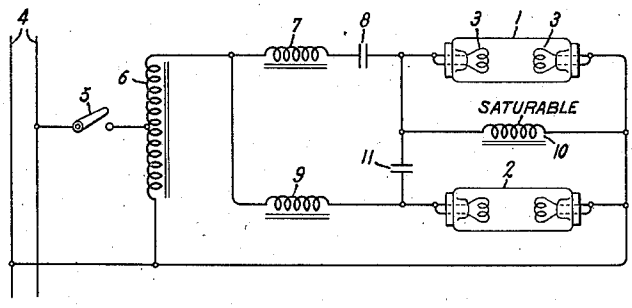
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STARTING AND CONTROLLING APPARATUS FOR ELECTRIC DISCHARGE LAMPS

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Inventor:
John H. Campbell,
by Harry E. Dunham
His Attorney.

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STARTING AND CONTROLLING APPARATUS FOR ELECTRIC DISCHARGE LAMPS

John H. Campbell, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York

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My invention relates to apparatus for starting and controlling electric discharge devices such as discharge lamps of the fluorescent type. As is well known, discharge lamps require a higher voltage for starting than for their subsequent operation. Such lamps in common use at the present time have filamentary electrodes and have apparatus associated therewith by which heating current is passed through the electrodes to heat them to an electron emitting temperature before the starting voltage is applied thereto. As a result of recent developments in the construction of such lamp electrodes the lamps may be started without prior heating of the electrodes, that is, started "cold cathode" without serious injury to the electrodes. It is the object of my invention to provide improved apparatus for producing the voltage necessary to effect the starting of such lamps without preheating their electrodes. A further object of my invention is to provide apparatus which while effective to start a lamp will also control its subsequent operation with the attendant energy losses reduced to a low value.

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.

In the single figure of the drawing which is a circuit diagram illustrating an embodiment of my invention two electric discharge devices 1 and 2 which, for example, may be 40 watt fluorescent lamps of similar construction and of common and well known form each having the filamentary or thermionic electrodes 3 are connected to be operated in parallel from the source of alternating current supply 4. The source may be a 60 cycle, 118 volt lighting circuit and the connection therewith is shown controlled by the line switch 5. Connected between the lamp circuits and the source 4 I employ suitable means, such as the autotransformer 6, for stepping up the voltage of the source to a somewhat higher value, for example 275 volts. In the circuit of the lamp 1 is the lamp ballast comprising the reactor 7, which for example may have an impedance of 890 ohms, and the capacitor 8, which for example may have an impedance of 1610 ohms. In the circuit of the lamp 2 is the lamp ballast comprising the reactor 9, which for example may have an impedance of 520 ohms. Thus it will be seen that the net impedance in the circuit of the lamp 1 is capacitive whereby the lamp current in that circuit is leading and the impedance in the circuit of the lamp 2 is inductive whereby the lamp current in that circuit is lagging. Preferably the impedances in

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the two lamp circuits have such values that the total energy taken from the source of supply has a power factor close to unity.

As mentioned above, the lamps which I employ although provided with thermionic electrodes do not have their electrodes preheated but rather are started "cold cathode." I obtain the voltage necessary so to start the lamps in the parallel connected circuits illustrated by means of circuits which shunt the lamps and which include fixed circuit elements which circuits I shall now describe. Connected across the lamp 1 is the reactor 10 and connected across the lamp 2 is the same reactor 10 in series with the capacitor 11, the reactor 10 thereby being common to the two lamp shunting circuits. The reactor 10 is constructed to saturate at the voltage applied thereto immediately upon the closing of the switch 5 and before the lamps start and in its saturated condition the impedance of that reactor may, for example be 1450 ohms. As soon as the lamps start the reactor 10 desaturates and in its desaturated condition its impedance may, for example, be 2550 ohms. The impedance of the capacitor 11 may, for example, be 3540 ohms. The resulting voltages applied to the lamps are sufficient to cause them immediately to break down upon the closing of the switch 5 after which they continue to operate, the one on a leading current circuit, the other on a lagging current circuit with but slight energy loss in the circuits shunting them.

The reactive circuit which shunts the lamp 1 will, for convenience, be spoken of as having reactance opposite in character to that of the circuit of the lamp 1 inasmuch as the reactive voltage across the reactor 10 is opposite to the net reactive voltage across the ballast 7 and capacitor 8. Likewise, the reactive circuit which shunts the lamp 2 will be spoken of as having reactance opposite in character to that of the circuit of the lamp 2 since the net reactive voltage across the reactor 10 and the capacitor 11 is opposite to the reactive voltage across the ballast 9.

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

1. In combination, a plurality of reactive lamp circuits each arranged to include an electric discharge lamp, one of said circuits being capacitive and the other inductive, said circuits being connected together to be supplied in parallel from a source of alternating current supply having a voltage less than that required to start the lamp, and a reactive circuit connected to shunt each lamp and functioning with the lamp circuits to

produce a high voltage to start the lamps, each of said shunt circuits having reactance opposite in character to that of the circuit of the lamp which it shunts and said shunt circuits having a reactive member in common.

2. In combination, a plurality of reactive lamp circuits each arranged to include an electric discharge lamp, said circuits being connected together to be supplied in parallel from a source of alternating current supply, the reactance of one of said circuits being capacitive and the reactance of the other being inductive, an inductive circuit connected to shunt the lamp in said one circuit and a capacitive circuit connected to shunt the lamp in said other circuit, said shunt circuits having an inductive reactive member in common.

3. In combination, a plurality of reactive lamp circuits each arranged to include an electric discharge lamp, said circuits being connected together to be supplied in parallel from a source of alternating current supply, the reactance of one of said circuits being capacitive and the reactance of the other being inductive, an inductive circuit including an inductive reactor arranged to shunt the lamp in said one circuit and a capacitive circuit including said reactor arranged to shunt the lamp in said other circuit.

4. In combination, a plurality of reactive lamp circuits each arranged to include an electric discharge lamp, said circuits being connected together to be supplied in parallel from a source of alternating current supply, the reactance of one of said circuits being capacitive and the reactance of the other being inductive, an inductive reactor connected across the lamp in said one circuit, and a capacitor in series with said inductive reactor connected directly across the lamp in said other circuit.

5. In combination, a source of alternating current supply, a plurality of reactive lamp circuits each including an electric discharge lamp, said circuits being connected to be supplied in parallel from said source, one of said circuits being capacitive and the other inductive, an inductive reactor connected across the lamp in said capacitive circuit, and a capacitor and said inductive reactor connected in series across the lamp in said inductive circuit.

6. In combination, a source of alternating current supply, a plurality of reactive lamp circuits each including an electric discharge lamp, said

circuits being connected to be supplied in parallel from said source, one of said circuits being capacitive and the other inductive, a saturable reactor connected across the lamp in said capacitive circuit, and a capacitor in series with said reactor and connected with said reactor across the lamp in said inductive circuit, said reactor being constructed to saturate at the voltage applied thereto before the lamps start and to desaturate at the voltage applied thereto after the lamps start.

7. In combination, a source of alternating current supply, a step-up autotransformer connected therewith, a plurality of lamp circuits each containing an electric discharge lamp connected to be supplied in parallel from said transformer, one of said circuits including both inductive and capacitive ballasting means, the latter predominating, the other of said circuits including inductive ballasting means only, an inductive reactor connected across the lamp in said one circuit, and a capacitor and said reactor connected in series directly across the lamp in said other circuit.

8. In combination, a source of alternating current supply, a step-up autotransformer connected therewith, a plurality of lamp circuits each containing an electric discharge lamp connected to be supplied in parallel from said transformer, one of said circuits being capacitive and including a reactor and a capacitor and the other being inductive and including a reactor, a saturable reactor connected across the lamp in said capacitive circuit and a capacitor in series with said saturable reactor and connected with said saturable reactor across the other lamp.

JOHN H. CAMPBELL.

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