Sept. 20, 1932. F. MEYER ET AL 1,877,932

ELECTRIC LAMP

Filed Dec. 19, 1927

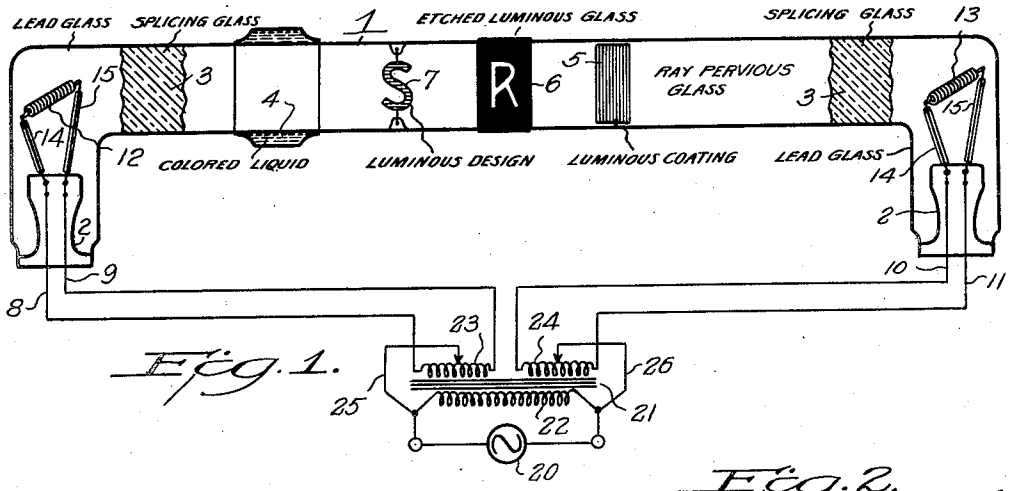


Fig. 1.

Fig. 2.

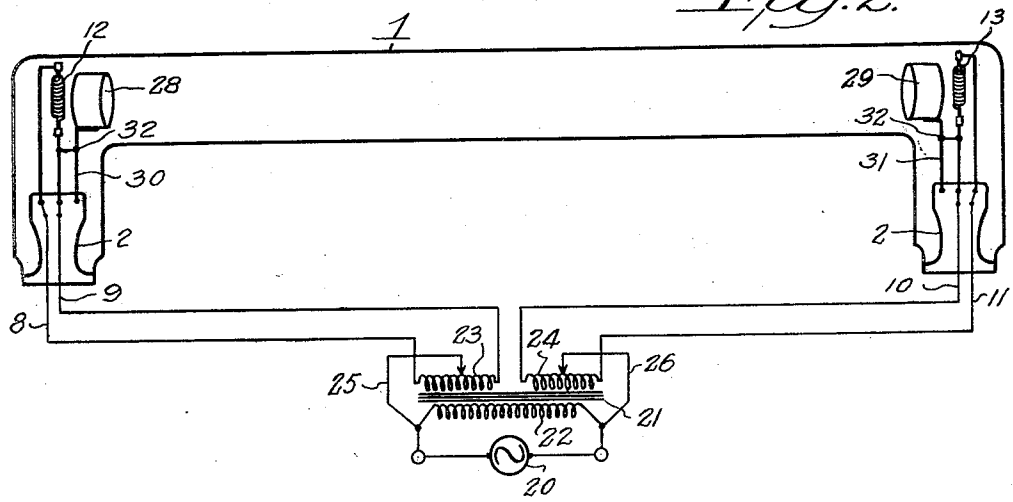
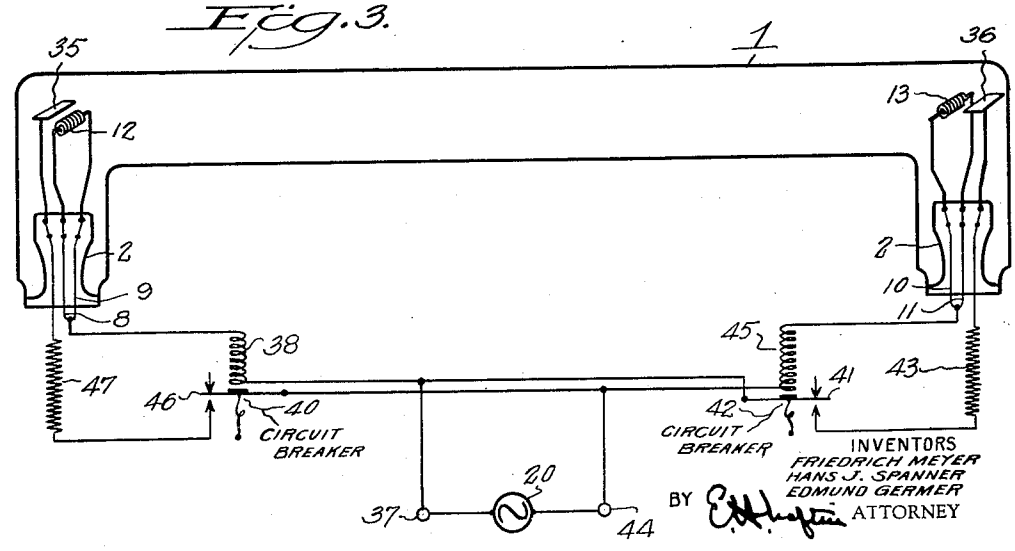


Fig. 3.



INVENTORS
FRIEDRICH MEYER
HANS J. SPANNER
EDMUND GERMER

BY ATTORNEY

Patented Sept. 20, 1932 1,877,932

UNITED STATES PATENT OFFICE

FRIEDRICH MEYER, OF BERLIN-HALENSEE, HANS-JOACHIM SPANNER, OF BERLIN, GERMANY, AND EDMUND GERMER, OF STOCKHOLM, SWEDEN, ASSIGNORS, BY MESNE ASSIGNMENTS, TO ELECTRONS, INC., A CORPORATION OF DELAWARE

ELECTRIC LAMP

Application filed December 19, 1927, Serial No. 241,035, and in Germany December 10, 1926.

Our invention refers to electric lamps, more especially of the kind employed in sign-lighting in which electrical glow discharges are caused to pass across a body of gas under reduced pressure. It is an object of our invention to provide a lamp of the kind aforesaid which is better adapted for practical use than similar lamps hitherto known.

The glow lamps such as nowadays in use for advertisement illumination and similar purposes are of a rather complicated construction. The glass bulbs or tubes filled with rare or other gas, for instance argon or neon and provided with suitable electrodes are inserted in a circuit having a high voltage whereby a permanent glow current is generated between the electrodes and across the gas filling the tube. In lamps of this kind which are operated with alternating current, ordinary cold electrodes having very little electronic-activity are employed. These tubes require high voltages in proportion to their length, and with alternating current such voltages can easily be attained. The drop of voltage in tubes of this kind is composed of the anode drop, the cathode drop and the drop in the path of discharge. The anode drop as a rule amounts to a few volts only, the drop of voltage in the path of discharge amounts to 1–20 volts per centimetre of the length of path, according to the diameter of the tube. In contradistinction thereto the drop at the cathode is considerable and ranges between 120 and 400 volts, depending on the nature of the gas in the tube.

An object of our invention is to produce a luminous glow discharge device for advertising purposes which device has a low starting potential and which is much more highly efficient in light production than the tubes at present employed for such use. Further objects of our invention will appear more fully hereinafter as the description of the apparatus is developed.

Our invention consists substantially in the construction, combination and arrangement of parts associated in our improved glow lamp and the electrical system actuating the same as will be more fully set forth hereinafter and as shown by the accompanying drawing and finally pointed out in the appended claims.

Reference is to be had to the accompanying drawing forming a part of this specification in which like reference characters indicate corresponding parts throughout the several views and in which

Fig. 1 is a diagrammatic illustration of the simplest form of our improved lamp and the electrical system for operating the same.

Fig. 2 is an improvement over the device shown in Fig. 1 as will be described in detail hereinafter, and

Fig. 3 is a modification thereof.

Referring particularly to Fig. 1, 1 designates an envelope impervious to gases and having therein a plurality of electrode stems 2. These stems and the portion of the envelope in close proximity thereto consist of the usual lead glass to which the portion of the envelope 1 which is to be used for its luminous effects is sealed by means of splicing glass 3.

This portion of the envelope 1 may be of ray pervious glass, of uranium glass or didynium glass; surrounded by a colored liquid as shown at 4; having a luminous coating thereon as shown at 5; having a section 6 sealed therein of etched luminous glass; or containing suspended therein luminous designs as indicated at 7.

Through the stems 2 are sealed the usual type of lead-in wires 8, 9, 10 and 11, which carry electrodes 12 and 13 maintained in fixed relation to the stems 2 by means of supports 14, 15.

The electrodes 12 and 13 are of the filamentary type and may consist of molybdenum, tungsten, or thorium, either singly or alloyed together; may be of the usual Wehnelt type of cathode with various electronic emissive coatings thereon.

The envelope 1 contains a small quantity of the rare or inert gases either singly or as mixtures depending upon the particular luminous effect desired.

The supply system for our improved glow lamp is as follows: 20 designates the source of alternating current across which is con-

nected a transformer 21 consisting of a primary 22 and a plurality of secondaries 23, 24. The midpoints of the secondaries 23 and 24 are maintained at a definite potential relative to the terminals of the primary 22 by means of connections 25 and 26. The secondary 23 supplies heating current to the electrode 12 through the wires 8 and 9 and the secondary 24 supplies current to the electrode 13 through the wires 10 and 11.

From the foregoing description it will be seen that the mid-points of the electrodes 12 and 13 follow the potential of the terminals of the source of power 20 so that each alternately acts as an anode and as a cathode with respect to the other electrode.

When current flow is maintained through the tube the ionic bombardment of the luminous coating within the tube, of the luminous designs within the tube or of the luminous glass itself will produce a visible glow which may be utilized in advertising signs and the like. The passage of current through the gas within the tube itself will produce a glow within the tube of color dependent upon the gas which glow may be given various luminary effects by means of the colored liquid surrounding the glass or the etched luminous portions of the envelope. It is to be understood that these features are to be considered as applicable to the devices shown and described with reference to Figures 2 and 3 although specific mention of the various luminary effects is not specifically stated.

Referring to Fig. 2 I have shown a glow discharge tube and a supply system in which like reference characters designate like parts as those described with reference to Fig. 1. In this particular case however, we have provided a plurality of auxiliary electrodes 28 and 29 supported upon the stems 2 by means of metallic supporting members 30, 31. These auxiliary electrodes are maintained at the potential of their corresponding main electrodes by means of electrical connections shown at 32. Each of these auxiliary electrodes is positioned directly in the path of current flow between the electrodes 12 and 13.

In the operation of this device it will be seen that since the auxiliary electrodes 28 and 29 are always at the same potential as the electrodes 12 and 13 the ionic stream strikes these electrodes with the result that the electrodes 12 and 13 are protected from deterioration by ionic bombardment.

In Fig. 3 we have shown means whereby a tube may be started and operated at low voltage by producing a low drop of voltage at the cathode at each half cycle of alternating current flow through said tube. In this case we arrange at the side of the glow electrodes 12 and 13 auxiliary electrodes 35 and 36 in closely spaced relation thereto.

We have shown the lead-in wires 8, 9 and 10, 11 shorted, so that the electrodes 12 and 13 may act as those heated only by current discharge through the tube. It is to be understood however, that these electrodes may be heated in a manner similar to that described in the structure shown in Figs. 1 and 2 without departing from the spirit of our invention.

The connections for the simple direct connection from the source of alternating current power 20 to the electrodes 12, 13, 35 and 36 are as follows: Terminal 37 of the source 20 is connected to the electrode 12 through the coil 38 of a circuit breaker 40 and to the electrode 36 through the armature and contacts 41 of a circuit breaker 42 and resistance 43. Terminal 44 is connected to the electrode 13 through the coil 45 of the circuit breaker 42 and to the electrode 35 through the armature and contacts 46 of the circuit breaker 40 and a resistance 47.

The resistances 43 and 47 are of such a value that once the tube is operating the current flow between the electrodes 35 and 12 and the electrodes 13 and 36 will be much smaller than the current flow between the electrodes 12 and 13.

The operation of this arrangement is as follows: the circuit of the tube being closed across the source of power 20, in view of the small distances between the auxiliary electrodes 35, 36 and the glow electrodes 12, 13, respectively, a glow current will pass through each auxiliary electrode and its glow cathode whereby this latter is heated so that after a short time the tube will be set operating. The voltage in the tube being now very low as compared with the resistances 47 and 43 inserted between the auxiliary electrodes 35 and 36 and the glow cathodes 12, 13 respectively, the main current will now pass only between the glow cathodes 12 and 13, the auxiliary ignition being cut out automatically by the operation of the armatures 41 and 46 of the circuit breakers 42 and 40.

From the foregoing description it will be seen that we have produced a glow discharge tube and an operating system therefor which when operating upon alternating current will produce in consequence of the extremely low drop of voltage at the cathodes a very steady light and which will have a very long life, inasmuch as in view of the low drop of voltage almost no disintegration of the electrodes will take place. A tube of this kind at the same time solves a further problem, viz: the provision of a low voltage alternating current lamp for use at places where high voltage lamps are too dangerous for use, such as in shop window advertising and the like. Moreover, numerous tubes of this kind can be connected to any normal alternating current system without requiring any costly high voltage apparatus.

It will be understood that the foregoing description and accompanying drawing

comprehend only the general and preferred embodiments of our invention and that minor detail changes in the construction and general arrangement of parts may be made within the scope of the appended claims without sacrificing any of the advantages of our invention.

Having thus described our invention what we claim is:

1. In a glow lamp system including an envelope having a gas therein, and a plurality of incandescible electrodes spaced apart therein, the combination of a transformer having a primary and a plurality of secondaries corresponding in number to said electrodes, connections between each secondary and its corresponding electrode and means for maintaining the mid-point of each secondary at a predetermined potential relative to the terminals of said primary whereby each of said incandescible electrodes acts alternately as a cathode and as an anode when said primary is energized by alternating current.

2. In a glow lamp system including an envelope having a gas therein, and a plurality of incandescible electrodes spaced apart therein, the combination of a transformer having a primary and a plurality of secondaries corresponding in number to said electrodes, connections between each secondary and its corresponding electrode, means for maintaining the midpoint of each secondary at a predetermined potential relative to the terminals of said primary whereby each of said incandescible electrodes acts alternatively as a cathode and as an anode when said primary is energized by alternating current, and an auxiliary conductive metallic shield connected to one or more of said electrodes adjacent thereto and extending in the direction of the discharge path whereby the said shield will operate as an auxiliary cathode.

In testimony whereof we affix our signatures.

FRIEDRICH MEYER.
HANS-JOACHIM SPANNER.
EDMUND GERMER.