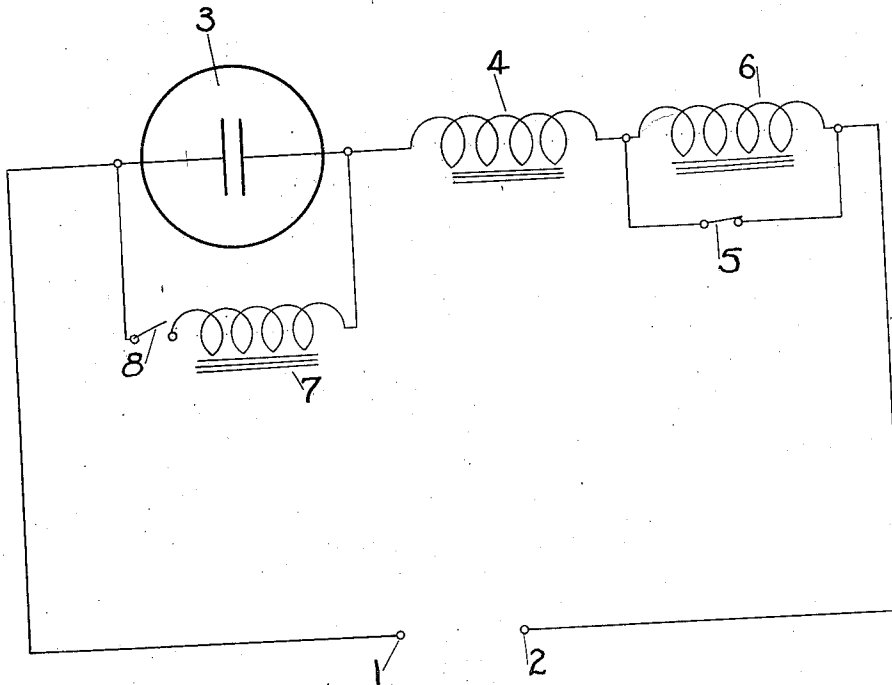


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CIRCUIT FOR ELECTRIC DISCHARGE DEVICES
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CIRCUIT FOR ELECTRIC DISCHARGE DEVICES

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1

This invention relates to combinations of gaseous electric discharge devices with means for operating them, of the type wherein the said means comprise an impedor in series with the discharge path through the device.

It is sometimes desirable to arrange that a high pressure metal vapor (HPMV) device (lamp) should be operated alternatively either so as to dissipate a relatively high power (full rating) or a relatively low power (reduced rating), which may be for example half the relatively high power, in such a manner that the change from the reduced to the full rating can be effected in a few seconds when the lamp is to be used. It is known that this can be effected by providing means, e. g. a transformer of variable transformation ratio through which the lamp is fed, for changing the supply voltage applied to the lamp circuit; the rating is then reduced by reducing the supply voltage. However, this method is not always convenient. An object of the invention is to provide an alternative method sometimes more convenient.

The obvious alternative is to reduce the rating by increasing the impedance of the impedor that is always in series with the lamp. But theory, based on the known voltage-current characteristics of HPMV lamps and of linear impedors and confirmed by experiments, shows that this method may not always be possible if the impedor is substantially linear. When the impedance is increased from that characteristic of full rating to that characteristic of the reduced rating, the lamp may be in such a condition at the reduced rating as to be unstable in the sense of being unable to maintain the full operating pressure. If this is the case, the pressure will fall gradually with the consequent loss of light. This condition is likely to be obtained when the ratio of the supply voltage to the running voltage is large, for example when the running voltage is 60 and the supply voltage 230. It should be observed here that the high supply voltage is desirable in order that the lamp may start from cold; a solution of the difficulty by reducing the supply voltage would therefore usually be precluded.

We have found that the difficulty can be avoided by increasing, while the discharge is passing through the lamp, the admittance of an impedor (parallel impedor) in parallel with the discharge. (It is to be understood that the said admittance may be zero before it is increased.) The effect of the increase is to reduce the effective voltage of the supply. It is usually desirable, and sometimes necessary, to increase at the

2

same time the impedance of the impedor (series impedor) in series with the combination of the discharge and the parallel impedor; but this is not always necessary. The changes in the series and parallel impedors should be nearly simultaneously; thus the change is preferably effected by ganged switches. If there is an interruption of the circuit in series with the lamp while its impedance is being increased, it must be so brief that the ionisation of the vapour in the lamp does not decay appreciably; the switch making this change must have a very rapid action.

According to the invention a combination of an HPMV electric discharge device with means for operating it comprises means for changing, during the passage of a discharge through the device, the admittance of an impedor in parallel with the device. One of the values of the impedance of the parallel impedor (but not of course of the series impedor) may be substantially infinite; none of the values of the impedance may be zero. If the supply is A. C., the impedors are both preferably chokes.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawing in which the single figure shows schematically a circuit comprising our invention. The supply voltage across the terminals 1, 2 is 230 at 50 C. P. S. (cycles per second). The lamp 3 at full rating dissipates 250 watt with 60 volts across it, the series impedor 4 being a choke of 0.175 henry inductance, and there being no parallel impedor connected to the lamp. It would be impossible to make the lamp run stably, dissipating 125 watts, on the same supply voltage by merely increasing the impedance of the series impedor. But if the inductance of the series choke is increased to 0.23 henry, by opening shunt switch 5 to insert an additional choke 6, for example, and a choke 7 of 0.68 henry inductance simultaneously placed in parallel with the discharge by closing switch 8, for example, the lamp runs stably dissipating 125 watts with 55 volts across it.

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

1. The method of regulating the operation of a high pressure metal vapor electric discharge device comprising a sealed envelope containing spaced electrodes, which method comprises operating an electric discharge at full power rating between said electrodes in series with a ballast impedance, and then connecting in shunt across only the discharge device, while it is operating, an inductance capable of materially reducing the

3

power dissipated in the discharge and thus maintaining the device in condition to operate substantially instantaneously at full power rating upon disconnecting the said shunting inductance.

2. The method of regulating the operation of a high pressure metal vapor electric discharge device comprising a sealed envelope containing spaced electrodes, which method comprises operating at full power rating an electric discharge between said electrodes in series with a linear ballast impedance, and then connecting in shunt across only the discharge device, while it is operating, a linear impedance capable of materially reducing the power dissipated in the discharge and thus maintaining the device in condition to operate substantially instantaneously at full power rating upon disconnecting the said shunting impedance.

3. The method of regulating the operation of a high pressure metal vapor electric discharge lamp which comprises operating the lamp at a relatively high rating of power dissipation in series with a ballast impedance, and then connecting in shunt across only the lamp, while it is operating, an inductance capable of materially reducing the power dissipated in the lamp and thus maintaining the lamp in condition to operate substantially instantaneously at the said high rating upon disconnecting the said shunting inductance.

4. The method of regulating the operation of a high pressure metal vapor electric discharge lamp which comprises operating the lamp at a relatively high rating of power dissipation in series with a ballast impedance, and then connecting in shunt across only the lamp, while it

4

is operating, an inductance capable of materially reducing the power dissipated in the lamp, while simultaneously increasing the value of the series ballast impedance and thus maintaining the lamp in condition to operate substantially instantaneously at the said high rating upon disconnecting the said shunting inductance.

5. In combination with a high pressure metal vapor electric discharge lamp having a ballast impedance in series therewith designed to operate the lamp at full power rating, an inductance, and means to connect said inductance in shunt across only the lamp while it is operating and to simultaneously increase the value of the series ballast impedance, said inductance being capable of materially reducing the power dissipated in the lamp with continued stable operation of the reduced power rating.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,930,123	Ewest	Oct. 10, 1933
2,043,023	Westendorp	June 2, 1936
2,046,980	Van Wijk	July 7, 1936
2,103,039	Pirani	Dec. 21, 1937
2,170,447	Edwards	Aug. 22, 1939
2,178,011	Von Wedel	Oct. 31, 1939
2,278,256	Frech	Mar. 31, 1942
2,339,051	Cates	Jan. 11, 1944
2,339,307	Warsher	Jan. 18, 1944