Oct. 16, 1951 M. PIPKIN ET AL 2,571,607

COATED FLASH LAMP AND MANUFACTURE THEREOF

Filed March 9, 1949

Fig. 1.

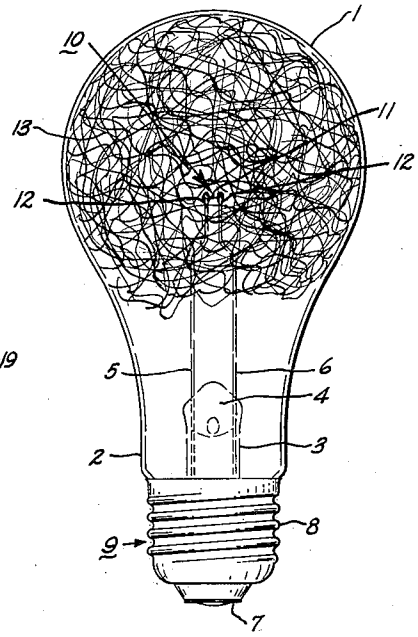


Fig. 3.

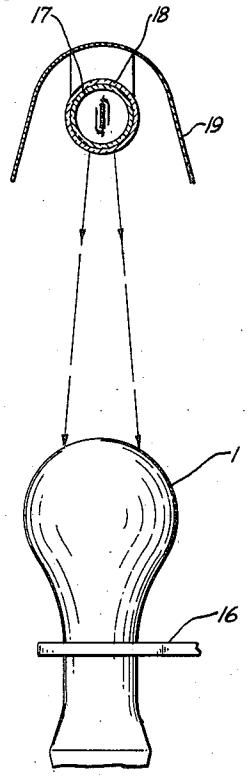


Fig. 4.

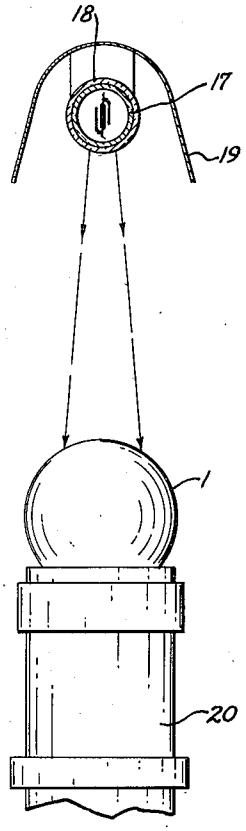
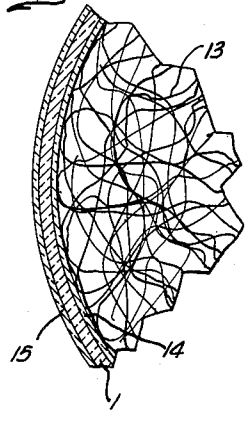


Fig. 2.



Inventors:
Marvin Pipkin.
J. Dean Johnson.
by Vernet C. Kauffman
Their Attorney.

Patented Oct. 16, 1951 2,571,607

UNITED STATES PATENT OFFICE

2,571,607

COATED FLASH LAMP AND MANUFACTURE THEREOF

Marvin Pipkin, Cleveland Heights, and J. Dean Johnson, Bellevue, Ohio, assignors to General Electric Company, a corporation of New York

Application March 9, 1949, Serial No. 80,424

6 Claims. (Cl. 67—31)

1

Our invention relates to flash lamps in general and to the manufacture thereof, and particularly to flash lamps of the type comprising a bulb or envelope of glass or similar material and containing a charge of readily combustible light-giving material which, on ignition, burns with great rapidity to produce a momentary flash of actinic light.

In flash lamps of the above indicated type, the bulb is customarily provided with an interior light-transmitting protective coating of a suitable material, such as a lacquer for instance, in order to strengthen the bulb and prevent the cracking thereof, upon charge flashing, by hot burning particles of the combustible material. Because the lacquer coatings preferably employed for this purpose are of a clear or colorless character, it is difficult to detect which bulbs have and which have not been provided with an interior coating. This difficulty is particularly troublesome in the high production manufacture of such type flash lamps where, because of the large numbers of bulbs handled, uncoated bulbs are apt to become intermingled with coated bulbs and processed and made into finished lamps in the usual way. Such uncoated lamps would then be hazardous to the user because of the possibility of the bulb cracking and exploding on charge flash with resultant danger of injury either to the user or the subject being photographed from flying glass fragments.

It is one object of our invention therefore to provide a flash lamp of the above described character having a light-transmitting bulb provided with an interior protective coating which is substantially clear and the presence of which is readily ascertainable.

Another object of our invention is to provide a bulb for a flash lamp or other lamp device having a protective coating on its inner surface which is substantially invisible under normal lighting conditions but which can be rendered visible by exposure to radiations of abnormal character.

Still another object of our invention is to provide an improved method of manufacturing interiorly coated flash lamps which will positively assure the production of flash lamps each provided with an inside protective coating.

A feature of the invention is the incorporation in the interior coating of the flash lamp bulb of a substance which, while not materially affecting the substantially clear and colorless character of the coating, will nevertheless cause the coating to radiate a distinctive and readily visible

2

hue or color when exposed to radiations of a wave length different from those present under normal lighting conditions. As an illustrative example according to the invention, a small amount of a suitable fluorescent substance, such as anthracene for instance, added to the conventional clear lacquers employed at present for the interior coatings of flash lamp bulbs will, on exposure to ultraviolet radiations, cause the interior bulb coating to fluoresce and radiate a readily visible hue or color, thus revealing with certainty the presence of such an interior coating on the bulb.

Further objects and advantages of our invention will appear from the following description of a species thereof and from the accompanying drawing in which:

Fig. 1 is an elevation of a flash lamp comprising our invention; Fig. 2 is a fragmentary sectional view of the bulb thereof; Fig. 3 is a diagrammatic view illustrating a step in the manufacture of the flash lamp according to the invention; and Fig. 4 is a similar diagrammatic view according to a modified method of manufacturing such flash lamp.

Referring to the drawing, the invention is there shown as applied to a flash lamp of the type comprising a sealed light-transmitting bulb or envelope 1 of glass or other suitable material and provided at its neck end 2 with a reentrant stem 3 which extends into the bulb and terminates at its inner end in a press or seal portion 4 through which are sealed a pair of lead-in wires 5 and 6 connected at their outer ends to the center contact 7 and shell 8, respectively, of a base 9 cemented or otherwise secured to the neck end of the bulb. The said lead-in wires 5, 6 extend into the bulb in more or less side-by-side relation and are provided at their inner ends with an ignition means 10 which may comprise a filament 11 connected across the lead-in wires and consisting of a short length of tungsten wire, for instance. The inner ends or tips of the lead-in wires 5, 6 are provided with small beads or coatings 12 of a suitable primer or fulminating material such as for example, a mixture of zirconium, magnesium and potassium perchlorate powders bonded together by a suitable binder such as nitro-cellulose. The primer beads 12 are located on the lead-in wires 5, 6 at the region of the connection of the latter to the filament 11 so as to imbed at least the end portions of the filament 11 and thus become ignited thereby upon passage of an electric current through the filament.

Disposed within the bulb 1 and around the ignition means 10 so as to be within effective ignition range thereof, is a charge of readily combustible light-giving material 13 such as leaf foil, wire, shredded foil, or ribbon which, on ignition by the igniter means 10, burns with great rapidity to produce a momentary flash of actinic light. In the particular lamp illustrated, the light-giving material 13 comprises a loose filling of filamentary material (such as shredded foil for instance) of a readily combustible composition such as aluminum, magnesium or alloys thereof. The bulb 1 further contains a gas filling, such as oxygen for instance, at a suitable pressure for supporting the combustion of the charge 13 of light-giving material.

To strengthen the bulb and minimize cracking thereof upon charge flashing, and also to prevent flying glass fragments in case the bulb actually should crack during flashing, the bulb 1 is coated interiorly, and preferably exteriorly as well, with protective coatings 14 and 15 respectively (Fig. 2) of suitable materials, such as a lacquer for instance. These protective coatings 14 and 15 are preferably of a clear or transparent character in order to provide transmission of substantially all the light generated within the bulb by the combustion of the light-giving material 13.

In the production manufacture of flash lamps of the type described above, the bulb 1 is first provided with the inside coating 14 after which the charge 13 of combustible material is introduced into the bulb through the open neck end thereof, the stem 3 then sealed into the bulb, the base 9 attached thereto and the bulb then coated exteriorly with lacquer. Because of the transparent and therefore undetectable character of the inside coating 14, it is difficult to determine whether or not such an inside coating is actually present on the bulb. As a result, uncoated bulbs are apt to become fabricated into finished lamps which, if subsequently detected and discarded represent a manufacturing loss on the one hand, but if not detected and discarded, are potentially dangerous to the ultimate user because of the possibility of the uncoated bulb cracking and exploding on flashing of the lamp.

In order to permit ready detection of the presence of the inside protective coating 14 on the bulb prior to introduction of the combustible material 13 and sealing of the stem 3 into the bulb, the said coating 14 is formed in accordance with the invention of a material which, while substantially clear and transparent and therefore invisible under radiations within the visible portion of the spectrum (such as are present under ordinary lighting conditions) will nevertheless radiate a distinctive hue or color upon exposure to radiations outside the visible portion of the spectrum. According to one form of the invention, use may be made of a coating material consisting of a conventional type clear lacquer such as heretofore employed for the inside coatings of flash lamp bulbs, for instance, a vinyl acetate (Vinylite) resin or a methacrylate resin lacquer, and containing in addition a small amount of a suitable fluorescent substance of a type which is soluble in, and will not materially affect the substantially clear or transparent character of the lacquer and which, on exposure to ultraviolet radiations or other radiations outside the visible portion of the spectrum, will fluoresce and emit a distinctive hue or color, thus indicating the presence of the inside coating on the bulb with certainty. As a specific example, the addition of a small amount of anthracene, fluorene, fluorescein, or other similar fluorescent material dissolved in the lacquer employed for the inside coating will impart the desired fluorescence thereto upon exposure to ultraviolet radiations having a wave length, for example, of 3600 Å. The amount of anthracene or other material employed for such purpose may be varied to impart the desired amount of fluorescence to the inside coating 14, but we have found an addition of as little as one-half gram or so of anthracene, per gallon or less of the lacquer coating material, to be entirely satisfactory for the intended purpose. An example of a representative inside lacquer composition according to the invention is as follows:

Alcohol, denatured	kilograms	18.5
Cellulose nitrate solution (containing around 16% solids)	kilograms	57.5
Ethylene glycol monoethyl ether acetate	kilograms	22.0
Polymerized vinyl acetate (Vinylite) resin solution (containing around 70% solids)	kilograms	53.0
Isopropyl acetate	kilograms	19.8
Diethylene glycol monobutyl ether (Carbitol) phthalate	milliliters	3.4

In the manufacture of flash lamps in accordance with the invention, the bulbs 1 are preferably tested for the presence of the inside coating 14 at the time or just before they are filled with the charge 13 of combustible material. This is done under subdued light by exposing the bulbs, at this stage in the manufacture of the flash lamp, to ultraviolet radiations such as that commonly referred to as black light, which then causes the inside coating, if present, to fluoresce and thus provide a ready and positive indication of the presence thereof. Bulbs which do not fluoresce under exposure to such ultraviolet radiations are then discarded and therefore are prevented from being fabricated into finished lamps which, because of the absence of an inside coating, would be of defective and potential dangerous construction. If desired, however, the test for the presence of the inside coating 14 on the bulb may be made after the lamp has been substantially completed, i. e., after the sealing of the stem 3 into the bulb and the attachment of the base 9 thereto, but preferably before the application of the outside lacquer coating 15 to the bulb. The testing of the bulb for presence of inside coating prior to sealing of the stem and attachment of the base thereto is preferable however because of the saving in stems and bases which otherwise would be discarded along with the bulb if the lamp were finished before testing for presence of inside coating.

Fig. 3 illustrates the manner in which flash lamp bulbs 1 may be tested for the presence of inside lacquer coating in accordance with the invention. The bulbs 1 in this case are shown being tested while they are mounted in the holders 16 of the drying conveyor on which the bulbs are placed following the application of the inside lacquer coating 14 to the bulbs. The bulbs 1 are subjected, while under subdued visible light, to the radiations emitted by a suitable source 17 of ultraviolet light or so-called black light, such as, for instance, a small tubular fluorescent lamp of the type emitting ultraviolet radiations of 3600 Å wave length and provided with suitable filter means (such as an outer enclosing sleeve 18 of visible light absorbing glass) for absorbing the

visible light from the lamp 17. A suitable reflector or shield 19 may be positioned around the ultraviolet emitting lamp 17 to confine the ultraviolet radiations therefrom to the region occupied by the bulb 1 to be tested. By looking at the bulb 1 while thus subjected to the rays from the ultraviolet emitting lamp 17, an operator can tell at a glance (i. e., by the presence or absence of a fluorescent glow within the bulb) whether or not the bulb is inside coated, and can separate any uncoated bulb from the coated bulbs and return it to the inside lacquering machine for application of the inside coating thereto.

Fig. 4 illustrates a suitable arrangement according to the invention for testing flash lamp bulbs 1 for the presence of inside lacquer coating at the time they are filled with the charge 13 of combustible material. In this case, the bulb 1 is shown mounted in place on the filling head 20 of apparatus, such as that shown in Geiger et al. U. S. Patent No. 2,347,046, for introducing into the bulb a charge 13 of combustible material in the form of shredded foil. Positioned adjacent the filling head 20 is the source 17 of ultraviolet radiations which are directed against the bulb 1 while positioned on the filling head 20, as shown in Fig. 4. The reflector or shield 19 is positioned around the ultraviolet emitting lamp 17 so as to shield the operator from the ultraviolet radiations emitted by the lamp 17. Bulbs which do not fluoresce while in the filling head 20 are separated by the operator from those which do and are returned to the inside lacquering machine for application of the inside coating thereto.

While we have shown and described the invention as applied to flash lamps of the type having a loose filling of combustible material such as wire, ribbon, shredded foil or leaf foil, it should be understood that the invention is applicable to any type of flash lamp containing combustible material which, on flashing of the lamp, is apt to cause cracking of the glass bulb. Thus, the invention may be applied as well to flash lamps of the so-called primer type such as disclosed in U. S. Patent No. 2,291,983, Pipkin, wherein the combustible material is in the form of small beads or coatings of a fulminating paste provided on the inner leads of the lamp and imbedding at least the end portions of the lamp ignition filament.

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

1. A flash lamp comprising a substantially clear glass envelope at least partially transmissive of ultraviolet light, a quantity of readily combustible material in said envelope adapted to generate on combustion a flash of actinic light, and a transparent protective coating on the inner surface of said envelope, containing a small amount of a fluorescent material imparting fluorescence to the coating upon irradiation thereof by ultraviolet light directed through the envelope wall without substantially impairing the transparent character of said coating, the said coated bulb transmitting substantially unmodified the radiations emitted by said combustible material on combustion thereof whereby said combustible material constitutes substantially the sole source of light emitted by the lamp upon flashing thereof.

2. A flash lamp comprising a substantially clear glass envelope at least partially transmissive of ultraviolet light, a quantity of readily combustible material in said envelope adapted to generate on combustion a flash of actinic light, and a transparent protective lacquer coating on the inner surface of said envelope, containing in solution a small amount of a fluorescent material imparting fluorescence to the coating without substantially impairing the transparent character of said coating, the said coated bulb transmitting substantially unmodified the radiations emitted by said combustible material on combustion thereof whereby said combustible material constitutes substantially the sole source of light emitted by the lamp upon flashing thereof.

3. A flash lamp of the character set forth in claim 2 wherein the said fluorescent material comprises anthracene.

4. A bulb for flash lamps made of a clear glass which is at least partially transmissive of ultraviolet light, and a transparent protective lacquer coating on the inner surface of said bulb, containing in solution a small amount of a fluorescent material imparting fluorescence to the coating without substantially impairing the transparent character thereof, the said coated bulb transmitting substantially unmodified the radiations emitted by said combustible material on combustion thereof whereby said combustible material constitutes substantially the sole source of light emitted by the lamp upon flashing thereof.

5. A bulb for flash lamps of the character set forth in claim 4 wherein the said fluorescent material comprises anthracene.

6. The method of manufacturing flash lamps of the type having a bulb provided with a transparent inside lacquer coating which method comprises, incorporating in the lacquer coating material a small amount of a fluorescent material capable of imparting fluorescence to the said lacquer coating without materially affecting the transparency thereof, applying thin films of the fluorescent lacquer coating material to the inner surface of the bulbs, irradiating the interiorly coated bulbs with ultraviolet light to cause the said inside coating to fluoresce and thus provide a visible indication of its presence, and subsequently fabricating into finished flash lamps only those bulbs which so fluoresce and therefore are provided with the inside coating.

MARVIN PIPKIN.
J. DEAN JOHNSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,305,609	Eaton	Dec. 22, 1942