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[54] PHOTOFLASH LAMP

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[51] **Int. Cl.** **F21k 5/02**

[58] **Field of Search** 431/93–95

[56] **References Cited**

UNITED STATES PATENTS

3,535,064 10/1971 Anderson et al. 431/93

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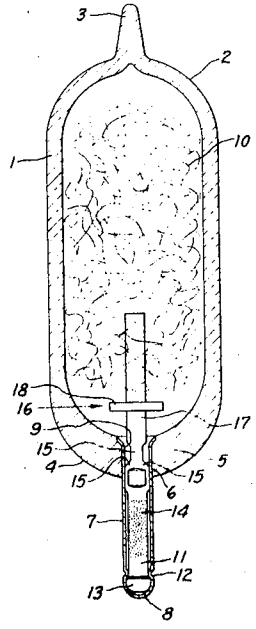
[57] **ABSTRACT**

The deflector shield of a percussion ignitable type flash lamp, for deflecting toward the side of the lamp envelope the hot particles of the lamp igniting fulminating material on ignition thereof, is constituted by an integral upset collar portion of the wire anvil which extends into the metal ignition tube of the lamp and which is coated with the fulminating material.

4 Claims, 1 Drawing Figure



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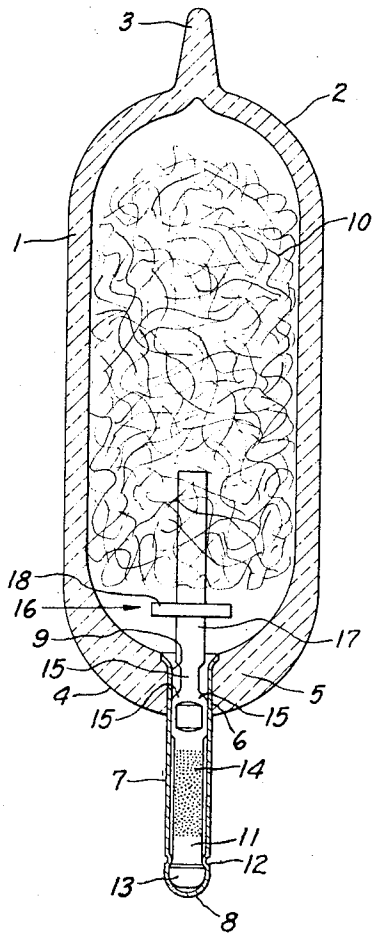

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PHOTOFLASH LAMP

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to photoflash lamps and more particularly to those of the so-called percussion-ignitable type.

2. Description of the Prior Art

Photoflash lamps in general use at present comprise a hermetically sealed light-transmitting envelope usually made of glass and containing a combustion supporting gas such as oxygen and a loosely distributed filling of a suitable light-producing combustible material such as a shredded foil of zirconium, aluminum or hafnium, for example, which, on ignition, produces a high intensity flash of actinic light. Suitable ignition means are generally provided in the lamp to initiate the flashing thereof. The most common forms of ignition means employed for such purpose are either of the electrical type wherein a tungsten or tungsten alloy filament disposed within the lamp envelope and coated or in contact with a primer or fulminating material is heated by the passage of an electrical current therethrough to ignite the primer material, or of the so-called percussion type wherein a charge of percussively sensitive fulminating material, located either within the lamp envelope or within an appendage thereon, is ignited by the application thereto of a sudden forceful mechanical impact as by means of a spring-tensioned striker arm or hammer.

In the percussive ignition type photoflash lamps in general use at present, the charge of percussively sensitive fulminating material is located within a readily deformable metal ignition tube sealed within and projecting from one end of a length of glass tubing which forms the lamp envelope and the other end of which is constricted and tipped off. The ignition tube extends generally axially of the tubular lamp envelope and opens thereinto, and the fulminating material is in the form of a coating on a wire anvil supported within the ignition tube and extending approximately axially thereof. Flashing of such constructed percussive type photoflash lamps is initiated by a forceful mechanical impact or blow applied against the side of the metal ignition tube to deform it inwardly against the coating of fulminating material on the wire anvil to cause deflagration of the fulminating material up through the ignition tube and into the lamp envelope where it then ignites the filamentary combustible material disposed therein.

On ignition of the primer or fulminating material to effect the flashing of such percussive ignition type photo-flash lamps, a high velocity flow of gas and hot particles of the ignited primer material stream out of the open inner end of the ignition tube and into the lamp envelope in paths more or less along the axis of the tubular lamp envelope. This high velocity flow of gas and hot primer particles, if permitted to continue throughout the full length of the lamp envelope, would impinge on the combustible material disposed therein, oftentimes compressing it into a compacted mass at the dome end of the envelope. Inasmuch as the combustion of such a compacted mass of combustible material would be comparatively inefficient, the light output of the photoflash lamp therefore would not reach its optimum level.

Another problem experienced with such percussive ignition type photoflash lamps is the danger of intensely hot particles of the combustible material entering or falling down into the ignition tube upon ignition and combustion of the combustible material. If not prevented from entering the ignition tube, these hot combustible particles would be likely to cause a burning through or melting of the exposed side wall or projecting end of the thin-walled ignition tube outside the lamp envelope with resultant loss of light output from the lamp and possible projection of other intensely hot combustible particles through the burned-through regions of the ignition tube to the outside thereof where they might then damage the lamp socket or other parts of the camera with which the lamp is used.

To prevent the above-mentioned undesired conditions from occurring, it has been customary to provide a deflector member or shield inside the lamp envelope on the wire anvil at a location thereon near the open inner end of the ignition tube. The deflector shield intercepts the high velocity stream of gas and hot primer particles produced on ignition of the fulminating material and deflects the primer particles to the side of and against the glass wall of the lamp envelope at a fairly uniform region slightly above the deflector shield, thereby eliminating the high velocity streaming effect of the hot primer particles through the length of the lamp envelope with its attendant adverse effect of compacting the filling of combustible material in the envelope and lowering the resultant light output from the lamp. The deflector shield also intercepts and deflects aside the intensely hot burning particles of combustible material in the lamp envelope which might otherwise enter the metal ignition tube and cause the burning through thereof. Besides its above-described protective functions, the deflector shield also serves the added operating function, through control of the spacing between the shield and the mouth of the anvil-containing ignition tube, of controlling the rate of combustion of the combustible material in the lamp envelope and hence the intensity versus time light flash characteristic of the lamp.

Heretofore, the deflector shields commonly employed for the above-mentioned purpose have been in the form of a small refractory or glass bead fusion-sealed to the wire anvil, as disclosed in U.S. Pat. No. 3,535,064, Anderson, for example. The constituting of the deflector shields by such a fused glass bead is characterized, however, by a number of disadvantages the principal one of which is the added assembly operation required to fuse the glass bead in place on the wire anvil, such an operation materially adding to the overall cost of manufacture of the lamp particularly in view of the high maintenance costs normally experienced with the machines customarily employed for such operation. Also, because of the demands of modern high-speed lamp production manufacture, the glass beads are not in all cases securely fusion-sealed in place on the wire anvil. As a result, the glass beads may either fall off the wire anvil or be dislodged therefrom by the physical shocks to which the lamp is normally subjected during shipping and handling thereof or by the thermal shocks to which the glass beads are subjected on ignition of the lamp. A further difficulty encountered with the use of such fused glass deflector

beads is that, because of the difficulty of controlling the shape of the softened and flowing glass mass comprising the bead during the fusion sealing thereof to the wire anvil, the final shape and size of the beads as well as their location on the wire anvils and their degree of concentricity therewith are all apt to vary considerably from lamp to lamp, thus varying the manner of ignition and thereby the combustion of the charge of combustible material in the lamp envelope with the result that the lamps are characterized by a considerable variation in their light flash characteristics.

SUMMARY OF THE INVENTION

It is an object of the invention, therefore, to provide a percussion ignitable flash lamp having a primer deflector shield in the lamp envelope which is of novel and practical form and can be readily and conveniently formed without introducing an added assembly operation into the overall lamp manufacturing process.

Another object of the invention is to provide a percussion-ignitable flash lamp having a primer deflector deflector shield the shape and and location and location of which can be readily controlled within close tolerance limits to thereby promote uniform light-flash characteristics for such lamps.

Still another object of the invention is to provide a percussion-ignitable flash lamp having a primer deflector shield on the primer carrying wire anvil thereof which shield is not subject to becoming accidentally dislodged from the anvil during lamp shipment, handling and operation and is precisely concentric with the wire anvil.

Briefly stated, in accordance with the invention, the primer deflector shield of a percussively ignitable flash lamp is constituted by an upset integral collar concentrically formed on the wire anvil of the lamp out of the material of the wire anvil itself.

Further objects and advantages of the invention will be apparent from the following detailed description of a species hereof and from the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing, the single FIGURE thereof is a cross-sectional view partly in elevation of a percussion type flash lamp comprising the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, the flash lamp according to the invention comprises a glass bulb or envelope 1 which, as shown, may be formed of a short length of glass tubing, for example, around ⅜ inch outside diameter, which is constricted and rounded off at one end as indicated at 2 and closed off thereat by an exhaust tip 3, and is formed at its other or base end 4 with a fused seal 5 about a readily deformable metal ignition tube 6 which may comprise a thin-walled (for example, 0.003 inch wall thickness) tube of a suitable metallic composition such as a nickel chromium iron alloy, for instance. The envelope 1 is made of a glass which is capable of forming a good hermetic seal to the particular metallic material employed for the ignition tube 6. As shown, the ignition tube 6, which may have an outside diameter of around 1/16 inch for example, is sealed into the base end 4 of the tubular lamp envelope 1 in a position extending longitudinally and preferably axially thereof, and it projects endwise from the envelope end 4 to provide an exposed section to The ignition tube 6 has a closed outer end 8 and an open inner end 9 which opens into the interior space of the lamp envelope 1 and, as shown, terminates approximately at the inner wall thereof. A quantity of filamentary combustible material 10 such as a shredded foil of zirconium, aluminum or hafnium, for example, is loosely distributed within the interior space of the envelope 1 which also contains a filling of a suitable combustion-supporting gas such as oxygen.

Disposed within the metal ignition tube 6 and extending substantially coaxially therethrough is a wire anvil 11 of a suitable metallic composition of high-temperature resistance and low thermal conductivity such as, for example, a stainless steel. The wire anvil 11 is suitably held or fastened in place in the ignition tube 6 as by a circumferential indenture 12 of the tube 6 near its outer end which laps over an enlarged head 13 or other suitable protuberance on the outer or lower end of the wire anvil. As shown, the wire anvil 11 is of slightly smaller diameter than the inside diameter of the ignition tube 6 so as to be spaced a slight distance, for example, around 0.05 inch or so from the inside wall thereof, and it is provided with a thin coating 14 of a percussively-sensitive primer or fulminating material over an appreciable lengthwise extent of that portion of the wire anvil located within the projecting portion 7 of the ignition tube 6. The coating 14 of fulminating material is of a thickness such as to be spaced a slight distance of around a few thousandths of an inch or so, for example, 0.004 inch, from the inside wall of the ignition tube.

To aid in supporting the wire anvil 11 substantially coaxially within the ignition tube 6 and insure clearance between the coating 14 of fulminating material and the inside wall of the ignition tube 6, the wire anvil 11 is formed near the open inner or mouth end of the ignition tube 6 with three or more protuberances or lobes 15 spaced apart more or less uniformly around the circumferential extent of the wire anvil and having, along with the head 13 on the wire anvil, a close sliding fit within the ignition tube. The anvil centralizing lobes 15 are of minimal thickness circumferentially of the wire anvil 11 so as to leave substantially unobstructed the annular space between the ignition tube 6 and the wire anvil 11 for the passage therethrough and into the lamp envelope 1 of the ignited particles of the fulminating material 14 on ignition and deflagration thereof. In the particular case illustrated, the anvil centralizing lobes 15 are formed by flattening the wire anvil 11 at two closely adjacent points along the length of the anvil and in two different planes at approximately right angles to one another.

For the purposes described hereinabove, and as is customary in percussively-ignitable flash lamps of the abovedescribed construction, the lamp is provided with a deflector shield 16 which is located just inwardly of the open inner mouth end 9 of the ignition tube 6 on an inwardly extending portion 17 of the wire anvil 11 that extends into the lamp envelope 1 from the mouth opening 9 of the ignition tube 6. In accordance with the invention, the deflector shield 16, rather than being con-

stituted by a glass bead fusion-sealed to the wire anvil 11 as in prior percussion-type flash lamps, is constituted instead by an upset or extruded integral concentric collar or flange portion 18 of the wire anvil 11 formed out of the material of the anvil itself. As shown, the deflector shield or collar 16 is of a diameter greater than the inside diameter of the ignition tube 6 but is spaced around its periphery from the wall of the envelope 1 a sufficient distance, for example, around 3/64 inch or so at its nearest region, to afford sufficient clearance or annular space therebetween for the passage of the ignited particles of the fulminating material 14 into the envelope 1 to effect the ignition of the combustible material 10 therein.

By being formed out of the material of the anvil 11 itself instead of as a separate glass member or bead fused to the anvil as in prior art flash lamps, the deflector shield 16 according to the invention therefore constitutes an integral and inseparable part of the anvil 11 and remains in place thereon at all times irrespective of whatever physical and thermal shocks the lamp may be subjected to during ship-ment and handling and lamp flashing, thereby assuring the presence of the deflector shield in proper position within and the performance of the intended functions thereof in every lamp, the principal functions being to prevent hot combustible particles from entering and burning through the ignition tube and to deflect the ignited streaming particles of the fulminating material to the side of the lamp envelope 1 so as not to compress the filling 10 of combustible material with resultant inefficient combustion thereof and corresponding lower light output from the lamp. Moreover, the forming of the deflector shield 16 by an upsetting of the material of the wire anvil 11 itself, instead of by fusing a glass bead to the wire anvil as in prior lamps, eliminates the additional assembly operation required to thread the glass bead over the wire anvil and fuse it in place thereon, thereby effecting a material reduction in the overall cost of manufacture of the lamp. Also, the formation of the deflector shield 16 by an upsetting of the material of the wire anvil 11 itself lends itself to closer control of the deflector shield dimensional tolerances and its location on the wire anvil, as well as its concentricity to the wire anvil center axis, as compared to that obtainable where the deflector shield is formed by the fusion of a glass bead to the wire anvil as in prior lamps, thus assuring more uniformity from lamp to lamp in the location and dimensions of the annular passageway between the periphery of the deflector shield 16 and the side wall of the lamp envelope 1 and therefore more uniformity in the manner of ignition of the combustible material 10 in each lamp with consequent greater uniformity of the intensity versus time light flash characteristics of the lamps.

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

1. A flash lamp comprising a hermetically sealed light-transmitting envelope, a quantity of filamentary combustible material loosely distributed within said envelope, a filling of a combustion-supporting gas in said envelope, and ignition means for said lamp comprising a readily-deformable metal ignition tube sealed in and projecting from one end of said envelope and closed off at its outer end, a wire anvil of a high temperature resistant and low thermal conducting material disposed within and substantially coaxial with said ignition tube, a quantity of fulminating material located in the portion of said ignition tube projecting from said envelope end, and a deflector member in said envelope disposed closely adjacent the open inner end of said ignition tube for deflecting toward the envelope side wall the hot particles of said fulminating material on ignition thereof, said deflector member being constituted by an extrusion of said wire anvil forming an upset integral collar portion of said wire anvil concentric therewith and of a diameter greater than the inside diameter of said ignition tube but spaced around its periphery from the wall of said envelope.

2. A flash lamp as specified in claim 1 wherein the said wire anvil is composed of stainless steel.

3. A flash lamp as specified in claim 1 wherein the said fulminating material comprises a coating thereof on a portion of the said wire anvil located within the said projecting portion of said ignition tube.

4. A flash lamp as specified in claim 3 wherein the said coating is spaced a few thousandths of an inch from the inside wall of said ignition tube.

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