

[54] PERCUSSIVE PHOTOFLASH LAMP AND
METHOD OF SECURING ANVIL THEREOF

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[75] Inventors: Donald H. Pfefferle; William C.
Fink, both of Montoursville, Pa.

[73] Assignee: Sylvania Electric Products, Inc.,
Danvers, Mass.

Primary Examiner—Charles W. Lanham
Assistant Examiner—J. W. Davie
Attorney—Norman J. O'Malley et al.

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[58] Field of Search. 29/25.11, 282, 515,
29/516, 517; 431/93, 95; 72/402

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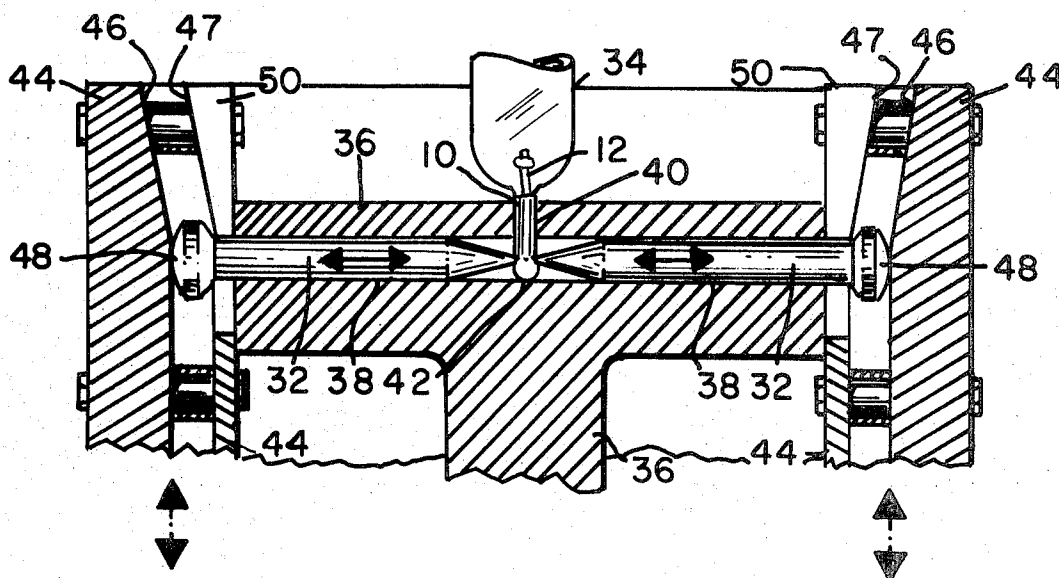
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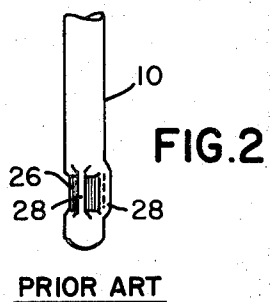
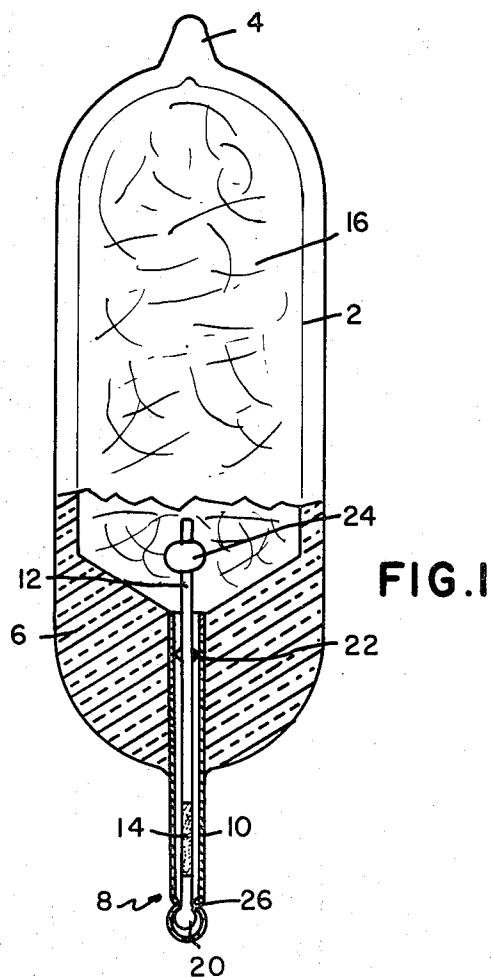
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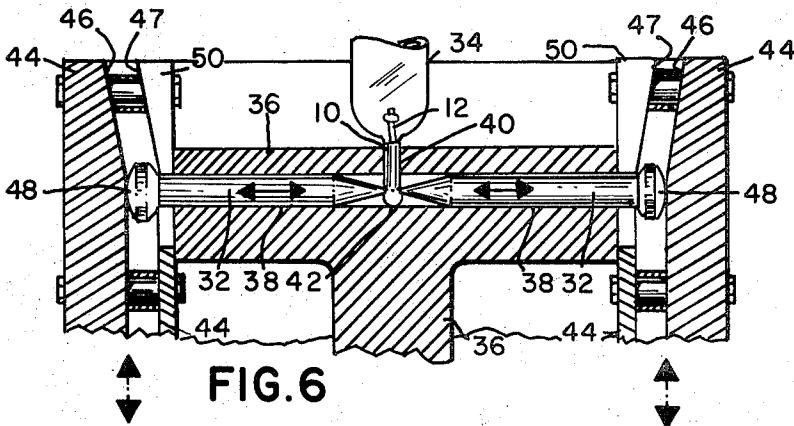
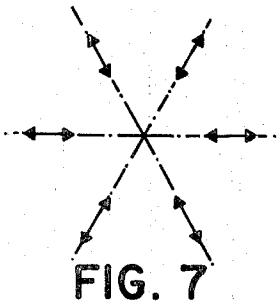
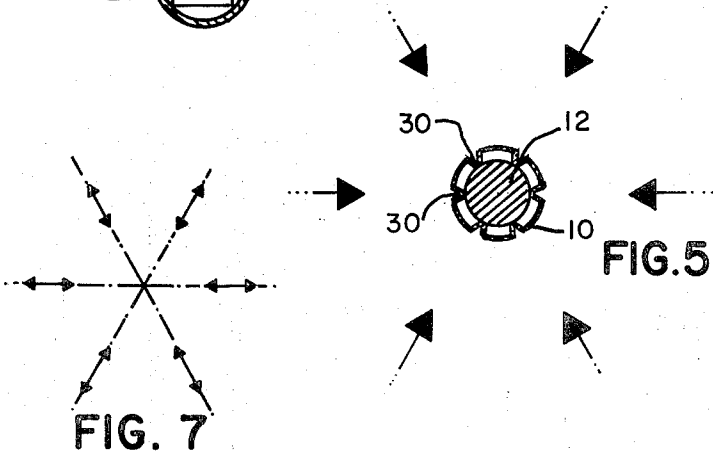
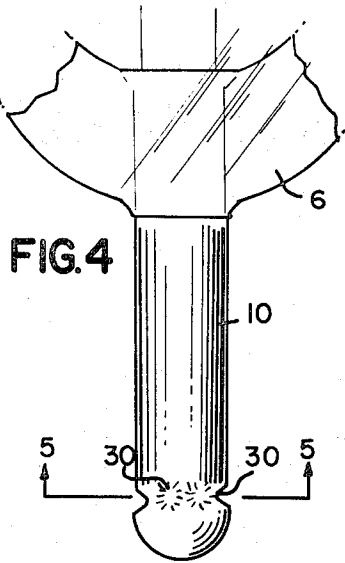
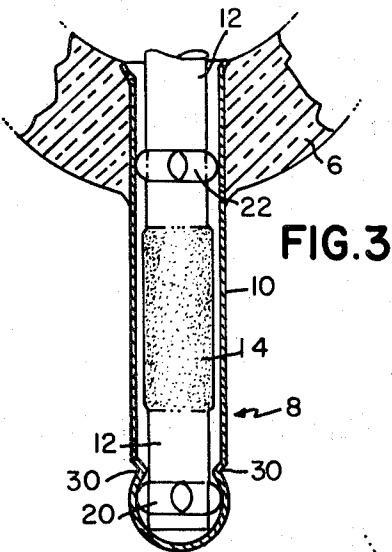
[57] **ABSTRACT**

A percussive-type photoflash lamp in which the primer anvil wire is secured coaxially within the primer tube by means of a plurality of conical indentations in the tube. The method of securing the anvil wire in this manner comprises: supporting the wire within the tube, simultaneously and uniformly pressing a plurality of radially disposed pins against the tube by means of one direction of motion of a cylinder having cam surfaces bearing against the pins, and then withdrawing the pins by reversing the direction of motion of the cylinder.

4 Claims, 7 Drawing Figures







PERCUSSIVE PHOTOFLASH LAMP AND METHOD OF SECURING ANVIL THEREOF

This is a division, of application Ser. No. 89,653, filed Nov. 16, 1970.

BACKGROUND OF THE INVENTION

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

FIG. 1 shows a photoflash lamp having a primer suitable for application of the present invention. 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 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.

Tube 10 has a relatively thin wall, in the order of 3 mils, and preferably is composed of an iron, nickel and chrome alloy. Prior to assembly, the tubing is heated in wet hydrogen at an elevated temperature to form a layer of chrome oxide on its surface, which provides an excellent interface for the hermetic glass-to-metal seal. The wire anvil 12 is provided with a protuberance, or head, 20 at the end thereof which is disposed within primer tube 10 and protuberances, or lobes, 22 intermediate the ends thereof, with the body of fulminating material 14 located therebetween. Head 20 and lobes 22 aid in stabilizing and supporting the wire anvil substantially coaxial within the primer tube 10 and in providing clearance between the fulminating material 14 and the inside wall of 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 the combustible 16 disposed within the lamp envelope. A refractory bead 24, fused to the wire anvil 12 just above the inner mouth of the primer tube 10 eliminates burnthroughs and functions as a deflector to deflect and control the ejection of hot particles of fulminating material from the primer tube.

The old method of firmly locating the anvil in the tubing was accomplished by providing a crimp 26 in the metal tube, or or above the head 20, by the use of crimping devices which consisted of three or four sections carrying curved jaws which when closed formed a circle around the tube. The diameter of the jaw circle was smaller than the o.d. of the tubing, and the jaws were mounted on pressure slides which forced 20-mil thick jaws into the tubing wall. Frequent readjustment of these jaws was necessary to prevent the formation of ears 28 on the tubing, as shown in FIG. 2. These ears 28 prevented the jaws from seating properly on the tube when indenting the tube wall against the anvil. The shape of the forming jaws, which due to primer design can be only 15-25 mils high, is frequently damaged by pressure and is also worn out by the hard, green chrome oxide formed on the surface of the tube. The ears in the metal tubing frequently lead to a split in the thin tube wall along the sharp bend. This makes the lamp unusable as the contained oxygen gas, which is under a pressure of 500-700 cm. Hg., will then escape. The achieved rigidity of the anvil with respect to the inside wall of the structure was also poor, and the fre-

quency of "loose" anvils was not tolerable in the mass production of the percussive lamps.

The lobes, or heads, on the anvil which help to centralize the anvil which carries the fulminating material do not prevent the anvil from falling out of the metal tube when the lamp is turned upside down; they only prevent the fulminating material from rubbing against the wall when the charged anvil is dropped into the bulb and slides into the metal tubing. The fulminating material, when rubbing against the oxide-covered inside wall of the tubing, frequently ignites and makes the ignition system inoperative. The space between the inner wall surface of the tubing and the surface of the fulminating material is about 2 mils wide, and a very high degree of rigidity is necessary to arrive at a reliability of +99.8 percent in lamp ignition, or less than 0.2 percent of inadvertent, premature firing.

SUMMARY OF THE INVENTION

In view of the foregoing, a principal object of this invention is to provide a percussive-type photoflash lamp having a primer structure which will withstand mechanical shock during manufacture, handling, and use without premature flashing.

Another object is to provide an improved method of securing a primer anvil wire within a primer tube of a percussive-type photoflash lamp.

These and other objects, advantages and features are attained, in accordance with the principles of this invention, by providing a plurality of conical shaped indentations in the primer tube which bear against the wire anvil, the indentations being circumferentially spaced to firmly locate the anvil substantially coaxial with the tube. The method of so securing the anvil comprises: supporting the anvil wire within the tube; simultaneously and uniformly pressing a plurality of radially disposed pins against the tube to provide the indentations; and then withdrawing the pins.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 1 is an elevational view in section of a percussive-type photoflash lamp having a primer suitable for application of the invention and to which previous reference has been made;

FIG. 2 is an enlarged scale, fragmentary elevation of the primer tube of the lamp of FIG. 1 illustrating a faulty crimp applied by prior art methods, also referred to earlier;

FIG. 3 is an enlarged scale, fragmentary elevation in section of the primer of FIG. 1 constructed in accordance with the invention;

FIG. 4 is an elevation view of the primer structure of FIG. 3 illustrating the outer wall appearance of the primer tube;

FIG. 5 is a cross-section taken along the line 5-5 of FIG. 4;

FIG. 6 is a sectional elevation of a mechanism for indenting a primer tube according to the invention; and FIG. 7 is a diagram illustrating the lines of motion of the pins employed in the mechanism of FIG. 6.

DESCRIPTION OF PREFERRED EMBODIMENT

In accordance with the present invention, the primer of the photoflash lamp of FIG. 1 includes, in lieu of the

old type crimp 26, six conical shaped indentations 30 in tube 10 (see FIGS. 3-5) which are circumferentially spaced and bear against wire anvil 12 to precisely locate and firmly retain the anvil in the desired coaxial position within the primer tube. More specifically, as shown in the sectional view of FIG. 3, the charged anvil is anchored coaxially within the primer tube by virtue of the tube indentations 30 firmly contacting anvil 12 below the body of fulminating material 14 and above the protuberance, or head, 20. As best shown in the primer elevation of FIG. 4 and the cross-section of FIG. 5, the six indentations 30 are equally spaced about tube 10 in a plane perpendicular to the longitudinal axis of the tube.

The method of providing the improved anvil retaining configuration of FIGS. 3-5 according to the invention comprises: (1) supporting the anvil wire 12 in a substantially coaxial position within tube 10; (2) applying to the outer wall of tube 10 the uniform indenting pressure of six conically pointed pins which are radially disposed about tube 10 to converge toward the longitudinal axis thereof; (3) and then withdrawing the pins from the tube.

FIG. 6 shows a simple mechanical arrangement for driving pins 32 symmetrically against the longitudinal axis of primer tube 10. Two of the pins 32 are shown an instant after producing the indentations 30 in tube 10. The mechanism includes a cylindrical stationary member 36 having six radial bores 38 in the horizontal plane for supporting the pins 32 and a vertical bore 40 for receiving the primer tube 10 of a partially completed photoflash lamp 34. The bottom of the vertical bore supports the primer tube 10 at the proper vertical position with respect to pins 32. The mechanism also includes a movable cylinder 44 which coaxially surrounds member 36 and has a set of cam surfaces 46 and 47 which retain cam follower heads 48 at the outer ends of pins 32. Cylinder 44 also includes slots 50 through which the pins 32 pass and which permit longitudinal motion of the cylinder. As illustrated in FIG. 6, cylinder 44 may comprise an assembly of two tapered, annular members which are bolted or riveted together.

Preferably, pins 32, are made of a conically shaped rod of "carballoy," a Tungsten carbide alloy, and carry a rounded pressure head 48 of hardened steel for bearing against cam surfaces 46 and 47. The configuration of the mechanism is such that the pins are disposed in a plane perpendicular to the longitudinal axis of tube 10 and arranged to conform to the radii of a six cornered polygon. The use of relatively heavy pins made from "carballoy" and ground to a precision point contributes substantially toward maintaining the critical tolerances of the lower part of the primer, which typically are about ± 0.5 to ± 1.0 mil.

Outer cylinder 44, which is coaxial with the primer tube 10 of lamp 34, operates by a longitudinal, up and down motion, as indicated by the arrows. The cam surfaces 46 and 47 are shaped to move all pins simulta-

neously in and out, as indicated in FIG. 7. FIG. 6, shows cylinder 44 in a position whereby all pins are pressed into tube 10; the pins are then withdrawn by reversing the direction of longitudinal motion of the cylinder.

In summary, an improved percussive-type photoflash lamp is provided by having the primer structure secured by the simultaneous indentation of conically pointed pins to obtain precise location and firm retention of the anvil. The location of the body of fulminating material at about 1 to 2 mils distance from the wall is maintained on high speed production machinery assuring a +99.8 percent flashability of the lamp, which means that during all production steps the fulminating material is not deflagrated by mechanical shock. The advantages of the improved structure is particularly evident when lamps are subjected to a drop test, in which the entire flash assembly is dropped from 4, 5, or 6 feet onto a concrete floor. Only 0.1 percent to 0.3 percent of the improved lamps flash by this rather severe testing method, whereas lamps made by circular crimping jaws exhibited 10 to 30 percent ignition in the above drop test.

What we claim is:

1. The method of securing a primer anvil wire within a primer tube of a percussive-type photoflash lamp, said method comprising:

supporting said primer tube at a predetermined vertical position with respect to a plurality of conically pointed pins radially disposed about said tube in a symmetrical pattern about the longitudinal axis thereof;

supporting said anvil wire within said tube substantially coaxial therewith;

pressing said plurality of pins simultaneously and uniformly against said tube toward the longitudinal axis thereby by one direction of longitudinal motion of a cylinder which is coaxial with said tube and has a set of cam surfaces retaining and bearing against follower heads at the outer ends of said pins, the pressure applied to said pins being sufficient to securely retain said anvil concentrically within said tube by means of the resulting indentations made in said tube;

and withdrawing said pins from said tube by reversing the direction of longitudinal motion of said cylinder whereby said set of cam surfaces bear on said follower heads in a manner causing said pins to be pulled radially outward by said cam surfaces.

2. The method of claim 1 in which said pins are shaped from a rod of tungsten carbide alloy.

3. The method of claim 1 in which said pins are disposed in a plane perpendicular to the longitudinal axis of said tube and arranged to conform to the radii of a polygon.

4. The method of claim 3 in which at least six of said pins are employed.

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