1,725,048

Filed Aug. 4, 1927



Patented Aug. 20, 1929.

1,725,048

UNITED STATES PATENT OFFICE.

WILLIAM A. BLACK, OF MONTCLAIR, NEW JERSEY, ASSIGNOR TO LUMINEX CORPORATION, A CORPORATION OF NEW JERSEY.

ELECTRIC CANDLE.

Application filed August 4, 1927. Serial No. 210,518.

designed to realistically simulate real candles of the burning-wick type.

- The present invention is closely related 5 to the subject matter of my co-pending application Serial No. 122,620, filed July 15, 1926, of which it is a continuation in part, and has to do with an improved electric candle structure of the same general type.
- As in the case of the invention described 10 in my aforementioned co-pending application the primary object underlying the present invention is to produce an electric can-dle which is as realistic in its simulation of
- 15 a burning-wick candle as it is possible to attain. Other objects of the invention have to do with the production of an electric candle structure which is well adapted for economical manufacture on a large scale.

In electric candles according to the pres-20 ent invention the candle flame is simulated by means of a miniature electric bulb wrapped with a suitable translucent material, such as tissue paper treated with shel-

- 25 lac, and formed into the shape of a candle flame. This is capable of producing a very realistic candle flame effect. In order to carry out this idea, however, the constric-tion at the base of the electric "flame" must
- 30 be of very small diameter, that is, of the order of the diameter of a candle wick of ordinary size. For that reason it has been found impractical to use electric bulbs with standard bases—the smallest standard base
- 35 being much too large for this purpose in an electric candle of ordinary size. For com-mercial reasons it has been found to be almost mandatory that these electric candles be designed and constructed with removable
- 40 "flames" so that when the lamps burn out it is not necessary to replace the whole can-dle. By the term "flame", as used throughout this specification, what is meant is the simulated flame comprising an electric bulb
- 45 with its wrapper. Due to the essential narrow constriction at the base of the "flame" it proved to be a difficult problem to pro-duce a removable "flame" which could be
- 50 been one of the important objects of this invention and it has been done in a most satis-

55 satisfactory removable "flame" other objects although very cheap, is not entirely suitable 110

This invention relates to electric candles leading up to this invention have been to produce a candle body structure which is entirely satisfactory from both a mechanical and electrical standpoint and which is well adapted for volume production and ca- 60 pable, of course, of being manufactured at low unit cost. The candle body structure described herein accomplishes these objects in a very satisfactory manner.

The several novel features of this inven- 65 tion may best be described and pointed out in connection with the illustrations contained in the drawing which accompanies this specification and in which

Fig. 1 is an enlarged elevational view of 70 a miniature incandescent electric bulb and special base adapted to form a part of the electric candle "flame"

Fig. 2 is a cross-sectional view taken along the line 2-2 of Fig. 1; Fig. 3 is a longitudinal sectional view 75

of the upper end of the interior part of an electric candle body and showing in cross section a special screw socket designed to receive the electric "flame";

Fig. 4 is a cross-sectional view taken along the line 4-4 of Fig. 3; and

Fig. 5 is an elevational view, partially in section, of a complete electric candle in 85 accordance with this invention.

Referring first to Fig. 5 which shows the entire electric candle in elevation, the principal parts of the candle structure comprise the electric "flame" which is designated as a whole by the numeral 1, the body portion 90 which is designated as a whole by the numeral 2, and a standard screw base which is designated by numeral 3. As is indicated by the drawing the electric "flame" 1 is made to represent as realistically as possible a burning- 95 wick candle flame. To carry out this effect the base of the "flame" is reduced to a very small diameter. The body portion 2 is com-posed of a rigid core 3' with an exterior 4 of a suitable wax or wax-like substance. The core 100 3' is made, preferably, of a hard wood dowel. The wax which I prefer to use for the exterior portion of the candle body consists of a mixmanufactured on a commercial scale to sell at ture of about two-thirds paraffin and one-third a reasonable price. To accomplish this has stearic acid by weight. Paraffin having a stearic acid by weight. Paraffin having a 105 high melting point should be used for this purpose in order to avoid running or distorfactory way as will be described hereinafter. tion in hot weather. Experience has indi-In addition to the problem of producing a cated that a wax consisting of paraffin only,

for the present purpose. to its tendency to crack in cold weather. sides of the bulb where the lead-in wires pass its cost is somewhat greater than that of par-

5 affin. As a result of experimentation it has been found that a mixture of paraffin and stearic acid in about the proportions specified above will avoid the cracking due to low temperatures, and the cost is considerably less 10 than that of pure stearic acid. Numerous

- other waxes and substances which are really wax-like in appearance may be used instead of paraffin or stearic acid. The whole object in this respect, of course, is to obtain a realis-15 tic simulation of a candle, and in order to ac-
- complish this end the material used for the exterior of the candle body must be either a real wax or look so much like it as to deceive the eye.
- 20 In Fig. 1 there is illustrated on an enlarged scale, a miniature bulb and special base which constitutes one of the important features of this invention. The electric bulb, per se, is designated by the numeral 5. This bulb com-
- 25prises a glass envelope of the form shown which encloses a small filament and has a sealoff tip at the bottom. A pair of lead-in wires 6 and 7 extend from the interior through the wall of the glass envelope above the seal-
- 30 off tip. These lead-in wires are the conductors by which current is supplied to the fila-ment. The special base of this lamp which is designated as a whole by reference numeral 8 is of necessity of very small outside diam-
- 35 This is essential in order to carry out eter. the effect of the narrow constriction at the base of the electric "flame". The preferred type of bulb having the tip at the bottom also aids in this result, as is pointed out in my
- 40 prior application referred to. In practice this base is made about $\frac{3}{32}$ nds of an inch outside diameter. It consists of a sleeve 9 made of brass tubing externally threaded, as indicated at 10, for a portion of its length. The
- 45 upper end of sleeve 9 is provided with a lateral slot as indicated at 11. The inside diameter of this sleeve is necessarily very small and, because of the fact that it is necessary to run a conductor through it, the problem of in-50 sulation between the sleeve and the conductor running through its center was a difficult one to solve. That is to say, it proved difficult to devise a suitable construction which would be well adapted for large scale manu-55 facturing. The conductor 12 which, as shown, extends through the brass sleeve 9 may
- conveniently be a common brass pin with its sharp point cut off. The head of the pin is indicated at 13. The lead-in conductor 6 is lead-in wires 6 and 7 at the point of juncture 60 soldered or brazed to the pin conductor 12. A second conductor 14 which may be a small piece of copper wire is soldered or brazed to the sleeve 9 and to the lead-in wire 7. Con-65

This is due partly seal-off tip at the bottom to the points on the Clear stearic acid may be used successfully but thru the glass. The slot 11 is made wide enough to accommodate the wire 14 and the pin 12 with its insulation. 70

> It is obvious that the pin 12 must be thoroughly insulated from the sleeve 9 and the conductor 14 because otherwise the filament lighting current would be short-circuited. To provide proper and dependable insulation 75 in such a small space and at the same time design a base structure which would be entirely satisfactory from the mechanical as well as manufacturing standpoint was indeed a difficult problem. This has been accom- 80 plished by the seemingly simple expedient of winding the pin 12 with fine thread and securing the thread to the pin by means of a quick-hardening insulating varnish. The varnish which is employed is known commer- 85 cially as "bakelite varnish" and is presumably a phenolic formaldehyde product. Any insulating cement or varnish which will set quickly would probably be satisfactory. In applying the insulating thread to the pin 12 90 a winding machine of special design is used. The point of the pin is secured in a suitable chuck. The free end of the thread is secured to the chuck, and an automatic feeding device moves the thread along longitudinally 95 of the pin while the chuck and pin revolve. A small amount of bakelite varnish is applied to the thread while it is being wound on the pin and at the same time or immediately thereafter a blast of hot air is directed 100 at the insulated pin. This causes the varnish to set immediately thereby preventing the thread from unwinding. The outer diameter of the insulation thus applied is proportioned to provide a snug fit for the insulated pin 105 within the sleeve 9. The insulating thread is wound on the pin to such a length as to avoid any possibility of short-circuiting be-tween the pin and the sleeve 9. In the drawing the thread is indicated as extending to a 110 point 15. The pin head 13 forms one of the electric contacts while the sleeve 9 forms the other. In winding the thread on the pin it is best to wind several turns just under the head of the pin to form a sort of cushion for 115 the pin head and prevent short-circuiting which might otherwise result from a longitudinal movement of the pin when the base is screwed into its socket.

A serious difficulty which was encountered 120 in the construction of electric "flames," especially those having a screw base as illustrated in Fig. 1, consisted in the breaking off of the with the supporting conductors 12 and 14. 125 It was found that these joints were subject to frequent breakage due to insufficient support for the electric hulb. After extensive experiment it was found that this trouble ductors 12 and 14 follow generally the con-experiment it was found that this trouble tour of the lower part of the bulb from the could be completely overcome by means of ¹³⁰ the application of a quick-drying insulating extend down to the screw base 3 and are solof nitro-cellulose, on general sale, has been

- 5 found especially satisfactory. A thin coating of this cement is practically transparent, but as the thickness is increased, the degree of transparency becomes less and the color deepens to an amber shade. The cement is
- 10 applied to the lower part of the bulb including the junctions between the lead-in wires and the supporting conductors 12 and 14. It forms a strong skin adhering to the glass envelope and to the conductors 12 and 14 which
- provide a sort of supporting crotch for the 15 bulb, permitting twisting of the bulb for the purpose of screwing it in and out of its socket without danger of breakage. The structure shown in Fig. 1 is provided with a wrapper
- 20 16 which is shown in Fig. 5. This wrapper may conveniently consist of white tissue paper which has been treated with shellac and allowed to dry. The shellacked paper is wrapped about the bulb and manipulated into
- 25 the form shown to simulate a candle flame. It is secured to the bulb with the mentioned cement; and an application of the same cement is applied to the outside of the wrapper. This cement dries quickly and forms a
- 30 very rigid coating. The application of shellac to the tissue paper gives to it a desirable degree of translucency and a color which causes the light to resembled closely that of a real candle flame.
- The next problem to be encountered was 35 to provide a suitable socket to receive the electric "flame" and which would be entirely satisfactory mechanically and electrically
- and at the same time be capable of being manufactured at very low cost. Such a socket is illustrated in cross-section in Fig. 3. It 40 comprises a piece of round brass rod 17 drilled and tapped axially as indicated at 18 and recessed as shown. The thread 18 is
- 45 designed to receive the threaded base 8. A cylindrical plug 19 of insulating material such as fiber, hard rubber or any other suitable material, is inserted in the counterbored recess in the part 17 and is secured
- 50 in place therein by punch-pricking or stak-ing the part 17. The pin 20 which may be of the form shown or even a common brass pin with its point cut off extends through the axis of the plug 19 and is rigidly held therein.
- The pin 20 forms the center contact which makes electrical engagement with the head 13 of the pin 12 forming part of the base of the electric "flame".
- The socket comprising the parts 17, 19 and 20 is seated in the end of the wooden dowel 60 3', a counterbored recess being provided for that purpose. A pair of conductors 21 and 22 make connection with the pin 20 and part 17, respectively, and are soldered thereto.
- 85 These conductors which may be of bare wire burned candle, as illustrated in Fig. 5. After 130

cement through which the light will pass; a dered thereto, one going to the center concent comprising a quick-hardening solution tact and the other to the screw shell which form the contacting elements of the base. The upper end of the wooden core 3' is 70 slotted laterally as indicated in Fig. 3 and the cross sectional view Fig. 4. This slot need extend but a short distance. Its purpose is to provide a convenient passageway for the conductors 21 and 22 and particularly for the for- 75 mer which is connected to the center contact pin 20. The wooden core 3' is selected of a diameter slightly greater than the inside diameter of the screw base 3. Its lower end is provided with two lateral slots at right angles 80 to each other. This permits contraction and expansion of the core allowing it to be forced readily into the screw base 3 and at the same time it provides a suitable passageway for the conductor 21 which extends to the center 85 contact of the screw base 3.

The whole structure, as will be noted, is very simple and lends itself admirably to economical production. The socket comprising parts 17, 19 and 20 is obviously well 90 adapted for rapid production at low cost. The wooden core is designed with a view to cheap production and at the same time to the facilitation of assembling operations. One feature which may not on its face seem im- 95 portant. but which is in reality quite important, is that the conductors 21 and 22 may be bare wires since there is no possibility of a short circuit between them. This saves the cost of cleaning off insulation which is a ma- 100 terial consideration.

The base 3 is secured to the core 3' by means of a prick-punching operation which is performed by a die. The upper part of the base is prick-punched thereby being forced into 105 the wooden core and is thus prevented from rotating when the candle is screwed into the socket.

In the manufacture of these electric candles the whole interior assemblage including the 110 wooden core, the screw base 3, the socket at the upper end and the conductors 21 and 22 is completed before the wax is applied. The interior assemblage comprising the elements mentioned is placed in a specially designed 115 mold in which it is centered by means of the screw base 3 at one end and a long brass pin at the other end which engages the thread The pin just mentioned fills the opening 18. 18 thereby preventing the hot wax from run- 120 ning into it, and at the same time this pin functions to center the core in the mold. After the wax, which is poured into the mold, has solidified, the candle body together with its centering pin are removed from the mold 125 and a hot convex iron is applied to the upper end of the candle to melt the excess wax which is allowed to flow down the side of the candle to produce the effect of a partially

3

this operation is completed the centering pin is removed and the candle body is then ready to receive the electric "flame." The process of manufacture which has just been de-5 scribed is an important feature of the present invention.

The miniature lamps which are used in these electric candles operate on six volts. This voltage is obtained from the usual 110 10 volt house-lighting circuits either by means of small step-down transformers, or resistance which may be incorporated in the lamp cord connected to the candle holder.

The life of the lamps is several hundred 15 hours and they consume very little current. The total cost of operation including lamp replacements is so low and the effect is so realistic that these electric candles are far more satisfactory and economical to use than ordi-20 nary candles.

I claim:

1. An electric "flame" designed to simulate a candle flame, comprising an incandescent electric bulb having a filament and a pair of 25 lead-in wires, a base for said bulb comprising a tubular conducting sleeve of small diameter, a conductor extending through said sleeve and insulated therefrom, said conductor being rigidly connected to one of 30 said lead-in wires, a second conductor connected to said sleeve and rigidly connected to the other of said lead-in wires, said conductors forming rigid supports for said bulb. 2. An electric "flame" designed to simu-

³⁵ late a candle flame, comprising an incandescent electric bulb having a filament and a pair of lead-in wires, a base for said bulb comprising a tubular conducting sleeve of small diameter, a conductor extending 40 through said sleeve and insulated therefrom, one end of said conductor being rigidly connected to one of said lead-in wires, the other end of said conductor forming a contact member, the insulation between said con-45 ductor and said sleeve consisting of thread wound on said conductor and secured thereto, a second conductor connected to said sleeve and rigidly connected to the other of said lead-in wires, said conductors forming 50 rigid supports for said bulb.

3. An electric "flame" designed to simulate a candle flame, comprising an incandescent electric bulb having a filament and a pair of lead-in wires, a base for said bulb compris-55 ing a tubular conducting sleeve of small diameter, said sleeve being threaded externally to engage a socket, a conductor extending through said sleeve and insulated therefrom, said conductor being rigidly connected 60 to one of said lead-in wires, a second conductor being connected to said sleeve and rigidly connected to the other of said lead-in wires, said conductors forming rigid sup-

ports for said bulb. 65 4. An electric "flame" designed to simulate said bulb.

a candle flame, comprising an incandescent electric bulb having a filament and a pair of lead-in wires, a base for said bulb comprising a tubular conducting sleeve of small diameter, a conductor extending through 70 said sleeve and insulated therefrom, said conductor having an enlarged end portion forming a contact element, said conductor being rigidly connected to one of said lead-in wires, a second conductor connected to said 75 sleeve and rigidly connected to the other of said lead-in wires, said conductors forming rigid supports for said bulb.

5. An electric "flame" designed to simulate a candle flame, comprising an incandescent 80 electric bulb having a filament and a pair of lead-in wires, a base for said bulb comprising a tubular conducting sleeve of small diameter, a conductor extending through said sleeve and insulated therefrom, one end portion of said conductor being rigidly connected to one of said lead-in wires, the other end of said conductor being enlarged to form a contact member, the insulation between said conductor and said sleeve consisting of thread 90 wound on said conductor and secured thereto, a second conductor connected to said sleeve and rigidly connected to the other of said lead-in wires, said conductors forming rigid supports for said bulb.

6. A supporting base for an electric bulb comprising a tubular conducting sleeve, a conductor extending through said sleeve and insulated therefrom, the insulation between said sleeve and said conductor comprising 100 thread wound on said conductor and adhesively secured thereto, and a second conductor rigidly attached to said sleeve, both of said conductors being sufficiently stiff to rigidly support an electric bulb. 105

7. An electric "flame" designed to simulate a candle flame, comprising an incandescent electric bulb having a filament and a pair of lead-in wires, a pair of conductors each connected to one of said lead-in wires, said conductors being adapted to support said bulb through their connections to said lead-in wires and also to conduct current to said bulb, and an adhesive coating applied conjointly to the exterior of said bulb and said conductors, 115 said coating providing mechanical reinforcement between said bulb and said conductors.

8. An electric "flame" designed to simulate a candle flame, comprising an incandescent electric bulb having an enclosed filament, a 120 base for said bulb comprising a tubular conducting sleeve of small diameter, a conductor connecting said sleeve with one terminal of said filament, said conductor forming a support for said bulb, and a second conductor 12 extending through said sleeve and insulated therefrom, said second conductor being connected at one end to the other terminal of said filament and forming a second support for 12

9. An electric "flame" designed to simulate tors secured to said wires and following gena candle flame, comprising an incandescent electric bulb having an enclosed filament, a base for said bulb comprising a tubular con-

- 5 ducting sleeve of small diameter, a conductor connecting said sleeve with one terminal of said filament, said conductor forming a support for said bulb, a second conductor extending through said sleeve and insulated
- 10 therefrom, said second conductor being connected at one end to the other terminal of said filament and forming a second support for said bulb, and an adhesive reinforcement applied jointly to said bulb and said conduc-
- 15 tors so as to strengthen the attachment therebetween.

10. An electric lamp intended to simulate the flame of a burning candle, comprising an incandescent electric bulb having a pointed

20 tip at the bottom thereof, a filament in said bulb, lead-in wires extending thru said bulb at points between said tip and the top of said bulb and connected to said filament, conduc-

erally the outside contour of the bulb from 25 said points to the extremity of said tip, and transparent adhesive means securing said conductors to said bulb whereby said bulb is rigidly supported by said conductors.

11. An electric lamp intended to simulate 30 the flame of a burning candle, comprising an incandescent electric bulb having a pointed tip at the bottom thereof, a filament in said bulb, lead in wires for the filament extending thru said bulb at points between said tip and 35 the top of said bulb, conductors secured to said wires and following generally the outside contour of the bulb from said points to the extremity of said tip, and transparent adhesive means entirely enveloping said bulb, 40 said means being point-shaped at the top of said bulb and serving to secure said conductors to said bulb.

In testimony whereof I affix my signature.

WILLIAM A. BLACK.