Sept. 22, 1931. C. J. WAMSER 1,824,452

LUMINESCENT TUBE

Filed July 16, 1929

Fig. 1.

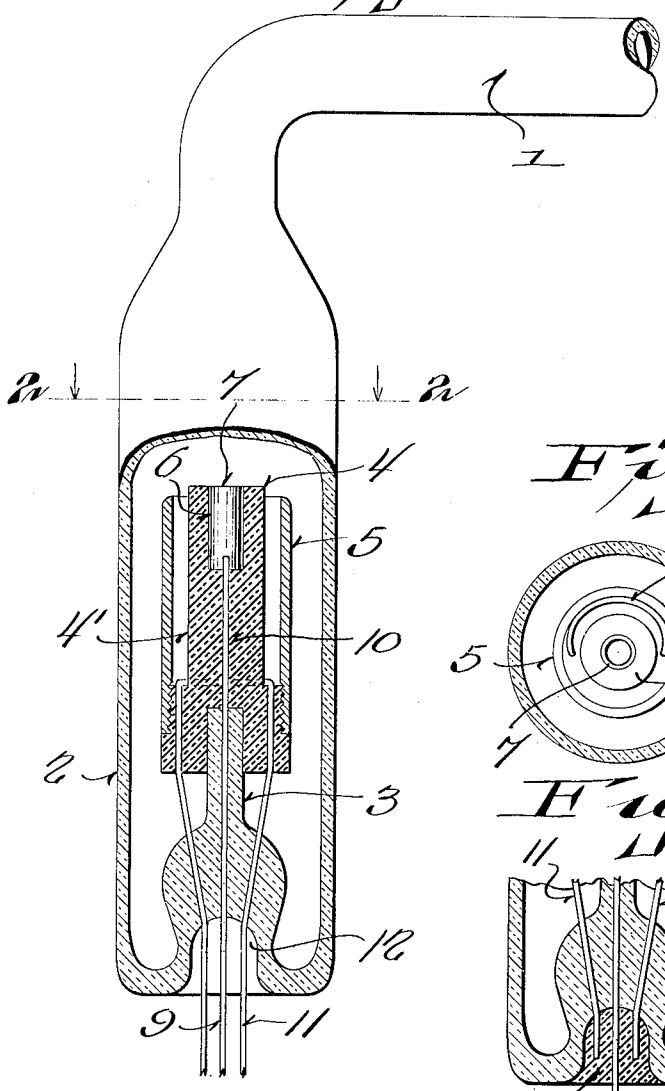


Fig. 2a.

Fig. 4.

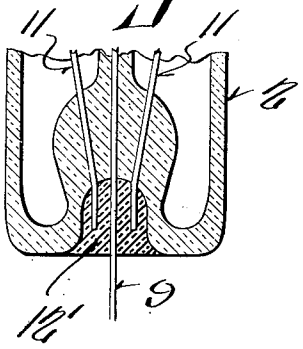
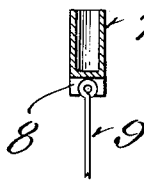


Fig. 3.



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UNITED STATES PATENT OFFICE

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LUMINESCENT TUBE

Application filed July 16, 1929. Serial No. 378,591.

This invention pertains to luminescent tubes, and more particularly to those utilizing neon gas.

At the present time, considerable difficulty is encountered in the manufacture of neon tubes, due to the fact that the methods employed for liberating the occluded gases in the walls of the tube are either slow and costly, or objectionable to the subsequent illumination operation. These methods comprise either an oven for heating the tube to the necessary degree of temperature to liberate the occluded gases, or heating the tube by means of illuminating electrodes of excessive size or area.

The present invention has primarily for its object to overcome the foregoing objections by the provision of simple, inexpensive, and efficient means for bombarding or heating a tube in a minimum length of time and thereafter rendering said means inoperative during illumination of the tube.

Incidental to the foregoing, a more specific object is to provide a luminescent tube with illuminating electrodes of restricted area, and auxiliary heating electrodes, the terminals of which are disconnected during illumination of the tube.

With the above and other objects in view, which will appear as the description proceeds, the invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

In the accompanying drawings is illustrated one complete example of the physical embodiment of the present invention constructed according to the best mode so far devised for the practical application of the principles thereof.

In the drawings, Figure 1 is a fragmentary elevation of a tube constructed in accordance with the present invention, with parts broken away and in section to more clearly illustrate the structural features.

Figure 2 is a transverse section taken on the line 2—2 of Figure 1;

Figure 3 is a detail section of the illuminating electrode; and

Figure 4 is a fragmentary section of the end of the tube sealed for illuminating operation.

Referring now more particularly to the accompanying drawings, the numeral 1 designates the capillary portion of a conventional luminescent tube, both ends of which are provided with enlarged portions 2, only one of which is illustrated. Projecting inwardly from the outer end of the portion 2 is a lug 3 which carries an insulating member 4, preferably constructed of isolantite or similar material, affording maximum resistance to heat and having maximum insulating properties. The insulator 4 is threaded exteriorily adjacent its lower end for reception of an electrode sleeve 5, the upper end of which terminates short of the top end of the insulator for the purpose to be hereinafter described.

The upper end of the insulator 4 is provided with a recess 6 which receives an illuminating electrode 7 provided with a recess, whereby its inner and outer surfaces are rendered effective during the illuminating operation. The lower end of the electrode 7 is provided with a slot or kerf 8 for reception of the crimped end of the supply wire 9, which is clamped within the kerf 8 after assembly, to insure a secure connection. The wire 8 extends through the central bore 10 of the insulator 4 and down through the supporting lug 3 to any suitable terminal, not shown.

Connection with the electrode 5 is obtained through the wire 11, which passes through the end of the enlarged portion 2, through the lower portion of the insulating member 4 and around the reduced portion 4′ to the opposite side of the insulator, thence on out through the end of the enlarged portion 2.

It will be noted the reduced portion 4′ of the insulator provides a spacing between the insulator and the inner wall of the electrode 5, thus rendering both surfaces of the

electrode 5 effective during the heating operation to be hereinafter described. That portion of the wire 11 extending around the reduced portion 4' of the insulator engages and makes contact with the electrode 5.

In the manufacture of luminescent tubes, it is well-known to those skilled in the art that various atmospheric gases occluded in the walls of the tube or in the electrodes, must be liberated and expelled prior to the introduction of neon gas, inasmuch as the property of neon gas is very largely attenuated by the appearance or traces of other gases. As heretofore stated, the operation of bombarding luminescent tubes to liberate the occluded gases has been accomplished by either heating through excessive size illuminating electrodes, or by placing the tubes in an oven. While the first method performs its function with a certain degree of success, an excessive size illuminating electrode has been found undesirable in the illuminating operation, and the second method is cumbersome, awkward, and slow, which not only increases the manufacturing cost to a prohibitive degree, but renders it difficult to locate leaky tubes, particularly if several sections are being pumped at the same time.

Furthermore, it is generally conceded that internal heating or bombarding is more effective than external heating in an oven.

The present invention overcomes all of the foregoing objections in that it provides illuminating electrodes of minimum area, and auxiliary electrodes of sufficient area for effecting bombarding or heating the tube internally to liberate occluded gases from the walls of the tube, electrodes, and insulating members.

This is accomplished in the course of manufacture prior to introduction of the neon gas by passing current through the wire 11, which is connected with the heating electrode 5, or, if desired, connecting both electrodes 5 and 7 with a source of current. The latter procedure provides an abnormally heavy current and quickly heats the tube to the desired degree of temperature, whereby the occluded gases are liberated and thereafter scavenged from the tube by the usual pumping operation.

In order to render the auxiliary heating electrode 5 inoperative during the subsequent illuminating of the luminescent gas injected into the tube, the ends of the wire 11 are clipped off closely adjacent to the point where they enter the tube, and for the purpose of effectively sealing the same against further connection, a recess 12 is provided in the end of the tube for the reception of any plastic sealing material 12', which, of course, must be non-conducting. The tube is then illuminated by the usual current through the wire 9 connected with the illuminating electrode 7. It will be noted also that the electrode 5 terminates short of the top of the insulating member 4, which absolutely precludes the formation of a corona between the illuminating electrode and heating electrode 5 during the illuminating operation.

From the foregoing, it will be seen that very simple, inexpensive, and efficient means has been provided for effectively heating the luminescent tube within a minimum length of time, thus materially facilitating scavenging of occluded gases therefrom, and thereby reducing the cost of manufacture to a minimum.

I claim:

1. In a tube for containing luminescent gas, insulators positioned within said tube, illuminating electrodes positioned within said insulators, and auxiliary electrodes carried by and surrounding said insulators for heating said tube to liberate occluded gases from its walls prior to introduction of said luminescent gas.

2. In a tube for containing luminescent gas, insulators positioned within said tube and provided with central recesses, illuminating electrodes positioned within said recesses, and auxiliary tubular electrodes carried by and surrounding said insulators and having their greater portion spaced therefrom, said auxiliary electrodes serving to heat said tube to liberate occluded gases therefrom prior to introduction of said luminescent gas.

3. An electrode for luminescent gas tubes comprising an insulating member provided with a central recess, an illuminating electrode positioned within said recess, and an auxiliary heating electrode carried by said insulator and surrounding the same.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee, in the county of Milwaukee and State of Wisconsin.

CHARLES J. WAMSER.