United States Patent

Shaffer

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[45] **Dec. 19, 1972**

[54] **PHOTOFLASH LAMP AND METHOD OF PROVIDING DEFLECTOR-SHIELD THEREFOR**

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[73] Assignee: **Sylvania Electric Products, Inc.**

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[52] **U.S. Cl.** **431/93**
[51] **Int. Cl.** **F21k 5/02**
[58] **Field of Search** 431/93

[56] **References Cited**

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3,535,064 10/1970 Anderson et al. 431/93

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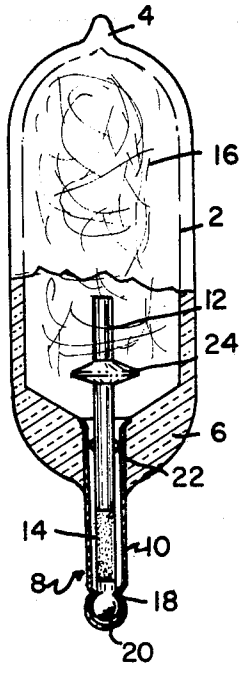
Attorney—Norman J. O'Malley, Edward J. Coleman and Joseph C. Ryan

[57] **ABSTRACT**

A percussion-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 coaxial with the tube. The wire anvil has a coating of fulminating material near the end therefor disposed in the tube and a metallic deflector-shield bead press-forged thereon near the other end thereof which is disposed inside the lamp envelope. The method of providing the deflector-shield bead on the anvil comprises: positioning an annular metallic member coaxially upon the wire anvil, and applying pressure to both shape the annular member and clinch it securely to the anvil.

3 Claims, 8 Drawing Figures



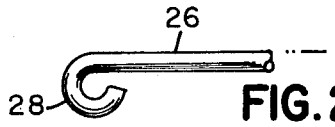


FIG. 2

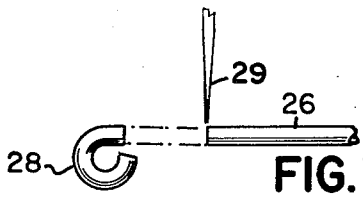


FIG. 3

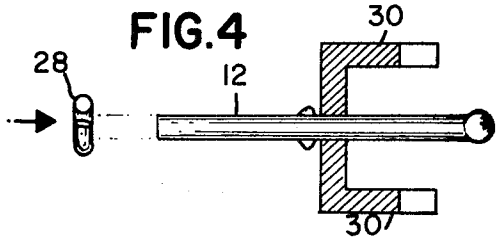


FIG. 4

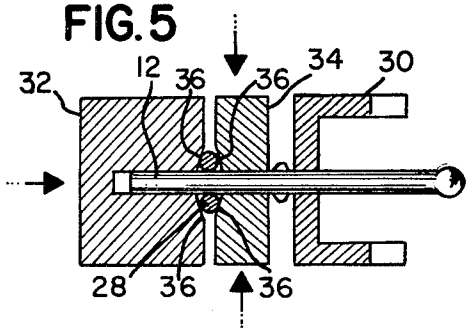


FIG. 5

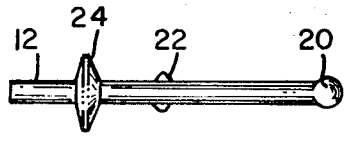


FIG. 6

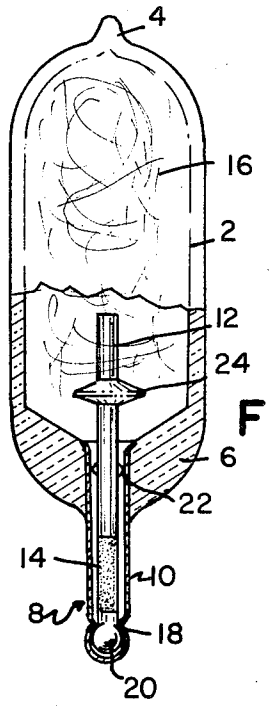


FIG. 1

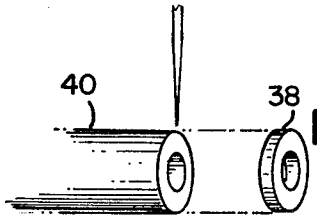


FIG. 7

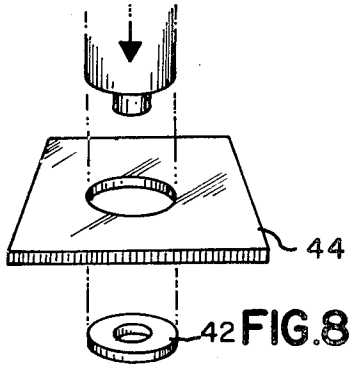


FIG. 8

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PHOTOFLASH LAMP AND METHOD OF PROVIDING DEFLECTOR-SHIELD THEREFOR

BACKGROUND OF THE INVENTION

This invention relates to the manufacture of photoflash lamps and 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 comprise 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, however, the high velocity flow of gas resulting from deflagration of the fulminating material impinges on the shredded combustible forming it into 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.

It was found that tube burnthroughs could be avoided by placement of a glass bead on the anvil just above the entrance of the metal tube into the lamp vessel. Current percussive flashlamps utilize a glass bead for attenuation of the fulminating material discharge and protection of the thin-walled metal tube.

Although the use of glass beads eliminated tube burnthroughs and the danger of lamp containment failures, their use is attended by several disadvantages. The anvil must be fabricated from a very expensive glass sealing alloy, such as alloy number 4. This fact in conjunction with the cost of molded glass beads themselves increases the cost of manufacturing percussive flash lamps and their ultimate cost to the consumer.

Glass beads are frangible and sometimes break off of the anvil during impact of the firing mechanism onto the metal primer tube. The use of glass beads requires that glass working fires are present on the anvil forming and coating machine, a detrimental factor with regard to manufacturing safety. The location, shape, and size of the final glass bead are difficult to control. Some lamps fail to flash because of "low" beads blocking off the mouth of the metal primer tube whereas beads that are too high do not protect the tube. Glass beads have a detrimental effect on uniformity of light output from one lamp to another. This is caused in part by the poor location and dimensional control previously mentioned and in part by the fact that their use results in high and nonuniform anvil temperatures on the lamp making machine going into the position where fulminating material is applied to the anvil. Changes in anvil temperatures have been found to affect the quantity of fulminating material deposited and consequently the light output.

SUMMARY OF THE INVENTION

In view of the foregoing, one of the principal objects of this invention is to provide a percussive-type photoflash lamp having improved means for shielding the thin, easily deformable, metal primer tube, which houses an impact sensitive wire anvil having a coating of fulminating material thereon, from extensive damage by molten and gaseous products developed during flash combustion.

Another object is to provide an improved deflector 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, inefficient combustion concentrated in relatively small volume.

A further object is to provide a highly uniform and accurately positioned nonfrangible deflector-shield for percussive flashlamps.

Another principal object of the invention is to provide an improved method of providing a deflector-shield over the mouth of the primer tube of a percussive-type photoflash lamp.

Yet a further object is to provide a manufacturing method for providing a deflector-shield on the primer anvil wire of a percussive flashlamp which is significantly more economical and yields improved lamp containment and reliability.

These and other objects, advantages and features are attained, in accordance with the principles of this invention, by providing the wire anvil with a metal deflector-shield bead press-forged thereto at a point above the mouth of the tube from which the wire anvil extends into the lamp envelope. The method of providing the deflector-shield comprises: positioning an annular metallic member coaxially on the anvil wire, and applying pressure to the annular member in a manner whereby the member is securely clinched to the anvil wire.

BRIEF DESCRIPTION OF THE DRAWINGS

This invention will be more fully described hereinafter in conjunction with the accompanying enlarged scale drawings, in which:

FIG. 1 is an elevational view partly in section of a percussive-type photoflash lamp with which the primer deflector-shield of this invention may be employed;

FIGS. 2–6 are sequential representations of the steps of a method in accordance with the invention which may be employed for providing a deflector-shield on a wire anvil;

FIG. 7 is a representation of an alternative method for obtaining an annular member for mounting and use as the deflector-shield; and

FIG. 8 is a representation of another alternative method for obtaining an annular member for mounting and use as the deflector-shield.

DESCRIPTION OF PREFERRED EMBODIMENT

The percussive-type photoflash lamp illustrated in FIG. 1 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 circumferential 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.

Operation of the lamp is initiated by an impact onto tube 10 to cause deflagration of the fulminating material 14 up through the tube to ignite combustible 16 disposed within the lamp envelope. A deflector-shield 24, heretofore a glass bead fused to the anvil, is attached to anvil wire 12 just above the inner mouth of the primer tube 10. As discussed above, deflector-shield 24, being a greater transverse dimension than the wire anvil, provides the dual function of deflecting the high velocity stream of hot gas and particles of fulminating material ejected from the primer tube and shielding the primer tube from burnthrough damage due to the molten and gaseous products of combustion.

In accordance with the present invention, deflector-shield 24 comprises an annular metallic member which has been press-forged, onto the wire anvil. The suitability of using a metal bead for this application was quite surprising in light of the fact that during the operation of percussive flashlamps, the length of anvil wire above the deflector shield frequently melts. However, it has been found that a metal or metal alloy which is not readily combustible and has a melting point above 1000°C. can satisfactorily withstand the actinic flash reaction and reliably protect the thin-walled metal primer tube. For example, low alloy steel provides perhaps the most convenient and economically feasible raw material from which to form deflector-shield 24. Nickel and stainless steel are functionally very suitable but significantly more expensive. Copper, which is considerably less expensive than stainless steel, is also applicable, at a somewhat higher cost than the low alloy steels.

Low melting metals such as lead, tin, and zinc and their alloys do not withstand the conditions of flash. Beads formed from lead-tin solder, for example, completely disintegrated and resulted in blackening of the inner surface of the glass flashlamp vessel and very low photometric output. Similarly, beads made from readily combustible metals such as aluminum, magnesium, titanium, or zirconium may ignite and actually contribute to primer tube failure. Aluminum beads, for example, showed definite partial burning with extensive melting and slag formation.

FIGS. 2–6 illustrate a method of providing a deflector-shield on the anvil wire, in accordance with the invention, which has been found to result in a highly reliable flashlamp structure while at the same time being particularly suited to automated assembly and providing a significantly more convenient and economical mode of manufacture. Basically, the method comprises: positioning an annular metallic member at a desired location on the anvil wire, with the member being coaxial with the wire; then applying pressure to the annular member in a manner whereby the member is securely clinched to the anvil wire.

As the deflector-shield beads are most conveniently and economically formed from low alloy steel wire, FIG. 2 illustrates the first step of a preferred method whereupon the end of a wire 26 is bent to preform a substantially annular, or toroidal, segment 28. Next, the preformed segment 28 is cut free from the wire 26, as illustrated in the FIG. 3 representation showing a cutting blade 29. Annular segment 28 is then coaxially slipped onto a wire anvil 12 held horizontally by a pair of jaws 30, as illustrated in FIG. 4, the segment 28 being generally positioned to its approximate longitudinal location on the anvil.

As illustrated in FIG. 5, the step of applying pressure to annular segment 28 is performed by the closing of a set of dies 32 and 34 having surfaces 36 sloped to provide both parallel and radially inward components of force with respect to wire anvil 12 whereby the annular segment 28 is press-forged to both shape it as the desired deflector-shield 24 and securely clinch it to the anvil wire 12. FIG. 6 shows the finished result of the press-forging process.

Referring again to FIG. 5, die 34 may be a split die, as shown, that closes over wire anvil 12 (die 34 can also function as a holding device in lieu of jaws 30), and die 32 can slip over the free end of the anvil wire and continue to exert force against die 34 to form the deflector-shield bead. It is to be understood, of course, that alternative techniques for shaping the deflector-shield bead and clinching it onto the anvil wire are available and may be used in accordance with the invention.

Alternative techniques include the use of a cut length 38 of metal tubing 40 (FIG. 7) or a washer-shaped disk 42 punched from sheet metal stock 44 (FIG. 8) instead of a preformed annular segment of wire. That is, the cut length of tubing 38 or the disk 42 is slipped onto the wire anvil 12 for press-forging by dies 32 and 34. Such raw materials, however, are not economically competitive with wire.

The advantages of this invention include substantially reduced cost of manufacture for percussive flashlamps and increased manufacturing safety through elimination of glass working fires on the machinery. The nonfrangible metal bead remains intact during im-

pact and firing of the lamp and exhibits better dimensional control than glass, thereby providing improved flash reliability and containment. Further, the elimination of the high temperature glass bead application process results in a more uniform application of fulminating material from one lamp to another with improved light output uniformity.

As my invention, I claim:

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 metallic deflector-shield supported within said envelope immediately above the inner end of said tube, the metal comprising said deflector-shield being selected from the group consisting of low alloy steel, nickel, stainless steel, and copper.

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 therein intermediate the ends thereof, and said deflector is mounted on the wire anvil, said deflector-shield being of greater transverse dimension than said wire anvil.

3. The combination of claim 2 in which said deflector-shield is an annular metallic member coaxially disposed on said wire anvil and press-forged thereto.

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