

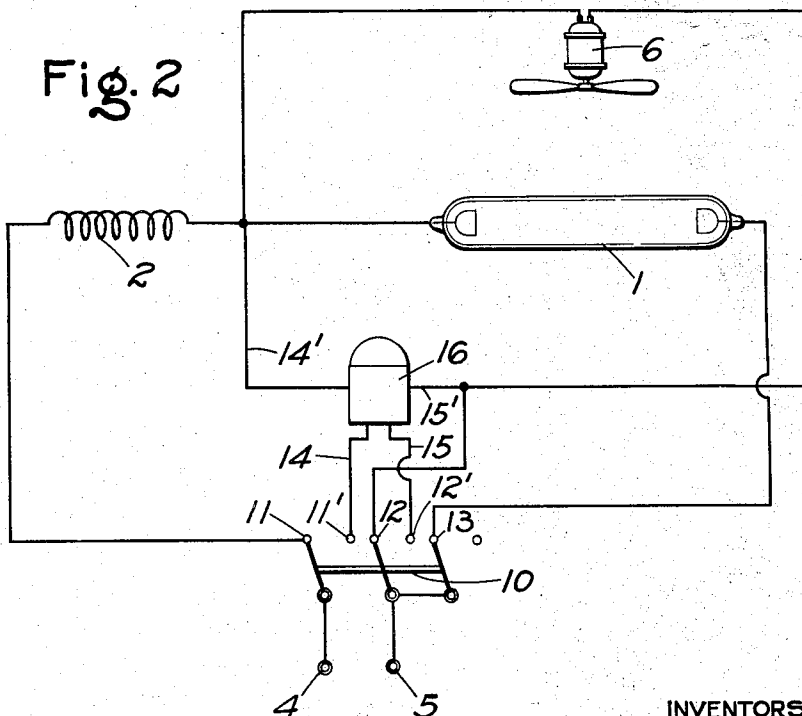
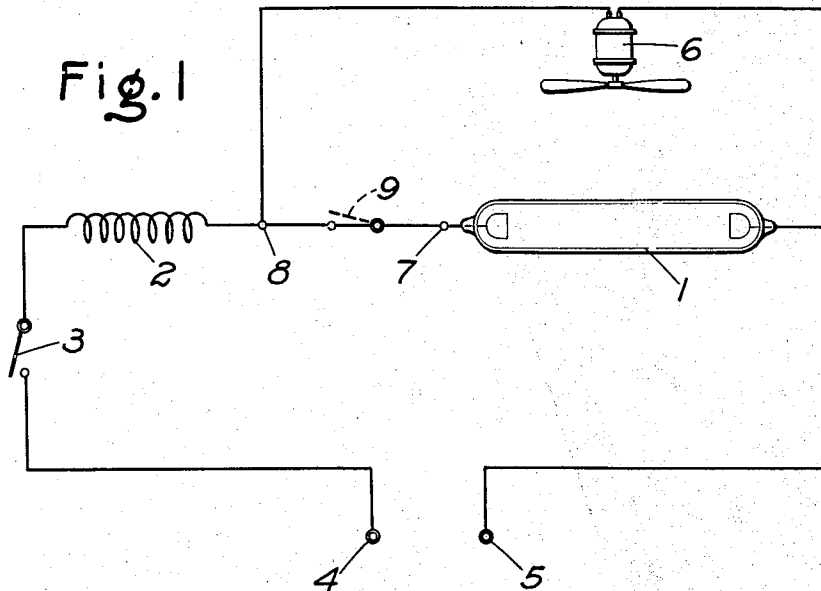
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ELECTRIC GASEOUS DISCHARGE DEVICE

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ELECTRIC GASEOUS DISCHARGE DEVICE

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The present invention relates to electric gaseous discharge devices, and in particular to vapor arc devices operating with a high vapor density.

A particular object of the invention is to reduce the time delay before a discharge in such a device can be restarted at the usual applied potential. A further object of the invention is to provide cooling means for such a device. Still another object of the invention is to provide a novel regulation of the cooling in accordance with the operation of the discharge device. Still other objects and advantages of the invention will appear from the following detailed specification or from an inspection of the accompanying drawing.

The invention consists in the new and novel combination of elements hereinafter set forth and claimed.

During the operation of vapor discharge devices, such as the high intensity mercury vapor arc lamp, the vapor density therein is raised to a relatively high value, as is well known, in order to attain the desired constricted discharge and high efficiency operation. As a result of this high density of the vapor the potential required to restart the lamp immediately after extinction of a discharge therein is extremely high, far in excess of that required when the device is at room temperature. The applied potential is ordinarily insufficient to restart the discharge under these conditions and hence the lamp remains extinguished, even though potential be applied thereto, until the lamp has cooled to such an extent that the discharge can be restarted on the the applied potential. This cooling period with the usual high intensity mercury vapor arc lamps amounts to from 2 to 10 minutes, depending upon their size, ambient temperature and the type of enclosure.

We have now found that this cooling time is materially shortened by a novel arrangement of our invention, wherein an electrically driven fan or blower is connected in parallel with the discharge device. With this novel arrangement the potential between the terminals of the discharge device is applied to the fan motor and determines the speed thereof. Thus at starting the discharge potential in a mercury vapor arc lamp of the high intensity type which is now going into extensive use is of the order of 20 to 40 volts, and at this potential the fan will be rotated only slowly, if at all. During continued operation the vapor density of the lamp increases, and the discharge voltage increases

therewith to a potential of the order of 150 volts, whereupon the fan motor speeds up. The fan is still not particularly effective at this speed, however, and results only in a steady moderate cooling which serves to protect the lamp against excessive temperature rises. As soon as the discharge has been momentarily extinguished, however, it will not restart at the applied potential, and hence practically the full 220 volts which is usually applied to these devices is impressed across the terminals of the lamp, and likewise across the fan motor, the current drawn by the fan motor producing but little voltage drop in the usual series impedance. The fan is thereupon operated at full speed and thus rapidly cools the discharge tube to a temperature at which the discharge will again start on the applied potential. As soon as the lamp is thus restarted the speed of the fan motor is again drastically reduced, and the operation thereof continues in the manner hereinbefore described for normal operation of the lamp.

Since the potential required to restart the lamp is determined by the coldest spot on the lamp envelope, however small, it is desirable to confine the cooling of the lamp to a small portion thereof, so that the entire vessel will regain its operating temperature as soon as possible after the discharge has been restarted. For this purpose the draft of the fan or blower is usually directed at a single spot on the lamp envelope, preferably some point away from the electrodes, and where desired heat insulating means are provided on the portions of the envelope adjacent the electrodes in order to keep the electrodes as hot as possible during the cooling period.

In some cases a special switching arrangement, including a delayed opening switch, is provided whereby the fan motor is caused to operate for a predetermined period after every extinguishment of the lamp, so as to insure rapid restarting of the lamp should its light be again desired within a few minutes.

For the purpose of illustrating our invention we have shown two embodiments thereof in the accompanying drawing in which

Fig. 1 schematically shows the connection of the fan motor in the circuit of a high intensity mercury vapor arc lamp to produce the desired cooling, and

Fig. 2 shows a modification of the circuit of Fig. 1.

In this drawing, with particular reference to Fig. 1, there is shown a high intensity mercury

vapor arc lamp 1 of any usual type containing the usual gas and mercury filling and having thermionic electrodes. This lamp is connected in series through an inductance 2, which serves to stabilize the discharge, and switch 3 across the terminals 4, 5 of a source of suitable potential of the order of 220 volts A. C. The motor of the fan 6 is connected in parallel with the discharge device 1. Said motor is preferably designed for normal operation on the same potential as that applied to the terminals 4, 5. The switch 9 is inserted between the terminal 7 of the lamp 1 and the connection point 8 to the fan motor, whereby the lamp can be extinguished without interrupting the operation of the fan motor.

In the operation of this device, switch 9 being closed, the lamp is started into operation by closing the switch 3, the cold lamp having a starting potential below that applied. The lamp voltage immediately falls to from 20 to 40 volts, and hence the voltage applied to the motor of the fan 6 is thus so low that this motor either idles along or fails to operate at all. As the temperature of the lamp increases the voltage drop therein likewise increases to the normal operating voltage of the order of 150 volts, with a resultant moderate speeding up of the fan. The cooling produced thereby is still relatively small, however, and serves only to protect the lamp against an excessive temperature rise. If the lamp is now extinguished by opening the switch 3 and directly afterward, for example one second later, the switch is again closed, the lamp will not restart at the applied potential due to the high vapor density existing within the lamp at the normal operating temperature. Heretofore, it has been necessary to await the natural cooling of the lamp before the lamp could be restarted, but with our new arrangement the fan 6 is operated at this time at full speed since the entire line voltage, with the exception of the relatively small voltage drop in the inductance 2 as a result of the motor current, is impressed upon the fan motor. As a result the lamp, and particularly a small area near the center thereof, is rapidly cooled to the temperature at which the lamp will again start on the applied potential. As soon as the lamp restarts the voltage across the fan motor is of course, drastically reduced, so that the fan again rotates at a greatly reduced speed.

The lamp 1 can also be extinguished by opening the switch 9, in which case the fan 6 continues to operate at full speed, rapidly cooling the lamp 1, until the switch 3 is opened at some later time. In this manner provision is made to restart the lamp as soon as possible after it is again switched on in case its light is again needed.

An improved arrangement wherein this operation of the switches is automatically interlocked is illustrated in Fig. 2. In this arrangement a three pole switch 10 is connected to the supply terminals 4, 5. This switch is of a type which must be in one or the other of two operative positions. In one position the switch blades lie on the contacts 11, 12, 13 shown at the left. In this position the line terminal 5 is connected over the contact 13 with the lamp 1 and also over the contact 12 with the motor of the fan 6; the other line terminal 4 is connected over the con-

tact 11 with both the lamp and the fan motor through the inductance 2. In this position of the switch 10 it is therefore obvious that the lamp 1 and the fan 6 are connected in parallel, this being the position of the switch for operation of the lamp. In order to extinguish the lamp the switch 10 is moved to its other work position. In this position the line terminals 4 and 5 are connected with the contacts 11', 12' which lead to the fan motor over the conductors 14, 15, the time switch 16 and the conductors 14', 15'. The time switch 16 is so constructed that after an adjustable time, for example 2 minutes, it disconnects the fan 6 from the supply line.

With this arrangement when the lamp 1 is extinguished by operation of the switch 10 the fan 6 is simultaneously connected directly to the line and thus left in full operation for the period determined by the time switch 16, with the result that the lamp is rapidly cooled off and will immediately restart if the light of the lamp is again desired after even a brief interval.

While we have described our invention by reference to certain specific embodiments thereof it is to be understood that it is not limited thereto but that various changes, omissions and substitutions, within the scope of the appended claims, may be made therein without departing from the spirit thereof.

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

1. In combination, a vapor discharge device of the high intensity type and a fan arranged to direct a blast of air upon said lamp, the motor for said fan being connected in parallel with said discharge device, whereby the cooling effect of said fan is determined by the condition of said discharge device.

2. In combination, a vapor discharge device of the high intensity type, a fan so disposed with respect to said device that it selectively cools the central portion thereof, the motor for said fan being connected in parallel with said discharge device, whereby the cooling effect of said fan is determined by the condition of said discharge device.

3. In combination, a vapor discharge device of the high intensity type, a fan arranged to direct a blast of air upon said lamp, the motor for said fan being connected in parallel with said discharge device, whereby the cooling effect of said fan is determined by the condition of said discharge device, and means to open the circuit through said lamp without opening the circuit through said motor.

4. In combination, a vapor discharge device of the high intensity type, a fan arranged to direct a blast of air upon said lamp, the motor for said fan being connected in parallel with said discharge device, whereby the cooling effect of said fan is determined by the condition of said discharge device, means to open the circuit through said device, and means including a delayed opening switch to continue the operation of said fan for a predetermined period after the circuit through said device has been opened.

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