

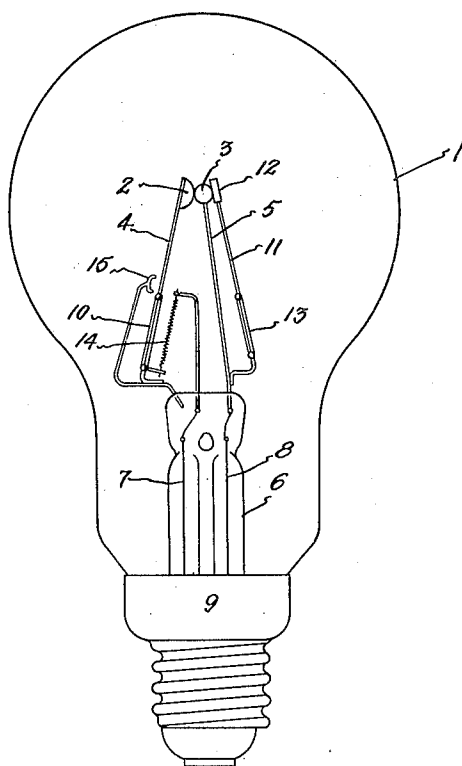
March 8, 1927.

1,620,397

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INCANDESCENT ELECTRODE DEVICE

Filed March 20, 1925



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## UNITED STATES PATENT OFFICE.

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## INCANDESCENT ELECTRODE DEVICE.

Application filed March 20, 1925, Serial No. 17,062, and in Germany June 21, 1924.

The present invention relates to the construction and operation of devices, such as electric lamps, in which an electric discharge is operated between electrodes heated to incandescence by the discharge.

It is the object of my invention to facilitate the starting of the discharge from a non-operative condition in which the electrodes are not heated.

In accordance with my invention I have provided for this purpose an arrangement whereby a discharge is first operated between one of the main electrodes and an auxiliary electrode of high electron emissivity, the opposing main electrode being heated to an operating temperature by this discharge. The auxiliary electrode later is deenergized, for example, by being moved out of arcing relation with the main electrodes. The novel features of my invention are set forth in greater particularity in the accompanying claims. For a complete understanding of my invention reference may be had to the following description taken in connection with the accompanying drawing which shows a lamp embodying my invention.

The lamp shown in the drawing is of the type described broadly in Friedrich Patent 1,393,520 of October 11, 1921. It comprises in the main a sealed bulb 1, charged with an inert gas at substantial pressure, and provided with electrodes 2, 3, the former constituting the anode and the latter the cathode. These electrodes are attached to wire holders 4, 5, which are sealed into a glass stem 6 projecting into the lamp in the usual manner. The leading-in wires 7, 8, for these electrodes are sealed by fusion into the glass stem and carried to the members of a screw base 9. The electrodes 2, 3, preferably consist of a highly refractory metal, such as tungsten or tantalum, and when the lamp is to be used for direct current operation, the anode preferably is made larger than the cathode. Included in the anode holder 4 is a bi-metal strip 10 which is adapted to change its shape when heated and thereby to separate the electrodes 2, 3. Mounted upon the cathode holder 5 is a conductive support 11 of an auxiliary electrode 12 which preferably consists of tungsten mixed with thoria, or other material which will ma-

terially enhance the electron emissivity of the electrode. Included in the support 11 is another bi-metal expansion strip 13 which also is adapted to change its shape when heated but as shown in the drawing the strip 10 is located much more closely to a series-connected electric heater 14 than is the strip 13 and hence the heating of the strip 13 is somewhat delayed with respect to the strip 10, when the lamp is connected in circuit.

At the beginning of the operation when current at suitable voltage is impressed upon the lamp, the resistor 14 becomes heated and causes the thermostatic device 10 to move the electrode 2 away from the electrode 3 until the holder 4 strikes the stop 15, the electrodes 12 and 3 remaining in contact. An arc-like discharge is thereby formed between the anode 2 and the plate-shaped electrode 12 acting as cathode. This discharge immediately heats the main cathode 3 to a high temperature. The discharge which for sake of convenience may be designated as an arc which it closely resembles, seeks the shortest path and therefore forsakes the oxidic electrode 12 and continues to operate between the main electrodes 2, 3. Thereupon the thermostatic strip 13 becomes heated and causes the electrode 12 to be moved away out of contact with the cathode 3. The electrode 12 remains inactive during the normal operation of the lamp, thus avoiding vaporization of the inactive material from its mass by continued heating to a high temperature.

It is not essential that the holder for the auxiliary electrode 12 should be connected to the holder 5 of the cathode. For example, the holder 11 may be supported directly from the stem 6 but the auxiliary electrode should be conductively connected to the negative terminal of the lamp and preferably should be lightly held in contact with the cathode 3 by the holder 11 at the time the lamp is placed in operation.

When a lamp embodying my invention is to be used for operation with alternating current certain changes should be made in the described structure which will be self-evident from the manner of operation which has been described above. My improved starting arrangement obviates the necessity of separate starting circuits as heretofore used in lamps of the described character and

it is more certain in its operation than devices in which the arc is started directly between the main electrodes without the assistance of a material of high electron emissivity than the electrodes themselves.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. An electric discharge device comprising main cooperating electrodes, an auxiliary electrode which is capable of more readily forming the seat of a discharge than one of said main electrodes, means for supporting said auxiliary electrode in electrical and thermal contact with one of said main electrodes, means for starting an arc between said contacting electrodes and another main electrode and means for moving said auxiliary electrode away from the contacting electrode after the arc has been operating an appreciable interval, thereby rendering the auxiliary electrode inactive while permitting the arc to continue operating between said main electrodes.

2. An electric lamp comprising the combination of a bulb, a charge of inert gas therein, main refractory electrodes in said bulb adapted to be heated to incandescence by a discharge in said gas between said electrodes, an auxiliary electrode containing material of higher electron emissivity than said main electrodes, means for initially starting an arc between said auxiliary electrode and one of said main electrodes and thermo-responsive means for thereupon transferring said arc to another of said main electrodes to the exclusion of said auxiliary electrode.

3. An electric discharge device comprising the combination of a container, a charge of gas therein, co-operating electrodes therein adapted to sustain an arc, means for moving said electrodes in and out of contact, an auxiliary oxidic electrode and means for causing said oxidic electrode to move into contact with one of said main electrodes when the device is non-operative and to

separate therefrom when a discharge has started between said main electrodes.

4. An electric lamp comprising a sealed bulb, an inert gas therein, main electrodes consisting of highly refractory metal, an auxiliary electrode comprising a material of higher electron emissivity than said main electrodes, means for holding said auxiliary electrode in contact with one of said main electrodes when said lamp is unlighted, an electric resistance heater connected in series with said electrodes, thermal-responsive means in said lamp for separating said main electrodes and a second thermal-responsive means arranged to function subsequent to said first means to separate said auxiliary electrode from the main electrode originally in contact therewith.

5. An electric discharge device comprising cooperating main electrodes, an auxiliary electrode which is capable of more readily forming the seat of an electric discharge than said main electrodes, means for supporting said auxiliary electrode in such position with respect to said main electrodes that an arc therefrom to one of said main electrodes will activate the opposing electrode and means responsive to said arc for transferring the arc from said auxiliary electrode to the activated electrode.

6. An electric discharge device comprising cooperating electrodes adapted to support an arc, an auxiliary electrode, means for holding said auxiliary electrode in contact with one of said electrodes when said device is inactive, means for starting an electric discharge between said electrodes and a third electrode without separating said contacting electrodes and means for rendering said auxiliary electrode inactive after said discharge has started.

In witness whereof, I have hereunto set my hand this 3rd day of March, 1925.

CURT SAMSON.