

United States Patent

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[54] PHOTOGRAPHIC FLASHLAMP UNIT 5 Claims, 3 Drawing Figs.

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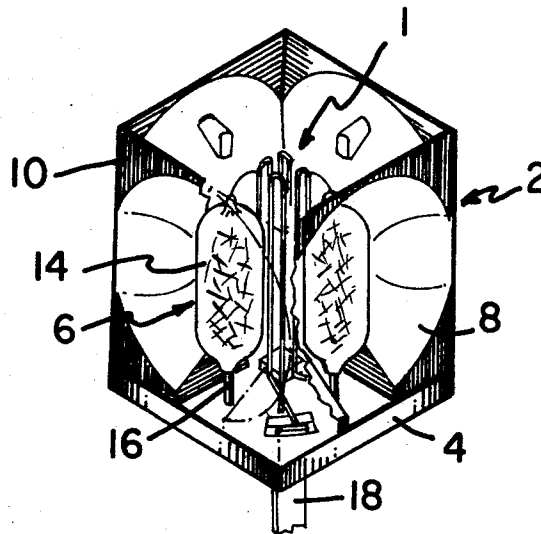
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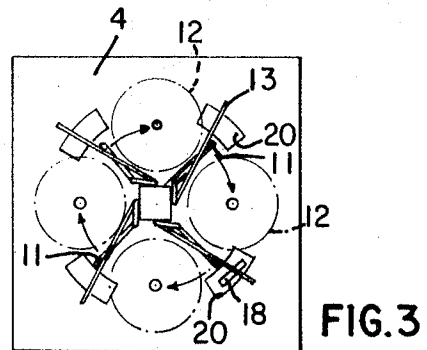
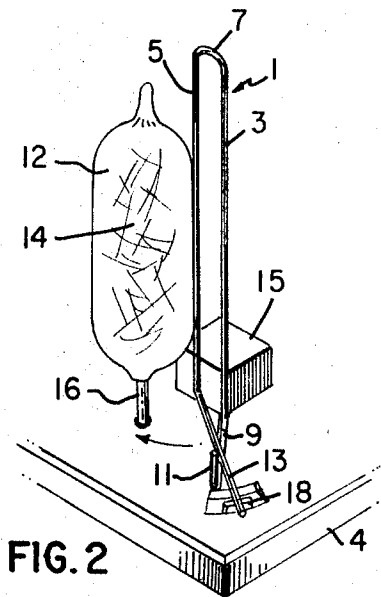
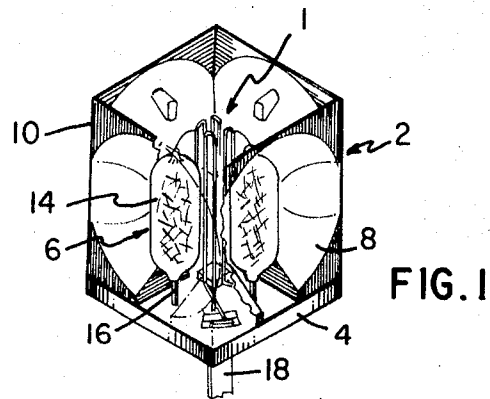
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ABSTRACT: A multilamp photographic flash unit, the lamps of which are of percussive primer type, having self-contained elements in the form of a folded torsion spring for firing the lamps. The tip of the stationary end of the spring is shaped to function as a catch to hold the striker formed on the movable end thereof while the spring is in a cocked position.





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PHOTOGRAPHIC FLASHLAMP UNIT

This invention relates to multilamp photographic flash units, commonly called flashcubes, and more particularly to flashcubes having lamps of the percussive primer type and the means employed to fire them.

Generally speaking, a percussive-type photoflash lamp comprises an hermetically sealed, light-transmitting envelope containing a is 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 anvil supported therein. Operation of the lamp is initiated by an impact onto the tube of the primer to cause deflagration of the fulminating material on the wire anvil up through the tube to ignite the combustible disposed in the lamp envelope.

Heretofore, several means were suggested for firing these percussive-type flashlamps, most of which involved some form of spring mechanism built into the camera. In a camera, it is desirable to use the lowest impact energy that will reliably flash the lamps because high impact energy requirements are disadvantageous for several reasons. For example, camera movement and vibration associated with high impact energies result in blurred pictures. In addition, the forces required to cock a high energy flash device may be several pounds in magnitude and are not compatible with the mechanisms found in most cameras.

Spring-driven hammers or levers have been considered. However, it was found that a cocking energy of from 6 to 8 inch ounces is necessary for lamp-flashing reliability with such a system because of the low hammer impact velocities attainable. Such energies are impractical and virtually impossible to use in view of the considerations noted above.

Cantilever springs have also been tried. These devices, through elimination of inert moving masses, provided higher impact velocities than those obtainable with the spring-driven hammers or levers. However, the physical size of cantilever devices does not permit them to be readily adapted to most existing camera models.

Devices of the foregoing types which were tried were either deficient in impact energy and velocity delivered so that high lamp flash reliability was not attainable, or dependent on severe overstressing of the metal which formed the spring. Such overstressed springs undergo permanent deformation during prolonged storage and thereby lose a significant part of the energy these were meant to deliver. Springs also break during repeated cyclic overstressing.

In view of the foregoing, the principal object of this invention is to provide a flashcube with self-contained means for firing the percussive-type flashlamps disposed therein.

Another object of this invention is to provide a flashcube with a firing spring that permits storage of the required amount of energy in the available space without exceeding the stress limits of the spring.

A further object is to provide a firing spring which attains very high strike velocities affording maximum lamp ignition reliability for any chosen amount of spring energy.

A further object is to provide a spring which, when cocked, contains all forces and stresses within itself and thereby permits long term storage of such cocked units without the development of practical problems arising from such long term storage.

A further object is to provide a flashcube with a self-contained firing spring which is simple in design and sufficiently inexpensive to make large-scale manufacturing of this type of flashcube feasible.

These and other function advantages and features are attained, in accordance with the principles of this invention, by providing each percussive-type flashlamp in the flashcube with its own folded torsion spring to store the energy for firing it, with the tip of the stationary end of the spring shaped to function as a catch to hold the striker formed on the movable end thereof, while the spring is in a cocked position. The moderate stress in the spring construction of this invention permits long term storage of such springs in the cocked position without appreciable loss of the energy stored therein.

Since the energy storage capability in a spring wire or rod is directly proportional to the mass thereof, for a wire or rod of any chosen cross-sectional diameter, the storable energy is limited primarily by the length thereof. Thus, in a flashcube application, this length in turn is limited by the desired vertical height of the flashcube. However, I have found that the vertical torsional section of the spring can be folded over somewhat like a hairpin without affecting its energy storage performance. This effectively doubles the torsional spring length and the amount of storable energy per spring. This excess of energy assures high operational reliability of the lamp system.

In the specific embodiment of the invention illustrated in the accompanying drawing,

FIG. 1 is a perspective view of a flashcube embodying the principles of this invention with a portion of the flashcube broken away for clarity of illustration.

FIG. 2 is a fragmentary view on an enlarged scale of a single lamp-firing spring assembly.

FIG. 3 is a plan view of the base of the flashcube of FIG. 1 with the several spring members shown in full and the several flashlamps associated therewith shown in phantom.

In the specific embodiment illustrated in the accompanying drawing, the flashcube 2 comprises a substantially rectangular base 4 along each side of which a percussive-type flashlamp 6 is arranged. Each lamp 6 is provided with its own reflector 8 and the assemblage of lamps and reflectors is enclosed in a transparent container 10 secured to the base 4. Each lamp 6 comprises an hermetically sealed light-transmitting envelope 12 having a primer depending therefrom and a filling of combustible foil 14 and a combustion-supporting gas disposed therein. The primer comprises a metal tube 16 within which an anvil and a charge of fulminating material are disposed.

As shown particularly in FIG. 2, the folded torsion spring 1 was formed from 0.026-inch diameter music wire about 2.75 inches long. The wire is shaped to define a hairpin torsional section having segments 3 and 5 and a bight 7. The end portion of segment 3 is shaped to define a stationary supporting leg 9, the tip of which is shaped to define a catch 11. The end portion of segment 5 is shaped to define a striker 13 which, when the spring is cocked as shown, crosses over the supporting leg 9 and is restrained by catch 11.

The stationary supporting leg 9 is seated in an elongated slot formed in the base 4 on or near a diagonal thereof, said slot being sufficiently shallow so that the catch 11 formed on the free end of the leg 9 will project a relatively substantial distance above the plane of the top face of the base 4. Initially, the striker 13 may be formed at an angle of about 90° to the stationary supporting leg 9, although the angle through which the striker is rotated to position it behind the catch 11 as shown may be any value that does not cause overstressing of the wire. The central post 15 on the top face of the base 4 provides a suitable bearing surface for the heel of the striker during cocking and it also aids in preventing an accidental displacement of the spring 1 sufficient to free the striker from the catch sometime after cocking and before firing is intended. Displacement of the cocked striker 13, to release it from the catch 11 and thus permit it to strike the tube 16 of the primer and fire the lamp, is effected by a suitable finger 18 or the like moving up through a slot 20 provided therefor in the base. The finger 18 may be part of a camera mechanism designed to enable the photographer to flash the lamp in synchronization with the tripping of the camera shutter to take a picture. Thus when

the finger 18 pushes the striker 13 upwardly a distance sufficient to clear the top of the catch 11, the striker swings clockwise as shown by the arrow in FIG. 2 and hits and indents the impact-sensitive primer tube 16 at high velocity to cause deflagration of the fulminating material located therein and thus ignite the combustible foil 14.

The bottom face of the base 4 of the flashcube 2 is provided with a suitable center post or the like (not shown) for mounting on a camera and providing a means whereby the flashcube may be rotated 90° after a lamp has been flashed so that another lamp may be advanced to firing position. As illustrated in FIGS. 1 and 3, each of the four flashlamps 6 is provided with its own firing mechanism as shown in detail in FIG. 2 and described above. As shown in FIG. 1, the hairpin torsional sections of the springs are clustered in the space behind the reflectors 8 and sufficient clearance is provided along the lower edges of these reflectors to permit the strikers to operate freely.

It will be readily apparent to those skilled in the art that a number of different geometrical variations of the specific folded torsion spring illustrated in the accompanying drawing and described above may be made without departing from the spirit and scope of this invention. For example, the stationary supporting leg 9 may contain bends, undulations or other shapes so as to facilitate mounting and holding of the spring on the flashcube base 4. Similarly, the striker 13 could be made nonlinear if it is so desired. The hairpin torsional section comprising segments 3 and 5 could be doubled again to form four vertical torsional sections without greatly affecting the overall performance of this torsion spring system. In addition, the spring might well be formed from fiberglass-reinforced

plastics rather than metal, without departing from the spirit or scope of the invention.

What I claim is:

1. A photographic flashlamp unit comprising:
 - a platform;
 - a plurality of flashlamps mounted on said platform, each of said flashlamps comprising an hermetically sealed, light-transmitting envelope having a source of actinic light disposed therein and a primer depending therefrom;
 - and a folded torsional spring having a substantially hairpin torsional section, a supporting leg extending from one end of said hairpin torsional section and fixedly mounted on said platform, and a striker extending from the other end of said hairpin torsional section for firing said primer and thus effecting ignition of said source of actinic light.
2. The combination of claim 1 in which said supporting leg has a catch formed at the tip thereof, said catch restraining said striker in a cocked condition.
3. The combination of claim 2 in which said platform includes access means for enabling said cocked striker to be tripped.
4. The combination of claim 1 in which each of said flashlamps has its own folded torsional spring associated therewith.
5. The combination of claim 1 and a plurality of reflectors located on said platform, one for each of said flashlamps, said reflectors being arranged so that the rear faces thereof define a central chamber, said folded torsional spring being located primarily within said central chamber.

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