Nov. 1, 1927.

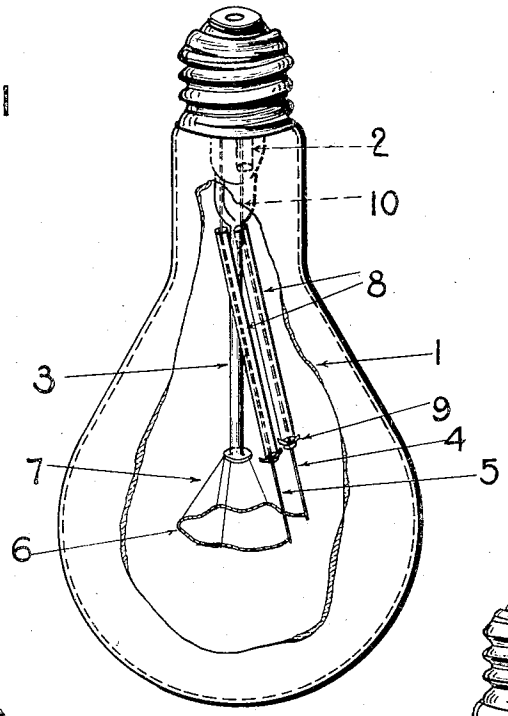
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W. A. McKAY ET AL.

NONARCING ELECTRIC LAMP

Filed July 29, 1924

FIG.1



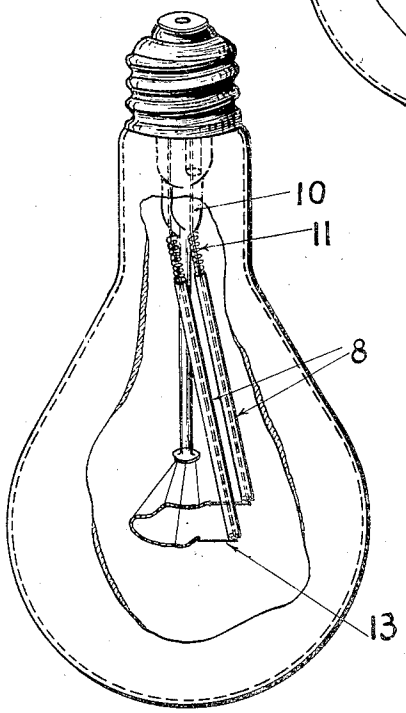
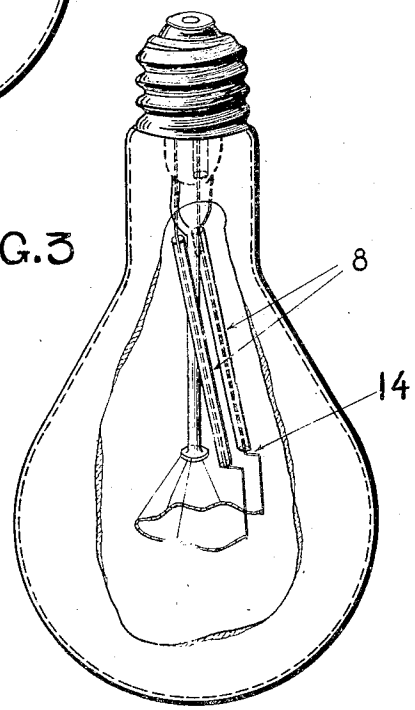


FIG. 2.

FIG.3



INVENTOR
WILLIAM A McKAY
CHARLES C. COLBY
BY
ATTORNEY

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UNITED STATES PATENT OFFICE.

WILLIAM AUGUSTIN McKAY, OF BLOOMFIELD, AND CHARLES CLIFTON COLBY, OF NEWARK, NEW JERSEY, ASSIGNORS TO WESTINGHOUSE LAMP COMPANY, A CORPORATION OF PENNSYLVANIA.

NONARCING ELECTRIC LAMP.

Application filed July 29, 1924. Serial No. 728,838.

This invention relates to non-arcing electric lamps and more particularly to gas-filled lamps emboding means for extinguishing an arc should one form between the leading-in wires of the lamp upon failure of the filament.

The expression "non-arcing lamp" is used herein in a sense similar to that in which the expression "fireproof building" is commonly used, it not being intended to imply that arcs will not occur in the "non-arcing lamps" herein described, but rather, that those arcs which may occur will be extinguished within the lamp without doing any exterior damage.

In the operation of gas-filled lamps, and particularly in cases where a number of lamps designed for a lower voltage are operated in series on circuits of 200 to 600 volts, or more, as in street lighting and street railway lighting practice, trouble has been experienced due to the formation of destructive arcs between the leading-in wires when the filament fails. It has been found in practice that such arcs may be maintained for a considerable length of time, and may not only travel along the leading-in wires to the stem press, but may actually burn a path through the stem press and continue into the base, fusing the base into the socket or even destroying the socket and injuring the surrounding parts.

The tendency toward the formation of such destructive arcs has been greatly increased by the widespread use of argon as a gaseous filling for lamps instead of nitrogen, as argon permits the formation and maintenance of the arc much more readily than does nitrogen. Argon, however, has particular advantages over nitrogen in other respects which render its use especially desirable.

In cases where a number of lamps are operated in series, as, for example, where five 110 volt lamps are operated in series on a 550 volt circuit, a considerable area might be thrown into darkness should one lamp burn out, as this would leave the circuit through the remaining lamps open. It is desirable, therefore, in such systems, to provide means for closing the circuit around each lamp in case it burns out, either directly or through an equivalent resistance. A number of devices for this purpose are incorporated either in the socket or in the socket-holder and require for their successful operation, the interruption of the current when the filament fails. The formation of an arc between the leading-in wires may thus prevent these devices from functioning and may result in the destruction of the auxiliary device as well as the socket.

One of the objects of the invention is to provided an incandescent lamp so constructed as to be capable of extinguishing an arc which may form therein due to the destruction of the filament.

Another object is to provide an effective, non-arcing, gas-filled lamp which is economical to manufacture.

Other objects and advantages will hereinafter appear.

In accordance with a preferred form of this invention, insulating sleeves are provided about the leading-in wires or other conductors within the lamp, said sleeves being adapted when an arc is formed between such wires or conductors, to move longitudinally of the wire to interpose an insulating barrier in the path of the arc to extinguish the same.

The weight of the insulating sleeve may be relied upon to cause such longitudinal movement or positive actuating means may be provided. These sleeves may be made of any suitable insulating material although when made of quartz, hard glass or other refractory material, of the proper dimensions, it is not necessary that they be movable to extinguish the arc.

In order that this invention may be more fully understood, reference will be had to the accompanying drawings in which;

Fig. 1 is a perspective view of a gas-filled lamp embodying this invention;

Fig. 2 is a perspective view of a modified form of lamp; and,

Fig. 3 is a perspective view of a still further form of the lamp.

The lamp shown in Fig. 1 comprises a bulb 1 containing an inert gas such as argon or nitrogen, a stem 2, arbor 3, leading-in wires 4 and 5, and a filament 6. The filament is welded or otherwise secured to the ends of the leading-in wires 4 and 5 and is supported at spaced points intermediate its length by supports 7 inserted into the arbor 3. On each of the leading-in wires 4 and 5

is placed a sleeve 8 of glass, quartz or other suitable insulating material. These sleeves are retained on the leading-in wires by metal cross pieces 9 welded or otherwise secured to the leading-in wires although other suitable supporting means may be provided. The sleeves 8 are preferably held tightly against the press of the stem of the lamp to prevent rattling and vibration thereof.

The lamp is designed to be operated with the base uppermost.

Should an arc form between the leading-in wires due to the destruction of the filament, it will, if it persists, follow up these wires as the latter are fused away until one of the cross pieces 9 is reached. The cross piece will then be consumed by the arc releasing one or both of the sleeves 4 and 5, causing the same to drop suddenly and cutting off communication between the arching ends of the leading-in wires, thereby quickly extinguishing the arc.

These sleeves when made of glass, may be relatively large in order to insure that they will drop quickly when the supporting means has fused away, since otherwise, the arc may pass directly up the leading-in wires, fusing away the glass sleeves in its path.

It has been found, however, that with quartz sleeves of the proper dimensions, it is not essential that the sleeves move at all; the arc is extinguished without this motion, as soon as the arcing ends of the leading-in wires have fused back to the sleeves. This, obviously permits the application of this invention to lamps burned base down, as well as to those burned base up.

Fig. 2 shows the use of positive means for causing the downward movement of the insulating sleeves upon the formation of an arc. A helical spring 11 is interposed between the upper end of each of the sleeves 8 and the stem press 10. These springs are retained under compression and the sleeves held in upward position by bending the leading-in wire outwardly against the lower end of the sleeves as at 13. In this form, when the arc is established, the outwardly bent ends of the wires are first consumed, releasing one or both of the sleeves 8 which are forced downwardly by the springs 11. The springs in addition to positively insuring the movement of the sleeve along the leading-in wire, also serve to cushion any vibration or tendency of the sleeve to rattle.

In the modification of Fig. 3, the leading-in wires are bent outwardly as at 14 to form supports for the sleeves 8, thus dispensing with the cross pieces 9 of Fig. 1. In this form, the springs have been eliminated and the weight of the sleeves relied upon to cause the downward movement thereof.

It will thus be noted that means have been provided for quickly and effectively extinguishing an arc, should it be formed and danger of such arc passing into the base of the lamp or into the socket is eliminated.

While this invention has been described as applied particularly to a gas-filled lamp, it is not so limited and may equally well be applied to vacuum incandescent lamps. It has been found, for instance, that in vacuum lamps in which an imperfect vacuum has been obtained or in the case of leaky lamps, that the heat of the filament may ionize the residual gas therein and decreases the resistance between the lead wires sufficiently to permit an arc discharge to pass therebetween which may cause destruction of the glass parts of the lamp.

These arcs are not as persistent, however, as in the case of gas-filled lamps and may be extinguished by coating the lead wire with a refractory insulating material, as zirconia, thoria, quartz or other suitable material which in powdered form, may be mixed with a suitable binder, applied to the wire and baked or allowed to dry thereon, although, if desired, a sleeve such as disclosed for gas-filled lamps may be used.

Obviously, this invention is not limited to the precise embodiments illustrated and described herein, but is susceptible to other modifications and variations may be made therein to adapt the same to other types of lamps.

What is claimed is:

1. An incandescent electric lamp having means for terminating electrical discharges between the leading-in wires of the lamp comprising an insulating barrier, means for normally supporting said barrier in a given relative position with respect to said leading-in wires, said supporting means being movable upon the formation of a discharge between said leading-in wires to release the barrier and interpose the same in the path of the discharge.

2. An incandescent lamp having means for extinguishing arcs between the leading-in wires comprising an insulating barrier movable across the path of the arc.

3. An electric incandescent lamp comprising a filament having leading-in wires connected thereto, an insulating sleeve surrounding at least one of said leading-in wires, means for holding said sleeve normally removed from said filament and means for moving said sleeve longitudinally of said filament upon the destruction of said holding means resulting from an arc occurring between said leading-in wires.

4. An incandescent lamp having means for extinguishing arcs across the leading-in wires comprising an insulating sleeve on each of said leading-in wires said wires having portions thereof bent to support the insulating sleeves, said sleeves being movable and adapted on the formation of an arc to be

released for movement into the path of the arc.

5. In an incandescent lamp having a plurality of conductors, means for extinguishing arcs between said conductors comprising a refractory insulating member movable relative to at least one of said conductors.

6. An incandescent lamp having means for extinguishing arcs across the leading-in wires comprising insulating sleeves on said leading-in wires, means for normally holding said sleeves in elevated position and adapted upon the formation of an arc to release at least one of said sleeves and cause it to traverse the path of the arc.

7. In an incandescent lamp having a plurality of conductors therein, means for extinguishing arcs between said conductors comprising an insulating sleeve means for holding said sleeve on said conductors against gravity, said sleeves being releasable on the formation of an arc to permit them to drop to interpose an insulating barrier in the path of the arc.

8. In an incandescent lamp, the combination with the leading-in wires thereof, of insulating members, means for normally holding said members substantially stationary on said leading-in wires and adapted to move by reason of their potential energy on the formation of an arc between said leading-in wires to interpose an insulating barrier in the path of the arc.

9. In an incandescent lamp, the combination with the leading-in wires thereof, of insulating members, means for holding said members substantially stationary on said leading-in wires and means for causing said insulating members to move longitudinally of the leading-wires on the formation of an arc between said wires.

10. An incandescent lamp having means for extinguishing arcs between the leading-in wires thereof comprising an insulating sleeve held on one of said wires by deformation of said wire said sleeve being movable by reason of its potential energy when released by a destruction of the deformed portion of said wire under the fusing action of an arc.

11. An incandescent lamp having a stem, leading-in wires sealed therein and means for extinguishing arcs between said leading-in wires comprising insulating sleeves mounted on said leading-in wires and resilient members interposed between the ends of said sleeves and the stem of the lamp.

12. A gas-filled incandescent lamp having means for extinguishing arcs between the leading-in wires thereof comprising an insulating barrier and means for directing said barrier across the path of the arc.

13. An incandescent electric lamp having conductors extending therein, a gaseous filling for said lamp containing argon and means movable under its potential energy within said lamp for extinguishing an arc should it form between said conductors.

14. An incandescent lamp having a filament and leading-in wires connected thereto, means for extinguishing arcs between the leading-in wires thereof comprising a member mounted on said leading-in wires and movable thereon, means for holding said member removed from said filament and adapted to drop by reason of its potential energy when said holding means is destroyed by an arc between said leading-in wires.

In testimony whereof, we have hereunto subscribed our names this 26th day of July 1924.

WILLIAM AUGUSTIN McKAY.
CHARLES CLIFTON COLBY.