Nov. 2, 1943. R. B. THOMAS 2,333,215

ELECTRIC DISCHARGE LAMP STARTING DEVICE

Filed April 27, 1942

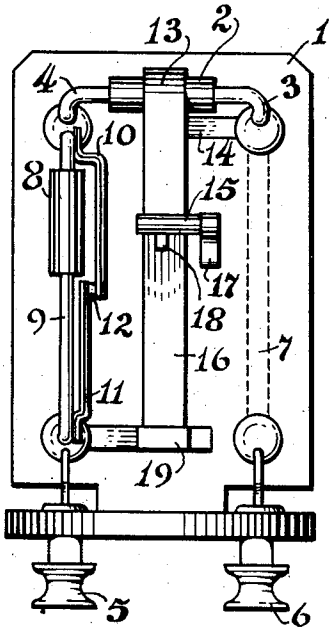


Fig. 1

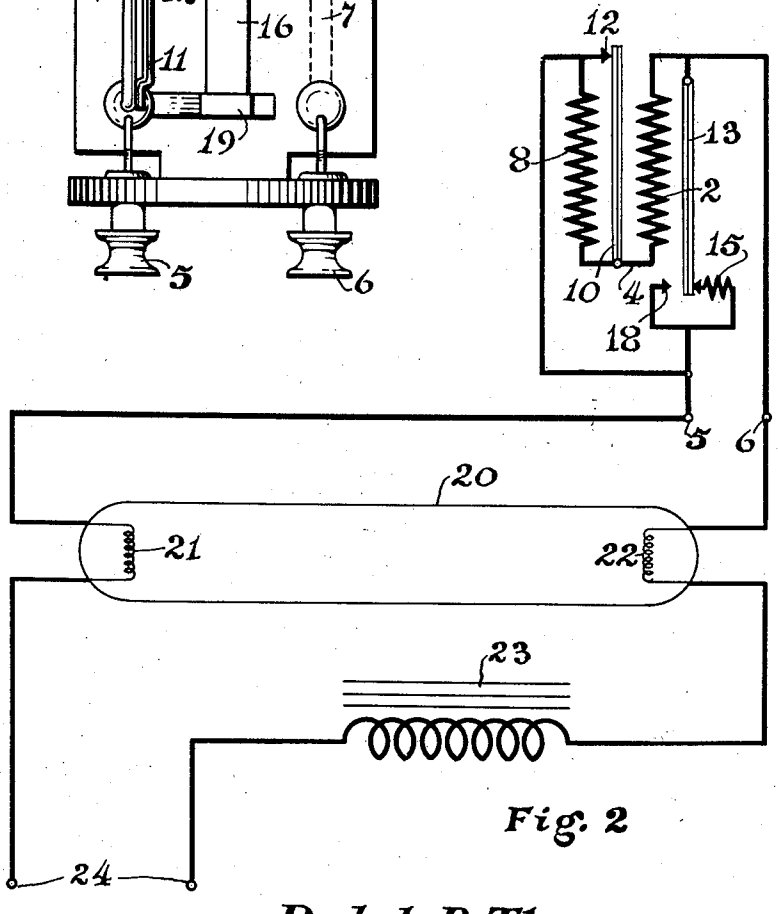


Fig. 2

Ralph B. Thomas, INVENTOR.

BY Laurence Burns,

ATTORNEY.

Patented Nov. 2, 1943 2,333,215

UNITED STATES PATENT OFFICE

2,333,215

ELECTRIC DISCHARGE LAMP STARTING DEVICE

Ralph B. Thomas, Beverly, Mass., assignor to Sylvania Electric Products Inc., a corporation of Massachusetts

Application April 27, 1942, Serial No. 440,744

2 Claims. (Cl. 176—124)

This invention relates to electrical circuit relays and more particularly to relays for regulating the electrode pre-heating period of electric gaseous discharge lamps.

An object of this invention is to provide a fluorescent lamp starter switch which will not only operate to provide a pre-determined heating period for the filamentary electrodes but will also automatically arrest its operation in this respect when for any reason the lamp fails to light after a number of unsuccessful attempts.

Another object is to provide a starter switch which will accomplish this arresting operation without putting a strain on the several elements which go to make up the switch or the auxiliary starting apparatus employed in conjunction therewith.

Further objects, advantages and features will be apparent from the following specification taken in conjunction with the accompanying drawing in which:

Figure 1 is a front view of the relay of my invention removed from the container in which it is normally enclosed.

Figure 2 is a schematic diagram of said relay and the circuit in conjunction with which it may be used.

In the operation of electric gaseous discharge tubes and more particularly in the operation of fluorescent lamps, a relay is generally employed to permit the pre-heating of the filamentary electrodes sufficient to effect a striking of the lamp arc. If the lamp arc fails to strike or maintain, the relay operates to provide a second period of electrode pre-heating. In this regard I have found that the thermal relay shown in the copending application, Serial Number 335,968, filed May 18, 1940, to be of distinct advantage for it provides an auxiliary starting means which operates when the lamp arc fails to strike or maintain in the first instance. A further improvement in thermal relays is embodied in the copending application, Serial Number 417,544, filed November 1, 1941. In this application the relay includes a cut-out feature which arrests the operation of the relay elements if the lamp is faulty. This is a highly desirable feature for it not only eliminates the unsightly appearance which a defective lamp presents when the arc fails to strike despite the successive pre-heating cycles but it also prevents any undue strain being placed on the auxiliary equipment under said conditions. A further improvement in that type of relay is embodied in the present invention, the distinctive features of which will be apparent from its description.

In Figure 1, the resistance rod 2 is mounted on the support 1 through the wires 3 and 4. Electrical connection through the base pin 6 to the wire 3 is made through the metallic strip 7 which runs up the back of the support 1. The arm 14, extending inwardly from the point at which it and the wire 3 are attached to the support 1 by eyelets, soldering or some similar means, has attached thereto one end of the bimetallic armature 13 which is bent around the resistance rod 2. The free end of this bimetal 13 is normally closed with the contact 15 of high contact resistance. This type of resistance may be obtained by utilizing carbon or some similar material as the contact itself or a resistance in series with a contact may be used to obtain the same effect. This carbon contact 15 is mounted on the outer end of a U-shaped arm 17 which is supported at its inner end from the bimetallic compensator 16. This compensator 16 is mounted on the support 1 through the arm 19. The free end of this compensator 16, i. e., the end from which the U-shaped arm 17 is mounted has fixed thereon a contact 18 of low contact resistance, such as silver for example. This contact element 18 is in contact relationship with the free end of the bimetallic strip 13 under certain operating conditions. The bimetallic element 16 serves to compensate for ambient temperature changes, thus automatically insuring proper spacing and proportioning of the contact elements of the relay under varying operating conditions. The arm 19 to which an end of the compensator 16 is fixed has an end thereof electrically connected to the lead-in wire extending up through the relay base from the contact pin 5. The wire 9, on which the resistance rod 8 is mounted, has one end thereof electrically connected to this same lead-in wire extending up from the contact pin 5. This wire 9 extends upwardly along the longitudinal axis of the support 1, its other end being electrically connected to the wire 4. The wire 9 has mounted at each end thereof bimetallic elements 10 and 11 extending towards each other. The bimetal 10 serves as an armature, the bimetal 11 being its compensator. These two elements are normally closed with each other through the contact 12.

In Figure 2, the electric gaseous discharge lamp 20 has the filamentary electrodes 21 and 22 sealed in the ends thereof. One end of the electrode 21 is directly connected to one end of the power line 24, the other end thereof being connected to

the relay of Figure 1 through the base pin 5. One end of the electrode 22 is connected to the other end of the power line 24 through a suitable ballast impedance, such as an inductance coil 23. The other end of electrode 22 is connected to the relay through the base pin 6.

The circuit through the relay will be through elements 5, 16, 15, 13, 3, 7, and 6, elements 11, 12, 10, 4, and 2 being connected in parallel therewith. Thus the contact 12 in the cut-out opens a circuit carrying only a very small current passed by the high resistance rod 2. Under ordinary conditions of lamp operation, the circuit through 11, 12 and 10 remains closed, the high resistance rod 8 being short-circuited thereby.

Under failed lamp conditions the pre-heating cycle is repeated a number of times and the heat developed in the high resistance rod 2 is considerably greater than during normal lamp starting and operating conditions. Enough of this heat will be conducted through the wire 4 to the bimetallic armature 10 to distort it sufficiently to open the circuit through 11, 12 and 10. The opening of this circuit places the high resistance rod 8 in series with the high resistance rod 2.

Once this condition obtains, the resistance rod 8 develops enough heat to keep open the circuit through 11, 12 and 10. This is especially true because of its location with respect to the armature 10 and the compensator 12. As may be noted from Figure 1 of the drawing, the resistance rod 8 is not located in the longitudinal center of the wire 9 but at a point considerably removed from the point at which the compensator 11 is mounted thereon. It is mounted directly adjacent to the armature 10 so that substantially all of the heat generated by the circuit therethrough will be concentrated by conduction, radiation, or convection on the armature 10 rather than on the compensator 11. This heat from the resistance rod 2 as is conducted through wire 4 will sufficiently distort the armature 10 to keep the circuit through 10, 12, and 11 open.

The resistance rods 2 and 8 are so designed that the high resistance rod 2 is now developing approximately the same amount of heat as it develops when the lamp is operating, thereby distorting the bimetallic armature 13 just enough to keep the pre-heating circuit therethrough open.

When the failed lamp is removed, the bimetal 10 will cool rapidly, thereby closing the circuit through 11, 12 and 10 and returning the relay elements to their normal positions with respect to each other under dead circuit conditions.

Although I have illustrated my cut-out in a manner in which it may best be utilized with a thermal relay, it must be readily understood that this cut-out may well be adapted for use with a glow relay without departing from the spirit of this invention. Thus, for example, when a relay of the thermal type is used, the relay and the resistor 2 would be connected in parallel with respect to each other and together they would be connected in series with the cut-out.

What I claim is:

1. A starting unit for an electric gaseous discharge device, said unit comprising: A plate-like base of insulating material; a panel of insulating material mounted on said base; a pair of contact pins extending from one side of said base; a pair of lead in wires, each connected to one of said contact pins and extending from the other side of said base; a switch assembly mounted on said panel in connection with said lead in wires and including a heater element, a hook-like thermally responsive member electrically connected to one of said lead-in wires and mounted with said heating element lying within the loop portion of said hook, and a contact assembly electrically connected to the other of said lead-in wires and including a supporting arm and a contact member, with said thermal member in normally closed relation with said contact member; and a second switch assembly connected with the heating element of said first named switch assembly and one of said lead in wires and including a heating element and a thermally responsive member arranged to short circuit said last named heating element when said member is unheated.

2. A starting unit for an electric gaseous discharge device, said unit comprising: A plate-like base of insulating material; a panel of insulating material mounted on said base; a pair of contact pins extending from one side of said base; a pair of lead in wires, each connected to one of said contact pins and extending from the other side of said base; a switch assembly mounted on said panel in connection with said lead in wires and including a heater element disposed horizontally across said upright, a hook-like thermally responsive member mounted with said heater element lying within the loop portion of said hook, and a contact assembly electrically connected to the other of said lead-in wires and including a supporting arm and a pair of spaced contact arms mounted thereon with a contact on each, with said thermal member electrically connected to one of said lead-in wires in normally closed relation with one of said contact members and disposed between said contacts; and a second switch assembly connected with the heating element of said first named switch assembly and one of said lead in wires and including a heater element disposed vertically along an edge of said upright and a thermally responsive member arranged to short-circuit said last named heater element when said member is unheated, said last named thermal member being disposed within the heating range of said horizontal heater element.

RALPH B. THOMAS