

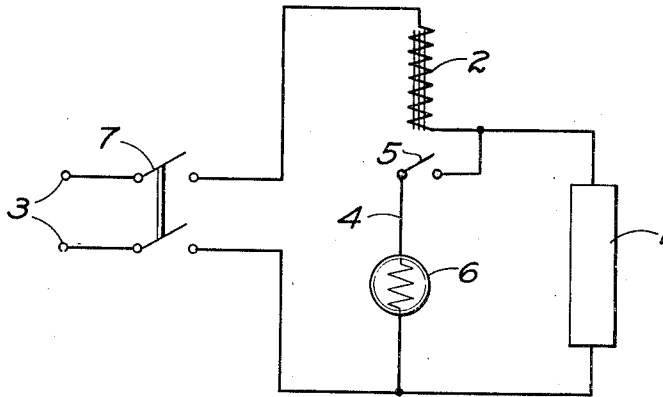
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GASEOUS ELECTRIC DISCHARGE DEVICE

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GASEOUS ELECTRIC DISCHARGE DEVICE

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The present invention relates to gaseous electric discharge devices generally and more particularly the invention relates to starting and operating circuits for such devices.

10 Gaseous electric discharge devices, such as electric discharge lamps, are successfully started into operation by a circuit comprising a choke coil connected in series with the device across the terminals of an alternating current source and an electromagnetic switch actuated by the series
15 choke coil which switch, when closed, short circuits said discharge lamp. When potential is applied to a circuit of this type the switch is moved from its closed position to its open circuit position by the current flowing through the choke coil. A voltage surge is thus produced in the choke coil which surge is applied across the terminals of
20 the lamp to start the discharge therein. When the discharge has been started the discharge current flows through the choke coil and the switch is held thereby in its open circuit position to interrupt the operation of the starting apparatus. When, however, the discharge does not start in the lamp the switch falls back to its closed circuit position, in which position the lamp is short
25 circuited, and the above described operation in the starting apparatus is repeated. When the lamp is inoperative so that it cannot be started by the starting apparatus the apparatus continues to operate. This is detrimental to the life thereof, for example, the contacts of the switch may become fused together, or the continual make and break of the switch in the starting apparatus causes radio disturbances.

35 Other types of starting devices have similar disadvantages, for example, for gaseous electric discharge devices comprising liquid mercury electrodes the starting apparatus frequently comprises means to tilt the device to bring the electrodes into momentary contact to cause the discharge to start therebetween. The operation of such starting means can be interrupted when the discharge device refuses to start after an appreciable time by a bimetallic switch which is
40 traversed and heated by an electric current during the operation of the starting apparatus. Such a device requires a complicated and expensive holding device to retain the bimetallic switch in its open circuit position when the starting apparatus has been open circuited thereby. Were such a
45 holding means omitted the starting apparatus would resume operation when the bimetallic switch had cooled sufficiently to close the starting circuit.

The object of the present invention is to pro-

vide a simple, inexpensive and effective means for interrupting the operation of a starting apparatus of a gaseous electric discharge device, which apparatus automatically ceases operation on the starting of said device, when said device
5 fails to start at a predetermined time after potential is applied thereto. Further objects and advantages attaching to the device and to its use and operation will be apparent to those skilled in the art from the following particular description.

The invention attains its object by associating with the starting apparatus a fuse having a high positive thermal coefficient of electrical resistance which fuse is traversed by current during the
15 operation of the starting apparatus and which, when heated to a predetermined temperature, breaks to open circuit said starting apparatus. When potential is applied to the starting apparatus and current is flowing through the fuse the temperature of the fuse at first is low and said
20 fuse offers but slight resistance to the flow of current therethrough. When the gaseous electric discharge device fails to start and the starting apparatus continues to operate the temperature of the fuse is gradually raised by the flow of
25 current therethrough and the resistance thereof gradually increases. The gradual increase in the resistance of the fuse to the electric current increases the temperature thereof until the melting temperature of the fuse is reached at which point the fuse breaks to cut the starting device out of circuit. When desired, the fuse is designed to break at a predetermined time after potential is applied to the starting apparatus which is not
30 possible with the ordinary fuses having a thermal coefficient of electrical resistance practically equal to zero.

Preferably the fuse consists of an iron wire mounted in a sealed container having hydrogen
40 or air therein. Such devices are now available in commerce and are generally known in the electrical art as "current variators." When desired, the fuse used in accordance with the present invention is small in size and is easily mounted in the
45 lamp unit.

In the drawing accompanying and forming part of this specification a gaseous electric discharge device and a starting and operating circuit therefor embodying the invention are shown schematically.

Referring to the drawing 1 is a gaseous electric discharge device, such as a sodium vapor discharge lamp of the positive column type comprising a sealed tubular container having electrodes
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which are electron emitting when heated, a starting gas, such as neon or argon, and a quantity of vaporizable material, such as sodium, therein. Said device 1 is connected in series with a choke coil 2 across the terminals of an alternating current source 3 by the switch 7. A fuse 6 consisting of a glass bulb having an iron wire sealed therein and containing a gas filling, such as hydrogen or air is connected across the terminals of the device 1 by the lead 4. An electro-magnetic switch 5 actuated by the current flow through said choke coil 2 is connected into said lead 4. Switch 5 is in its closed circuit position when no current flows through said choke coil 2. When a current of sufficient magnitude flows through the choke coil 2 switch 5 is moved thereby into an open circuit position.

The gaseous electric discharge device 1 is started into operation by closing the switch 7. Current then flows through the choke coil 2, the switch 5, lead 4 and the fuse 6, the gaseous electric discharge device being short circuited when switch 5 is in its closed position. The current flow through the choke coil 2 moves the switch 5 to its open circuit position which causes a voltage surge in the choke coil 2 which surge is impressed across the terminals of the device 1 to start the discharge therein. When the discharge starts in said device 1 the switch 5 is held in its open position by the discharge current flowing through the choke coil 2 and the starting apparatus automatically ceases operation. When the discharge does not start in the device 1 the switch 5 drops back to its closed circuit position and the above described operation of the starting apparatus is repeated. The starting apparatus continues to operate until the device 1 is started or until the iron wire in the fuse 6 is heated to its melting temperature by the current flow therethrough. When this temperature is reached the iron wire breaks to interrupt the flow of current through the starting apparatus. The circuit is then inoperative until the fuse 6 is replaced at which time the defective discharge device 1 is either repaired or replaced.

The device described above is of simple structure, is effective in operation and the starting apparatus has a long useful operating life.

While I have shown and described a particular device embodying my invention it will be understood of course that numerous changes in the form and details of the device and in its use and operation may be made by those skilled in the art without departure from the spirit and scope of the invention.

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

1. In combination an electric discharge device, an automatic starting means which ceases operation on the starting of said device connected in series therewith and a fuse consisting of a metal wire having a high positive thermal coefficient of electrical resistance enclosed by a sealed container having gaseous atmosphere therein, said fuse being connected in series with said starting means and across the terminals of said device to interrupt current flow through said starting means on the failure of said discharge device to start at a predetermined time after potential is applied to said device.

2. In combination an electric discharge device, an automatic starting means which ceases operation on the starting of said device connected in series therewith and a fuse consisting of an iron wire enclosed by a sealed container having a hydrogen containing gas therein, said fuse being connected in series with said starting means and across the terminals of said device to interrupt current flow through said starting means on the failure of said discharge device to start at a predetermined time after potential is applied to said device.

3. In combination a gaseous electric discharge device, an automatic starting means which ceases operation on the starting of said device connected in series therewith and a fuse having a high positive thermal coefficient of electrical resistance connected in series with said starting means and across the terminals of said device to interrupt current flow through said starting means on the failure of said discharge device to start at a predetermined time after potential is applied to said device.

EDUARD G. DORGELO.