

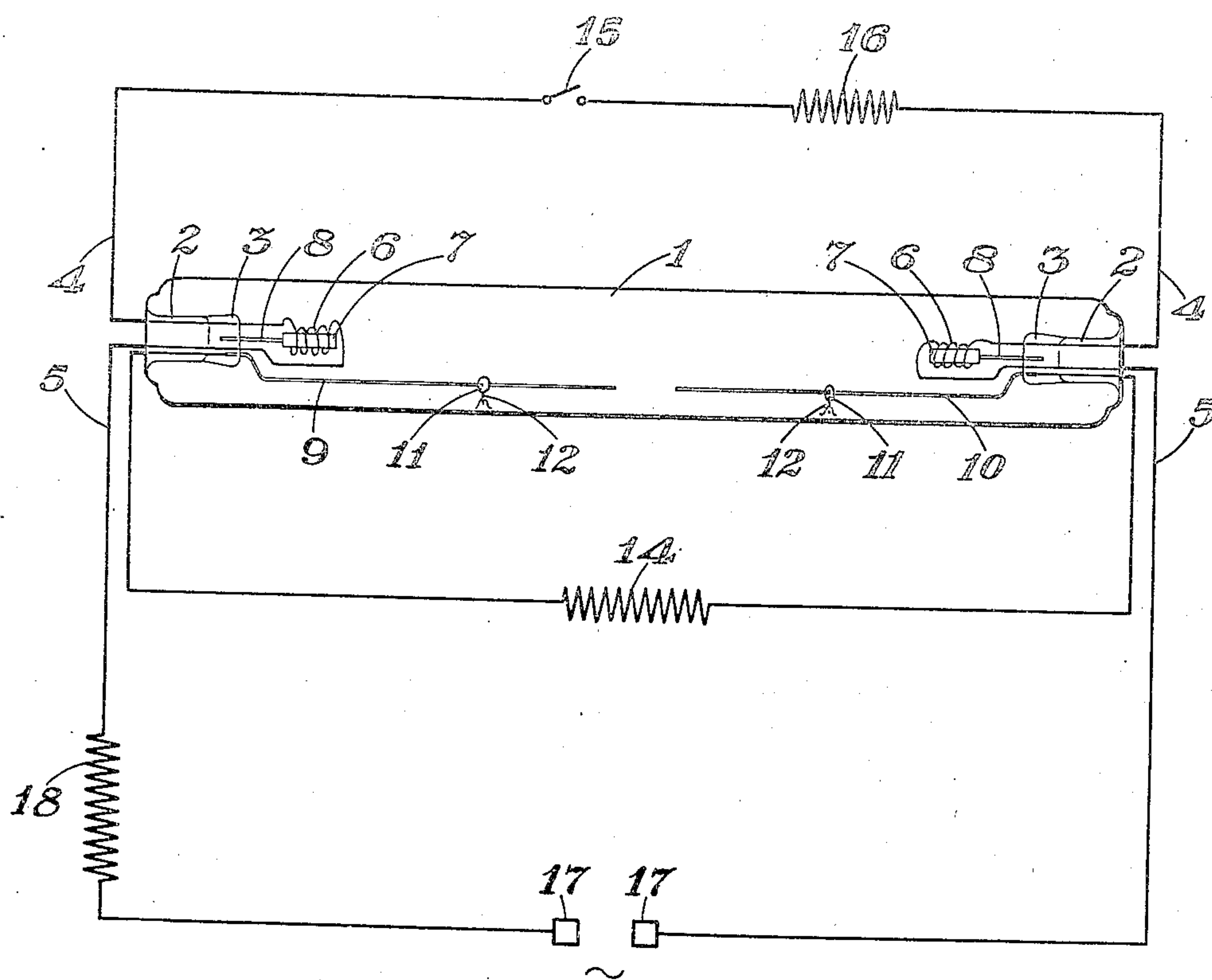
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M. PIRANI ET AL

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GASEOUS ELECTRIC DISCHARGE DEVICE

Filed April 7, 1932



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UNITED STATES PATENT OFFICE

MARCELLO PIRANI, OF BERLIN-WILMERSDORF, HANS EWEST, OF BERLIN, AND GEORG GAIDIES, OF BERLIN-PANKOW, GERMANY, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

GASEOUS ELECTRIC DISCHARGE DEVICE

Application filed April 7, 1932, Serial No. 603,862, and in Germany April 16, 1931.

The present invention relates to gaseous electric discharge devices generally and more particularly the invention relates to methods and means for starting into operation such devices of the type having thermionic electrodes.

The object of the invention is to provide a simple method and means for starting into operation gaseous electric discharge devices having thermionic electrodes. A further object of the invention is to make the starting of such electric discharge device equipped with auxiliary electrodes more positive and quicker than has been the case heretofor. Still further objects and advantages attaching to the invention and to its use and operation will be apparent to those skilled in the art from the following particular description and from the appended claims.

In accordance with these objects the device comprises two electrical conductors sealed into the container of said device, one at each end thereof. Said conductors extend along the discharge path between the electrodes in said device and terminate near the middle of the discharge path in the container of the device. Said members are electrically connected to each other through a resistance. When potential is applied to the main discharge supporting thermionic electrodes a glow discharge is struck between said electrodes and that part of the conducting member adjacent thereto. This glow discharge covers the entire length of the conducting members resulting in a heavy omission of ions and electrons which ionizes the gas in the container to facilitate the starting of the main discharge in said device. The magnitude of the resistance through which the conducting members are connected, depending upon the potential applied to the main discharge supporting electrodes and the length of the discharge path between said electrodes and said members, is such that only a strong glow discharge and not an injurious arc discharge is struck between said electrodes and said members.

In the drawing accompanying and forming part of this specification an embodiment of our invention is shown in a side elevational

view a circuit therefor being shown schematically.

Referring to the drawing the new and novel electric discharge device comprises a container 1 having a gaseous atmosphere therein consisting of gases, gas mixtures, vapors, or gas vapor mixtures and particularly neon. Said container 1 has stems 2 one at each end thereof, current leads 4 and 5 for the electrodes 6, 7 are sealed into pinch-parts 3 of said stems 2. Said electrodes 6, 7 comprises a heater filament 6 surrounding a body 7 of electron emitting material, such as the oxide of an alkali earth metal, and said body 7 is supported in said container 1 by rod 8 fused into said pinch-part 3. Leads 4 and 5 are connected to said filament 6 and leads 5 are connected to the terminals 17 of an alternating current source of commercial 110 or 220 volts. The usual ballast resistance 18 is connected into one of the leads 5. The heaters 6 of said electrodes 6, 7 are connected in series by leads 4 which, together with leads 5, form a heating circuit. Switch 15 is provided in said leads 4 as is resistance 16, said resistance 16 being provided to prevent over-heating of the electrodes 6, 7 during the starting period. This circuit is similar to the circuit shown and described in co-pending application Serial No. 500,342, filed December 5, 1930, the inventors being Marcello Pirani, Hans Ewest, and Martin Reger. Said filament 6 and said body 7 make up a thermionic electrode to support the main discharge in said device.

Two electrically conducting wires 9 and 10 are sealed into said container 1, one in each of said pinch parts 3. Said wires 9 and 10 extend along the discharge path between said electrodes 6, 7 terminating near the midpoint of said discharge path. Said wires 9 and 10 are supported by glass beads 11 at the ends of support wires 12 fused into the glass wall of said container 1. Said wires 9 and 10 are electrically connected to each other exterior to said container through a resistance 14.

In starting the electric discharge device into operation switch 15 connected into leads 4 is closed to bring the thermionic electrode

6, 7 to an electron emitting temperature, this takes place in the order of 10 to 30 seconds or less. After, or during this heating period the operating potential is applied to the electrodes 6, 7 by opening switch 15. Two glow discharges are then struck, one between each of said main electrodes 6, 7 and that part of the wires 9 or 10 adjacent thereto, the strength of said discharge being determined by said resistance 14. The glow discharges cover the entire length of said wires 9 and 10 resulting in a heavy emission of electrons and ions to quickly and heavily ionize the discharge path between said electrodes 6, 7 which facilitates the establishment of the discharge between said electrodes 6, 7. During the operation of the device said electrodes 6, 7 are maintained at an electron emitting temperature by the heat of the discharge. Various means well known in the art, such as, a relay traversed only the operating current, may be used to operate switch 15 at the desired time.

When desired the main electrodes 6, 7 of the device are of any other suitable type of thermionic electrode, for example, of the type disclosed in co-pending application Serial No. 447,051, filed April 24, 1930, the inventors being Georg Gaidies and Marcello Pirani or of the sintered, pressed, mixture of electron emitting material and high melting point metal type similar to those described in co-pending application Serial No. 377,044, filed July 9, 1929, the inventors being Marcello Pirani and Hans Ewest. These types of electrodes are brought to an electron emitting temperature by the glow discharge during the starting of the device and are maintained at such temperature by the main discharge during the operation of the device so that a heating filament therefor is not necessary. The wires 9 and 10 are, when desired, coated with an electron emitting material such as an alkali earth metal or the oxide of such metal.

While we have shown and described and have pointed out in the annexed claims certain novel features of the invention, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its use and operation may be made by those skilled in the art without departing from the broad spirit and scope of the invention.

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

1. An electric discharge device comprising a container, electrodes sealed therein, a gaseous atmosphere therein, and a plurality of electrically conducting members adjacent said electrodes and extending along the discharge path between said electrodes, said members being connected together through an external resistance.

2. An electric discharge device compris-

ing a container, thermionic electrodes sealed therein, a gaseous atmosphere therein, and a plurality of electrically conducting members adjacent said electrodes and extending along the discharge path between said electrodes, said members being connected together through an external resistance.

In witness whereof, we have hereunto set our hands this 24th day of March, 1932.

MARCELLO PIRANI.

HANS EWEST.

GEORG GAIDIES.

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