CIRCUIT ARRANGEMENT FOR ELECTRIC DISCHARGE LAMPS

Filed Dec. 29, 1949
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Application December 29, 1949, Serial No. 135,635
In Great Britain January 1, 1949

1 Claim. (Cl. 315—257)

When an electric discharge lamp is provided with cathodes which require to be heated before the lamp strikes it is usual to employ a cathode heater through which current is passed prior to the lamp striking, such current causing the heaters to operate and warm the cathodes. When the lamp has struck, the heat generated by the discharge is sufficient to maintain the cathodes at operating temperature and if no precautions are taken this heat together with that generated by the preheating current would cause overheating of the cathodes and cause them to deteriorate rapidly so that their useful life would be short since the impedance in the circuit is different after the lamp has struck from what it was before, means must be provided to control the current in the circuit. This was usually effected by means of a choke coil serially connected in the discharge path. Many expedients have been suggested and used for reducing the flow of the preheating current when the lamp has struck and the present invention is a circuit arrangement of novel and simple design to provide this facility.

According to a feature of the present invention a circuit arrangement for an electric discharge lamp comprises an auto-transformer provided with winding sections for supplying heating current to the electrodes of the lamp and wherein the steady voltage applied across the discharge path is only a predetermined portion of the potential difference across the auto-transformer, the arrangement being such that when the lamp has struck, part of the winding of the auto-transformer is substantially by-passed by the lamp discharge path and the remainder of the winding acts as a normal stabilising choke.

According to another feature of the invention the auto-transformer is placed in longitudinal proximity to the lamp so as to facilitate starting.

The above and other features of the invention will be more readily understood by a perusal of the following description having reference to the accompanying drawings of which Figure 1 is a circuit diagram for a discharge lamp according to the invention; Figure 2 is a plan view of an auto-transformer which may be used in the circuit of Figure 1; and Figure 3 is a side elevation and Figure 4 an end elevation of the parts shown in Figure 2.

Referring to Figure 1, an auto-transformer A is supplied with alternating current from mains M and in the example given this voltage is 230. The transformer has two main sections H and D and two small sections B and C which latter supply heating current to the cathodes E of the lamp L. The lamp is an ordinary fluorescent discharge lamp and further description of it will be unnecessary. The sections B and C are arranged to supply a voltage of approximately 10—12 volts across the lamp electrodes E. The section D of the auto-transformer winding has induced in it a voltage of say 130 this being adequate for causing the lamp to strike.

When the lamp has struck, the section D of the winding as well as the small sections C and AB are placed in parallel with the discharge path of the lamp so that in this condition only a very small current flows through these windings. The winding H is in series with the lamp discharge path and therefore serves as an ordinary choke coil to limit the current flowing in the lamp circuit.

The auto-transformer may be constructed in accordance with Figures 2, 3 and 4. It comprises a plurality of insulated laminations of magnetic material of E shape assembled in known manner to provide a central core I and a yoke 2. The windings H, D, B and C are mounted on the core as indicated to constitute a leaky auto-transformer. The coils B, C and D form a single coil unit, the sections B, C and D being constituted by tappings which are connected to terminal tags T1, T2, T3, T4 and T5. The tags T1 and T5 are adapted to connect to one cathode heater E (Figure 1), the tags T2 and T3 being connected to the other cathode heater E, whilst the winding D is connected to the tags T2 and T3. A tag T4 is connected to T1 and a tag T5 is connected to one end of the coil H the other end of which is connected to tag T1. Tags T3 and T4 are adapted to be connected to the terminals of the mains supply source M. The specification of the windings may be as follows:

Coil H—2500 turns of diameter 0.00923";
Coil D—1600 turns of diameter 0.00767";
Coils B and C each 120 turns diameter 0.01244".

In order to assist in causing the lamp to strike, which is sometimes difficult especially when the surrounding temperature is very low, it has been the practice to provide what was known as a "starting strip." This was a length of metal wire or foil extending from one end of the lamp to the other and being held close to the outside surface of the lamp envelope. We have found that the transformer designed as above having a length much greater than its width and depth may in effect constitute a starting strip if the transformer is mounted in close proximity with the
lamp and parallel therewith. Such an arrangement would be diagrammatically illustrated in Figure 1 by making the leads between the coils B and C and their respective lamp electrodes as short as possible.

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

A circuit arrangement for an electric discharge lamp comprising an auto-transformer in the form of a plurality of serially connected windings, the outermost ends of the transformer being connected to mains supply terminals and the transformer comprising two large windings and two small windings, all the windings being serially connected and the auto-transformer being of elongate form, an elongated discharge lamp situated in close parallel relation with the auto-transformer, a cathode heater at each end of the lamp, one cathode heater being serially connected with one small winding of the transformer and the other cathode heater being serially connected with the other small winding of the transformer, one only of the large windings of the transformer being interposed in the circuit between the two said small windings, the other large winding being connected directly in series between a mains terminal and the lamp discharge path.

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