Dec. 23, 1941. H. J. SPANNER ET AL 2,267,344

DISCHARGE DEVICE

Original Filed Oct. 4, 1929

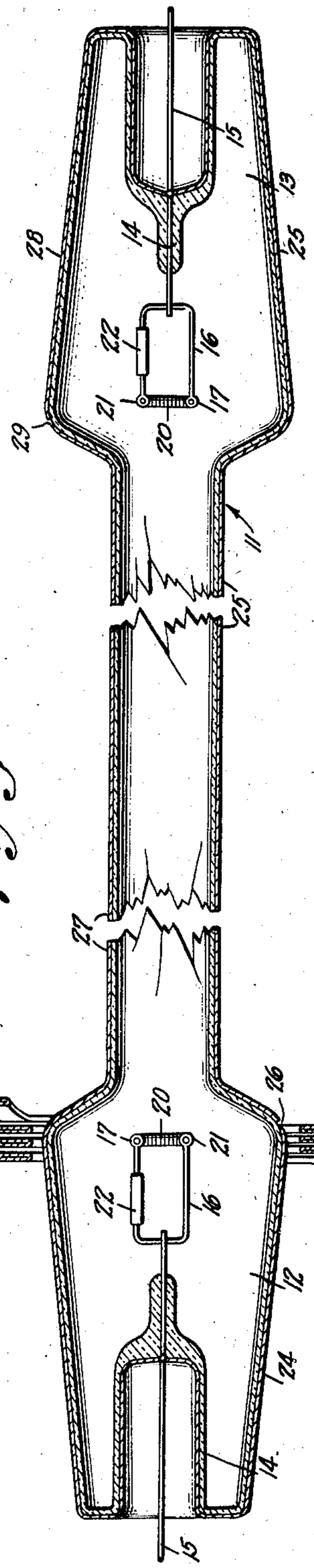

Fig. 1.

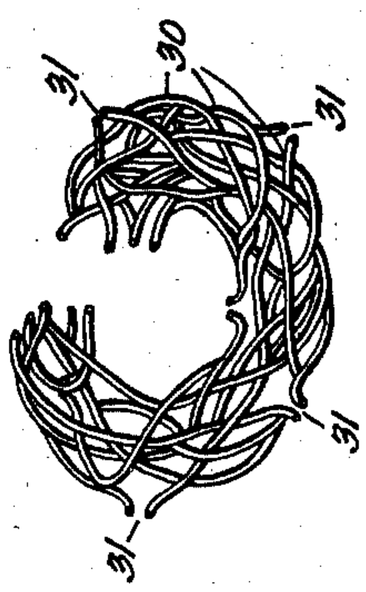

Fig. 3.

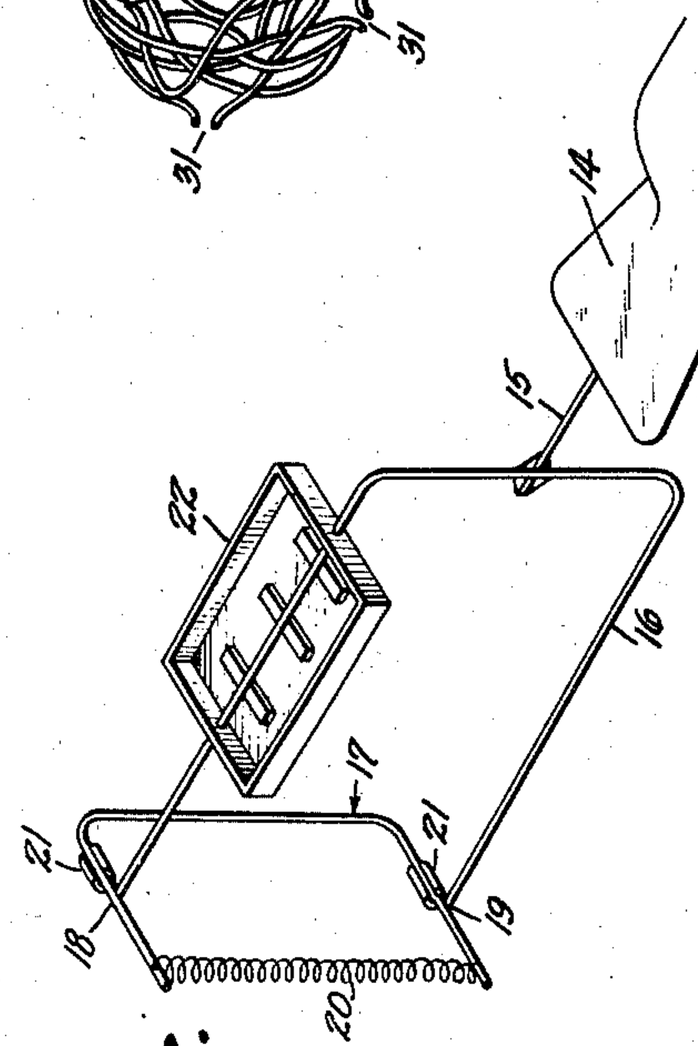

Fig. 2.

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DISCHARGE DEVICE

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Original application October 4, 1929, Serial No. 397,427. Divided and this application October 22, 1936, Serial No. 106,958. In Germany July 1, 1929

3 Claims. (Cl. 176—122)

This invention relates to gaseous electrical discharge devices and more particularly to such devices in which an electrode is heated to glowing temperature by the action of the discharge.

This application is a division of application Ser. No. 397,427, filed Oct. 4, 1929, and now U. S. Patent No. 2,073,885 issued March 16, 1937. As described in prior applications of the applicant, Spanner, alone and with others, especially Serial No. 351,368, filed March 30, 1929 and Serial No. 387,986, filed August 23, 1929 there have been developed cathodes for electric discharge tubes which are capable of sustaining discharges at 220 volts either direct current or alternating current, the dimensions of such tubes may be approximately a meter long by 2 centimeters in diameter.

In order to start such discharges various devices have been employed which require a plurality of leading-in wires in each stem, many of the devices requiring three or more wires in each stem.

One object of our present invention is to provide an improved and simplified construction wherein only one lead-in wire is required. The foregoing and other objects of the invention may best be understood from the following description of one embodiment thereof taken in connection with the accompanying drawing in which

Fig. 1 is a plane view of a discharge tube showing the cathodes and supporting structure;

Fig. 2 is an enlarged perspective view of one of the cathodes and the supporting structure therefor; and

Fig. 3 is a greatly enlarged perspective view showing the construction in detail of one turn of the cathode helix.

Referring to the drawing more in detail the reference character 11 indicates a gas discharge device with enlarged end portions 12 and 13 in each of which there is sealed the usual stem 14. A single leading-in wire 15 is sealed into each stem and carries a supporting frame 16. A closed loop 17 is secured to the supporting frame as at 18 and 19 and is supported thereby in such a manner that it lies disposed substantially perpendicular to the supporting frame. A cathode is indicated at 20 and is so disposed that it constitutes a portion of the electric path provided by the closed loop 17. While the electrode shown at 20 is described as a cathode it is to be understood that in a tube adapted to be used on an alternating current circuit each electrode 20 acts alternately as a cathode and as an anode as the polarity of the potential difference across the tube terminals is periodically reversed. Small pieces of magnesium 21 may be mounted on the loop 17 and secured thereto in any suitable manner as by bending over and clinching. If desired provision may also be made for additional quantities of getter material such as magnesium by securing a small box 22 or similar receptacle to the frame 16. This is preferably so disposed that the open side of the box is toward the glass of the container.

Provision may be made for setting up induced currents in the closed loop 17. A coil 23 having its axis in the same general direction as axis of the loop 17 is positioned around the tube 11 and is supplied with high frequency current by any suitable means not shown. The coil 23 is shown at one end only but it is to be understood that a similar coil may be provided at the other end.

In order to facilitate the starting of the discharge the outer wall of the glass tube may be provided with a conductive coating. This may be in the form of a bronze varnish, one portion of such coating being shown at 24 which portion is connected with one of the leading-in wires 15. The other portion is indicated at 25 and is connected with the other leading-in wire 15. A space as indicated at 26 separates the two portions of the conductive coating and is preferably positioned near one of the cathodes 20. It is to be understood that the thickness of these coatings as shown on the drawing is greatly exaggerated. A second coating similar to the first one may be applied to the other side of the tube, the two portions 27 and 28 of the coating being separated by a space 29 near the opposite cathode 20. It is not essential that there shall be two coatings, one on each side of the tube, but such an arrangement is advantageous in case one of the conductive coatings fails to function to start the discharge. For red tubes a gold varnish is preferable and for blue tubes a silver varnish.

The cathode may have associated therewith special activating materials such as barium or compounds thereof and preferably with the addition of amphoteric compounds and may be constructed in the form of a thorn-crown-cathode. Such a construction is shown in Fig. 3. A plurality of wires 30 are loosely twisted together and at certain points may be cut and pulled outwardly as indicated at 31 giving to the whole arrangement the appearance of a crown of thorns. The discharge takes place quite readily at the points and thereafter passes over to the other portions of the cathode. The interstices in the loosely arranged wires afford space for activating material such as barium and by the construction shown

such material is well held in place mechanically.

In degassing the cathode the evacuated tube may be filled with a rare gas such as argon to a pressure of about 2 millimeters when the tube may be sealed off and the ultimate formation of the cathode undertaken together with the cleaning of the rare gases in the sealed-off condition. For this purpose the two leading-in wires 15 are connected through a ballast resistance to a 220-volt alternating current circuit. When the discharge current reaches a value of three to ten amperes the cathodes and the loops start to glow and the magnesium gets so hot that it vaporizes and through its getter effect purifies the rare gases. The tube may also be filled with inert gas with the addition of metallic vapor.

In discharge tubes designed for operation on alternating current circuits the cathodes at each end of the tube are of the same construction. When the tube is designed for operation on direct current circuits only, one end may be constructed as an anode of any suitable type and material such as carbon or sheet nickel and the anode may be provided if desired with getter material.

The above described discharge tube may be used for various purposes, especially for neon tubes operating directly from the supply lines, ultra violet radiators, rectifiers, and also for oscillation and modulation tubes.

It is to be understood that the above described embodiment of the invention is for the purpose of illustration only and various changes may be made therein without departing from the spirit and scope of the invention as defined in the subjoined claims.

We claim:

1. In a discharge tube adapted to start with cold cathode filled with inert gas and an addition of metallic vapor, a cathode having activated material to increase its emissivity, a loop forming in conjunction with said cathode a closed circuit, a supporting frame for said loop the loop being disposed perpendicularly to the frame, and a leading-in wire for supporting said frame.

2. In a discharge tube adapted to start with cold cathode filled with inert gas with an addition of metallic vapor, a cathode having activated material to increase its emissivity, a loop forming in conjunction with said cathode a closed circuit, a supporting frame for said loop, the loop being disposed perpendicularly to the frame, a leading-in wire for supporting said frame, and pieces of magnesium secured to said loop and frame.

3. In a discharge tube adapted to start with cold cathode filled with inert gas with an addition of metallic vapor, a cathode having activated material to increase its emissivity, a loop forming in conjunction with said cathode a closed circuit, a supporting frame for said loop the loop being disposed perpendicularly to the frame, a leading-in wire for supporting said frame, and a receptacle for getter material positioned on said frame and open toward the glass of the tube.

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