Aug. 24, 1943. D. W. ABERNATHY 2,327,755

GASEOUS ELECTRIC DISCHARGE DEVICE

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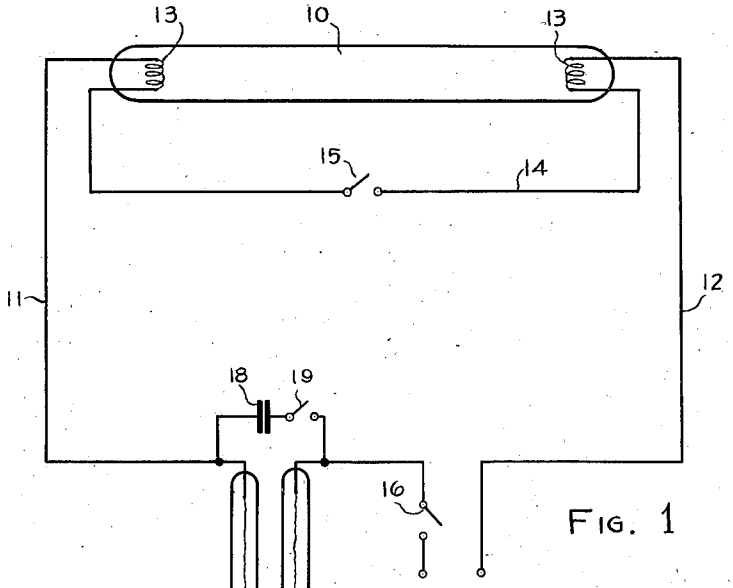


FIG. 1

FIG. 2

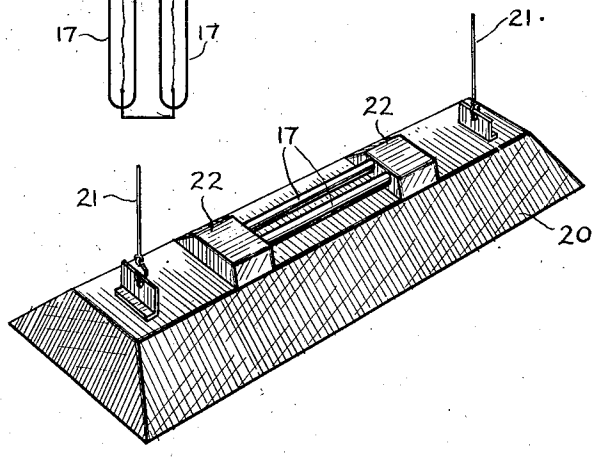
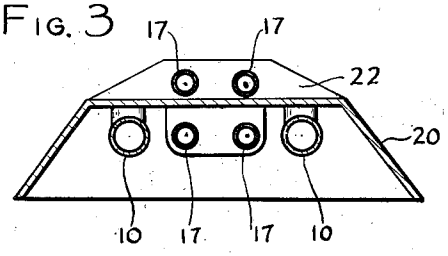


FIG. 3



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GASEOUS ELECTRIC DISCHARGE DEVICE

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Application April 1, 1942, Serial No. 437,133

1 Claim. (Cl. 240—78)

This invention relates to an improved and simplified circuit for striking an arc and maintaining a constant operating voltage in a tube containing conductive gases and more particularly relates to an improvement in the apparatus described in my copending application Ser. No. 422,060, filed December 8, 1941.

The object of this invention is to provide a simple and fool-proof circuit for starting and operating gaseous discharge tubes, such as, for example, those known as fluorescent tubes.

Another object of this invention is to provide a novel and improved circuit for gaseous discharge tubes in which the stroboscopic effect caused by such tubes operating on alternating current will be substantially eliminated.

A further object of the invention is to provide a novel and improved circuit for gaseous discharge tubes which will provide a greater amount of illumination than normally possible with such circuits.

A further object of the invention is to provide a novel and improved fluorescent lighting fixture which will provide upward as well as downward illumination.

A further object of the invention is to provide a circuit for a fluorescent lighting fixture having substantially no useless energy dissipation.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention consists of certain novel features of construction, arrangement and combination of parts hereinafter fully described, illustrated in the accompanying drawing, and particularly pointed out in the appended claim, it being understood that various changes in the form, proportion, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

For the purpose of facilitating an understanding of my invention, I have illustrated in the accompanying drawing a preferred embodiment thereof, from an inspection of which, when considered in connection with the following description, my invention, its mode of construction, assembly and operation, and many of its advantages should be readily understood and appreciated.

Referring to the drawing in which the same characters of reference are employed to indicate corresponding or similar parts throughout the several figures of the drawing:

Fig. 1 is a diagrammatic representation of an electrical circuit used in connection with a fluorescent lighting tube and embodying my new invention.

Fig. 2 is a perspective view of a lighting fixture used in fluorescent lighting and embodying my new invention.

Fig. 3 is a schematic sectional view of the fixture shown in Fig. 2.

The numeral 10 represents a gaseous discharge tube such as the type filled with conducting gas and having the walls thereof coated with materials which fluoresce when an arc in the tube causes emissions of electrons and the consequent production of rays of certain wave lengths, in a well known manner.

The tube 10 is connected with a source of alternating current, such as an alternating circuit line by the leads 11 and 12, whereby an appropriate alternating current voltage may be impressed across the tube 10. Said tube 10 is provided with filaments 13 at opposite ends thereof and between which the path of arc or discharge of the tube is adapted to be established. Said filaments are connected by branch circuit 14 arranged parallel to the discharge path, having a starting switch 15 of a well-known type therein.

The lead 11 is provided with resistive elements 17 arranged parallel with a condenser 18 in series with a switch 19. Lead 11 is also provided with a line switch 16.

The resistive elements 17 comprise incandescent lamps of the elongated variety, preferably frosted. They may be arranged in series or parallel depending upon the voltage drop desired to occur across same.

The device operates as follows:

The switches 16 and 19 are closed and the switch 15 also momentarily closed. This heats up the filaments 13, thereby producing clouds of electrons in the tube 10 and lowering the value of voltage needed to ignite same. During this period the net voltage drop across the resistive elements is substantially line voltage minus the small drop in the filaments 13. Then the switch 15 which is of the well-known self-operating variety opens.

The capacity of the condenser 18 has been chosen rather large, in order that it require a comparatively long time to discharge. During the time that the switch 15 was closed the condenser 18 was charged by the voltage existing across the resistive elements 17. When the switch 15 opens, the charge on the condenser commences to leak off, but the polarity of the line changes before the entire charge can leak off; hence, on the next half cycle, the voltage

impressed across the tube 10 is equal to line voltage plus that portion of the discharge voltage of the condenser 18 which has not as yet leaked off same.

The combined voltages reach and exceed the ignition voltage of the tube 10, and therefore, cause the arc to be struck. Since the conductivity of the tube when the arc has been struck is considerably greater than the conductivity of the resistive elements 17, the condenser 18 will preferably discharge through the tube sustaining the ignition voltage a sufficient time to establish ionization discharge in the tube 10.

The greatly increased conductivity of tube 10 after discharge has been established will thereafter permit flow of current therethrough and cause the operation of the tube at normal voltage. The condenser 18 and the resistive elements 17, in parallel, now serve as current-limiting impedance.

The condenser 18 may now be removed from the circuit by opening switch 19, and eliminating reactive influence upon the line. Thus with only the resistive elements 17 in the circuit, the same will have a power factor of one. This, of course, reduces the costs of maintaining my circuit.

I have shown incandescent lamps in use as the resistive elements 17. In prior circuits, where a ballast included any manner of resistance the operation of the circuits provided for the dissipation of energy by the resistance as a means of limiting the flow of current through the tube 10. In my invention, however, I utilize the resistive elements for one or more of three purposes. In achieving these purposes, I install the incandescent lamps 17 of the circuit on top of the fluorescent fixture or within the same, or in both places.

The lamps 17 on top of the fixture serve to illuminate the dark space above the fixtures. Where many fixtures are used, as in industrial plants, ceiling illumination would normally require many fixtures and much power not serving a productive purpose. With my new invention, not only are superfluous fixtures eliminated, but no more power is used than would normally be used by the downwardly directed fixtures themselves. This arrangement also finds valuable use in merchandising establishments where it is necessary to illuminate the ceiling for display purposes and for the improvement of the appearance of the establishment.

Those of the lamps 17 that are disposed within the fixtures serve not only to add to the illumination derived from the tubes 10, but also temper the light from the fluorescent tubes with illumination of different wave lengths. Further, since the lamps 17 are incandescent, the alternation of polarity of the line does not affect the illumination derived therefrom. The fluorescent tubes 10, of course, will produce illumination consisting of as many flashes as the alternations of the current in the line. With the augmented illumination afforded by the use of lamps 17 in accordance with my invention, the otherwise produced stroboscopic effect is substantially eliminated.

In Figs. 2 and 3, I have shown a fluorescent fixture comprising a large reflector 20 suspended from the ceiling by any appropriate means such as cables 21. Within the reflector 20 are provided fluorescent tubes 10. In accordance with my invention, the circuit used in the fixture is that shown in Fig. 1 which utilizes incandescent lamps 17. I have shown such lamps installed both within the reflector 20 and on top of the reflector, although obviously either group could be eliminated. Reference characters 22 representing housing for various electrical elements, such as condensers, sockets, switches, etc.

It is believed that my invention, its mode of construction and assembly, and many of its advantages should be readily understood from the foregoing without further description, and it should also be manifest that while a preferred embodiment of the invention has been shown and described for illustrative purposes, the structural details are nevertheless capable of wide variation within the purview of my invention as defined in the appended claim.

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

In combination, a reflector, gaseous discharge means providing fluorescent illumination arranged within said reflector and adapted to have illumination directed downwardly, an electrical circuit for initiating and maintaining the arc in the gaseous discharge means, said circuit including an A. C. source of potential for operating said gaseous discharge means, a filament heating branch short-circuiting the gaseous discharge means, a capacitive element mounted on said reflector and connected into said circuit in series with the arc discharge path within said gaseous discharge means, and a resistor element in said circuit serving to cause said capacitive element to be charged while said filament heating branch is short-circuited, said capacitive element impressing its charge across the gaseous discharge means, together with line voltage when the short-circuit is opened, thereby igniting said gaseous discharge means, said resistor element comprising a plurality of incandescent lamps arranged to augment the illumination obtained from said gaseous discharge means, at least one of said lamps being arranged on the outside of said reflector.

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