United States Patent [19]

Prochnow

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[54] **ELECTRONIC FLASH APPARATUS**

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[52] **U.S. Cl.** **240/1.3,** 240/41.6, 354/126, 354/127

[51] **Int. Cl.** **G03b 15/02**

[58] **Field of Search** ..... 240/1.3, 52 R, 41.6; 354/126, 127

[56] **References Cited**

UNITED STATES PATENTS

2,898,447	8/1959	Hanlon	240/52 R
3,018,707	1/1962	Whittier	240/1.3
3,299,788	1/1967	Ackermann et al.	240/1.3
3,749,900	7/1973	Jonas et al.	240/1.3

FOREIGN PATENTS OR APPLICATIONS

741,194	8/1966	Canada	240/1.3

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[57] **ABSTRACT**

Electronic flash apparatus of the so-called computer type, having a sensor for receiving light reflected from the object being photographed, to determine the instant at which the flash should be extinguished, in order to provide just the right amount of light for the photographic exposure. The housing or casing of the flash unit is divided into two parts movable relative to each other. The main part of the housing contains the sensor. Pivotally attached to the main housing portion, for rotation about an axis at an angle to the optical axis of the sensor, is a lamp head portion containing the flash lamp and its reflector. In the normal position, the optical axis of the reflector is parallel to the optical axis of the sensor. When the lamp head is turned through 180° on its rotary axis, the optical axis of the flash reflector is at a substantial angle to the optical axis of the sensor (usually 90° or somewhat less than 90°) so that the main housing part may be held with the sensor axis correctly pointing toward the object to be photographed, while the light from the flash tube and its reflector is projected upwardly onto the ceiling, to provide indirect or "bounce" lighting for the object to be photographed.

4 Claims, 8 Drawing Figures

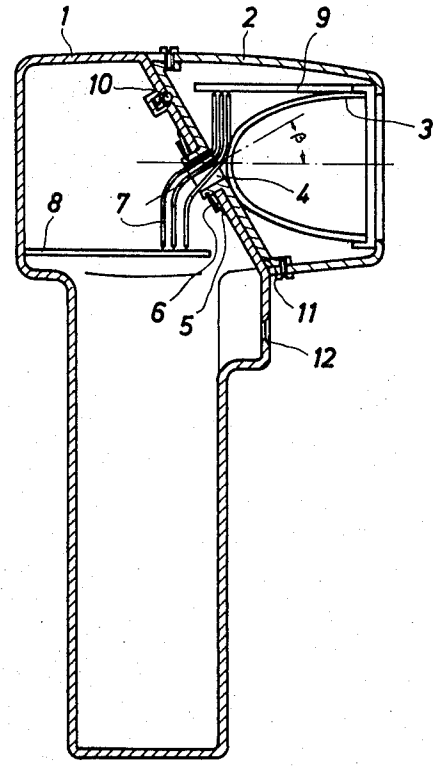


Fig. 1

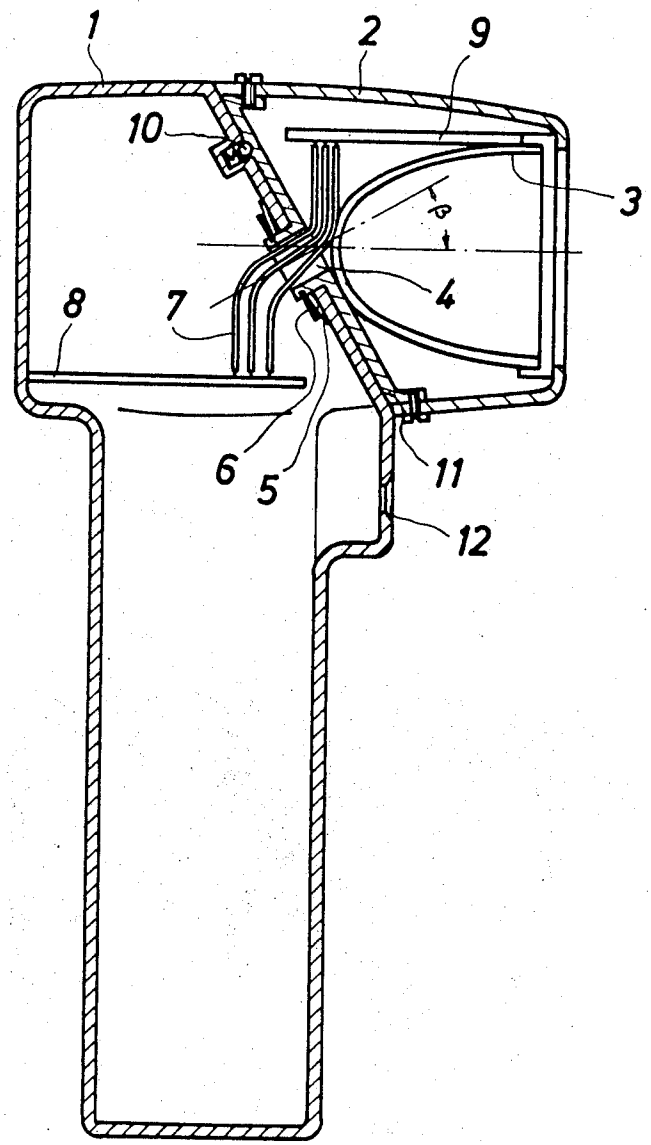


Fig. 2

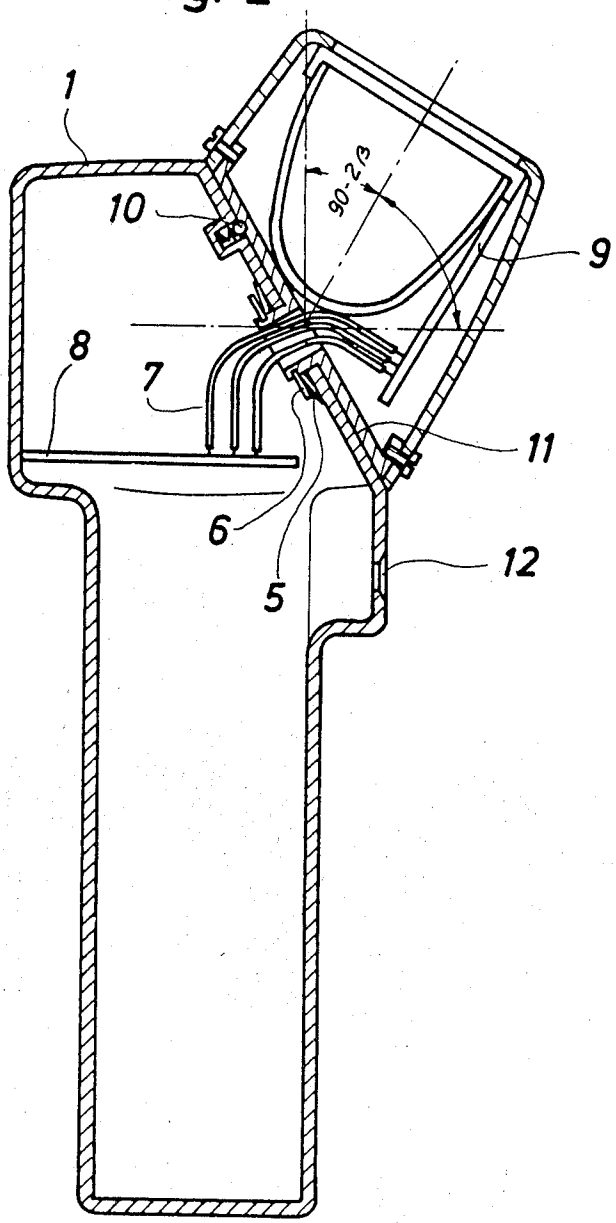
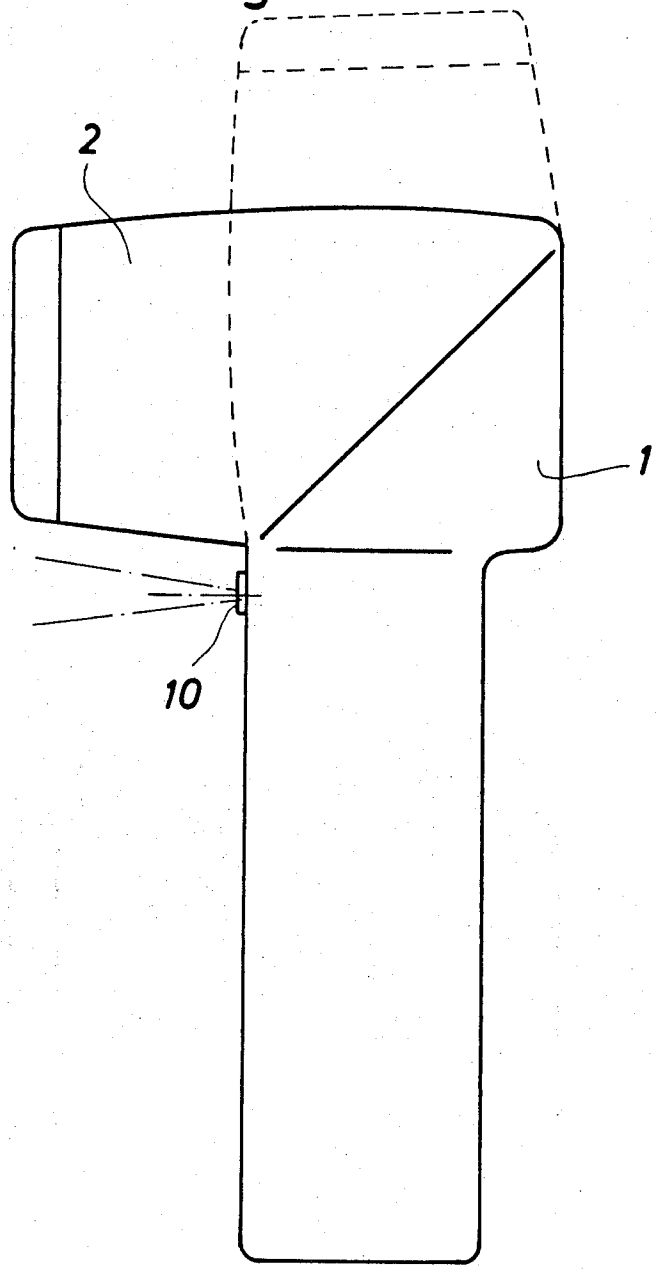


Fig. 3



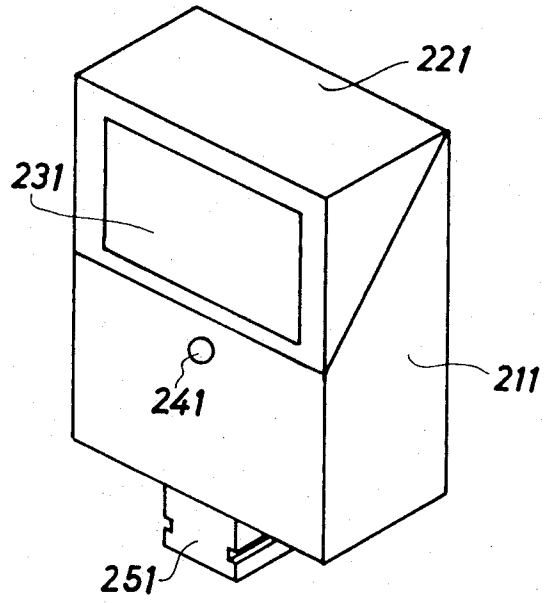


Fig. 4

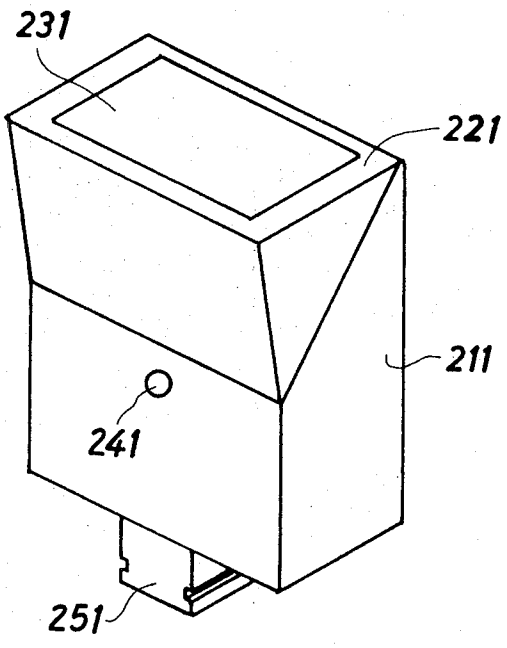


Fig. 5

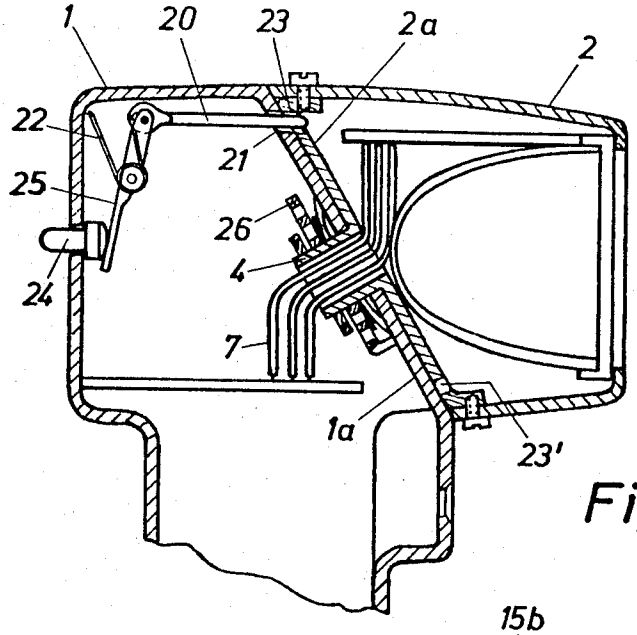


Fig.8

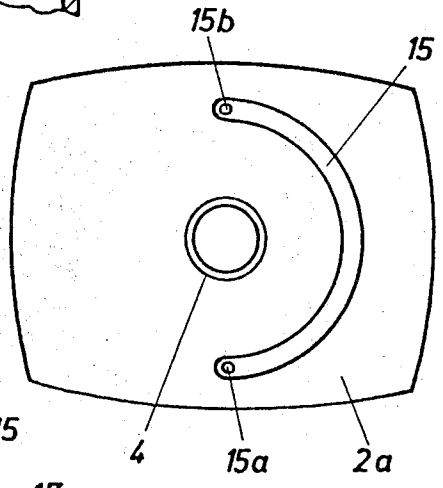


Fig.7

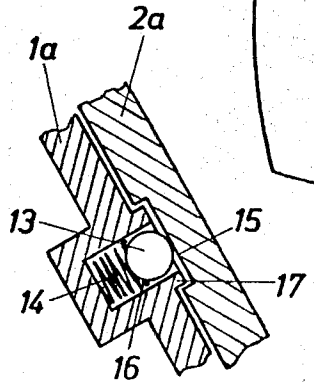


Fig.6

ELECTRONIC FLASH APPARATUS

BACKGROUND OF THE INVENTION

Photographic flash apparatus of the computer type is well known in the art, many examples being currently available on the commercial market both in the United States and elsewhere. In such apparatus, the electronic flash has a maximum duration longer than the duration needed for most pictures. That is, if the flash tube is allowed to emit its flash for the full duration of which it is capable, the resulting photograph would in most cases be over exposed. Therefore in modern flash apparatus of the computer type, there is a sensor which receives light reflected from the object or subject being photographed, integrates the reflected light, and cuts off or terminates the flash when the proper quantity of light has fallen on the object being photographed. This much is well known in the art, and details need not be repeated here.

In conventional flash apparatus of the computer kind or type, the optical axis of the reflector associated with the flash tube is parallel to the optical axis of the sensor. This relationship is what it should be, of course, when the flash apparatus is used in the normal or usual way, with the light from the flash tube and its reflector pointed or projected directly toward the object being photographed. But a variant lighting technique, known as indirect lighting or "bounce" lighting, is also well known in the art and widely practiced. When taking a photograph by the bounce technique, the flash is directed or pointed toward the ceiling, rather than toward the object being photographed. The bright illumination thus produced on the ceiling is reflected from the ceiling onto the object being photographed, thus giving more even illumination to the object and avoiding the harsh shadows which sometimes occur on portions of the object when using direct illumination. But bounce illumination is difficult with conventional electronic flash units of the computer kind, because in conventional units the optical axis of the sensor and the optical axis of the flash (that is, of the reflector of the flash) are in fixed parallel relation to each other. Hence if the flash unit is tilted so that the flash is directed toward the ceiling rather than toward the object, the axis of the sensor will also be directed toward the ceiling, whereas the axis of the sensor should point toward the object, even though the flash is directed toward the ceiling. For accurate results, the sensor axis should be aligned with the object being photographed at all times.

To overcome this difficulty and to enable the flash apparatus to be used for indirect or bounce lighting, it has been suggested that the sensor should be attached to a base connected to the camera in the usual manner by an accessory shoe, and that the flash head (containing the flash tube and its reflector) be tiltably mounted on a shaft attached to the base which carries the sensor, and extending transversely to the optical axis, or at least that the reflector should be so pivoted about a transverse shaft, even if the entire lamp head is not pivoted. Another suggestion has been that only the sensor be affixed to the camera, and be connected by a cable to the flash lamp which is freely movable in all directions. But both of these suggestions are unsatisfactory, because they do not readily control the extent of angularity of the direction of flash propagation relative to the direction of the sensor axis. Thus the user, when intending to take a bounce light photograph, may perhaps not tilt the flash projecting axis far enough relative to the sensor axis, with the result that the cone of rays from the flash apparatus may fall partly on the ceiling and partly directly on the object being photographed, or onto some other part of the field of view of the camera lens, particularly when using a lens of the wide angle variety. This would produce very uneven and unsatisffactory illumination of the field of view of the camera lens. Or again, the user may tilt the projection axis at too great an angle to the sensor axis, with the result that the flash illumination may be projected slightly rearwardly rather than straight upwardly or slightly forwardly, resulting in an inefficient loss of proper illumination of the field of view of the camera.

An object of the invention is the provision of flash apparatus so designed that it may be readily used for both direct illumination and bounce illumination of the field of view of the camera, upon making a quick and simple adjustment, and so designed that, when adjusted for bounce or indirect illumination, the light is always projected at the proper angle to the axis of the sensor, neither too great nor too small an angle.

Another object of the invention is to provide an apparatus which, in the normal position, with the reflector parallel to the optical axis of the sensor, cannot be outwardly distinguished from an ordinary apparatus, and which likewise does not deviate greatly from this compact basic shape when in the position for bounce or indirect illumination.

According to the invention, that part of the housing which contains the reflector is rotatable, on the part containing the sensor, about a shaft forming an acute angle of less than 45° with the optical axis of the sensor. This pivoting shaft is preferably situated in the central point of the joint faces between the two parts of the housing, and the contours of the said joint faces are constructed on axially symmetrical lines, in such a way that the joint faces, when rotated so that they are 180° apart, are congruent. The joint faces are preferably circular or square. The pivoting shaft is made hollow, to give passage to the electrical cable connections, in addition to which stops and/or catches are preferably provided for the two extreme positions into which the housing parts are rotatable.

A restoring spring may also be provided, which is subjected to tension on departure from the normal position, to which the reflector will therefore automatically return when released.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a somewhat schematic vertical section through a compact club-shaped flash unit according to one embodiment of the present invention, with the flash reflector axis in normal position parallel to the sensor axis;

FIG. **2** is a similar view of the same apparatus with the lamp head turned to the upward position for directing the flash illumination onto the ceiling;

FIG. **3** is a schematic side elevational view of such apparatus having a slightly different outline from that shown in FIGS. **1** and **2**, with the normal position of the lamp head shown in full lines and the indirect or bounce lighting position thereof shown in dotted lines;

FIG. **4** is a perspective view of another embodiment of the invention, with the parts in normal position;

FIG. 5 is a perspective view similar to FIG. 4, but with the lamp head adjusted to the upward tilting position;

FIG. 6 is an enlarged section through a fragment of the junction between the main part of the housing and the tilting part thereof, showing details of the spring catch partly shown in FIG. 1;

FIG. 7 is a face view of the base plate of the tilting lamp head or tube and reflector containing portion of the apparatus; and

FIG. 8 is a view similar to FIG. 1, showing a modified form of construction.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The torch--like flash unit is subdivided into the basic housing 1 and the reflector 2 with the reflector 3, which contains the usual conventional flash lamp tube, not shown. The housing 2 may also be referred to as the lamp head. The reflector housing 2 is pivotally mounted on the housing part 1 by means of a hollow tubular bearing 4 formed on one housing part (preferably on the lamp head) and extending snugly through an opening in the other housing part. The two housing parts are held snugly together, free from play, by a spring washer 5 and a retaining ring 6 engaging in a circumferential groove around the hollow bearing 4. An electrical conductor cable 7, passing through the hollow bearing 4, provides the necessary electric circuit connections between the conductor plates or circuit boards 8 and 9 in the same housing 1 and lamp head 2, respectively.

Preferably the reflector housing can be tilted to either one of two boundary positions as shown in FIGS. 1 and 2. The reflector is retained by a spring catch 10, an enlargement of which is shown in FIG. 6, at these two boundary positions. The spring catch 10 comprises a ball 13 which is passed by a spring 14 into a notch 15, which is a semi-circular shaped notch set concentrically to the bearing 4 in the base plate 2*a* of the tilting reflector. In each case at the extremity of the semi-circular notch 15 a depression 15*a* or 15*b* is sunk, in which the ball 13 can catch. Ball 13 and spring 14 lie in a socket or recess 16 of the sloping face plate 1*a* of the basic housing 1 which faces the base plate 2*a* of the lamp head.

The ball socket 16 in the front plate of the basic housing has a ring shaped elevation 17 which extends into the notch 15 of the base plate 2*a* of the reflector housing 2. In the two stop positions 15*a* and 15*b* of the ball 13, this ring shaped elevation 17 lies at the extremity of the semi-circular shaped notch 15 and forms here a stop against a further rotation. In this way the reflector housing 2 can be turned 180° from its basic position to its reflector position and from this position it must be returned in the opposite direction to its basic position. The reflector housing can, therefore, only revolve 180° to and fro. This prevents excessive turning or twisting of the cable 7 led through the hollow bearing 4.

The main housing part 1 contains the conventional sensor which is responsive to light reflected from the object being photographed, ,and which serves, in known manner, to extinguish at the proper instant the flash produced by the flash lamp tube in the reflector 3. The sensor itself is not illustrated. It receives light from the object through the window 12 at the front of the housing part 1, and this window may be regarded as a schematic representation of the sensor. The optical axis of the sensor is horizontal when the flash apparatus is held upright as in FIGS. 1 and 2; that is, it is parallel to the optical axis of the reflector 3, when the latter is in its normal position shown in FIG. 1.

The joint face between the two housings 1 and 2 formed by the base plate 2*a* of the reflector housing 2 and the front plate 1*a* of the basic housing 1 is flat (except for the groove and limiting projection above mentioned) and its contour is symmetrical about an axis in such a way that both housing parts join together in both boundary positions without protrusions and recesses. The angle of tilt β between the swivel axis (axis of the bearing 4) and the axis of the sensor 12 or as the case may be the reflector axis parallel to the sensor axis in normal setting, FIG. 1, is a maximum 45°. An angle β larger than 45° would be less efficient, as in the case of a tilted reflector the tilt of the reflector axis is 2β relative to the sensor axis. With an angle of tilt β greater than 45° in the case of tilted reflector, the light would, therefore, be directed backwards, away from the object.

In FIGS. 4 and 5 the idea of the invention is shown on a flash unit with a box-like construction. Here again the lamp head or reflector housing part 221 with the reflector 231 is pivoted in the same way on the main housing 211, as shown in the embodiments illustrated in FIGS. 1–3 and FIGS. 6–8. The sensor is indicatd at 241. The unit has a foot 251, by which it may be mounted on the conventional accessory shoe on the top of the camera.

FIG. 8 shows the flash unit as per FIG. 1, improved by providing a device which allows the tilted reflector to automatically return to its normal position after releasing an arresting mechanism. Arranged parallel to the sensor axis is a stop pin 20 which can be moved axially. The stop pin extends through an opening 21 in the front plate 1*a* of the housing part 1, and influenced by a spring 22 engages into an opening or depression 23 in the base plate 2*a* of the reflector housing 2 in the normal position of the reflector, and a depression 23′ in the tilt position of the reflector. This stop pin 20 can be withdrawn from the latch depressions 23 or 23′ by means of a press key or button 24 via a swing lever 25. The reflector housing 2 is thereby released. This can now be rotated from its normal setting, by tensioning a spiral spring 26 fitted on the bearing 4, 180° to its tilt setting. In the tilt position influenced by the spring 22 the stopping lever engages in the depression 23′ and with spring 26 taut holds the reflector housing in tilt position. By operating the key 24 the reflector housing is released from its tilt position and influenced by the taut spiral spring 26 returns to its normal position where the stop pin 20 again stops the reflector housing by engaging in the depression 23. With this modification the spring catch 10, 13, 14 can be dispensed with as its function is performed by the stop member 20.

As stated above, the maximum tilt angle of the rotary axis is 45°, resulting in a reflector axis tilt of 90° relative to the sensor axis. But the rotary axis tilt angle is frequently less than this, an angle of 30° being satisfactory in most cases. This results in an upward tilt angle of 60° of the reflector axis relative to the sensor axis when the lamp head is adjusted upwardly for bounce lighting, and this is very effective in most cases.

What is claimed is:

1. Electronic flash apparatus of the type having a sensor receiving light reflected from an object being photographed and controlling the duration of a flash in response to the light reaching the sensor along a sensor axis, said apparatus comprising a first housing part containing said sensor, a second housing part containing a flash reflector having an optical axis, and means for rotatably mounting said second housing part on said first housing part for rotation relative thereto about a rotary axis forming an acute angle of less than 45° to said sensor axis, said rotary axis being defined by a hollow tubular bearing membber, said apparatus further comprising an electrical conducting cable passing through said tubular bearing member to connect electric circuit parts within said second housing part to electric circuit parts within said first housing part.

2. Flash apparatus as defined in claim 1, further including stop means limiting turning of said second housing part relative to said first housing part to a turning range of 180°.

3. Flash apparatus as defined in claim 2, further comprising spring means tending to restore said second housing part to a normal one of its extreme positions relative to the first housing part, when it is turned to another position.

4. Flash apparatus as defined in claim 3, further comprising releasable latch means for holding said second housing part in its other extreme position turned 180° from its said normal position, said spring means serving to turn said second housing part back from its latched position to its normal position when said latch means is released.

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