Aug. 25, 1942. L. R. PETERS 2,294,203

STARTING APPARATUS FOR ELECTRIC DISCHARGE LAMPS

Filed Jan. 9, 1941

Fig. 1.

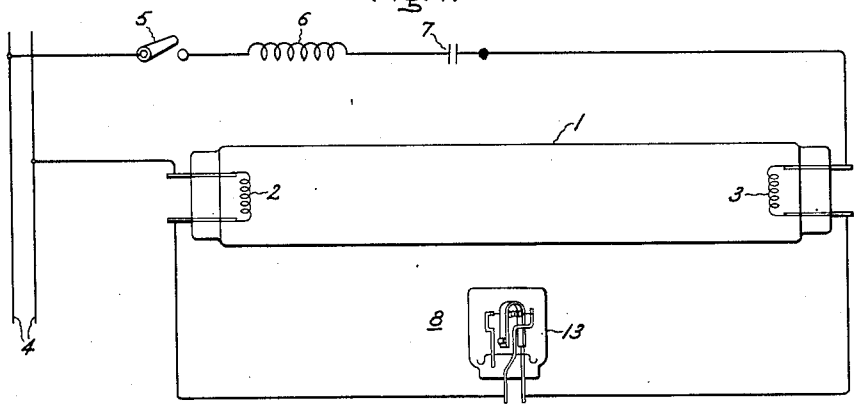
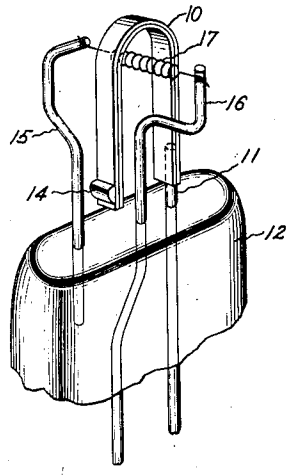


Fig. 2.



Inventor:
Leo R. Peters,
by Harry E. Dunham
His Attorney.

Patented Aug. 25, 1942

2,294,203

UNITED STATES PATENT OFFICE

2,294,203

STARTING APPARATUS FOR ELECTRIC DISCHARGE LAMPS

Leo R. Peters, East Cleveland, Ohio, assignor to General Electric Company, a corporation of New York

Application January 9, 1941, Serial No. 373,734

3 Claims. (Cl. 250—27.5)

My invention relates to the starting of electric discharge lamps of the type having thermionic electrodes which are adapted to be heated to an electron emitting temperature before the discharge in the lamp is started. A form of apparatus in common use for automatically heating the lamp electrodes by the passage of current therethrough and subsequently causing a starting voltage to be applied to the lamp comprises a switch of the so called glow discharge type, disclosed for example in the Dench Patent 2,200,443. With such a switch only a slight amount of heating of the lamp electrodes takes place during the time of the glow discharge in the switch due to the small current flow at that time. The main heating of the electrodes takes place during that short interval after the switch contacts engage each other and before they separate as a result of the cooling of the actuating member. Under certain conditions it has been found desirable that the period of heating of the lamp electrodes should be somewhat longer than provided by the switch.

It is the object of my invention to provide improved apparatus of this character whereby the period of electrode heating may be increased as desired. In accordance with my invention I provide means for supplying to the heat responsive member of the switch a small amount of additional heat when the switch closes thereby to delay the opening thereof.

My invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

Referring to the drawing, Fig. 1 is a circuit diagram of apparatus embodying my invention and Fig. 2 is a perspective view of the switch forming a part thereof. In Fig. 1, 1 is an electric discharge lamp, for example a fluorescent lamp having at its ends the filamentary electrodes 2 and 3 which are arranged to be preheated to an electron emitting temperature before the lamp is started. One end of each electrode is connected with the source 4 of alternating current which, for example, may be a 60 cycle, 115 volt lighting circuit. In the connections between the lamp and the source I have shown the main starting switch 5 and the ballast comprising the reactor 6 and the capacitor 7. Connected between the other ends of the electrodes is the thermal starting switch 8. This switch, as shown more clearly by Fig. 2, comprises the bi-metallic strip 10 preferably in the form of an inverted U having one end secured to the terminal stud 11, which is anchored in the press 12 of the enclosing enevelope 13, and the other free end having attached thereto the contact 14. Arranged opposite that contact is the stud 15 which is anchored in the press 12, the stud being so positioned that when the strip 10 is heated and tends to straighten out the contact 14 will engage it. Connected between the second terminal stud 16, which also is embedded in the press 12, and the stud 15 is the small resistance heater 17 which is arranged in close proximity to the strip 10, preferably extending through the loop thereof. It will be seen that when the contact 14 engages the stud 15 as a result of the heating of the bi-metallic strip a circuit is closed between the terminal studs 11 and 16 which includes the small resistance heater 17, the purpose of this heater being to supply a small amount of additional heat to the bi-metallic strip. The main heating of the strip is caused by a glow discharge between the strip 10 and some or all of the other elements within the envelope 13. For this purpose the enevelope is filled with a suitable ionizable gas or mixture of gases at a suitable pressure while the strip and the studs 15 and 16, and possibly also the resistance heater 17, are coated with a suitable activating material The voltage at which a glow discharge occurs in the envelope is less than that of the source 4 but greater than the operating or arc drop voltage of the lamp.

When the switch 5 is closed to energize the lamp, the lamp does not immediately start since its starting voltage is above that of the voltage of the source. However, a glow discharge does immediately occur at the starting switch between the bi-metallic strip and the studs 15 and 16 and possibly also the resistance 17. The heat of the glow discharge causes a straightening movement of the strip whereby the contact 14 thereon engages the stud 15. This closes a low resistance circuit through the two lamp electrodes and the ballast whereby the temperature of the electrodes is quickly raised to an electron emitting point. Since this movement of the strip short circuits the glow discharge path, the supply of heat immediately ceases and the strip begins to cool and return to its original shape whereupon the switch automatically opens the electrode heating circuit. The resulting surge due to the effect of the reactance of the ballast causes the lamp to start.

In certain cases, it has been found that the time during which the thermal switch is closed is insufficient to enable the lamp electrodes to

reach the desired temperature before the starting voltage is applied to the lamp. This difficulty is avoided by the small heater 17 which, during the time that the thermal switch contacts are closed, and hence the glow discharge is extinguished, supplies a certain small quantity of heat to the bi-metallic strip partially to compensate for its loss of heat. In this manner the interval during which the thermal switch is closed is lengthened thereby to enable the lamp electrodes to attain their desired electron emitting temperature before the starting voltage is applied to the lamp.

I have chosen the particular embodiment described above as illustrative of my invention and it will be apparent that various modifications may be made without departing from the spirit and scope of my invention which modifications I aim to cover by the appended claims.

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

1. A thermal switch for controlling the supply of heating current to the electrodes of an electric discharge lamp comprising cooperating contacts, a heat responsive deformable member connected with one of said contacts for moving that contact to closed circuit position, a member spaced from said deformable member between which members an electric discharge is adapted to occur, and a resistance heater adjacent to and in thermal relation with said deformable member and connected in series with said contacts, the rate of heat transmission from the heater to the deformable member being less than the rate of heat dissipation from the deformable member, thereby delaying the subsequent separation of the contacts.

2. A thermal switch comprising cooperating members, one of said members being responsive to the heat of an electric discharge between the members to engage the other member and quench the discharge whereby said members alternately engage and disengage each other, and a resistance heater connected in series with said members and mounted to heat said one member, the rate at which heat is transmitted from the heater to said one member when the members are in engagement with each other being less than the rate at which heat is dissipated from said one member at that time, thereby producing a delay in the disengagement of said members.

3. A thermal switch comprising cooperating members, one of said members having a bimetallic looped portion mounted when heated by an electric discharge between the members to bend into engagement with the other member whereby the discharge is extinguished and the members subsequently separate, and a resistance heater connected in series with said members and positioned within said looped portion, the rate of heat transmission from the heater to the bimetallic looped portion when its members are in engagement with each other being less than the rate of heat dissipation from the bimetallic looped portion.

LEO R. PETERS.