June 9, 1931. G. E. TEASDALE 1,808,826

LUMINESCENT TUBE

Filed July 12, 1929

FIG. 1.

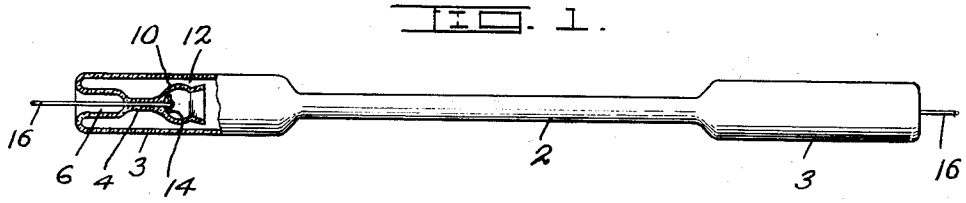


FIG. 2.

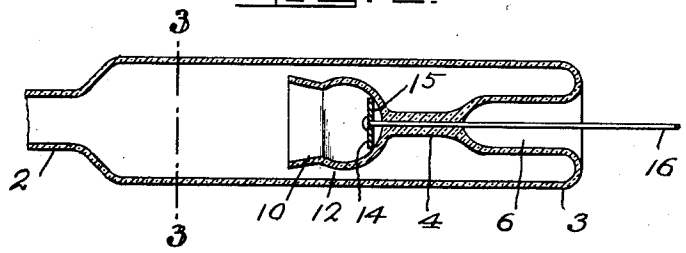
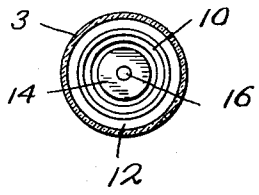


FIG. 3.



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UNITED STATES PATENT OFFICE

GEORGE E. TEASDALE, OF KANSAS CITY, KANSAS

LUMINESCENT TUBE

Application filed July 12, 1929. Serial No. 377,703.

My invention relates generally to luminous tubes made of transparent material such as glass and intended to be filled with a rare atmospheric gas, such, for instance, as neon gas which becomes luminescent by the passage therethrough of high voltage electric currents introduced into the gas through electrodes located in the ends of the tube. The electrodes are in direct contact with the gas and connected to the inner ends of terminal wires which extend outwardly through the ends of the tube and are connected to the two sides of a high voltage circuit.

When the high voltage is applied to the electrodes, the neon gas in the tube acts as a conductor and becomes brilliantly illuminated, giving off a bright orange red color which makes it very desirable for advertising and other commercial purposes, especially when the tubes are formed into letters, numbers and other designs.

Heretofore, some difficulty has been experienced with the electrodes because when made with a surface area of less than 1.5 square decimeters per ampere a phenomenon known as "vaporization" or "spluttering" takes place and is very pronounced in the presence of rare gases such as neon. The high temperature causes the electrodes to sputter at high rate so that particles of material composing the electrodes are thrown off and deposited on the glass walls of the tube in which the electrodes are located. As the particles of material are thrown off they carry and pocket a certain quantity of the neon gas against the glass walls. This pocketing causes so much of the gas to be used up and its pressure so reduced, that it no longer remains conductive and the lamp becomes extinguished.

One objection to making the electrodes with a surface area of 1.5 or more square decimeters per ampere is that it necessitates making the ends of the tubes where the electrodes are located of a much greater diameter than the rest of the tube and as the space available is very limited in a great many designs into which some of the tubes are formed, it is desirable to provide electrodes with a surface area of less than 1.5 square decimeters per ampere, provided the "sputtering" and "vaporization" above referred to can be overcome. I have succeeded in accomplishing this result by surrounding each electrode with a reflector which projects the heat longitudinally in the tube and prevents the smaller electrodes from becoming overheated with consequent "sputtering" and "vaporization".

In order that the invention may be fully understood, reference will now be had to the accompanying drawings, in which:

Fig. 1 shows one of the tubes equipped with the invention.

Fig. 2 is a broken longitudinal section of one of the enlarged ends of the tube equipped with an electrode and a reflector.

Fig. 3 is a cross section on line 3—3 of Fig. 2.

Referring in detail to the different parts, 2 designates a transparent tube of glass or other suitable material. Said tube is provided at each of its enlarged ends 3 with an inwardly projecting stem 4. The stems 4 are hollow at one end as indicated at 6 and provided at their other end with a shield 10 which is preferably bell-shaped and has a flaring mouth as best shown by Fig. 3. Preferably, the tube 2, the stem 4 and the shield 10 are cast in one piece. The shields 10 are of less diameter than the interior of the enlarged ends 3 to leave a surrounding space 12.

14 designates two electrodes which consist of suitable metal or an alloy of two or more metals. Preferably, the electrodes 14 are of disk conformation and arranged within the shields 10 adjacent to the closed ends of the latter. The electrodes 14 are connected to wire conductors 16 which lead outwardly through the stems 4, in which they are hermetically sealed, so that they may be connected to a high tension circuit, not shown. The electrodes 14 preferably have a surface area not exceeding 1 square decimeter per ampere, so that the enlarged ends 3 of the tube 2 may be of less diameter than usual with tubes of this character.

When the gas within the tube 2 is illumi-

nated by the current passing therethrough from one electrode to another the heat caused by the discharge of the current from the electrodes 14 is, to a large extent, carried away from the latter and projected longitudinally within the tube 2 which, being surrounded by the outer atmosphere, is prevented from attaining a high enough temperature to crack the glass of which it is preferably constructed.

Preferably, the electrodes 14 are placed against the inner rear surfaces of the shields 10, so that the rear surfaces 15 will have no electrode effect as is evidenced by absence of glow when the electrodes are charged with current and hence the effective electrode surface is considerably under 1.5 square decimeters per ampere.

While I have shown one form of electrode and one form of shield, it is to be understood that I do not restrict myself to these particular forms but reserve all rights to such changes and modifications thereof as properly fall within the spirit and scope of the invention as claimed.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:

In combination, a transparent tube of the character described, stems extending inwardly from the outer ends of said tube, bell-shaped shields formed integral with the inner ends of said stems and provided with flaring mouths, disk electrodes located at the closed ends of said shields, and conductors connected to said disks.

In testimony whereof I affix my signature.

GEORGE E. TEASDALE.