Nov. 10, 1942. I. A. YOST 2,301,840

CONTROL FOR GASEOUS ELECTRIC DISCHARGE LAMPS

Filed April 24, 1940

Fig. 1.

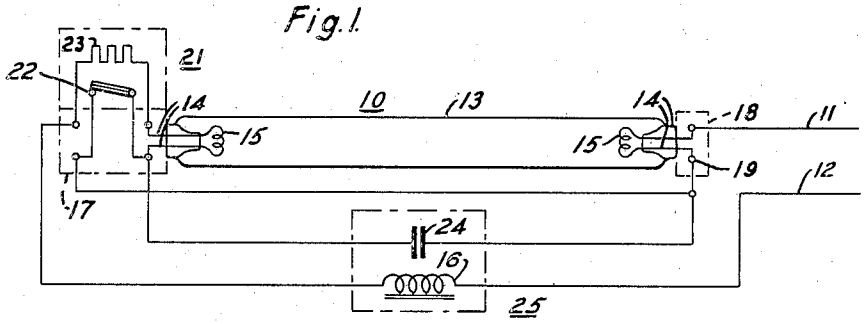


Fig. 2.

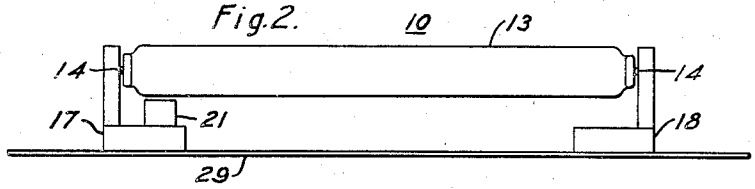


Fig. 3.

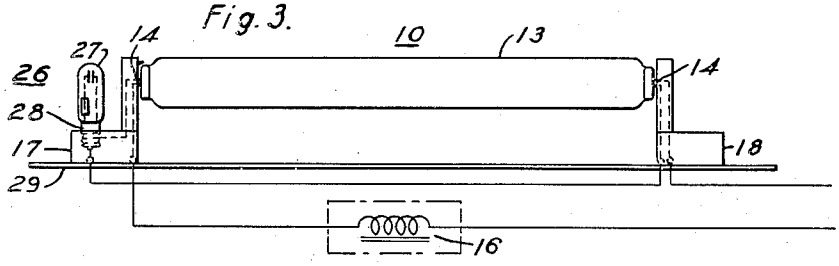
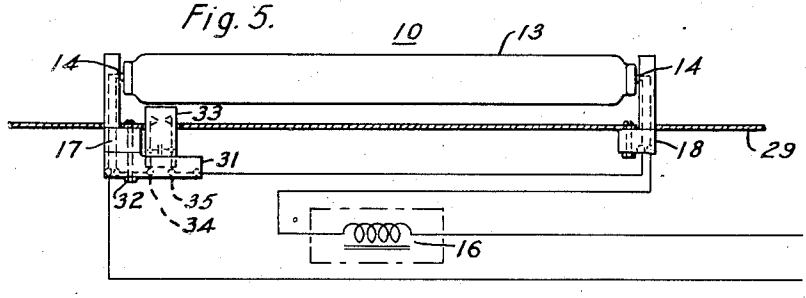


Fig. 5.

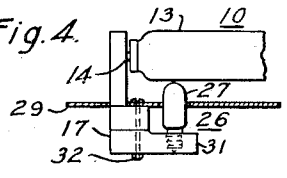


WITNESSES:

H. F. Sprecher.

Mrs. C. Groome

Fig. 4.



INVENTOR

Irvine A. Yost.

BY

G. D. Crawford

ATTORNEY

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CONTROL FOR GASEOUS ELECTRIC DISCHARGE LAMPS

Irvine A. Yost, Lakewood, Ohio, assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application April 24, 1940, Serial No. 331,377

6 Claims. (Cl. 176—124)

My invention relates, generally, to lighting control systems and, more particularly, to systems and apparatus for controlling the operation of gaseous electric discharge lamps of the type which are started on one voltage and operated on a different, usually lower, voltage. One example of a lamp of this type is the fluorescent mercury vapor lamp and it is for the control of a lamp of this character that my invention is particularly adapted.

Heretofore, it has been the usual practice to control the operation of gaseous electric discharge lamps by means of a control unit connected in the lamp circuit. The control unit usually comprised a reactor, capacitor and a thermal control switch of some kind installed in a suitable casing or box, wired up in the necessary manner and provided with connection terminals. Since these control units are relatively large and not of an ornamental nature, it is necessary to install them in a non-exposed manner in a more or less inaccessible place, usually in the wiring trough provided in the building or other structure in which the lamp is to be used. Furthermore, as these control units are made up in a permanent form by placing the various control elements in the casing and sealing it with insulating material, it is very difficult to replace or repair any element thereof without tearing the unit down and rebuilding it in the original form.

It has been found that of all the elements of the control unit, the thermal switch is the one most likely to fail and require replacement. This is due to the severe duty imposed on it in starting the lamp frequently in normal usage and under conditions of lamp failure where the cathodes remain intact but the lamp does not start because of lack of emission material on the cathodes.

Therefore, it is apparent that the control units heretofore used are not entirely satisfactory from the standpoint of economical operation of lamps of this type as failure of the thermal control switch thereof requires replacement of the entire control unit which is not only time consuming for the reason that the wiring trough must be opened and the circuits disconnected, but is also expensive and keeps the lamp out of service for longer periods of time than is usually desirable.

Accordingly, it is the object of my invention to provide an improved control for gaseous electric discharge lamps, which shall be of simple construction, economical to make and use, and in which provisions made for readily replacing the element thereof which is most likely to fail in normal service.

A more specific object of the invention is to provide for controlling the operation of a gaseous electric discharge lamp by means of a thermal control switch located in or on the socket or holder for the lamp.

Another object of my invention is to provide a control system for a gaseous electric discharge lamp which utilizes a thermal control switch located adjacent the lamp and in an accessible position separate and apart from other control elements of the control system.

A further object of my invention is to provide a lamp socket or holder for gaseous electric discharge lamps which supports or contains the thermal control switch for the lamp.

These and other objects of my invention will become more apparent from the following detailed description when considered in conjunction with the drawing, wherein:

Figure 1 is a diagrammatic view of a starting and operating circuit for a gaseous electric discharge lamp embodying the principal features of my invention;

Fig. 2 is a view in elevation showing one way in which a thermal control switch of one type may be mounted on one of the lamp sockets or holders;

Fig. 3 is a view similar to that of Fig. 2 showing a control relay of another type mounted on the socket and also showing diagrammatically the control and operating circuit for the lamp;

Fig. 4 is a fragmentary view in elevation of a lamp and socket showing a still different way of mounting the control switch of Fig. 3 on the socket; and

Fig. 5 is a view similar to Fig. 3 showing the mounting for a still different type of control relay or switch.

Referring to Figure 1 of the drawing, the numeral 10 designates generally a gaseous electric discharge lamp of the fluorescent mercury vapor type which is to be operated from a suitable source of voltage connected to the conductors 11 and 12.

The lamp 10 is of well known construction and may comprise a tubular glass envelope 13 sealed at both ends and provided with pairs of terminal prongs or pins 14 to which the cathodes 15 are connected on the inside of the envelope. The particular lamp illustrated is known as a fluorescent lamp and like other mercury vapor lamps, it is of the dual voltage type meaning that it is started at a definite voltage and

operated at a different voltage. This requires the use of a reactor or a transformer having a high internal reactance and, in this instance, a reactor 16 is shown connected in the lamp circuit.

In order to provide for supporting the opposite ends of the lamp 10 and conducting current thereto, a pair of sockets or lampholders 17 and 18 are utilized. These sockets are provided with contact members 19 which are engaged by the terminal prongs 14 of the lamp and connected to the voltage source. They may be of any suitable construction as the details of their construction are not of any particular importance as regards the present invention and, it is for this reason that they have been illustrated diagrammatically.

In order to provide for controlling the effectiveness of the reactor 16 to control the voltage impressed across the lamp terminals during the starting and operating periods, there is provided a control switch 21 which may be of any suitable type, such, for example, as the thermal switch illustrated. It is to be understood that the particular type of control switch used is not of any particular importance insofar as the present invention is concerned so long as it will function to provide the desired control of the lamp during the starting and operating periods.

The control switch 21 may comprise, generally, a normally-closed contact element 22 and an associated heater element 23 and constructed so that the contact element 22 is opened in response to the heat to which it is subjected by the associated heater element 23.

The contact element 22 of the control switch being normally closed, the reactor 16, cathodes 15 of the lamp and heater element 23 of the control switch are connected in series circuit relation to the supply conductors 11 and 12. When these conductors are energized or connected to a suitable source, the heater element 23 causes the contact element 22 to open this series circuit after the cathodes have been heated thus producing a high peak voltage or "kick" from the reactor 16 which starts the lamp by initiating a discharge between the heated cathodes 15.

Heretofore, it has been the practice to mount the control switch 21, reactor 16 and condenser 24, the latter being connected across the lamp terminals to eliminate radio interference, in a common casing or box and fill the same with a suitable insulating compound to form a permanent unitary assembly which may be referred to as a control unit.

As pointed out hereinbefore, this practice is uneconomical and unsatisfactory from the standpoint of satisfactory operation and maintenance as the control switch is subjected to a relatively heavy duty cycle in the frequent starting of the lamp under ordinary operation when the lamp is new and in good operating condition. The control switch is subjected to a heavier duty cycle in some instances when the lamp begins to approach the end of its normal life and the cathodes begin to deteriorate which makes it more difficult to start the lamp often requiring several attempts, and consequently, several operations of the control switch. Should the lamp fail to start the control switch may function repeatedly in attempting to start it if the lamp is not replaced or disconnected from the source.

Therefore, in order to provide for readily and economically replacing control switches which have failed, my invention provides for mounting the control switch, regardless of its particular type or construction and whatever other control element may be incorporated therein, adjacent the lamp in a more or less exposed and accessible position.

Preferably the control switch may be mounted on one of the lamp sockets or holders as shown diagrammatically in Fig. 1. In this instance, the control unit 25 is made up only of a suitable casing (not shown) for housing the reactor 16 and condenser 24 and which is suitably filled with an insulating compound in the usual manner. Since the condenser 24 is small as compared to the reactor 16 it may be built into or combined with the control switch in some instances and it is to be understood that my invention contemplates such an arrangement.

Fig. 2 shows the way in which the control switch 21 may be mounted directly on the socket 17, the sockets 17 and 18 being mounted on top of the cover 29 of the wiring trough or any other suitable support, the circuit connections being the same as shown in Fig. 1.

Fig. 3 shows the physical mounting of a different type of control switch 26 on the socket 17. In this instance, the control switch 26, or glow relay tube as it is sometimes called, comprises generally a glass envelope 27 provided with a screw contact base 28 similar to a small lamp bulb which is screwed into a suitable threaded opening provided in the base portion of the socket as shown.

The envelope 27 contains the control or switch elements together with an ionizable medium which function, when heated by the flow of current therethrough, to first close the circuit through the cathodes of the lamp in series and then break the circuit to produce the necessary peak voltage from the reactor to start the lamp.

In this embodiment of the invention, the sockets 17 and 18 are surface mounted as in Fig. 2 and the circuit connections are as shown. The control switch functions in the same general way to control the lamp as in Fig. 1.

In Fig. 4 there is shown a different type of mounting for the control switch of Fig. 3 wherein the main socket is flush mounted and an auxiliary attachment or adapter 31 is provided for mounting the control switch 26 on the main socket 17. In this instance the main socket 17 and adapter 31 are secured to the cover 29 by means of a single bolt 32, the cover being provided with a suitable opening beneath the lamp through which the control switch 26 extends in a more concealed position but still in an accessible position. In this instance, the control switch may be readily removed for inspection or replacement by removing the lamp from the socket or sockets.

Fig. 5 shows the physical mounting of a still different type of control switch 33, which is a different form of the glow relay tube, and which is made in the form of a metal envelope containing control elements similar to those of the control switch 26 and operating on the same principle. It differs further from the switch 26 in that it is provided with a pair of contact members 34 and 35 which mechanically engage the terminals in the adapter 31 to hold the control switch in position and complete the electrical circuit through its control elements. Control switch 33 is also mounted beneath the lamp and extends through an opening in the support 29.

In view of the foregoing, it will be apparent that I have provided for mounting the control

switch regardless of its type or construction, in a readily accessible position on or adjacent to the socket or lamp-holder so that it is entirely independent of any of the other control elements used to start and control the operation of a lamp of the character described. By so doing, I have made it possible to use and operate these lamps and, particularly, the fluorescent lamp, more economically and to greater advantage than heretofore possible. The accessibility and ease of replacement of the control switch not only reduces the cost of operating lamps of this kind but reduces the time that such lamps are out of service to a minimum as the replacement of a control switch which has failed amounts to no more than the replacement of an ordinary lamp bulb which has burned out.

Although several embodiments of the invention have been shown and described, it is to be understood that other embodiments thereof may be made without departing from the spirit and scope thereof as defined by the appended claims.

I claim as my invention:

1. The combination with a gaseous electric discharge lamp and a source of voltage therefor, of a socket for the lamp, a control unit comprising a reactor, and a thermal control switch for controlling the electrical connections between the lamp, control unit and a source of voltage to produce a peak voltage for the discharge of the lamp, said thermal control switch being rigidly supported by the lamp socket in a mechanically detachable manner apart from the control unit in an accessible position, whereby it may be readily removed for inspection or replacement.

2. In combination, a gaseous electric discharge lamp, a plurality of sockets for supporting and conducting current to the lamp, a reactor, a glow relay device for controlling the lamp, said glow relay device functioning to start the lamp discharge by first connecting the reactor and electrodes of the lamp in series circuit relation to a source of voltage for a predetermined time and then opening said circuit to produce a peak voltage, and means for detachably mounting said glow relay device as a separate element on one of said sockets adjacent one end of the lamp in an accessible and readily removable position.

3. In combination, a gaseous electric discharge lamp of the dual voltage type, a source of voltage, a pair of sockets for supporting and conducting current to the lamp, said sockets being adapted for mounting upon a support, a reactor, circuit connections for connecting the lamp and reactor to the voltage source through the lamp sockets, and a time-delay control switch interposed in said connections between the reactor and the lamp for controlling the starting operation of the lamp by first closing and then opening the circuit through the cathodes thereof to produce a peak voltage, said control switch being detachably mounted on one of said sockets with a portion thereof disposed in an exposed position on the same side of the support as the lamp is positioned, whereby it may be readily attached and detached.

4. The combination with a mercury lamp of the fluorescent type, of a socket for supporting and conducting current to the lamp, a reactor connected in circuit relation with the lamp, a thermal control switch for controlling the operation of the lamp by first connecting the reactor in series with the cathodes of the lamp to a voltage source and then opening said circuit to produce a peak voltage, and means for detachably securing said thermal control switch to the socket in an exposed position adjacent the lamp where it is readily accessible for inspection and replacement without disturbing the socket mounting or circuit connections to the reactor.

5. In combination, a mercury vapor lamp, a socket for supporting one end of the lamp and conducting current thereto, a thermal switch for controlling said lamp, said thermal switch having mounting means thereon, and means on said socket disposed to receive the mounting means of the said switch whereby the switch may be detachably mounted on the socket as a separate element in close proximity to the lamp and in an exposed and accessible position to facilitate inspection and removal for replacement purposes.

6. In combination, a mercury vapor lamp, a socket for supporting one end of the lamp and conducting current thereto, said socket being adapted for attachment to a supporting medium, a thermal switch for controlling said lamp, said thermal switch having a plurality of contact pins thereon for mounting the switch and also serving as contact elements, and a socket mounted on the lamp socket for receiving the contact pins of the switch to support said switch with at least a portion thereof on the same side of the supporting medium as the lamp is located, whereby the said switch may be detachably mounted on the socket in an accessible and readily removable position.

IRVINE A. YOST.