter. When it is desired to prevent only ultra-violet rays from striking the lamp device the filter consists of ordinary glass, such as lead glass, which will not transmit these rays. When it is desired to cut off the visible rays of short wavelength a colored glass filter, such as a yellow glass filter, which does not transmit either ultra-violet rays or the visible rays of short wave length is used. When the lamp device is liquid cooled a cooling liquid having the desired light transmitting characteristics is used, when desired.

In the drawings accompanying and forming part of this specification two embodiments of the invention are shown, in which

Fig. 1 is a side elevational, partly sectional view of an apparatus embodying the invention,

Fig. 2 is a sectional view along the line 2—2 of Fig. 1,

Fig. 3 is a side elevational view of another lamp unit embodying the invention, and

Fig. 4 is a sectional view along the line 4—4 of Fig. 3.

Referring to Figs. 1 and 2 of the drawings the lamp unit comprises three high pressure mercury vapor discharge lamp devices 1, 2 and 3 which are mounted in parallel positions in a receptacle consisting of a base plate 4, a cover 5 and a bowl-shaped lens 6. The cover 5 is attached to the base plate 4 by the screws 7. A ring 8 of resilient material impervious to water, such as rubber, is interposed between said cover 5 and said plate 4. A similar ring 9 is interposed between the cover 5 and the lens 6 and said lens 6 is held in position by a nut 10.

Each of the discharge lamp devices 1, 2 and 3 comprises a tubular container of vitreous material, such as quartz, and has an internal diameter of about 1 mm. and an external diameter of about 3 mm. Two tungsten electrodes are sealed into said container 1, one at each end thereof, and the end of each of said electrodes projects a short distance from a quantity of mercury about each of said electrodes. The container of the lamp device has therein a starting gas, such as argon, at a pressure at room temperatures of about 50 mm. of mercury. Lamp devices having this structure are capable of operation at a current of 1.5 amp, and a current load of about 800 watts per cm. of the discharge path. When the lamp device has attained operating equilibrium the vapor pressure therein is about 120 atmospheres. The lamp devices 1, 2 and 3 are connected to a common current lead 11 at one terminal thereof and to separate current leads 12 and 13 at the other terminal thereof. Said leads 11, 12 and 13 pass through and base plate 4 and are connected to the proper terminals of a suitable current source.

An arched glass plate 14 which guides the stream of cooling water onto and along the lamp device is interposed between said lamp device and said lens 6. The cooling water is forced through

the tube 15 into the apparatus and passes out of the tubes 16 and 17.

The lamp devices 2 and 3 have thereinbetween a glass plate 18 having a thickness of about 1.5 mm. and which supports the arched glass plate 19 which has a like thickness and which is interposed between the lamp device 1 on one hand and the lamp devices 2 and 3 on the other hand. The glass plates 18 and 19 consist of a glass having the following composition:

	Per cent
Silica (SiO_2)	64.4
Sodium oxide (Na_2O)	13.9
Lead oxide (PbO)	15.1
Zinc oxide (ZnO)	2.3
Barium oxide (BaO)	4.3

About 0.5% of lead chromate is added to the glass batch. This glass composition is a yellow glass which cuts off the ultra-violet rays and the short wave-length visible rays, such as the violet and blue rays emitted by the discharge lamp devices. At a thickness of 1.5 mm. the glass absorbs about 85% of the rays having a wave-length of 4100 Å., about 74% of the rays having a wave-length of 4200 Å., and about 57% of the rays having a wave-length of about 4400 Å.

The embodiment shown in Figs. 3 and 4 of the drawings comprises a high pressure lamp device 20 of the type which is not liquid cooled and which comprises a tubular container of vitreous material, such as quartz, having an internal diameter of about 5 mm. and an external diameter of about 7.5 mm. A pair of activated, thermionic electrodes is mounted in said container, one at each end thereof, and said container has a quantity of mercury therein in such amount that it is completely vaporized when the lamp is at operating equilibrium. When desired, a larger quantity of mercury is used. A starting gas, such as argon, is present in said container 20. The lamp device illustrated in Figs. 3 and 4 is operated at lower currents than the lamp device illustrated in Figs. 1 and 2 and a current load thereon of about 35 watts per cm. of the length of the discharge path is preferred. The mercury vapor pressure is then about 20 atmospheres. The lamp device 20 is mounted in an evacuated bulb 21 of vitreous material, such as a glass or quartz bulb and is supported in said bulb 21 by the current leads 22 and 23 connected to the electrode leads of the lamp device 20. Said leads 22 and 23 are sealed into the press 24 of the bulb 21. When desired, the bulb 21 is provided with an inert gaseous filling, such as nitrogen. A reflector is mounted in said bulb 21 in a parallel position with said lamp device 20 to direct the light from said lamp device 20 in a desired direction. Said reflector consists of an arched glass plate 26 having a reflecting metal coating 25 on the surface thereof remote from the lamp device 20. The glass plate 26 is cylindrical in shape so that the reflecting metal coating 25 thereon is in the form of a cylinder, the axis of which coincides with the longitudinal axis of the lamp device 20. Preferably the glass plate 26 consists of a glass having a composition disclosed above in connection with Figures 1 and 2 and absorbs the ultraviolet rays as well as the visible rays of shorter wave-length emitted by the lamp device 20. The rays of longer wave-length are transmitted by the glass plate 26 and are reflected by the metal coating 25 thereon.

The lamp devices described above are highly efficient ones having a long useful operating life.

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

1. A lamp unit comprising in combination a gaseous electric discharge device of the high vapor pressure type capable of emitting visible and ultra violet rays, another source of similar rays associated with said lamp device in such manner that the rays from said source are incident on said lamp device and a filter interposed between said lamp device and said source for absorbing ultraviolet rays to lengthen the useful operating life of said lamp device.

2. A lamp unit comprising in combination a gaseous electric discharge device of the high vapor pressure type capable of emitting visible and ultra violet rays, another source of similar rays associated with said lamp device in such manner that the rays from said source are incident on said lamp device and a filter interposed between said lamp device and said source for absorbing rays of a wave-length shorter than 4500 Å. to increase the useful life of said lamp device.

3. A lamp unit comprising in combination a gaseous electric discharge device of the high vapor pressure type capable of emitting visible and ultra violet rays, another source of similar rays associated with said lamp device in such manner that the rays from said source are incident on said lamp device and a filter of colored glass interposed between said lamp device and said source for absorbing blue, violet and ultraviolet rays to lengthen the useful operating life of said lamp device.

4. A lamp unit comprising in combination a gaseous electric discharge device of the high vapor pressure type capable of emitting visible and ultra violet rays, a reflector associated with said lamp device and a filter interposed between said lamp device and said reflector for absorbing the rays of shorter wave-length emitted by said lamp device to lengthen the useful operating life of said lamp device.

5. A lamp unit comprising in combination a gaseous electric discharge device of the high vapor pressure type capable of emitting visible and ultra violet rays, another gaseous electric discharge device of the same type capable of emitting similar rays, said devices being mounted in such position relative to each other that the rays from each device are incident on the other of said devices and a filter interposed between said devices for absorbing ultraviolet rays emitted by each of said devices in the direction of the other of said devices to lengthen the useful operating life of said devices.

6. A lamp unit comprising in combination, a gaseous electric discharge device of the high vapor pressure type capable of emitting visible and ultraviolet rays, a radiation projecting means mounted in light receiving relation to said discharge device, said means being capable of projecting visible and ultraviolet rays toward said discharge device and a filter interposed between said device and said projecting means for absorbing ultraviolet rays to lengthen the useful operating life of said device.

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