Oct. 17, 1950 F. G. A. HAEGELE 2,526,559

ELECTRIC DISCHARGE LAMP AND CIRCUIT THEREFOR

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FIG. 1.

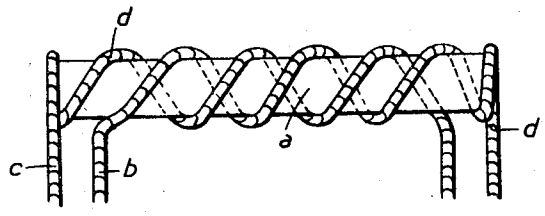


FIG. 2.

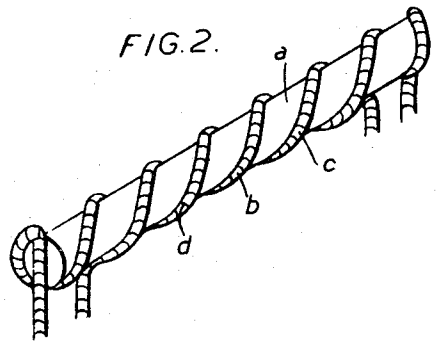
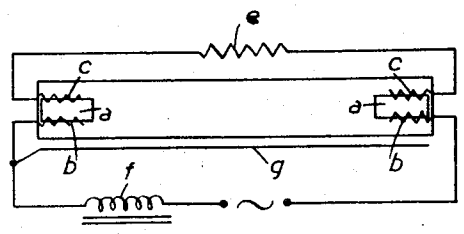


FIG. 3.



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ELECTRIC DISCHARGE LAMP AND CIRCUIT THEREFOR

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6 Claims. (Cl. 176—126)

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This invention relates to gaseous electric discharge lamps of the type comprising a pair of main operating electrodes thermionically activated and means for initiating a discharge between them, as for example in a low pressure discharge lamp of the type containing a fluorescent substance excited by the radiation from the discharge. When such lamps are adapted for use in circuit with the mains voltages in common use in this country, viz. 200/250 v., at 50 cycles per second, it is usual to provide special switching arrangements which enable a starting circuit to function until the cathodes have reached emissive temperature whereupon a circuit interruption causes the lamp to "strike."

It has heretobefore been proposed to dispense with such starting arrangements by the employment of cathodes which are "self-starting."

A feature of the present invention is a discharge lamp having a cathode at each end of the lamp comprising a core of electrically conductive refractory material having incorporated in it a thermionically active material, on which core are mounted two spaced apart wires, one end of each wire being taken to a terminal at that end of the lamp, the arrangement being such that the lamp is adapted to be connected so that one lamp terminal at each end thereof may be connected to a source of electric supply in series with a suitable impedance (e. g. choke) whilst the other two lamp terminals are connected through a current limiting device, the construction of the cathodes being such that on connection to the supply source, small isolated areas on the cathodes are brought to an emissive state by current passing between each pair of the spaced apart core wires through points of contact on their respective cores, the circuit of this current being shunted by the relatively low resistance discharge path when the lamp strikes.

The term "end of the lamp" is used in its ordinary significance when the lamp is tubular but the invention may be used in lamps of other shape, for instance spherical, and in such a case, as is usual, by "end of the lamp" is meant that part of the lamp situated near an end of the discharge path.

The above and other features of the invention will be more readily understood by a perusal of the following description of one embodiment thereof which is illustrated in the accompanying drawings in which Figure 1 is a side elevation of a cathode for a lamp according to the invention, Figure 2 is a perspective view and Figure 3 illustrates a circuit in which the lamp may be used.

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The drawings are diagrammatic, Figures 1 and 2 being to an enlarged scale. In Figures 1 and 2 a cathode comprises a core *a* of refractory metal, highly porous and with a rough surface having a high electrical conductivity in the cold state and which contains a suitable thermionically active material which is incorporated either during or after fabrication from coarse refractory metal powder. For instance, the refractory powder may be of tungsten and the thermionically active material be barium oxide. The composite core may be made by compressing a mixture of the tungsten and barium oxide with or without a removable binder, e. g. paraffin wax. The manufacture of cores of this nature is well known in the art and further description is considered unnecessary. This core is held in two interwound helices *b* and *c* each composed of a wire overwound with another wire *d* so that this second wire *d* forms projections on the surface of the helices which make contact at isolated points with the core. All the wires are preferably of tungsten. The interwound helices are not in electrical connection, except through the core, and are mounted rigidly on the lamp foot so that the core is retained within them but is not clamped tightly. One helix, say *b*, has one end connected to one terminal of the lamp and the other helix *c* has one end connected to another terminal of the lamp at the same end thereof, whilst the other ends of the helices have no electrical connection between them except through the core.

In Figure 3 one helix of each cathode is joined to one helix of the cathode at the other end of the discharge tube, by way of a resistance *e* or other impedance of a few thousand ohms in value. The remaining two helices are connected to the mains supply AC in series with a stabilizing impedance *f* for the arc in the customary manner. An auxiliary electrode *g* in the form of a conducting metallic strip deposited on the tube wall and either connected to one electrode helix directly, or arranged in close spatial relationship therewith, may be used for the dissipation of random wall charges which impede starting.

When current is supplied to this circuit a multiplicity of small arcs occur between the rough metallic core and the surrounding helices which serve to produce highly activated hot spots which act as the cathode spots for initiating the main discharge.

The hot spots considerably facilitate the formation of a discharge and their size and number can be governed by the roughness of the core, the pitch of the secondary helix on the supporting

primary helices and, if necessary, by shaping the primary helices to present more isolated points of contact to the core, thereby raising the current density at each spot.

Due to the means of formation of incandescent, highly emissive spots independent of the main discharge, the restarting peak at each half cycle of an A. C. discharge device will be markedly reduced, whereby an improvement in its power factor results.

The symmetrical structure of the cathode is an advantage in that the lamp may be inserted in an ordinary type of fitting without the possibility of its being connected incorrectly, e. g. the wrong way round, since the spaced apart wires of the cathodes are obviously interchangeable in function.

Various modifications may be made in the specific arrangements described without exceeding the invention.

What is claimed is:

1. In a discharge lamp a cathode at each end of the discharge path each cathode comprising a core of electrically conductive refractory material incorporating a thermionically active material, two spaced apart wires mounted on each core, one end of each wire connected to a terminal at the corresponding end of the lamp and the other end of each said wire being free and each wire making electrical connection at isolated points with the respective core.

2. In a discharge lamp a cathode at each end of the discharge path each cathode comprising a core of electrically conductive refractory material incorporating a thermionically active material, two helical wires interwound on each core, one end of each wire connected to a terminal at the corresponding end of the lamp and the other end of each said wire being free and each of said wires being separately overwound with a conducting wire making isolated points of contact with the respective core.

3. In a discharge lamp a cathode at each end of the discharge path each cathode comprising a refractory core of high porosity with a rough surface and of high electrical conductivity in a cold state and incorporating thermionically active material, two helical wires interwound on each core, one end of each wire connected to a terminal at the corresponding end of the lamp and the other end of each said wire being free and each of said wires being separately overwound with a conducting wire making isolated points of contact with the respective core.

4. In a discharge lamp a cathode at each end of the discharge path, each cathode comprising a core of cylindrical shape with protuberances formed upon it and consisting of electrically conductive refractory material incorporating a thermionically active material, two spaced apart wires wound on each core making contact with said protuberances, one end of each wire being connected to a terminal at the corresponding end of the lamp and the other end of each said wire being free.

5. In a discharge lamp a cathode at each end of the discharge path, said cathode comprising a circular cylindrical core of electrically conductive refractory material incorporating a thermionically active material, two separate and intermeshed wire coils non-circular in cross-section mounted on each core and making isolated points of contact therewith, one end of each wire being connected to a terminal at the corresponding end of the lamp and the other end of each said wire being free.

6. In a discharge lamp a cathode at each end of the discharge path, each cathode comprising a core of cylindrical shape non-circular in cross-section and consisting of electrically conductive refractory material incorporating a thermionically active material, two separate and intermeshed wire coils circular in cross-section mounted on each core and making isolated points of contact therewith, one end of each wire being connected to a terminal at the corresponding end of the lamp and the other end of each said wire being free.

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