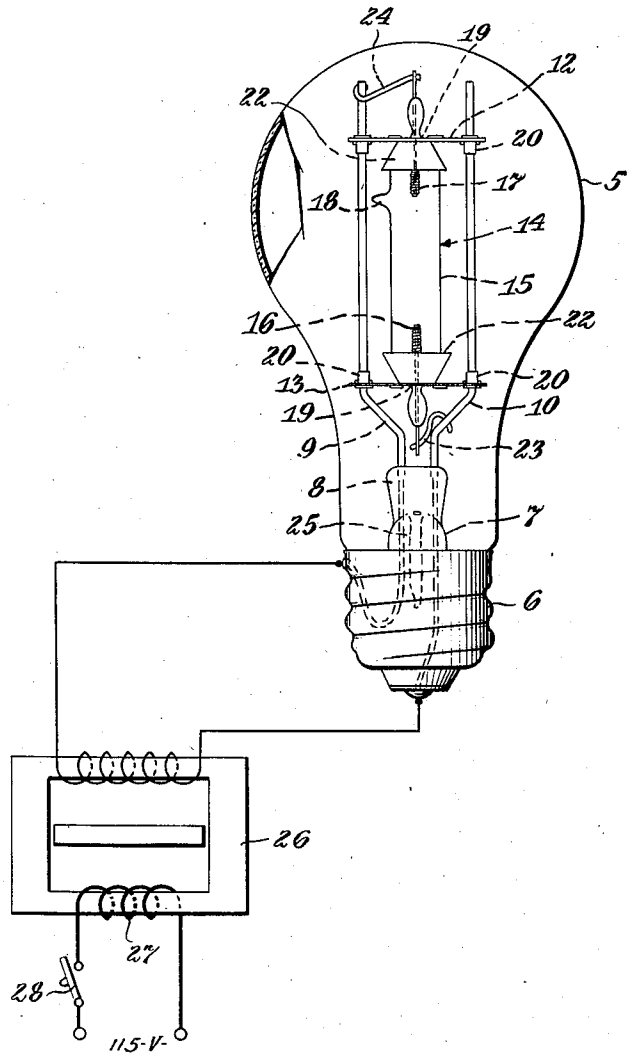
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QUARTZ LAMP

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QUARTZ LAMP

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The present invention relates to gaseous electric discharge lamps and more particularly to such lamps which are operable at a high mercury pressure.

Lamps of this type are now well known to the art and in order to withstand the high operating temperatures, it is customary to seal the electrodes in a capillary envelope of fused silica or quartz which is surrounded by an outer envelope or container having a configuration of the usual type incandescent lamp.

Such lamps, however, require a relatively high starting voltage until after the discharge supporting medium has been vaporized, after which the operating voltage drops in most instances to approximately 50% of the starting voltage. To facilitate starting, an inert gas such as neon, argon, or the like, is usually employed, together with a starting electrode which initiates a glow discharge between the starting electrode and one of the main electrodes. This in turn heats the metallic vapor causing the initiation of an arc discharge between the two main electrodes. The necessity for a starting electrode thus materially increases the manufacturing cost of such lamps, as well as the auxiliary equipment employed therewith.

It is accordingly an object of the present invention to provide a high pressure gaseous discharge lamp which requires no starting electrode for initiating a discharge.

Another object of the present invention is the provision of a high pressure gaseous discharge lamp surrounded by an enclosing envelope and wherein a glow discharge is initiated in the outer envelope, which lowers the starting voltage of the lamp.

Another object of the present invention is the provision of a high pressure gaseous discharge lamp surrounded by an enclosing envelope or container provided with a discharge supporting gas therein which initiates a glow discharge about the inner lamp to heat the same, whereby the starting voltage for the lamp is materially reduced.

Still further objects of the present invention will become obvious to those skilled in the art by reference to the accompanying drawing wherein the single figure shows a high pressure gaseous discharge lamp constructed in accordance with the present invention.

Referring now to the drawing in detail, the device as shown comprises an enclosing envelope or container 5 of suitable vitreous material, such as glass or the like, transparent to light, and, if desired, it may be of an ultra-violet pervious material. A screw base 6 of the usual type is secured to the container 5 to enable the lamp to be screwed into a socket. The container 5 is provided with a mount comprising a reentrant stem 7 having the customary press portion 8. A pair of leading-in conductors 9 and 10 of suitable metal, such as magno, nickel, tungsten, or the like and provided with a seal-forming portion having a coefficient of expansion approximating that of the envelope, are sealed to the press and connected to the central contact and shell of the base 6.

As will be noted, the leading-in conductors 9 and 10 are of rod-like form and widen out immediately above the press portion and extend in parallel relation longitudinally of the container 5. A pair of bridges 12 and 13 of a suitable insulating material, such as mica or the like, tie the leading-in rods together for the purpose of forming a rigid mount for a discharge lamp 14. This lamp 14 as shown is of the high pressure type and comprises an envelope 15 of vitreous material, such as fused silica, quartz or the like, capable of withstanding the high temperature of operation, and is provided with a pair of electrodes 16 and 17 between which a discharge occurs when a suitable potential is applied therebetween.

The electrodes 16 and 17 may be of any suitable construction, but preferably are of thorium metal surrounded by a tungsten helix, such as shown and claimed in the copending application of Daniel S. Gustin et al., Ser. No. 321,640, filed March 1, 1940. After evacuation of the envelope 15 through an exhaust tip 18, it is filled with an ionizable medium, such as mercury, together with an inert gas, such as argon, neon, or the like, to facilitate starting.

The lamp 14 has an elongated tapering seal at each end to which the leading-in wire for each electrode is sealed. These elongated ends pass through openings 19 provided in the bridges 12 and 13, which thus suspends the lamp 14 between the bridges in firm engagement therewith. Each bridge is provided with a pair of eyelets 20 secured thereto having annular portions projecting normally to the surface, through which the rod-like leading-in conductors 9 and 10 extend and, after the bridges are in the proper position relative to the lamp 14 and the leading-in conductors, the eyelets are secured to the latter in any suitable manner, such as by welding.

A heat-reflecting shield 22 of suitable metal, such as nickel, iron, or an alloy, of conical con-

figuration is secured to each of the bridges 12 and 13 by means of an eyelet or tabs. The opening in the shield is of slightly larger diameter than that of the opening 19 in the bridges so that the lamp is primarily supported by the bridges rather than the shields 22, to prevent heating of the latter to too high a temperature which might otherwise cause melting of the envelope 14.

After the bridges 12 and 13 are secured in place upon the leading-in and surrounding conductors 9 and 10, a flexible lead 23 connects the electrode 16 to the leading-in conductor 10; and in a similar manner a flexible lead 24 connects the upper electrode 17 to the leading-in conductor 9. Prior to securing the base 6 to the container 5, the latter is exhausted through an exhaust stem 25 and prior to sealing off is filled with a readily ionizable inert gas for a purpose hereinafter described.

The lamp may be energized from a suitable source of supply which as shown comprises a leakage transformer 26, the primary winding 27 of which may be connected to the customary source of the usual potential of 115 or 220 volts.

The invention thus far described differs very little from the prior art except for the fact that the lamp 14 is not provided with a starting electrode, as has been heretofore necessary. Moreover, it has been suggested in the prior art to provide the outer envelope or container with an inert gas in order to transmit heat from the inner lamp to the outer envelope for cooling purposes. To accomplish this result, the pressure of the gaseous filling has always been above about 50 millimeters so as to be readily affected by convection currents and at the same time prevent the formation of a destructive arc discharge.

I have discovered, however, that the starting voltage otherwise necessary to initiate an arc discharge between the electrodes 16 and 17 can be materially decreased by the formation of a glow discharge within the container.

While I have made no attempt at the present time to verify the cause of this phenomena, my theory is that it is probably produced by photo-ionization, the addition of radio frequency to the starting circuit by the glow discharge, and removal of charges from the walls of the lamp. Regardless of the cause of such phenomena, by limiting the gaseous filling in the outer container to a pressure ranging from approximately 10 to 50 millimeters, I have found that a glow discharge, as above noted, results between the exposed metallic parts of opposite instantaneous polarity in the container 5. After continuance of such glow discharge for a very brief period, the starting voltage of the high pressure discharge lamp 14 is materially reduced so that an arc discharge is initiated between the electrodes of the lamp, followed by extinguishment of the glow in the outer container. Moreover, by limiting the pressure to not greater than approximately 50 millimeters, the resulting glow discharge is prevented from being converted into a destructive arc.

For example, a lamp normally requiring a voltage of 260 volts is reduced to approximately 200 volts by the resulting glow discharge within the outer container. Thus a leakage transformer 26, which may be connected to the customary source of potential of 115 volts and having a secondary producing a voltage of about 200 volts, can be readily employed. Upon closure of a switch 28, the gaseous filling within the outer container 5 is readily ionized, causing a glow discharge between the conductors 9 and 10. This glow thus reduces the voltage necessary to initiate an arc discharge between the electrodes 16 and 17 to 200 volts, whereas a voltage of 260 would otherwise be required.

Moreover, upon the initiation of the arc discharge between the electrodes 16 and 17, the glow discharge in the outer container is automatically extinguished and, as the lamp 14 increases in temperature during operation, its operating voltage continues to decrease in the customary manner so that the voltage drop across the lamp during operation ranges from 130 to 150 volts.

It thus becomes obvious to those skilled in the art that a high pressure gaseous discharge lamp is herein provided in which an arc discharge can be readily initiated between the electrodes without the necessity for a starting electrode, by providing the outer surrounding container with a gaseous filling at a pressure sufficiently high to cause a glow discharge between the current carrying parts of opposite instantaneous polarity, and sufficiently low to prevent conversion of said glow into a destructive arc. Otherwise, if the pressure of the gaseous filling in the container is too low, no glow discharge will result and, if the pressure is too high and exceeds approximately 50 millimeters, a destructive arc discharge occurs which not only impairs the lamp, but prevents the initiation of a discharge between the electrodes 16 and 17. Thus the pressure range of the gaseous filling in the outer container must be within a relatively definite range so that the breakdown voltage thereof is below the supply transformer open circuit voltage.

Although one specific embodiment of the present invention has been shown and described, it is to be understood that many modifications thereof may be made without departing from the spirit and scope of the appended claims.

I claim:

1. A gaseous electric discharge lamp comprising a sealed envelope, electrodes in said envelope between which an arc discharge occurs during operation of said lamp, an ionizable medium within said envelope for supporting the discharge between said electrodes, a sealed container surrounding said envelope, leading-in conductors extending into said container for supplying electrical energy to the electrodes of said lamp, and a readily ionizable gaseous atmosphere in said container having an ionizable potential of not more than 200 volts for causing a glow discharge between said leading-in conductors upon the application of a potential thereto to decrease the starting voltage of said lamp and initiate an arc discharge between the electrodes of said lamp at the potential applied to said leading-in conductors.

2. A gaseous electric discharge lamp comprising a sealed envelope, electrodes in said envelope between which an arc discharge occurs during operation of said lamp, an ionizable medium within said envelope for supporting the discharge between said electrodes, a sealed container surrounding said envelope, leading-in conductors extending into said container for supplying electrical energy to the electrodes of said lamp, and a readily ionizable gaseous atmosphere in said container having an ionizable potential of not more than 200 volts and at a pressure sufficient to cause a glow discharge therein upon the application of a potential to the electrodes of said

lamp with attendant initiation of an arc discharge between said electrodes.

3. A gaseous electric discharge lamp comprising a sealed envelope, electrodes in said envelope between which an arc discharge occurs during operation of said lamp, an ionizable medium within said envelope for supporting the discharge between said electrodes, a sealed container surrounding said envelope, leading-in conductors extending into said container for supplying electrical energy to the electrodes of said lamp, and a readily ionizable gaseous atmosphere in said container having an ionizable potential of not more than 200 volts and at a pressure sufficiently high to cause a glow discharge between current carrying parts of opposite instantaneous polarity upon the application of a potential to said leading-in conductors and at a pressure sufficiently low to prevent conversion of said glow to an arc discharge, to cause an attendant decrease in the starting voltage of said lamp to a value where an arc discharge is initiated between the electrodes of said lamp at the potential applied to said leading-in conductors.

4. A gaseous electric discharge lamp comprising a sealed envelope, electrodes in said envelope between which an arc discharge occurs during operation of said lamp, an ionizable medium within said envelope for supporting the discharge between said electrodes, a sealed container surrounding said envelope, leading-in conductors extending into said container for supplying electrical energy to the electrodes of said lamp, and a readily ionizable gaseous atmosphere in said container having an ionizable potential of not more than 200 volts and at a pressure ranging from approximately 10 to 50 millimeters to cause a glow discharge between said leading-in conductors upon the application of a potential thereto without conversion thereof into a destructive arc discharge, to cause an attendant decrease in the starting voltage of said lamp to a value where an arc discharge is initiated between the electrodes of said lamp at the potential applied to said leading-in conductors.

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