Dec. 29, 1953

C. WIENER

TIPLESS QUARTZ LAMP

Filed Feb. 27, 1952

2,664,517

Fig. 1.

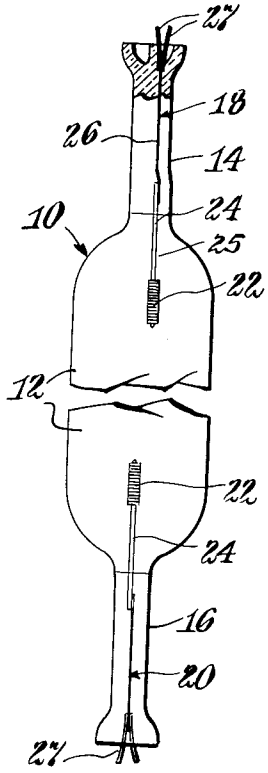


Fig. 2.

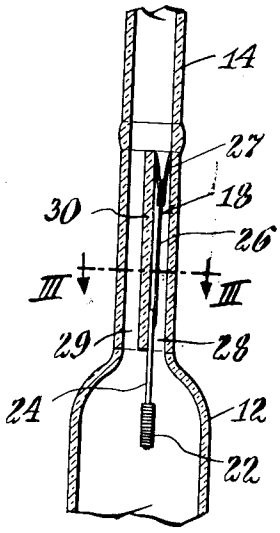


Fig. 4.

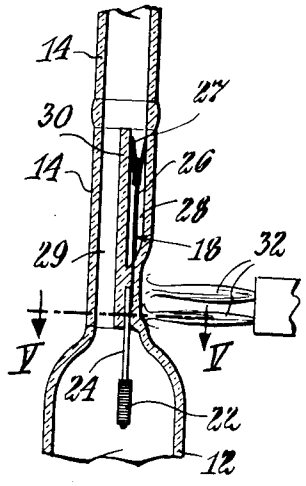


Fig. 3.

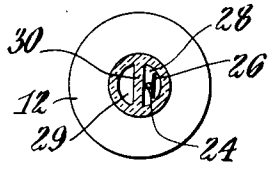


Fig. 5.

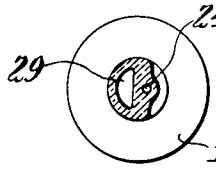


Fig. 8.

Fig. 6.

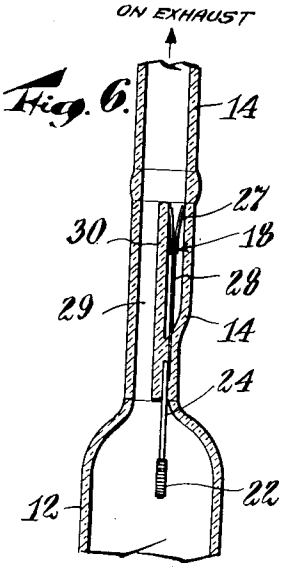
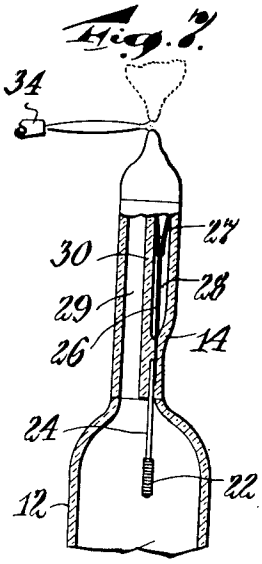
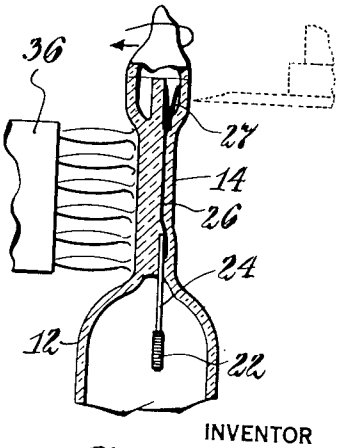


Fig. 7.





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Patented Dec. 29, 1953

2,664,517

UNITED STATES PATENT OFFICE

2,664,517

TIPLESS QUARTZ LAMP

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Application February 27, 1952, Serial No. 273,745

3 Claims. (Cl. 313—213)

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This invention relates to electric discharge devices and, more particularly, to mercury vapor lamps employed for photochemical processes.

The conventional mercury vapor lamp employed for photochemical processes comprises a long tubular intermediate-wattage source of visible and near ultra-violet light. This lamp comprises a high-silica glass envelope having thorium non-activated electrodes sealed in each end. Due to its low internal operating vapor pressure and resultant ability to restart instantly after momentary interruptions, its principal field of application is as a light source for blueprinting machines and as a tool for effecting photochemical processes.

One of the chief drawbacks of the conventional lamp is the exhaust tip on the body of the envelope which casts a shadow and interrupts the photoprinting and photochemical use of the lamp. A further drawback to the projecting exhaust tip is that it has a relatively large area and naturally operates at a lower temperature because the loading per unit area is less. Drafts from the blueprinting machine further cool the tip and cause the mercury to migrate thereto and condense until equilibrium of condensation and evaporation is reached. The pressure at which a mercury vapor lamp operates is of course determined by the coolest portion of the lamp envelope.

To eliminate the objectionable exhaust tip on photochemical mercury vapor lamps, a single bore end portion which simultaneously acts as a means of evacuating the lamp and contains the molybdenum ribbon portion of the electrode leading-in conductor therein is sealed to one end of the lamp. However, during the baking operation on exhaust the deleterious gases released from the lamp envelope and pumped from the bulb interior through the single bore tubing contaminate the molybdenum ribbon and deposit a film thereon. Later when the single bore tubing is collapsed and the ribbon embedded in the vitreous mass, this film on the molybdenum ribbon prevents a tight bond between it and the glass.

Hence, it has been found advantageous according to my invention to employ on one end of the lamp envelope a double bore of 96% silica (glass) such as sold by Corning Glass Works under the trade-mark ("Vycor") or quartz end portion which contains a molybdenum ribbon in one bore and employs the other bore as an exhaust tube. The bottom portion of the ribbon is preferably sealed between the wall of the bore and the partition adjacent the junction of the end portion and the lamp envelope, thereby preventing passage of any deleterious gases along

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the ribbon during the exhaust. After tipoff from the exhaust position, the lamp is placed in a ribbon sealing machine to collapse both bores simultaneously and to eliminate any cavities wherein mercury vapor might condense. In the lamp of my invention there is no exhaust tip projecting laterally from the body of the lamp envelope which might interfere with its photoprinting or photochemical operations.

In its general aspect, the present invention has the object of overcoming the defects and disadvantages of prior art mercury vapor lamps employed for photochemical processes.

A specific object of my invention is a mercury vapor lamp for photoprinting service which eliminates any objectionable shadow produced by a projection from the envelope body.

An additional specific object is a tipless mercury vapor lamp for photoprinting and photochemical service which eliminates any objectionable cavities in the envelope body wherein mercury might condense and detrimentally affect the lamp characteristics during operation.

A further object is a tipless mercury vapor lamp for photoprinting and photochemical service wherein the molybdenum ribbon of the electrode leading-in conductor is not contaminated during the baking operation on exhaust and a vacuum-tight seal is produced.

An additional object is a tipless mercury vapor lamp for photoprinting and photochemical service having at least one double bore end portion affixed to the lamp envelope; one bore for sealing off the molybdenum electrode ribbon and the other bore for an exhaust tubulation.

Other objects and advantages of the invention will appear to those skilled in the art to which it appertains as the description proceeds.

Referring to the accompanying drawing, in which like numerals of reference indicate similar parts throughout the several views:

Fig. 1 is a side elevational view of a mercury vapor lamp for photochemical service and embodying my invention.

Fig. 2 is a sectional view of a double bore or partitioned tubular end portion of the lamp of Fig. 1, showing an electrode assembly in position for sealing.

Fig. 3 is a horizontal sectional view on the line III—III of Fig. 2, in the direction of the arrows.

Fig. 4 is a view similar to Fig. 2, but showing the sealing of the lower portion of the molybdenum ribbon between the outer wall of one bore and the partition of the end portion at the junction of the end portion and the envelope.

Fig. 5 is a horizontal sectional view on the

line V—V of Fig. 4, in the direction of the arrows.

Fig. 6 is a view similar to Figs. 2 and 4, but showing the use of one bore as an exhaust tubulation on exhaust.

Fig. 7 is a view similar to Fig. 6, but showing the tipping off operation on exhaust.

Fig. 8 is a view similar to Fig. 7, but showing the collapsing of the exhaust tubulation bore and molybdenum ribbon bore of the end portion to seal said ribbon therebetween.

Referring to the drawing, and more particularly to Fig. 1, a mercury vapor lamp for photoprinting and photochemical service is designated by the reference numeral 10. Although a mercury vapor lamp for photochemical service is shown in the present embodiment, it will be understood that the present invention is not restricted to use therewith. This lamp 10 comprises a tubular envelope 12, of high melting point vitreous material, having an elongated end portion 14, made from a double bore tube and an end portion 16, of smaller diameter and like vitreous material made from a single bore tube and to which are respectively sealed electrode assemblies 18 and 20.

As shown in Figures 2, 4, 6, 7, and 8, each of the electrode assemblies 18 and 20 desirably comprises a thorium electrode 22 mounted on one end of a short rod 24 of refractory material, such as tungsten or the like, as part of a leading-in conductor 25. The other end of the rod 24 is welded to a strip or ribbon 26 of tantalum or molybdenum, about .0006" in thickness. A loop 27 of tantalum or molybdenum about .004" in thickness is secured as by welding to the opposite end of the ribbon 26. After affixing the loop 27 to the ribbon 26, the loop is cut so as to provide a V-shaped end portion having a spring tension capable of securing the elctrode assemblies 22 within the end portions 14, as hereinafter explained. The end portion 14 has a molybdenum ribbon sealing more 28 and an exhaust tubulation bore 29 separated by a partition 30.

According to my invention, the electrode assembly 20 is first positioned within the end portion 16 and sealed therein in the desired position. The other electrode assembly 18 is positioned by means of the V-shaped end portion 27 within the molybdenum ribbon bore 28 of the double bore end portion 14, as shown in Figures 2 and 3. The lower end of portion 14 at the envelope 12 is heated by means, such as the fires 32 (Fig. 3), until the lower portion of the outer wall of the bore 29 collapses upon the partition 30 and seals the lower portion of the ribbon 26 and the rod 24 therebetween. In this way the molybdenum ribbon 26 is sealed off from any contamination by deleterious exhaust gases.

The lamp 10 is then sealed to an exhaust manifold, by means of end portion 14, and exhausted thru the bore 29, as shown in Fig. 6. This exhaust may comprise a suitable bake, an inert gas flush, final evacuation, a final fill with an inert gas such as argon, mercury fill, and tip-off by a suitable torch 34 as shown in Fig. 7.

After tip-off, the lamp 10 is then secured in a ribbon sealing machine and rotated between stationary sealing fires 36, as shown in Fig. 8, to heat the end portion 14 substantially along its entire length and to cause the collapse of the outer wall portions upon the partition 30, thereby completely embedding the ribbon 26 in a vitreous mass and eliminating any objectionable

cavity in the end portion 14 wherein mercury might condense during operation of the lamp 10. After the sealing operation, the end portions 14 and 16 are cut off by suitable means, such as a grinding wheel, to expose the outer ends of the V-shaped end portions 27 and thereby provide suitable external connections for operation of the lamp.

Thus it will be seen from the foregoing description that my invention has provided a tipless mercury vapor lamp 10 for photoprinting and photochemical service, which does not cast any objectional shadows during photoprinting use, and which eliminates any projecting cavity wherein mercury might condense and vary the operating characteristics of the lamp. My lamp 10 employs at least one double bore partitioned end portion 14 having a molybdenum ribbon bore 28, wherein the molybdenum ribbon of the electrode assembly 18 may be preliminarily sealed prior to the exhaust operation, and an exhaust tubulation bore 29. Use of this double bore end portion 14 prevents the oxidation and contamination of the molybdenum electrode ribbon 26 during the exhaust operation and permits an improved hermetic seal between the ribbon 26 and the walls of the double bore end portion 14.

Although an embodiment of my invention has been disclosed, it will be understod that modifications may be made.

I claim:

1. A tipless mercury vapor lamp for photoprinting and photochemical service comprising a vitreous envelope, provided with elongated end portions, an ionizable medium for supporting a discharge, oppositely disposed electrodes in said envelope between which a discharge occurs, leading in conductors for said electrodes, at least one of which has a refractory metal ribbon embedded in a fused mass of vitreous material produced from a double-bore tube.

2. A tipless mercury vapor lamp for photoprinting and photochemical service comprising a vitreous envelope provided with elongated end portions, an ionizable medium for supporting a discharge, oppositely disposed thorium electrodes in said envelope between which a discharge occurs, leading-in conductors for said electrodes, at least one of which comprises a refractory metal rod, a molybdenum ribbon on said rod and a tantalum V-shaped end portion on said ribbon, said ribbon being embedded in a fused mass of vitreous material produced from a double-bore tube.

3. A mercury vapor lamp in condition for exhaust comprising a vitreous envelope provided with elongated end portions, at least one of which is a double bore tube; oppositely disposed electrodes in said envelope, and leading-in conductors for said electrodes, at least one of which comprises a refractory metal ribbon sealed to one bore of the double bore tube, leaving the other bore for evacuating the envelope.

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