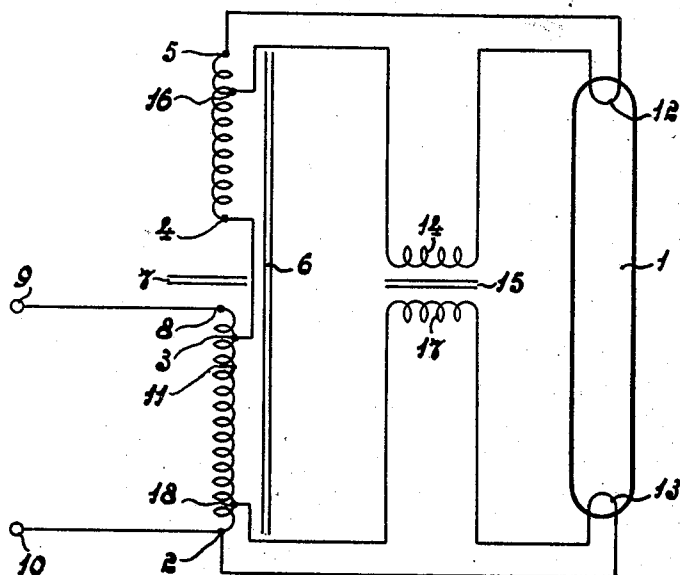


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GAS VAPOR DISCHARGE TUBE DEVICE

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GAS OR VAPOR DISCHARGE TUBE DEVICE

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2 Claims. (Cl. 315—98)

The present invention relates to an electric discharge device circuit arrangement. More particularly, the invention relates to a device or circuit arrangement comprising a gas or vapor discharge tube, having two filament electrodes, which are connected to different windings of a filament current transformer.

If, for example due to an excessively high transition resistance between a tube holder contact and a tube contact, the filament current circuit of one of the filament electrodes is interrupted, the discharge current circuit being, however, intact, the tube is capable of igniting with a cold filament electrode. This is harmful to the lifetime of the tube.

The invention has for its object the elimination of this disadvantage.

According to the invention the filament current transformer is a stray transformer having a magnetic shunt, in which the filament current windings are arranged each on one side of the magnetic shunt. The filament current circuits are interconnected magnetically by a coupling transformer, the no-load impedance of which is substantially greater than its full-load impedance.

In order that the invention may be readily carried into effect, it will now be described more fully with reference to the accompanying drawing, in which the single Figure is a schematic diagram of an embodiment of the circuit arrangement of the present invention.

In the drawing, reference numeral 1 designates a gas or vapor discharge tube, for example a 20 watt fluorescent lamp of about 60 cms. in length and about 3.5 cms. of inner diameter, this lamp absorbing, in normal operation, a current of about 0.37 ampere at a tube voltage of about 60 volts.

The tube 1 is connected to the secondary supply-winding (constituted by two parts 2—3 and 4—5) of a stray transformer 6, shown herein as an autotransformer, having a magnetic shunt 7. The primary winding 2—8 of the transformer 6 is connected to an alternating voltage supply source 9—10 of for example 80 to 130 volts and 50 or 60 cycles per second frequency. The point 8 of the primary winding is intended for higher values and the point 11 for lower values of the supply source voltage.

If desired, points lying between these points may be used for supply source voltage connection. As an alternative, the part of the primary winding not employed may be omitted.

The part 2—3 represents the part of the secondary winding, coupled closely with the primary winding. The part 4—5 of the secondary winding, arranged on the other side of the magnetic shunt 7, is the loosely coupled part of the secondary winding.

The tube 1 is provided with two filament electrodes 12 and 13, which are constituted by helical tungsten wires coated with a substance which is highly electron-emissive at a higher temperature.

The tube may be provided, on the inner side or on

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the outer side of the discharge vessel, with a conductive coating to facilitate the ignition.

The electrode 12 is connected in series with a winding 14 of a coupling transformer 15 to a filament current winding 5—16 of the transformer 6. The electrode 13 is connected in series with a winding 17 of the coupling transformer 15 to a filament current winding 2—18 of the transformer 6.

The filament current windings are located one on each side of the magnetic shunt 7, so that the winding 2—18 is closely coupled with the primary winding and with the part 2—3 of the secondary winding, and the winding 5—16 is closely coupled with the part 4—5 of the secondary winding.

If voltage is applied to the device in normal operation the electrodes 12 and 13 are rapidly heated to emissive temperature at a mean electrode voltage of about 10 volts and a mean filament current of about 0.4 ampere, since the resistance of tungsten is considerably lower at the ambient temperature than at the emissive temperature. The tube ignites after about 0.7 second at the voltage of about 155 volts of the secondary winding 2—3—4—5.

If an interruption occurs in one of the filament current circuits, the other filament current circuit is traversed only by a low current. The value of this low current is mainly determined by the impedance of the coupling transformer 15 in its zero load condition; this impedance is chosen to be so high that the filament current through the non-interrupted filament current circuit is only about 25 milliamperes. This current is insufficient for the filament electrode of the intact filament current circuit to assume the emissive temperature. Therefore in the case of an interruption of one of the filament current circuits, the tube cannot ignite.

By way of example it is stated that the coupling transformer 15 was constructed as a shell transformer without air gap, having a core diameter of 12.8 x 20 mm. and 365 turns of copper wire of 0.25 mm. in diameter for each of the windings 14 and 17. The zero load impedance of the coupling transformer at a connecting voltage of 24 volts was about 1000 ohms and the impedance at a connecting voltage of 15 volts and a secondary load current of 0.4 ampere was about 37 ohms.

In the case of an interruption of one of the filament current circuits, the voltage of the corresponding filament current winding and, through the coupling transformer, the voltage of the other filament current winding, occur across this interruption, i. e. in an additive sense. Due to the sum voltage thus occurring, the interruption is bridged more easily than, in the case of the omission of a coupling transformer, by means of the voltage of only one filament current winding.

In the case of a short-circuit of one of the filament electrodes, the full load impedance of the coupling transformer is maintained in the filament current circuit concerned, so that the overload of the associated filament current winding is comparatively low, a current of not more than about 0.5 ampere occurring.

The stray transformer 6 was constructed in the form of a shell transformer having a core diameter of 17 x 20 mms., 1070 turns for the part 2—3 of the secondary winding, of which 250 turns comprised the filament current winding 2—18, and 825 turns for the part 4—5 of the secondary winding, of which 160 turns comprised the filament current winding 16—5, all of them made of copper wire of 0.3 mm. in diameter. Each of the two magnetic shunt parts had a sectional area of 12 x 17 mms. and an air gap of 2 x 0.1 mm.

After the ignition of the tube 1 the voltage across the secondary winding 2—3—4—5 was equal to the tube voltage of about 60 volts; the current through the con-

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nections between the tube and the points 2 and 5 respectively was about 0.44 ampere. The current across the winding 14 or 17 of the coupling transformer 15 was about 0.135 ampere, the current through the winding part 4—16 about 0.37 ampere, the current through the winding part 18—3 about 0.32 ampere. If the current source 9—10 of about 100 volts and 60 cycles per second is connected to the winding part 2—3, the current absorption in normal operation is about 0.675 ampere.

While the invention has been described by means of specific examples and in a specific embodiment, I do not wish to be limited thereto, for obvious modifications will occur to those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. A circuit arrangement comprising an electric discharge device having first and second electrodes of filamentary type, a filament supply transformer having first and second windings arranged on the core thereof and having a magnetic shunt interposed between said windings, an auxiliary transformer having a primary winding and a secondary winding, means for connecting said first winding, said primary winding and said first electrode in series circuit arrangement, means for connecting said second winding, said secondary winding and said second electrode in series circuit arrangement, said auxiliary transformer having a no-load impedance substantially greater than its full-load impedance whereby interruption of current flow to either of said electrodes prevents

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ignition of said device, and means for applying an igniting potential to said electrodes.

2. A circuit arrangement comprising an electric discharge device having first and second electrodes of filamentary type, a filament supply autotransformer having an input section and a plurality of output sections arranged on the core thereof and having a magnetic shunt interposed between said output sections, means for applying a voltage to said input section, an auxiliary transformer having a primary winding and a secondary winding, means for connecting one of said output sections, said primary winding and said first electrode in series circuit arrangement, means for connecting another of said output sections separated from said one output section by said shunt, said secondary winding and said second electrode in series circuit arrangement, said auxiliary transformer having a no-load impedance substantially greater than its full-load impedance whereby interruption of current flow to either of said electrodes prevents ignition of said device, and means for connecting a third of said output sections to said electrodes for applying an igniting potential thereto.

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