June 13, 1944. F. J. RIPPL ET AL 2,351,290

FLASH LAMP

Filed April 8, 1942

Fig. 1.

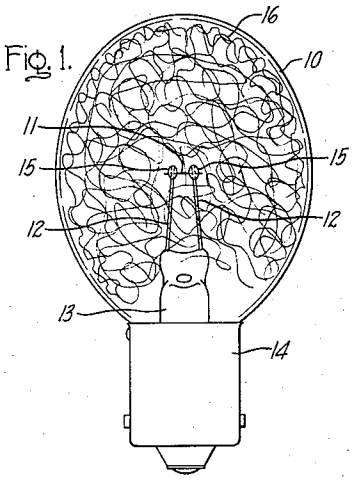


Fig. 2.

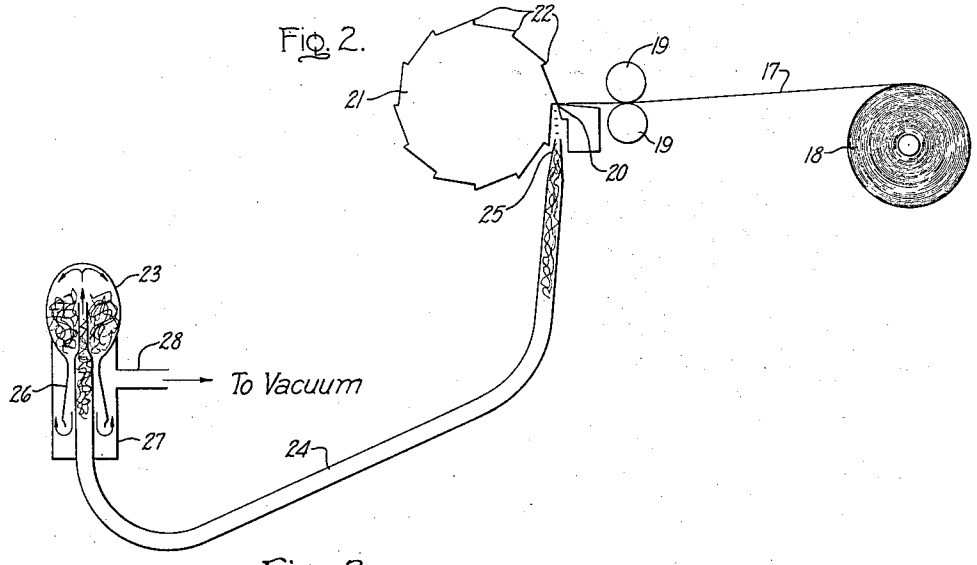
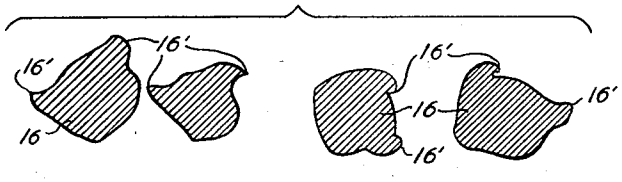


Fig. 3.



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2,351,290

FLASH LAMP

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Application April 8, 1942, Serial No. 438,198

4 Claims. (Cl. 67—31)

Our invention relates in general to flash lamps of the type comprising a bulb containing a loose filling of a readily combustible material and a combustion supporting medium, such as an oxygenous gas, which enters into a reaction with the combustible material with the resulting emission of an instantaneous flash of actinic light of high intensity. More particularly, our invention relates to combustible material for such flash lamps. The present application is a continuation-in-part of our copending applications Serial No. 322,520, filed March 6, 1940; Serial No. 353,650, filed August 22, 1940; and Serial No. 383,096, filed March 13, 1941.

Prior to the present invention, the combustible material generally employed in flash lamps consisted either of a quantity of extremely thin metallic foil or a quantity of extremely fine metallic wire. The foil, generally of aluminum, was of the order of approximately 0.000015 to 0.000020 inch thickness. To obtain such extremely thin foil, the aluminum was first rolled into thin sheets and then beaten between suitable beating forms, in the manner known for the preparation of gold foils, until the desired thinness was obtained. Such a beating process is slow and costly, making the aluminum foil quite expensive. Likewise, the wire used heretofore and at the present time in flash lamps, and which generally consists of aluminum or magnesium or their alloys, must undergo an involved and expensive wire-drawing process in order to be drawn to the required size or fineness, generally 1.5 mils or less in diameter, for satisfactory flash lamp use. Thus, up to the present invention, there has been no relatively inexpensive combustible filling material for flash lamps.

One object of our invention is to provide a flash lamp having a loose filling of a relatively inexpensive combustible material.

Another object of our invention is to provide a flash lamp having a loose filling of combustible material comprising a light and fluffy mass of shredded metal foil the individual shreds of which are of substantially uniform cross-section.

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 diagrammatic illustration showing the method of manufacturing the combustible flash lamp material comprising our invention and a suitable method of loading such material into the bulb of the flash lamp; and Fig. 3 shows cross-sectional views of several strands of the shredded foil as it appears when magnified 670 times.

Referring to the drawing, the flash lamp according to the invention comprises a sealed light-transmitting bulb or envelope 10 of suitable material, such as glass. Mounted within the bulb is a small filament 11 the ends of which are connected to the inner tips of a pair of leading-in wires 12, 12 which extend through a re-entrant stem 13 to a base 14 secured to the neck of the bulb. The inner tips of the leading-in wires 12, 12, and at least a portion of the filament 11, are coated with a layer of a suitable fulminating substance 15 to thereby form the primer or ignition means for the lamp. The fulminating material 15 is preferably of the type disclosed and claimed in copending United States patent application Serial No. 278,288—G. H. Meridith, filed June 9, 1939, and assigned to the assignee of the present application. The bulb is coated on its inner or outer surface, preferably on both surfaces, with a coating of a suitable light-transmitting varnish or lacquer to thereby minimize cracking of the bulb on charge flashing and to render the bulb substantially shatterproof.

The bulb 10 is filled with a quantity of readily combustible material 16 of the type comprising our invention, the said material being loosely arranged within and uniformly distributed throughout the bulb 10 so as to surround the ignition filament 11. The bulb 10 is also filled with a combustion-supporting gas such as oxygen or an oxygen-containing gas, at a suitable pressure, for supporting the combustion of the combustible material 16. The pressure of this gaseous filling will vary, depending upon the type of gas employed, the size of the bulb, and the quantity and type of combustible material therein. For bulb sizes in commercial use at present, and with oxygen being used as the combustion-supporting gas and pure aluminum as the combustible material, the pressure of the gaseous filling may vary up to 600 mm. of mercury or even close to one atmosphere. Preferably, however, the pressure of the oxygen is between about 450 to 600 mm. of mercury.

The combustible material 16 according to our invention comprises a quantity of shredded metal foil which is sliced or shredded from a thin metal sheet or strip 17 (Fig. 2) which has been previously rolled to the thinness (i. e., of the order of approximately 0.001 inch or less) which the finally cut shreds are to possess. The individual shreds or strands are cut to a width of the order of about .001 inch or less, and should have a cross-sectional area of the order of 1½ square mils or less. The shredded foil material is preferably made of aluminum, although other materials may be used such as magnesium or alloys of aluminum and/or magnesium. Where aluminum is used, the sheet 17 is preferably of the type known as "full hard" aluminum.

The shredded foil filling material 16 is produced by the method disclosed and claimed in our said copending applications Serial Nos. 353,650 and 383,096. The rolled sheet 17 of aluminum is

in the form of a continuous strip of uniform width, such as from six to twelve inches, but preferably about eight inches wide, which is wound into a roll 18. The metal sheet 17 is fed from the roll 18 by a pair of feed rollers 19 to a transversely extending knife edge 20 where it is sliced into fine shreds of uniform width by a rotating cutter 21 provided with a plurality of cutting edges 22 co-operating with the knife edge. The rotation of the cutter 21 is so adjusted, relative to the feeding of the metal sheet 17 to the knife edge 20, as to cut shreds of foil of a uniform width of the order of .001 inch wide or thereabouts. The strands of shredded foil made in this manner are characterized by the presence of burrs of microscopic size extending longitudinally thereof. The minute burrs are shown at 16' in Fig. 3.

The shredded foil material 16, after its manufacture, is then loaded into the bulb of a flash lamp by any suitable procedure. Thus, a quantity of shredded foil sufficient to constitute the filling for a single lamp may be gathered together and fluffed out by a suitable small rod-shaped tool, and the fluffed out mass of shredded foil then stuffed into and distributed throughout the bulb by the said tool. Preferably, however, the shredded foil material 16 is pneumatically loaded into the flash lamp bulb in the manner described and claimed in copending United States application Serial No. 374,372, Geiger et al., filed January 14, 1941 and assigned to the assignee of the present invention. As therein disclosed, the bulb 23 to be filled is placed over one end of a feed or inlet tube 24 the other end of which is provided with a nozzle 25 disposed directly underneath and as near as practicable to the knife edge 20. The open end or neck 26 of the bulb is then connected to a source of vacuum, through the filling head 27 and tube 28 as shown, with the result that the suction in the feed tube 24 causes the individual shreds of metal foil, as they are cut, to be drawn through the suction nozzle 25 and feed tube 24. The shreds of metal foil are then discharged into the interior of the bulb 23 where, because of their curled, crinkled or rumpled condition and the restricted air-outlet space between the bulb neck and the feed tube, the said metal foil shreds are trapped and gradually fill up the entire bulb to form a uniformly distributed tangled mass of shredded foil therein.

The shredded foil material 16 according to the invention is extremely light and fluffy, and possesses very little, if any, elasticity. In fact, the said material is so light that the air alone fluffs it up, in which fluffed condition the shredded foil material will remain against all ordinary handling and shipping impacts but will tend to compact somewhat when the lamp bulb is subjected to excessive sharp impacts. The light and substantially inelastic shredded foil filling material according to the invention is thus quite different from wire filling material such as disclosed in United States Patent No. 2,162,847—Korver, issued June 20, 1939. With such wire material, it is necessary to introduce an internal strain in the wire in order to impart inherent elasticity thereto. It is the inherent elasticity, then, of the wire itself which serves to maintain such wire filling material in an expanded condition, the wire possessing elasticity to a degree such that the wire filling cannot be compacted even when the lamp bulb is subjected to excessive impacts.

The shredded foil combustible material 16 according to the invention is very inexpensive to manufacture. Rolled foils of "full hard" aluminum one mil and below in thickness are commercially obtainable in strip form at relatively low cost as compared to the extremely thin beaten foils heretofore used for flash lamps. While such rolled aluminum foil is very thin, nevertheless it is insufficiently thin to be effectively ignitable when comparatively wide strips are used as the filling material for flash lamps. However, by simply cutting such rolled aluminum foil of the order of one mil thickness into shreds having a width of the order of one mil, a very inexpensive and satisfactory filamentary combustible material is obtained.

The rolled foil, as obtained commercially, is of substantially uniform thickness. Consequently, by cutting such uniform thickness foil into shreds of substantially uniform width, the individual shreds will be of uniform cross-section so that different flash lamps filled with such material will possess uniform flash characteristics.

Although, as stated above, the shredded foil material 16 comprising our invention will retain its fluffed out condition under normal shocks or impacts, still, if desired, it may be positively secured in place within the bulb in the manner disclosed and claimed in copending United States application Serial No. 285,980—J. H. Oram, filed July 22, 1939 and assigned to the assignee of the present invention. As therein disclosed, the combustible material is secured at a plurality of spaced points to the inner bulb wall by means of a lacquer coating on the inner surface of the bulb, those portions of the combustible material 16 in contact with the inner coating being embedded therein to thereby provide a positive affixation of the material within the bulb.

While we prefer to use our shredded foil material 16 as the sole combustible filling material in flash lamps, nevertheless, it is entirely possible to combine it with other well-known types of combustible material, such as the conventional beaten foils or fine-drawn wires of aluminum or magnesium or their alloys, to thereby obtain any desired flash characteristics.

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

1. In a flash lamp of the character described comprising a sealed light transmitting container, a combustible filling material consisting of a fluffed out mass of fine metallic strands having burrs thereon serving to render said strands more easily ignitable.

2. In a flash lamp of the character described comprising a sealed light transmitting container, a combustible filling material consisting of a fluffed out mass of fine strands of aluminum having burrs thereon serving to render said strands more easily ignitable.

3. In a flash lamp of the character described comprising a sealed light transmitting container, a combustible filling material consisting of a fluffed out mass of fine metallic strands having burrs thereon serving to render said strands more easily ignitable, the individual strands having a cross-section of the order of a square mil.

4. In a flash lamp of the character described comprising a sealed light transmitting container, a combustible filling material consisting of a fluffed out mass of fine strands of aluminum having burrs thereon serving to render said strands more easily ignitable, the individual strands having a cross-section of the order of a square mil.

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