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PHOTO-FLASH BULB

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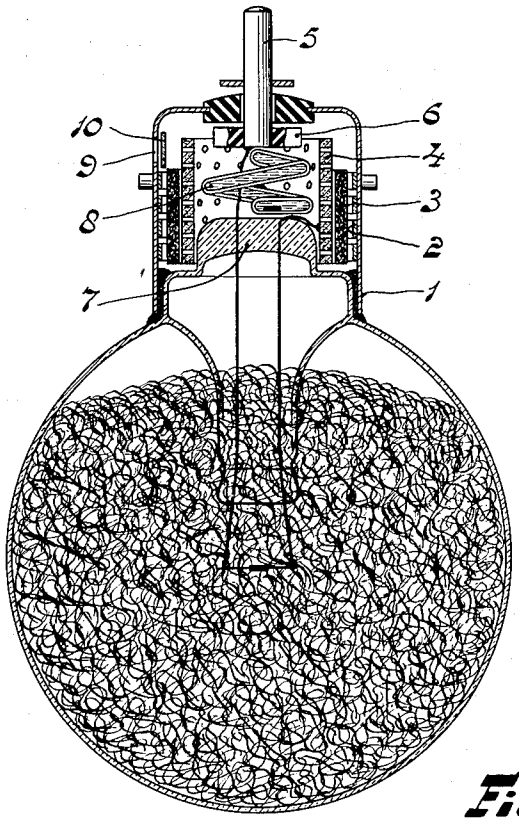


Fig. 1

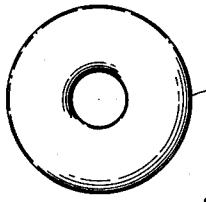


Fig. 4



Fig. 2

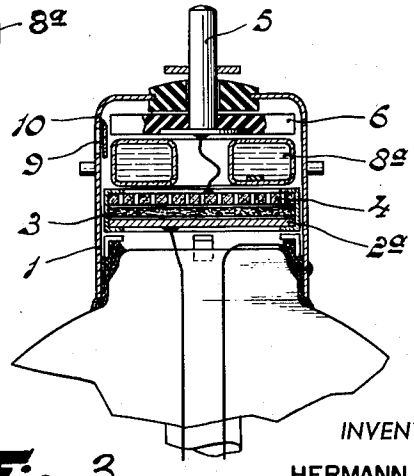


Fig. 3

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PHOTO-FLASH BULB

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9 Claims. (Cl. 67—31)

This invention relates to a photo-flash bulb to be ignited electrically. Such photo-flash bulbs are known to comprise an envelope which encloses a material adapted to be burnt with the radiation of actinic light and which contains in addition an electric igniting mechanism.

The electric igniting mechanism generally comprsies one or more filaments which are connected by means of current supply wires to two contacts provided on the cap of the photo-flash bulb. The actinically reacting material is ignited by the filament being brought to incandescence by means of electric current so that, for example, an ignition paste is ignited and the combustion of the actinically reacting material is thus initiated.

In order that the ignition may be started with sufficient rapidity the electric current must not be excessively low. Generally, a current from 0.3 to 0.5 ampere is required for this purpose but this also depends on the thickness and the composition of the ignition filaments. If lower currents are used ignition of the photo-flash bulb does not ensue at all or ensues with time-lag. In the latter case synchronisation between the shutter of the camera and the combustion of the actinically reacting material is not sufficiently accurate so that light radiation does not ensue wholly or in part until, after opening, the shutter of the camera has closed.

This difficulty occurs, for example, when for the purpose of igniting a photo-flash bulb use is made of a largely exhausted electrochemical source of energy, for example an electric cell.

Such cells are known to be used frequently for the ignition of photo-flash bulbs, the same cell being used many times. Exhaustion of the electric cell can be ascertained by the photographer with difficulty, only, since testing with the use of a small electric incandescent lamp, as often effected for checking a cell, is not a reliable indication whether the cell is still capable of supplying the current required for the ignition in due time of a photo-flash bulb.

The invention embodies a photo-flash bulb to be ignited electrically, the envelope of which encloses a material adapted to be burnt with the radiation of actinic light and to be ignited by means of an electrically heated filament, and is characterised in that the photo-flash bulb, for example its cap, accommodates an electrochemical source of energy which is capable of supply a quantity of electrical energy, sufficient for once igniting the photo-flash bulb within the short time required for ignition.

The invention is based on recognition of the fact that the electric current required for once igniting the photo-flash bulb, is required to be maintained for such a short period only that a comparatively low amount of energy from about 20 to 50 mw./sec. is given off and that electric sources of energy capable of transiently supplying this quantity of energy may be small enough to be readily accommodated in the cap of a photo-flash bulb. Thus, for example, it has been found, according to the invention, that an electric cell of sufficient power for this purpose can be manufactured by severing from a commercially obtainable cell a portion the electrode surface area of

which is 3 cm^2. For this purpose a portion 5 mms. in length may be severed from a cylindrical cell of the Danish mark "Hellesens" having a section of 19 mms. After its end faces have been sealed this cell may be incorporated in the cap of a photo-flash bulb. The internal diameter of the cap is 22 mms. The positive terminal of the cell is connected to the bottom contact in the cap. The other (negative) terminal is soldered to one of the current supply wires. The other current supply wire is connected to the cap wall.

For the purpose of igniting the paste, two tungsten wires having a length of 3 mms. and a diameter of 11 mms. are connected to the two current supply wires. Upon connection of the two contacts on the cap in an electrically conductive manner the photo-flash bulb is ignited at once and measuring the igniting rate does not reveal any retardation of the ignition.

However, as is well-known many electrochemical cells have no keeping qualities so that after having been stored for a period their power is affected. A delayed ignition may ensue when the photo-flash bulb according to the invention has been stored for a period.

According to the invention a cell is preferably incorporated which becomes operative immediately before ignition due to the electrolyte being transferred from a particular tank to the cell.

In order that the invention may be more clearly understood and readily carried into effect, it will now be described in greater detail with reference to the accompanying drawing, in which examples of preferred embodiments of the invention are shown.

Fig. 1 is a cross-sectional view of a flashlamp embodying the present invention,

Fig. 2 is a top plan view of the electrolyte tank therein,

Fig. 3 is a modification of the device embodying the present invention,

Fig. 4 is a top plan view of the electrolyte tank shown in Fig. 3.

A highly preferred embodiment of the invention is obtained with photo-flash bulbs by accommodating the powerful cell within the cap and in addition by using the internal surface of the cap as one of the electrodes of the cell. For this purpose it is preferable that the internal surface of the cap should be coated with a galvanic zinc layer about 20 μ in thickness. The counter electrode may be constituted by an oxidised lead foil about 0.1 mm. thick. The lead foil may be coiled up to form a cylindrical body and be gripped in the cap, a cellulose strip serving as the intermediate layer.

Referring to Fig. 1, as outlined hereinbefore, the cap **1** is internally coated with a zinc layer **2**. The intermediate layer is designated **3** and the oxidised lead foil **4**. Extending through the cap bottom is a movable stud **5** which is electrically insulated relatively to the cap and which serves as the bottom contact of the cap. In addition it constitutes the control member by which the electrolyte tank **8** can be acted upon, for example smashed. The stud **5** is connected to a disc **6** which on the stud being forced inwards engages with the electrolyte tank. The electrolyte tank itself rests upon the element **7**. The supply wires of the helical filament are connected on the one hand to the electrode **4** which is made of oxidised lead foil and on the other hand to the contact stud **5**, for example by soldering. When the control member **5** is moved inwards by manual compression or by screwing in of the lamp into the socket, the electrolyte tank **8** is smashed and the electrolyte liquid reaches in the shortest time possible the preferably perforated lead bioxide foil and soon penetrates through the absorbing intermediate layer **3** into the space intermediate the electrodes so that the galvanic element is in readiness to become operative.

The stud **5** is preferably such that even after termina-

tion of its inwardly directed movement it remains a predetermined distance from the cap bottom to and in addition engages with the central part of the socket.

The electrolyte tank may be constituted for example by an annular glass tube such as in Fig. 2 or by a helically wound glass tube such as in Fig. 3. As an alternative, the material of such electrolyte tanks may be a brittle synthetic substance which is capable of holding the electrolyte liquid without any substantial reaction on said tanks, or else it may be a ceramic material. When using an electrolyte tank of ceramic material the parts of the wall which face the active space intermediate the electrodes may readily be made thinner, for example by grinding, so that upon exertion of pressure by the control member 5 they are smashed prior to the remaining parts of the wall and a directional effect for the electrolyte liquid is thus produced.

It is advisable for the electrolyte liquid in the electrolyte tank to be maintained under pressure in order to ensure a given squirting effect, or a rapid flowing away of the electrolyte liquid from the tank. Pressure above atmospheric pressure may be produced, for example, by introducing a zinc pastille or a piece of zinc wire after filling the electrolyte tank to capacity and sealing the tank only subsequently. The action of the electrolyte liquid on the zinc will then result in known manner in the production of hydrogen which brings about an appreciable increase in pressure so that when the walls of the electrolyte tank are being smashed, the electrolyte impinges forcibly upon the electrode surfaces.

The ignition of a photo-flash bulb is effected by the stud 3, which also serves as a bottom contact and is connected to one supply wire for the helical filament, being electrically connected to the cap wall. As mentioned hereinbefore, the cap wall constitutes one electrode of the cell. The counter electrode, that is to say, the oxidised lead foil is connected to the second supply wire of the helical filament. The connecting lead between the members 5 and 1 preferably includes a switch by means of which ignition is struck.

With the embodiment shown in Fig. 4 like parts are designated by reference similar to those in Fig. 1. The construction shown in Fig. 4 differs from the embodiment shown in Fig. 1 in that a horizontally located cell insulated relatively to the cap wall is provided with one electrode being constituted by an oxidised lead foil 4 and the other electrode 2*a* being made of zinc. The electrolyte tank 8*a* is shaped in the form of a circular ring. It is located immediately below the control member 5 or below the disc 6 connected to this member. As soon as the electrolyte tank is smashed and the electrolyte liquid has got into the space intermediate the electrodes, ignition may be initiated by establishment of an electrical connection between the control member 5 and the cap 1, preferably by way of a switch. The control member 5 or the disc 6 is connected to one electrode 4 of the cell. The supply wires for the helical filament are secured on the one hand to the second electrode 2*a* and on the other hand to the cap 1. In the two embodiments shown in Figs. 1 and 4 provision is made laterally in the wall of the cap of an aperture 9 which is covered by a preferably transparent plate 10. This plate 10 is prepared in such manner that it shows a change in colour upon engagement with the electrolyte liquid. This provides an indication perceptible from without whether the powerful cell may possibly be already consumed. For preparing the plate 10 use may be made of any of the numerous indicating devices known in experimental chemistry, with which we are concerned as a rule with organic dye stuffs the colouring of which depends on the hydrogen ion concentration and which consequently indicate an acid, neutral or alkaline reaction by change in colour.

What I claim is:

1. A photo-flash bulb adapted to be ignited electrically comprising an envelope composed at least partially of a light transmitting material provided with a cap, a substance enclosed by said envelope and adapted to be ignited electrically and burned while radiating actinic light, an electrochemical source of energy including a frangible container having a liquid electrolyte therein in said cap being an integral part of said bulb and which is capable of supplying a quantity of electrical energy sufficient for igniting once the photo-flash bulb within the short time required for ignition, igniting means, and connecting leads for connecting said igniting means to said electrochemical source of energy.

2. A photo-flash bulb adapted to be ignited electrically comprising an envelope composed at least partially of a light transmitting material and provided with a cap, a substance enclosed by said envelope and adapted to be ignited electrically and burned while radiating actinic light, an electrochemical source of energy in said cap comprising a closed frangible tank containing electrolyte liquid, and means actuated from the outside of said bulb for crushing said tank whereby said electrolyte liquid is transferred immediately before ignition from said tank to the remainder of said area within said cap, igniting means, and connecting leads for connecting said igniting means to said electrochemical source of energy.

3. A photo-flash bulb adapted to be ignited electrically comprising an envelope composed at least partially of a light transmitting material and provided with a cap, a substance enclosed by said envelope and adapted to be ignited electrically and burned while radiating actinic light, an electrochemical source of energy in said cap comprising a tank for electrolyte liquid whereby said electrolyte liquid is transferred immediately before ignition from said tank to the remainder of said area within said cap, said tank being composed of a brittle, synthetic material which is substantially non-reactive to said electrolyte liquid, igniting means, and connecting leads for connecting said igniting means to said electrochemical source of energy.

4. A photo-flash bulb adapted to be ignited electrically comprising an envelope composed at least partially of a light transmitting material and provided with a cap, a substance enclosed by said envelope and adapted to be ignited electrically and burned while radiating actinic light, an electrochemical source of energy in said cap comprising a frangible tank for electrolyte liquid maintained at above-atmospheric pressure by a zinc pastille therein whereby said electrolyte is transferred immediately before ignition from said tank to the remainder of said area within said cap, igniting means, and connecting leads for connecting said igniting means to said electrochemical source of energy.

5. A photo-flash bulb adapted to be ignited electrically comprising an envelope composed at least partially of a light transmitting material and provided with a cap, said cap having its internal surface coated with a galvanic metal layer which serves as one electrode of said photo-flash bulb, a substance enclosed by said envelope and adapted to be ignited electrically and burned while radiating actinic light, an electrochemical source of energy in said cap comprising a frangible tank for electrolyte liquid whereby said electrolyte liquid is transferred immediately before ignition from said tank to the remainder of said area within said cap, igniting means, and connecting leads for connecting said igniting means to said electrochemical source of energy.

6. A photo-flash bulb adapted to be ignited electrically comprising an envelope composed at least partially of a light transmitting material and provided with a cap, a substance enclosed by said envelope and adapted to be ignited electrically and burned while radiating actinic light, an electrochemical source of energy in said cap comprising a frangible tank for electrolyte liquid and a metal stud extending through a wall of said cap and insulating therefrom whereby when a force is exerted on said stud in a predetermined direction said tank is shat-

tered thus permitting the electrolyte liquid from said tank to penetrate the remainder of said area with said cap, igniting means, and connecting leads for connecting said igniting means to said electrochemical source of energy.

7. A photo-flash bulb as claimed in claim 6 wherein said stud is provided with a pin positioned transversely of the longitudinal axis of said stud and externally of said cap for limiting the movement of said stud in said predetermined direction.

8. A photo-flash bulb adapted to be ignited electrically comprising an envelope composed at least partially of a light transmitting material and provided with a cap, said cap having its internal surface coated with a galvanic metal layer which serves as one electrode of said photo-flash bulb, a substance enclosed by said envelope and adapted to be ignited electrically and burned while radiating actinic light, an electrochemical source of energy in said cap comprising a frangible tank for electrolyte liquid and a metal stud serving as the other electrode of said photo-flash bulb and extending through a wall of said cap and insulated therefrom whereby when a force is exerted on said stud in a predetermined direction said tank is shattered thus permitting the electrolyte liquid from said tank to penetrate the remainder of said area within said cap, igniting means, and connecting leads for connecting said igniting means to said electrochemical source of energy.

9. A photo-flash bulb adapted to be ignited electrically comprising an envelope composed at least partially of a light transmitting material and provided with a cap having an aperture in one wall thereof, a substance enclosed by said envelope and adapted to be ignited electrically and burned while radiating actinic light, an electrochemical source of energy in said cap comprising a frangible tank for electrolyte liquid whereby said electrolyte liquid is transferred immediately before ignition from said tank to the remainder of said area within said cap, an indicator plate covering said aperture and showing a change in color upon contact with said electrolyte liquid, igniting means, and connecting leads for connecting said igniting means to said electrochemical source of energy.

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