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LOCK-OUT SWITCH FOR FLUORESCENT LAMP STARTERS

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Fig. 1.

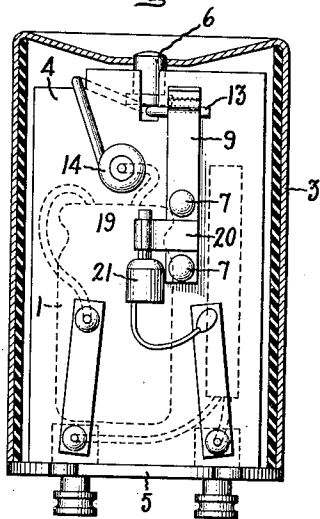


Fig. 2.

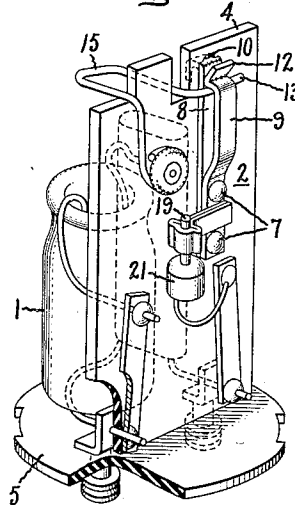


Fig. 3.

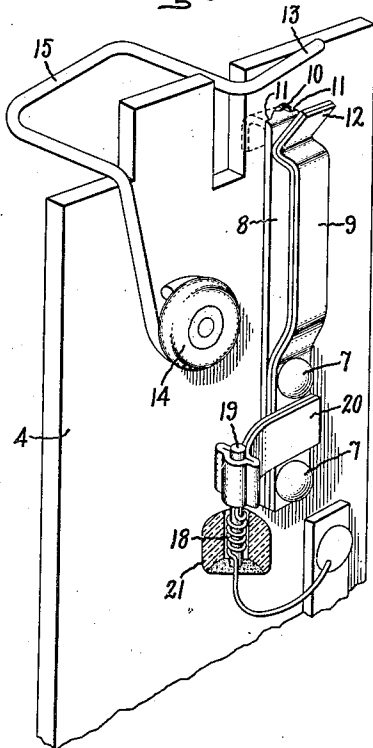
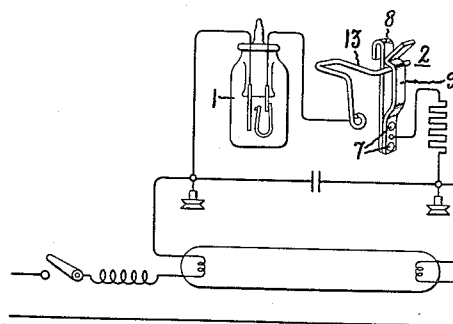


Fig. 4.



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UNITED STATES PATENT OFFICE

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LOCK-OUT SWITCH FOR FLUORESCENT
LAMP STARTERSLeonard W. Cook, Stratford, Conn., assignor to
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Application October 18, 1943, Serial No. 506,640

5 Claims. (Cl. 200—122)

My invention relates to lock-out switches for fluorescent lamp starters. Fluorescent lamps provided with starters such as are in common use at the present time sometimes fail to start for one cause or another and the starter continues to make successive efforts to start the lamp until finally it damages or destroys itself. The continued flickering of the lamp due to the unsuccessful efforts of the starter to start it, moreover, is annoying to many people. It is the object of my invention to provide an improved time delay lock-out switch to be used with a lamp starter. In the event that the lamp fails to start after a reasonable number of starting efforts made by the starter, the switch will open the circuit of the starter and thereby prevent its making further starting efforts.

My invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

Referring to the drawing, Fig. 1 is a cross sectional view of a complete starter and lock-out switch unit; Fig. 2 is a perspective view of the lock-out switch; Fig. 3 is a detailed view drawn to a larger scale; and Fig. 4 is a circuit diagram.

The arrangement of the lamp starter and the lock-out switch as shown on the drawing is similar to that shown in the copending application of William R. Young and Prescott K. Turner, Serial No. 493,004, filed May 3, 1943, of which the present invention is a further development. As in that application the starter 1 and the lock-out switch 2 are enclosed in a common casing 3 and the two devices are mounted on opposite sides of the insulating plate 4 which is attached to the end or terminal plate 5 closing the end of the casing.

The purpose of the lock-out switch as explained in the above-noted application is to render the starter inoperative in the event that the lamp will not start after the starter has made a reasonable number of successive unsuccessful attempts to start it. As shown by Fig. 4 the lock-out switch is connected in series with the starter so that after the switch trips open the starter is de-energized until the switch is re-set, as for example by pressing the resetting button 6 which projects from the end of the casing. Firmly secured at one end to the plate 4, as for example by the rivets 7, are the arcing strip 8 which may be of steel and the bimetallic strip 9. At its opposite end the arcing strip is also secured to the plate, being shown on the drawing as passing through the opening 10 and the slots 11 in the plate 4 and

clined at the other side. The bimetallic strip is bent at its free end to form the latch 12 and the strip is so tensioned that at ordinary room temperature it engages or stands very close to the arcing strip, the two strips constituting the fixed contact member of the switch.

The cooperating movable contact member of the switch is the wire spring 13 which is fixed at one end as by the rivet 14, and extends in a loop represented at 15 at the other side of the plate and has its free end when in closed circuit position between the arcing and the bimetallic strips. The spring is initially tensioned both to press against the arcing strip when in closed circuit position, that is when retained by the latch, and to take a position separated from the arcing strip as represented in Fig. 3 after being released by the latch. As a result of these two tensions the spring rests against the arcing strip when retained by the latch and remains in contact therewith notwithstanding the outward movement of the latch when the bimetallic strip is heated. After being released by the latch it slides rapidly along on the arcing strip to the end thereof finally opening the circuit. Since the arcing strip extends somewhat beyond the latch any burning or pitting that takes place due to an arc between the spring and the arcing strip is localized and does not interfere with the contact surfaces of the spring and the bimetallic member which members must disengage freely.

The loop 15 in the spring in addition to giving the spring a greater effective length serves as a part to be engaged by the resetting button. Burning and carbonizing of the plate 4 is avoided by the opening 10 in the plate near the end of the arcing strip where the arc occurs. As the spring, after being released, moves along the surface of the plate for a short distance beyond the end of the arcing strip before coming to rest the importance of avoiding any carbonizing of the plate in the path of the arc will be appreciated since should carbonizing be allowed to occur the arc would not be broken.

The bimetallic strip is heated during those successive intervals at which the starter closes the circuit by which the lamp electrodes are heated. Sufficient time delay in the operation of the lock-out switch is desirable in order that the starter may have ample time to make a number of attempts to start the lamp. In the event that considerable voltage variations occur in the lamp supply circuit it is important that the time delay mechanism should not render the switch erratic in operation. It is also important that the time

delay action shall be dependable even though the operating current is low due to low line voltage and the ambient temperature is low.

Such desiderata I obtain with the apparatus which I shall now describe. The resistance heater coil 18, formed from suitable heater wire, such as for example "Nichrome" wire, is wound on a fibre glass core 19 the core projecting beyond the end of the coil. Heat is conveyed from the core to the bimetallic strip by the thin steel band 20, the ends of which are brought together and welded to the bimetallic strip and the intermediate part of which is passed around and firmly clamped to the projecting part of the core. The band 20 also serves to electrically connect one end of the coil winding with the bimetallic strip. The heater coil is jacketed by the ceramic cylinder 21 which is secured in position by cement and the cement also is used to close the lower end of the cylinder.

Each time that the starter closes the circuit of the lamp electrodes to heat them in its efforts to start the lamp the heater coil is traversed by line current and receives an increment of heat. Because of the poor heat conductivity of the fibre glass core and the ceramic jacket of the heater the temperature of the heater coil soon rises to a high value which may be approximately 1000° F. and because of the specific heat of those parts an appreciable time is required for them to reach that temperature. The core and jacket function as a heat reservoir which after attaining a high temperature from a number of successive energizations of the heater coil supplies heat at a restricted rate through the steel strip to the bimetallic strip. By selecting a resistance wire of suitable size, such for example as wire having a diameter of .008 of an inch for use with a 100 watt lamp, one may be certain that the parts constituting the heat reservoir will always get hot even with current of the lowest permissible value in the circuit. The bimetallic strip is constructed to warp enough to unlatch the contact spring after attaining a temperature of about 210° F. which is well above any ambient temperature which would be encountered in service. If the heat reservoir always reaches a temperature of say 1000° F. regardless of voltage variations that may occur one can rely on there being a flow of heat through the steel band sufficient to cause the bimetallic strip to open the circuit. Inasmuch as the heat produced by the heating coil is for the most part stored since it is not lost to an appreciable amount by conduction through the ceramic jacket because of its poor conductivity and is not conducted to the bimetallic strip through the restricted path provided by the steel strip to an appreciable degree until a high temperature is reached, the time delay action of the switch is very dependable even over the wide range of operating conditions encountered in service. In other words, the variation in the time delay with the variations in the line voltage encountered in service is relatively small.

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

1. A lock-out switch for a fluorescent lamp starter comprising an insulating plate, a bimetallic contact strip secured at one end thereto, a heater associated with said strip for causing the free end thereof to deflect away from said plate, said strip having a latch at its free end, a co-operating contact wire mounted on said plate for engagement with said strip, said wire being biased to disengage said strip when released by said latch, and an arcing strip mounted on said plate in electrical connection with said bimetallic strip, said arcing strip extending beyond said latch and arranged to engage said contact wire on the side thereof opposite to that engaged by said bimetallic strip.

2. A lock-out switch for a fluorescent lamp starter comprising an insulating plate, a bimetallic contact strip secured at one end thereto and having a latch at its free end, a heater associated with said strip for causing the free end thereof to deflect away from said plate, an arcing strip secured to said plate beneath said bimetallic strip and in engagement therewith, a resilient contact wire secured to said plate and arranged to be retained by said latch in engagement with said arcing strip, said contact wire being tensioned to disengage said strips when released by said latch and said arcing strip extending beyond said latch.

3. A time delay lock-out switch for a fluorescent lamp starter comprising cooperating contacts, a thermal member for moving one of said contacts relative to the other, a resistance heater, low heat conductivity enclosing means for said heater, a core formed from low conductivity material positioned within said enclosing means adjacent to said resistance heater, and means having good heat conductivity connected to said core and forming a restricted path for conveying heat from said heater to said thermal member.

4. A time delay lock-out switch for a fluorescent lamp starter comprising cooperating contacts, a thermal member for moving one of said contacts relative to the other, a resistance heater coil having a low heat conductivity core and a low heat conductivity enclosing member, and a member having good heat conductivity connected to said core and providing a restricted path for the transfer of heat from said core to said thermal member.

5. A time delay lock-out switch for a fluorescent lamp starter comprising a fixed contact, a bimetallic strip having a cooperating contact, a resistance heater coil, a ceramic jacket enclosing it, said coil having a fibre glass core constructed to project beyond the coil at one end thereof, and a thin steel strip clamped around the projecting part of said core and connected with said bimetallic strip.

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