

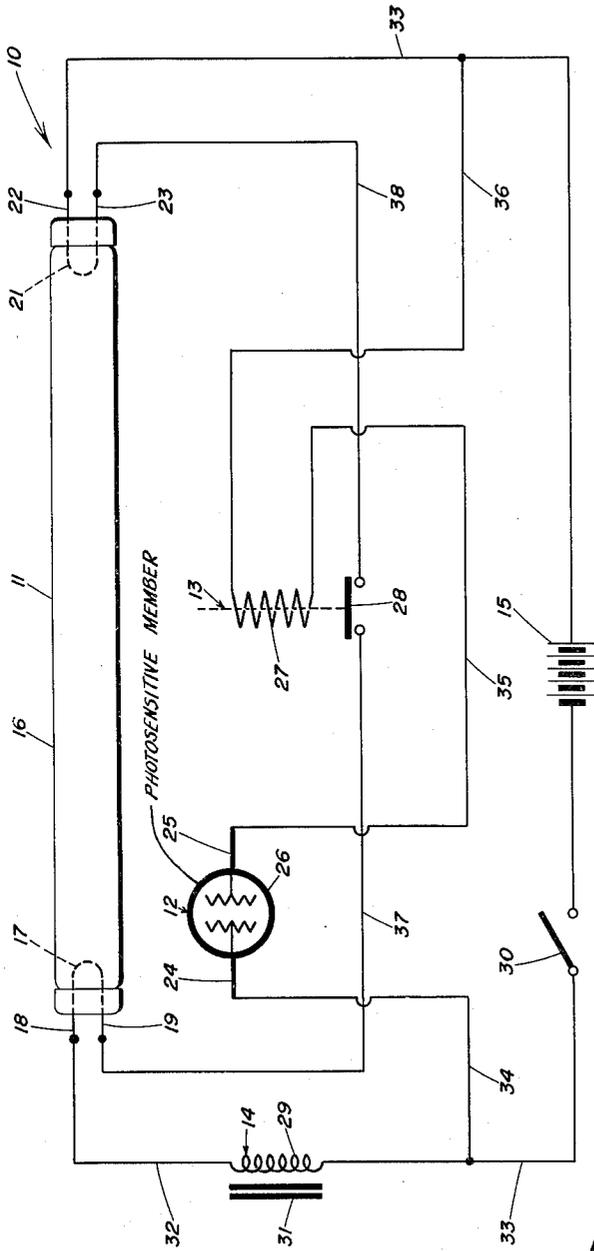
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PHOTOSENSITIVE FLUORESCENT LAMP STARTER

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**PHOTOSENSITIVE FLUORESCENT LAMP
 STARTER**

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This invention relates to a lamp circuit and more particularly to apparatus arranged to assist in the starting of a fluorescent lamp or the like.

In the starting of fluorescent lamps it is necessary that current pass through the cathodes for a short period of time to heat them up. After the cathodes are heated up and current flow exists from cathode to cathode through the medium of the ionized gas, it is desirable to withdraw the flow of current which has been taking place through the cathode filaments, since this flow of current determines the life of the lamp to a large extent. Various means have been used in the past to shut off the current flowing through the cathodes once the gas has been ionized, but all of these methods have suffered from one deficiency or another. For instance, many of the known arrangements have been quite expensive, difficult to install, and many of them fail after a relatively short period of use. In many cases they have not acted in a positive manner (particularly with direct current operations) with the result that, on occasion, the lamps flicker on and off, thus shortening the life of the lamp. These and other difficulties experienced with the prior art devices have been obviated in a novel manner by the present invention.

It is, therefore, an outstanding object of the invention to provide a lamp circuit which is inexpensive to manufacture and which is capable of a long life of useful service.

Another object of this invention is the provision of a fluorescent lamp starting means which acts positively and without false starting for an extremely long period of time.

A further object of the invention is the provision of a fluorescent lamp starting circuit that will operate effectively with direct current electricity.

Another object of the present invention is the provision of a lamp circuit which operates in such a way to give extremely long lamp life.

It is another object of the instant invention to provide a fluorescent lamp starting circuit which is extremely compact and light.

It is a further object of the invention to provide a fluorescent lamp starting circuit which is made up of standard electrical components and which is relatively free of a maintenance problem.

It is another object of the invention to provide a fluorescent lamp starting circuit which is made up of standard electrical components and which is relatively free of a maintenance problem.

A still further object of this invention is the provision of a fluorescent lamp starting circuit which removes current flow from the cathodes when they reach a predetermined incandescence.

Another object of the invention is the provision of a lamp starting circuit that operates on the ultimate function, i.e., the production of light, rather than an intermediate function such as an increase in current flow.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

The character of the invention, however, may be best

understood by reference to one of its structural forms as illustrated by the accompanying drawing in which:

The single figure shows somewhat schematically a lamp circuit embodying the principles of the present invention.

Referring to the drawing, the lamp circuit, indicated generally by the reference numeral 10, is shown as consisting of a fluorescent lamp 11, a photo-sensitive member 12, a relay 13, a ballast 14, and a source 15 of direct current electricity. The fluorescent lamp 11 consists of an elongated glass enclosure 16 at one end of which resides an incandescent element such as a filament cathode 17 having ends 18 and 19 extending from the enclosure. At the other end of the enclosure 16 resides an incandescent element such as the filament cathode 21 having ends 22 and 23 extending from the enclosure 16.

The photo-sensitive member 12 consists of a cadmium sulfide photoconductive cell, such as the element produced by the National Semi-Conductors, Ltd. and designated by their code number NSL-5. The cell is provided with two leads 24 and 25 which extend outwardly of an enclosure 26. It is the nature of this photo-sensitive element that the internal resistance is very high when no light is directed on the enclosure 26, but, when light falls on it and, particularly, when light falls on a window (not shown) opening into the enclosure, the internal resistance drops very rapidly. The member, therefore, acts as a switch which is "open" when no light falls on it and "closed" when light does fall on it.

The relay 13 is provided with an actuating coil 27 and a normally-closed contactor 28, such that the contactor will be open when current passes through the coil 27. The ballast 14 is provided with an induction coil 29 and an iron core 31 in the usual manner. The end 18 of the cathode 17 is connected by a line 32 to one side of the coil 29 of the ballast 14, while the other side of the coil 29 is connected by a line 33 through a main switch to one side of the source 15. The end 22 of the cathode 21 is connected by a line 33 to the other side of the source 15. The line 33 between the coil 29 and the source 15 is connected by a line 34 to the lead 24 of the photo-sensitive member 12, while the other lead 25 is connected by a line 35 to one side of the coil 27 of the relay 13. The other side of the coil 27 is connected by a line 36 to the line 33 at a point located between the end 22 and the source 15. The end 19 of the cathode 17 is connected by a line 37 to one side of the normally-closed contactor 28 of the relay 13, the other side of the contactor being connected by a line 38 to the end 23 of the cathode 21.

The operation of the invention will now be readily understood in view of the above description. Upon the closing of the main switch 30 in the line 33 current passes from the source 15 through the switch 30, through the line 33, through the coil 29 of the ballast 14 to the end 18. From there it passes through the cathode 17, through the end 19, through the line 37, to the contactor 28, the contactor being in closed condition. The current passes through the contactor 28 and through the line 38 to the end 23 of the cathode 21. The current passes through that cathode, through the end 22 and the line 33 to the other side of the source 15. The cathodes 17 and 21 are, therefore, connected in series and, being incandescent elements, they heat up with the passage of current. Eventually, as these filaments heat, the gas in the enclosure 16 of the lamp 11 is ionized, so that current passes by the flow of ionized gas in the well-known manner from the cathode 17 to the cathode 21. At that time, it is no longer necessary to pass current through the filament (cathode) 17 or through the fila-

ment (cathode) 21 in the manner which has been described. As the cathode 17 heats up, it becomes luminescent or incandescent and its light falls on the photo-sensitive member 12. Since it is the nature of this member to have a high resistance when no light falls on it and to have very low resistance when light does fall on it, when the incandescence of the cathode 17 reaches a predetermined point, the resistance through the photo-sensitive element is reduced to a very low value. Current then passes from the source 15 through the closed switch 30 and the line 33, through the line 34 to the lead 24 of the photo-sensitive element. The current passes through the photo-sensitive element within the enclosure 26 and outwardly through the lead 25 into the line 35. From there the current passes through the coil 27 of the relay 13, through the line 36 to the line 33, and along the line 33 to the other side of the source 15. The passage of current through the coil 27 causes the relay to be energized and the normally-open contactor 28 opens. This opens the circuit branch formed through the cathodes 17 and 21 so that current no longer flows through them. The only current then flowing is that which takes place from the source 15, through the closed switch 30, through the ballast 29, through the lamp 11 by means of the ionized gas, back through the line 33 to the other side of the source 15.

It can be seen that, when the current flow through the cathodes 17 and 21 is reduced, the wear on these elements is also reduced, since the failure of these elements is largely due to the amount of current which has passed through them, as is true with almost any incandescent filament. In addition, the circuitry is very simple and requires no large heavy apparatus which are a problem in mounting lamps in the ceiling. It will be understood that the photo-sensitive member 12 may be located in any number of places; for instance, it might be located in the center of the enclosure 16 to receive light from the lamp when the ionized gas glows in the manner of a fluorescent lamp or, as has been described, the opening of the photo-sensitive member can depend on a certain pre-determined incandescence of the cathode 17. The starting operation takes place from the production of light rather than from an intermediate function, so that its operative is very sure. This is particularly useful where the lamp electrical supply is direct current.

It is obvious that minor changes may be made in the form and construction of the invention without depart-

ing from the material spirit thereof. It is not, however, desired to confine the invention to the exact form herein shown and described, but it is desired to include all such as properly come within the scope claimed.

The invention having been thus described, what is claimed as new and desired to secure by Letters Patent is:

1. A lamp circuit, comprising an elongated gaseous discharge lamp having an incandescent element at each end, each element having two terminals, a power line adapted to connect one of the terminals of each element to a source of electrical power, a line connecting the other terminals of the elements, a relay having a normally-closed switch and an actuating coil, the switch connected in series in the connecting line to interrupt, on occasion, the flow of current through the elements, and a photo-sensitive member arranged adjacent one of the said elements to receive light therefrom and to change its condition when the element reaches a predetermined level of incandescence, the said member and the said coil being connected in series with one another from one power line to the other.

2. A lamp circuit, comprising an elongated gaseous discharge lamp having an incandescent element at each end, each element having two terminals, a power line adapted to connect one of the terminals of each element to a source of direct current electrical power, a ballast in one of the power lines, a line connecting the other terminals of the elements, a relay having a normally-closed switch and an actuating coil, the switch connected in series in the connecting line to interrupt, on occasion, the flow of current through the elements, and a cadmium sulfide photo-conductive member arranged adjacent one of the said elements to receive light therefrom and to change its condition when the element reaches a predetermined level of incandescence, the member having the characteristic of high internal resistance when no light falls on it and of low internal resistance when substantial amounts of light fall on it, the said member and the said coil being connected in series with one another from one power line to the other.

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