Oct. 6, 1931. G. CLAUDE 1,826,382

VACUUM DISCHARGE TUBE

Filed Jan. 12, 1926

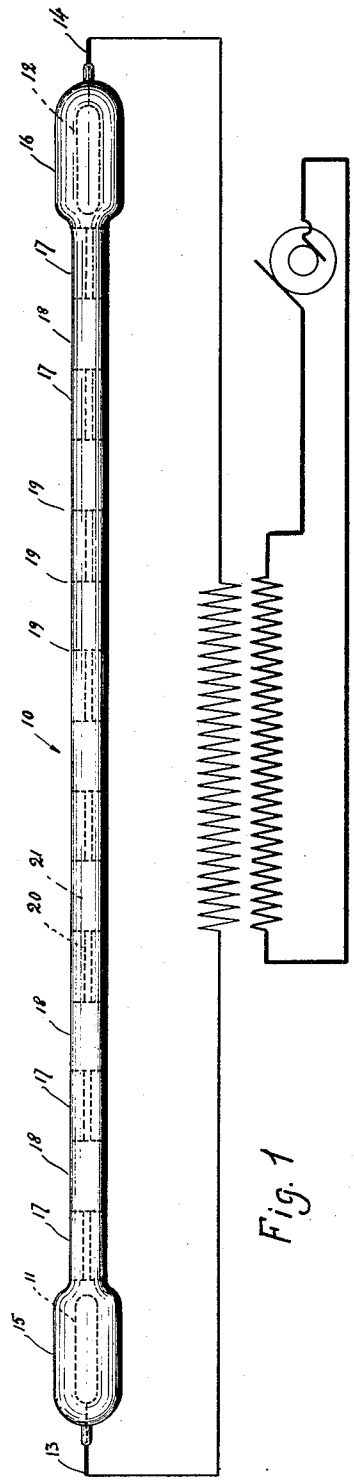

Fig. 1

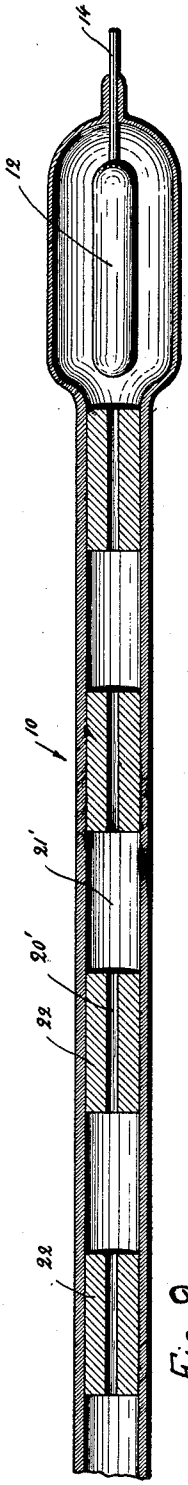

Fig. 2

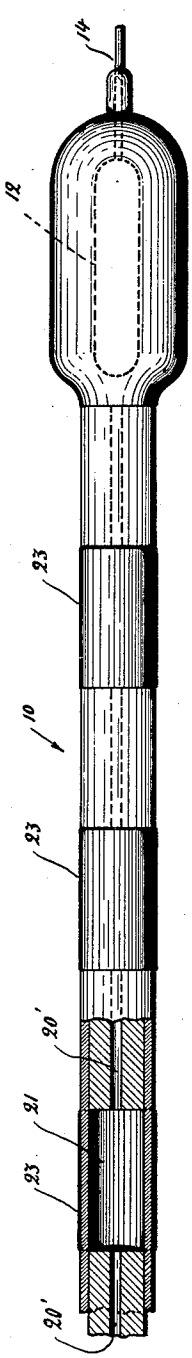

Fig. 3

INVENTOR
Georges Claude
BY
Bohlebers & Ledbetter
ATTORNEYS

Patented Oct. 6, 1931

1,826,382

UNITED STATES PATENT OFFICE

GEORGES CLAUDE, OF BOULOGNE-SUR-SEINE, FRANCE, ASSIGNOR TO CLAUDE NEON LIGHTS, INC., A CORPORATION OF NEW YORK

VACUUM DISCHARGE TUBE

Application filed January 12, 1926, Serial No. 80,707, and in France January 22, 1925.

Heretofore it has been impossible to correct in a permanent way the red light of neon tubes by the introduction into the atmosphere of the tube of a certain quantity of mercury which, during the electric discharges through the tube, would take or assume the proper position or location therein. This correction is accidentaly realized under certain conditions but a slight change or modification of such conditions brings the color of the light to blue or red.

The present invention relates to a process and apparatus for utilizing the luminescent and other properties of neon and mercury to produce multi-color effects. More specifically the invention consists in the utilization of the curious observation which has been made, that it is possible to obtain in one and the same tube containing mercury and neon some well limited regions some furnishing neon light and others mercury light.

This invention further relates to the production of a substantially white light by the use of neon and mercury in a tube of the character hereinafter more specifically described.

Further objects, features and advantages of the present invention will more fully hereinafter appear taken in connection with the accompanying drawings, in which:

Figure 1 illustrates a vacuum tube made in accordance with my invention and which is capable of carrying out my new method of producing multi-color effects.

Figure 2 is a longitudinal section illustrating a modified form of the vacuum tube to carry out the principles of my invention; and

Figure 3 illustrates a still further form of the invention.

Referring to Figure 1 of the drawings in detail the reference numeral 10 designates generally a neon vacuum tube having the electrodes 11 and 12 and the leads 13 and 14 connected at one end to the electrodes and connected at their other ends to a suitable source of high tension current. The vacuum tube 10 is preferably made up of a plurality of sections comprising the end portions 15 and 16 which receive the electrodes 11 and 12 and the intermediate sections 17 and 18. The sections 17 are preferably made of the relatively small internal diameter and the sections 18 of relatively large internal diameter. The sections 17 and 18, as illustrated in Figure 1, are preferably united or welded to each other in any suitable way at the points indicated by the reference numeral 19. As so constructed the tube comprises regions or spaces therein of relatively small cross sections connected to and alternating with regions of spaces of relatively large cross sections.

In Figure 2 there is illustrated a modified form of the invention in which the body portion of the vacuum tube 10 is made of uniform diameter but in which a plurality of sections 22 have been telescoped into the body of the tube 10 and appropriately fixed thereto as by friction, the sections 22 having a central longitudinal bore 20′ of relatively small diameter as compared with the internal diameter of the body 10. These sections have between them spaces or regions 21′ of relatively large areas.

In the manufacture of the tube shown in Figure 1 the sections or portions 18 of larger internal diameter are supplied with a small amount of mercury. The vacuum tube is then exhausted in any known way and thereafter supplied with the requisite amount of neon gas. As constructed in the manner above described the sections having relatively small internal diameters will under proper electric intensity (règime) give very pure neon light or slightly modified by weak mercury radiations, and the other sections having a relatively large internal diameter will give the characteristic mercury blue light.

After the heating up of the tube as constructed in the manner above described the mercury will become volatilized and when the current is turned off, said mercury will form very minute globules on the walls of the sections of relatively large diameter. It will therefore be seen from this that the tube, forming the subject matter of my invention may be used in practice in either vertical, horizontal, or any inclined position. A variation of the respective lengths of the red

and blue sections of the tube permits a variation at will of the color of the resulting light to be obtained.

I have found however, that if the intensity of the light is increased beyond a certain limit the red light produced by the sections of relatively small area can be modified and become near white by the progressive appearance of mercury radiations. Furthermore, if the blue light of the sections of large area is hidden by any means, as by coating the outside of these sections with black varnish, the tube will give only a light which is approximately white. It is to be understood however, that the use of varnish as means for screening the blue light is only referred to as an example, and that other means can be employed for accomplishing the same result.

I have illustrated and described herein apparatus capable of carrying out the principles of my invention but it is to be expressly understood that I do not limit myself thereto as many changes may be made in point of detail and other embodiments resorted to without deviating from the true spirit and scope of my invention. Furthermore, it is to be expressly understood that certain changes may be made in practicing the method and accordingly I do not limit myself to the exact steps described.

What I claim is:

1. The method of creating a plurality of distinct colors in a positive column tube light, which consists in forming in said tube regions or spaces relatively small in cross section alternating with regions or spaces which are relatively large in cross section, supplying said tube with a luminescent gas and with a volatilizable substance.

2. The method of creating a plurality of distinct colors in a positive column tube light, which consists in forming in said tube regions or spaces of relatively small areas connected to and alternating with regions or spaces of relatively large areas, supplying said tube with neon gas, and with small quantities of mercury, and then passing a current through said tube.

3. A method as described in claim 2 with a view of obtaining a substantially white light which comprises the modification of the red light in the region or spaces of relatively small areas by the blue radiations from the regions or spaces of relatively large areas.

4. A luminescent positive column tube light for producing multi-color lighting effects comprising regions or spaces therein of relatively small areas connected to and alternating with regions or spaces of relatively large areas, the whole tube containing a volatilizable substance and a luminescent gas.

5. A luminescent positive column tube light for producing multi-color lighting effects comprising regions or spaces therein of relatively small areas connected to and alternating with regions or spaces of relatively large areas, the whole tube containing mercury and neon.

6. The method of obtaining a substantially white light in a positive column tube light which consists in forming in said tube regions or spaces relatively small in cross section alternating with regions or spaces which are relatively large in cross section, supplying in said tube with a luminescent gas adapted to emit a red light and with a volatilizable substance adapted to emit a blue light and modifying the red light in the regions or spaces of relatively small cross section by the blue radiations from the regions or spaces of relatively large cross section.

7. The method of obtaining a substantially white light in a positive column tube light which consists in forming in said tube regions or spaces relatively small in cross section alternating with regions or spaces which are relatively large in cross section, supplying said tube with a luminescent gas and with a volatilizable substance and modifying the light in the regions or spaces of relatively small cross section by the radiations from the regions or spaces of relatively large cross section.

8. The method of obtaining a substantially white light in a positive column tube light which consists in forming in said tube regions or spaces relatively small in cross section alternating with regions or spaces which are relatively large in cross section, supplying said tube with a luminescent gas and with a volatilizable substance and modifying the light in the regions or spaces of relatively small cross section by the radiations of a different color from the regions or spaces of relatively large cross section.

9. A process for operating a discharge tube with positive column light, which in addition to at least one rare gas also contains at least one vapor characterized by rendering the current density within the tube variable with respect to space, said density being so chosen that at the high current density it is the light of the rare gas and at the low current density it is the light of the vapor that predominates.

10. A process according to claim 9, characterized by causing a current of substantially constant value to pass through a discharge tube with positive column light, which tube in different places has different internal cross sections.

11. A discharge tube for the generation of positive column light which in addition to at least one rare gas also contains at least one vapor, characterized in that the envelope of the tube consists of a tube in which the different places of the region where the light column is produced have different cross sec-

tions for carrying out the process according to claim 9.

12. A new article of manufacture, comprising a luminous electrical discharge tube containing a mixture of conducting materials and provided with electrodes said tube providing a continuous passage-way for said conducting materials and made up of connected communicating tubular sections of expanded and restricted cross sections, the walls of the restricted sections having a relatively greater thickness than the walls of the enlarged sections, in combination with means for supplying to said electrodes current of such value as to produce a glow of one color in the expanded tubular sections and a glow of a different color in the restricted tubular sections.

13. The method of creating a plurality of distinct color in a positive column tube light which comprises forming in said tube regions or spaces of relatively small areas connected to regions or spaces of relatively large areas, supplying said tube with a rare gas and with mercury and then passing a current through said tube.

14. A luminescent positive column tube light for producing multi-color lighting effects comprising regions or spaces therein of relatively small areas connected to regions or spaces of relatively large areas, the tube containing mercury and a luminescent gas.

15. A luminescent positive column tube light for producing multi-color lighting effects comprising regions or spaces therein of relatively small areas connected to and alternating with regions or spaces of relatively large areas, the tube containing mercury and a rare gas.

In testimony whereof, I have hereunto affixed my signature.

GEORGES CLAUDE.