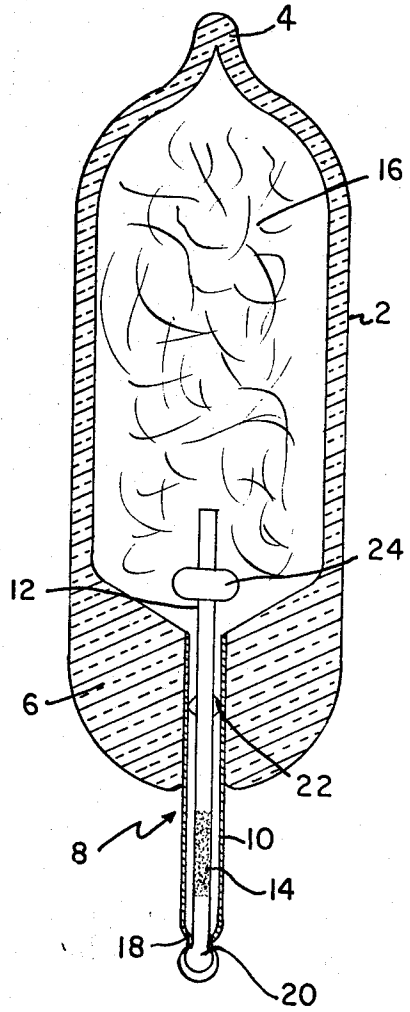
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PHOTOFLASH LAMP

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PHOTOFLASH LAMP

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ABSTRACT OF THE DISCLOSURE

A percussive-type photoflash lamp in which the primer comprises a metal tube sealed in and extending from one end of the lamp envelope and a wire anvil supported in and substantially concentric with the tube. The wire anvil has a coating of fulminating material near the end thereof disposed in the tube and a glass bead disposed thereon near the other end thereof which is disposed inside the lamp envelope.

This invention relates to the manufacture of photoflash lamps and more particularly those of the percussive type.

Generally speaking a percussive-type photoflash lamp comprises an hermetically sealed, light-transmitting envelope containing a source of actinic light and having a primer secured thereto. More particularly, the percussive-type photoflash lamp may comprises a length of glass tubing constricted to a tip at one end thereof and having a primer sealed therein at the other end thereof. The length of glass tubing which defines the lamp envelope contains a combustible such as shredded zirconium foil and a combustion-supporting gas such as oxygen. The primer may comprise a metal tube and a charge of fulminating material on a wire supported in said tube.

Operation of the percussive-type photoflash lamp is initiated by an impact onto the tube to cause deflagration of the fulminating material up through the tube to ignite the combustible disposed in the lamp envelope. Often the high velocity flow of gas resulting from deflagration of the fulminating material impinges on the shredded combustible forming it nto a compact mass located in the dome of the lamp. The combustion of such compacted shreds is very inefficient and the light output of the lamp does not attain its desired value.

It has also been noted that, during combustion, intensely hot gases and molten particles whirl about the interior of the lamp envelope transiently, acted upon by thermal, mechanical and gravitational forces. Some of these hot particles inevitably and unpredictably contact the primer tube and others actually drop down into the tube. Although this tubing is usually a material that resists oxidation at lower temperatures, it cannot withstand flash combustion temperatures of approximately 4000° C. without oxidizing or melting, particularly where the metal is exposed within the lamp envelope. Thus, in some cases where some of these hot particles actually fell down through the very small opening around the wire anvil at the mouth of the primer tube inside the lamp envelope, there was a burning through or melting of the exposed end of the primer tube outside the lamp envelope. Such burnthroughs must be completely eliminated since intensely hot particles may be projected outside the primer tube and this could damage the lamp socket and/or other parts of the camera with which the lamp is used.

In attempting to solve this burnthrough problem, several wire anvil modifications were tried but without success. For example, the diameter of the wire anvil was increased in order to decrease the size of the aperture through which the hot particles could drop. However, when the diameter was increased to a size so that it could become effective, a significant increase in the number of cases of accidental flashing of the fulminating material during primer assembly was noted. Also, no burnthrough advantage was obtained by substituting more oxidizing resistant materials for an iron wire anvil. Lengthening of the wire anvil did not help. Attempts to use metal shields fastened to the inner end of the wire anvil also were unsuccessful. Unless they were prohibitively large, the metals oxidized or melted and offered little protection from hot combustibles, particles and, in fact, molten metal from these shields also melted through some of the tubes.

In view of the foregoing, one of the principal objects of this invention is to provide an effective and practical means for protecting the thin, easily-deformable, metal tube, housing an impact-sensitive wire anvil having a coating of fulminating material therein, from extensive damage by molten and gaseous products developed during flash combustion.

Another object is to provide a deflector shield in the path of high velocity burning particles of fulminating material to prevent or reduce streaming to the dome of the lamp envelope, with attendant compression of fill and rapid, selective combustion concentrated in relatively small volumes.

A further object is the reduction of thermal and mechanical impact forces directed to relatively small areas of the lamp envelope, particularly the dome.

A further object is to provide a means for controlling the rate of combustion and therefore the light intensity vs. time characteristic of the flashlamp.

A further object is to obtain an increase in total light output by permitting burning to progress smoothly throughout the normally uniform fill dispersion rather than compacting the fill into smaller volumes and violently projecting unburned fill and combustion products against the wall of the lamp envelope, with decreased combustion efficiency.

These and other objects, advantages and features are attained, in accordance with the principles of this invention, by providing the wire anvil with a glass bead fused thereto at a point immediately above the mouth of the tube from which the wire anvil extends into the lamp envelope.

In the specific embodiment of this invention illustrated in the accompanying drawing, the figure is an elevational view partly in section of a percussive-type photoflash lamp with which the wire anvil of this invention may be employed. The lamp comprises a length of glass tubing defining an hermetically sealed lamp envelope 2 constricted at one end to define an exhaust tip 4 and shaped to define a seal 6 about a primer 8 at the other end thereof. The primer 8 comprises a metal tube 10, a wire anvil 12 and a charge of fulminating material 14. A combustible such as filamentary zirconium 16 and a combustion-supporting gas such as oxygen are disposed within the lamp envelope. The wire anvil 12 is centered within the tube 10 and held in place by a circumferentail indenture 18 of the tube 10 which laps over a head 20 or other suitable protuberance at the lower extremity of the wire anvil. Additional means, such as lobes 22 on wire anvil 12 for example, may also be used to aid in stabilizing the wire anvil, supporting it substantially coaxial within the primer tube 10 and insuring clearance between the fulminating material 14 and the inside wall of the tube 10.

We have found that a refractory bead 24, fused to the wire anvil 12 just above the inner mouth of the primer tube 10 provides a very effective solution to the several problems described above. Destruction of the tube from the inner end by hot combustion particles that may swirl around the bead is further inhibited by sealing and em-

bedding the top of the metal tube in glass. This seal to the outside diameter of the top of the tube covers the entire surface due to capillary attraction of the molten glass and does not flow over the top of the tube to restrict the opening because of the surface tension of the molten glass. During combustion, the segment of the wire anvil **12** above the bead **24** is oxidized or fused but below the bead the wire remains intact. Burnthroughs are eliminated.

Beading a wire with glass tubing in production can be a relatively costly operation. Cut tubing itself is expensive, and high speed mechanical feeds of these small tubes are likely to be unreliable due to irregular cut surfaces. We have found that lower cost multiformed beads, having a lower melting point than glass tubes, are equally effective in preventing burnthroughs and can be fed much more easily on high speed machines.

Surprisingly, we have also found that this bead **24** functions very effectively as a deflector. High speed motion pictuers show that hot primer particles stream through the entire lamp to the dome thereof in approximately 200 microseconds when no deflector is used. The bead deflects and diffuses this stream so that the hot particles of fulminating material strike the glass wall of the lamp envelope fairly uniformly slightly above the bead. The fill of combustible material **16** is ignited near the lower end and burning progresses upwardly at a much slower rate and with less fill compression in the dome. High speed motion pictures show that the high velocity streaming effect is eliminated and progression of combustion from the lower end of the lamp envelope to the dome takes approximately two milliseconds. Not only does this deflector control the streaming effect, but it also permits use of heavier applications of the fulminating material to insure greater ignition reliability at impact without excessive streaming. In addition, the spacing between the bead and the mouth of the primer tube can be used to control the rate of combustion and hence the intensity vs. time characteristic of the flashlamp.

Thus the use of a refractory bead on the inner end of a wire anvil immediately above the mouth of the primer tube serves a dual function; it eliminates burnthroughs and it functions as a deflector to deflect and control the ejection of hot particles of fulminating material from the primer tube. Sealing in the top of the tube also aids in eliminating burnthroughs by preventing destruction of the tube from the side.

What we claim is:

1. A photoflash lamp comprising:
an hermetically sealed, light-transmitting envelope;
a quantity of filamentary combustible material located within said envelope;
a combustion-supporting gas in said envelope;
and a primer secured to and extending from one end of said envelope and in communication therewith, said primer including a metal tube sealed in said end of said envelope, a body of fulminating material located in said tube, and a refractory member supported within said envelope immediately above the inner end of said tube.

2. The combination of claim **1** in which the primer includes a wire anvil disposed within and substantially coaxial with said tube with said fulminating material being disposed thereon intermediate the ends thereof.

3. The combination of claim **2** and means for supporting said wire anvil substantially coaxial within said tube.

4. The combination of claim **2** in which said refractory member is mounted on the wire anvil, said refractory member being of greater transverse dimension than said wire anvil.

5. The combination of claim **2** in which the exterior surface of the inner end of said tube is sealed in said envelope.

6. The combination of claim **2** in which the inner end of said tube terminates substantially flush with the adjacent inner wall of said envelope.

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