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DISCHARGE LAMP APPARATUS

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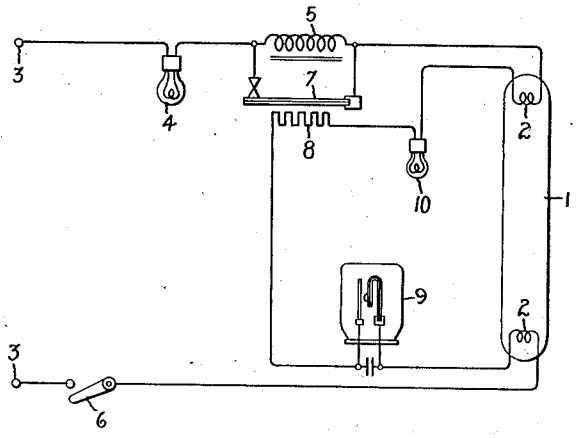

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DISCHARGE LAMP APPARATUS

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4 Claims. (Cl. 315—100)

Our invention relates to apparatus for starting and operating discharge lamps. Since such lamps have a negative temperature resistance coefficient it is necessary to employ a suitable ballasting impedance in series therewith. A form of such ballasting impedance commonly employed is a choke coil or reactor which functions not only to ballast the lamp but supplies a voltage surge by which the lamp is started. Where the ballast employed is resistive, however, a starting voltage surge is lacking. One may of course add a reactor for the benefit of starting the lamp but the cost of it would be objectionable for, inasmuch as such a reactor would remain in the circuit during the operation of the lamp, it would necessarily have to be a size suitable for continuous use.

It is the object of our invention to provide an improved lamp circuit wherein even though the ballast is largely if not entirely resistive the lamp may be started by a voltage surge without the above mentioned objectionable cost.

In accordance with our invention we employ in the lamp circuit a reactor of relatively light and accordingly inexpensive construction which while suitable for starting purposes would not be adapted for continuous use in the lamp circuit. We provide a switch which normally short-circuits this reactor, that is, during the operation of the lamp but which is opened when the lamp is to be started.

Our 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 our invention 1 represents an electric discharge lamp, such for example as a fluorescent lamp, having therein the spaced thermionic electrodes 2. The lamp is connected to be supplied by alternating current from the source 3 which may be a 115 volt 60 cycle lighting circuit. As shown the lamp is resistance ballasted, the ballast being represented by way of example as comprising the series connected incandescent lamp 4 which may be of common construction having a tungsten filament. Connected also in series with the lamp is the choke or reactor 5 and the control switch 6. The reactor 5 is of relatively light construction being lighter than that which would be required were it intended to be included in the path of the current supplied to the lamp during its operation. It may be safely employed in the lamp circuit, however, for short intervals and is capable of producing a desired inductive kick or voltage surge to effect the starting of the lamp. The reactor 5 normally is short-circuited by the switch 7, that is, it is short circuited and hence ineffective during both the non-operation and the operation of the lamp. Although switches of various forms may be used we prefer and have illustrated the switch by way of example, as one of the thermal type having a bimetallic operating member. Inasmuch as the switch illustrated depends for its operation upon temperature changes the controlling member therefor is shown as the heater 8 which is arranged in good thermal relation therewith. The switch is self-biased to its closed circuit position but when heated by its heater is deflected to an open circuit position; hence, the switch may be defined as normally closed since that is its position when its actuating heater is not energized. Moreover, that is its position at all times except during a brief interval at each starting of the lamp. When the lamp is to be started the heater is energized to cause the switch to open thereby making the reactor available as a source of starting voltage.

For starting the lamp one may use a starting switch of any one of various well-known forms which connect across the lamp. We have chosen to show as a part of the present embodiment of our invention a glow discharge thermal starting switch. This switch 9 is connected in a series circuit with the heater 8 which circuit is bridged across the lamp. Where it is desired to preheat the lamp electrodes before applying the starting voltage the series circuit is connected to include them also as illustrated by the drawing. The construction of the switch 9 is such that the voltage of the source applied to the lamp before it breaks down is sufficient to cause a glow discharge in the switch which by heating its thermal element causes the switch to close and thus short-circuit the glow discharge path. Because of the resulting cooling of the thermal element the switch then opens and presumably the lamp starts. After it has started the voltage across it is insufficient to produce a glow in the starting switch; hence, the starting switch remains open. This switch may therefore be defined as a normally open switch since it is open when not energized and is in that position at all times except a very brief interval at each starting of the lamp. Inasmuch as the heater 8 is connected in series with the starting switch it becomes heated by the current flow therethrough

particularly when the switch closes and effects the opening of the switch 7.

Preferably the thermal inertia of the switch 7 is somewhat greater than that of the starting switch so that the latter will open and close again at least once before the switch 7 opens. It will be understood that prior to the opening of the switch 7 an opening of the starting switch probably will not start the discharge since the reactor 5 is inoperative to produce the starting voltage usually required. Soon after the lamp starts, the switch 7 will have cooled sufficiently to close the short circuit it provides about the reactor since the circuit of the heater 8 is maintained open by the starting switch.

If the ballast lamp 4 employed is such that it is fully loaded when the discharge lamp is operating it will be overloaded during the electrode preheating or lamp starting period. This condition we avoid by the insertion of a resistance, such for example as the small incandescent lamp 10, in the series circuit including the heater and the starting switch such that the ballast lamp will be only approximately fully loaded during the starting period.

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

1. In combination an electric discharge lamp having spaced thermionic electrodes, lamp ballasting means and reactive means connected in series with said lamp, a switch biased to closed circuit position for short-circuiting said reactive means, and a circuit connected across said lamp including means for opening said switch and a normally open starting switch for the lamp arranged in series, said starting switch serving to render said switch opening means ineffective after the lamp has started.

2. In combination an electric discharge lamp having spaced thermionic electrodes, a ballast resistor and a reactor connected in series with said lamp, a normally closed switch connected across said reactor, means for opening said switch, a normally open thermal starting switch and means connecting said means and said thermal switch in series across said lamp, whereby after said lamp has started said starting switch renders said switch opening means ineffective.

3. In combination an electric discharge lamp having spaced thermionic electrodes, a ballast resistor and a reactor connected in series with said lamp, a normally closed thermal switch connected across said reactor, a heater for said switch, a glow discharge lamp starting switch, and means connecting said heater and said starting switch in series across said lamp.

4. In combination an electric discharge lamp having spaced thermionic electrodes constructed to be preheated by the flow of current therethrough, a ballast resistor and a reactor connected in series with the lamp, a normally closed thermal switch connected across said reactor, a circuit connected across said lamp and in series with said electrodes, said circuit including a resistance heater in thermal relation with said thermal switch and a glow switch in series therewith for starting said lamp, said thermal switch having greater thermal inertia than said glow switch.

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