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T. H. HEINE ET AL
GASEOUS DISCHARGE LAMP

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Fig. 1.

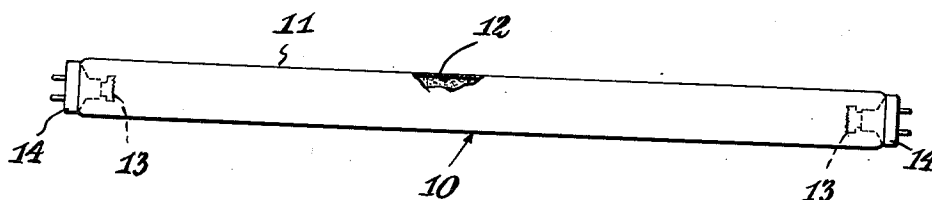
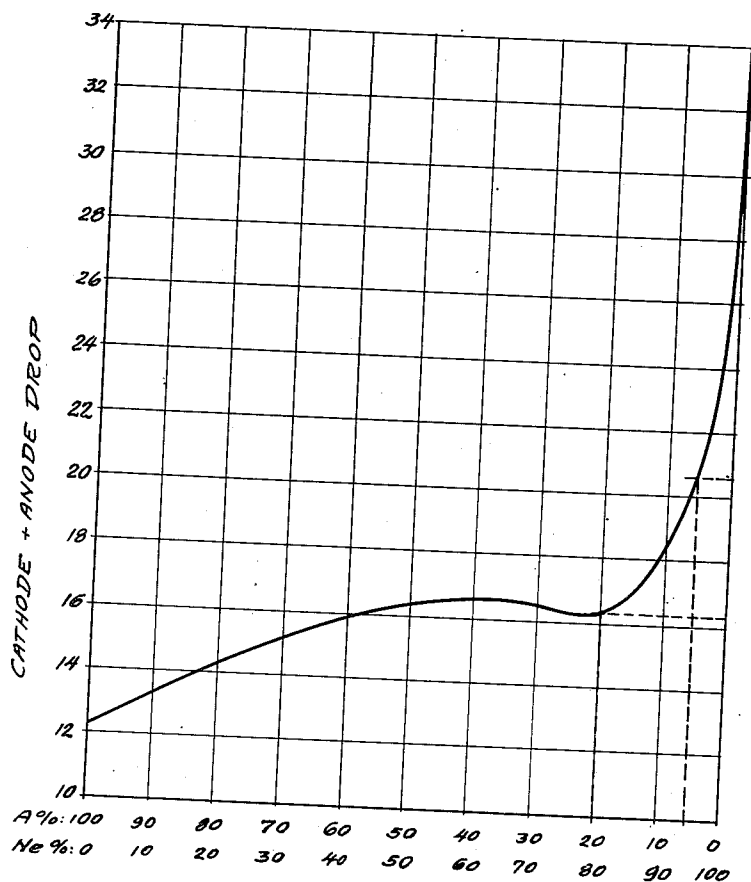


Fig. 2.



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GASEOUS DISCHARGE LAMP

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1 Claim. (Cl. 313-109)

1

This invention relates to a low pressure mercury vapor lamp and, more particularly, to a neon-argon gas mixture for such a lamp.

It has long been desirable to the lamp industry to develop a gaseous discharge lamp, such as a fluorescent lamp, specifically for the purpose of operating outdoors on a year round basis. Conventional lamps employing inert gases, such as argon, krypton, xenon, and mixtures thereof and operating on substantially constant current ballasts, due to their low output, have proved to be unsatisfactory during winter weather.

This condition is brought about as the mercury vapor pressure goes below that necessary for the most efficient production of the mercury resonance radiation at 2537A. The mercury vapor pressure is reduced when the power taken by the lamp is insufficient to maintain a suitable bulb wall temperature. Conventional lamps tend to take less power as the bulb wall temperature drops due to the fact that the lamp voltage decreases; this in turn causes a still further reduction in the already inadequate power consumption. The practice of running conventional lamps at overrated currents to obtain a reasonable low temperature output can only be done at the expense of an acceptable output at high temperature and lumen maintenance throughout life.

Therefore, it is evident that a fundamental requirement for an outdoor lamp, if it is to be self regulating, is that its lamp voltage increase as the ambient temperature is reduced in order to raise the power input and thereby maintain an efficient bulb wall temperature particularly during cold weather. It has been found that a neon filled lamp will satisfy this requirement, increase the lamp wattage and maintain the light output.

However, there are several objections which are encountered in the employment of neon in a final fill. The first of these limitations is its characteristic red glow which localizes at the electrodes during lamp operation, detracting from the appearance of the lamp. The second objection is the high electrode drop introduced by the neon gas, which not only reduces overall lamp efficiency, but also causes rapid deterioration of the cathode emission material and consequently short lamp life.

Hence, it has been found advantageous according to our invention to overcome the objections to the pure neon gas fill in an outdoor gaseous discharge lamp, and to retain the desirable cold temperature characteristics of the

2

neon, by employing a mixture of neon and argon gases. We have found that by employing 6% to 20% argon in such a mixture, the objectionable characteristic red glow of neon about the electrodes has been eliminated, due to the fact that the electrode drop is less than the excitation potential of the neon itself. We have found that such mixtures possess the desirable characteristic of raising the lamp voltage as the ambient temperature is reduced. With mixtures of this composition, a reasonable electrode drop in such lamps is produced, which prevents a deterioration of the cathode emission material and subsequent short lamp life.

In its general aspect, the present invention has the object of overcoming the aforementioned defects and disadvantages of the prior art outdoor gaseous discharge lamps.

Specifically an object of the present invention is an outdoor gaseous discharge lamp having a mixture of neon and argon comprising from 6% to 20% argon.

Another and specific object is an outdoor gaseous discharge lamp having a mixture of neon and argon and eliminating the characteristic red glow of neon at the electrodes during lamp operation.

An additional object is a gaseous discharge lamp having a mixture of neon and argon and a lamp voltage which increases as ambient temperature is reduced.

Another object is a gaseous discharge lamp having a mixture of neon and argon which reduces the excessively high electrode loss introduced by neon.

A further object is a gaseous discharge lamp having a mixture of neon and argon with improved overall lamp efficiency and free of rapid deterioration of the cathode emission material and subsequent short lamp life.

Other objects and advantages of the invention will appear to those skilled in the art to which it appertains as the description proceeds, both by direct recitation thereof and by implication of the context.

Referring to the accompanying drawing, in which like numerals of reference indicate like parts:

Fig. 1 is a side elevational view of a gaseous discharge lamp of my invention.

Fig. 2 is a plot of cathode plus anode voltage drop versus neon-argon gaseous mixture composition.

In Fig. 1 a gaseous discharge lamp, such as a fluorescent lamp, is designated by the reference numeral 10. While a fluorescent lamp has been

3
selected as an embodiment of our invention, it will be understood that our invention is not restricted for use only with fluorescent lamps. This lamp 10 has a tubular vitreous envelope 11 which is coated on its inner surface with fluorescent material 12, and has a filamentary electrode mount 13 sealed in each end.

After the preceeding steps of the exhaust of lamp 10, which may consist of a primary evacuation, baking, electrode treatment, final evacuation and mercury filling, a final gas fill of our invention, namely a mixture of neon and argon comprising from 6% to 20% argon at a suitable pressure, such as 1.0 to 10.0 mm. of mercury, is introduced into the lamp and the lamp 10 is tipped off from the exhaust position. A base 14 is applied to the lamp 10 at each end of the envelope 11 with a suitable cement.

A gaseous mixture, wherein a minimum of the 6% argon is employed, in an outdoor gaseous discharge lamp eliminates the objectionable neon glow at lamp electrodes. This is believed to be explained in Fig. 2, the curve of the cathode plus anode drop versus the gaseous mixture composition. This curve shows that with a mixture of this composition, namely 94% neon, 6% argon, the electrode drop is less than the excitation potential of the neon, namely 21.47 volts, and therefore, little or no red glow occurs about the lamp electrodes.

Fig. 2 also shows that only when relatively high percentages of neon are used, such as greater than 95% neon, is there a prohibitive rise in the electrode drop and consequent electrode losses. With a mixture comprising 20% argon, as shown in Fig. 2, the electrode drop is reduced to $\frac{1}{2}$ the electrode drop of pure neon. This value is commensurate with reasonable cathode life.

Thus it will be seen from the foregoing description that the gaseous discharge lamp 10 of our invention has overcome the defects and disadvantages of the prior outdoor gaseous discharge lamps. We have provided an outdoor gaseous discharge lamp 10 having a mixture of neon with from 6% to 20% argon which eliminates the characteristic red glow of neon about the lamp electrodes during lamp operation. The lamp voltage of our gaseous discharge lamp 10 increases as outdoor ambient temperature is reduced and thereby maintains a satisfactory light output. The reasonable electrode loss of our lamp produces an improved overall lamp efficiency and eliminates rapid deterioration of the cathode emission material and subsequently short lamp life.

Although a present embodiment of our invention has been disclosed, it will be understood that modifications may be made within the spirit and scope of the appended claim.

We claim:

A low pressure mercury vapor discharge lamp comprising a vitreous envelope, a fluorescent material on the inner surface of said envelope, an electrode mount in each end of said envelope, a discharge supporting material, and a gaseous mixture of argon with from 60% to 66 $\frac{2}{3}$ % neon at a pressure of from 2.0 to 4.0 mm. of mercury.

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