

PATENT SPECIFICATION

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10

(54) PHOTOGRAPHIC FLASH UNIT

(71) We, EASTMAN KODAK COMPANY, a Company organized under the Laws of the State of New Jersey, United States of America of 343 State Street, Rochester, New York 14650, United States of America do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a photographic electronic flash unit.

Many camera manufacturers produce a number of different models from a basic camera design. These models may range from a very simple, low-cost design to a camera designed to operate over a wide range of picture-taking conditions. The former may include only a single lens and a fixed-speed shutter whereas the latter may employ an optical system capable of achieving a high resolution image of the scene being photographed, as well as exposure control apparatus controlled electronically to automatically set both the camera diaphragm and shutter speed in accordance with scene conditions. There are generally other camera models intermediate between these two extremes.

As a result of the different features included in the different camera models, there may be minor physical differences from one model to another of a particular line of cameras. For example, one camera model may be slightly larger than the other models or the camera flash-receiving socket may not be located in exactly the same position on the camera body with respect to the other models. This results despite the fact all models may utilize the same size film, and have essentially the same flash-firing mechanism, etc.

As a result of these differences, camera accessory equipment, such as an electronic flash unit, manufactured for a particular line of cameras may not be suitable for all camera models.

An object of the present invention is to provide an electronic flash unit which may be used with any model of a particular range of cameras.

In accordance with the present invention there is provided a photographic electronic flash unit comprising a flash tube, a trigger means for firing said flash tube, an electrical connector for connecting the flash unit to a photographic camera, the connector having first and second electrical contacts continuously connected to the trigger means, the connector being movable along a path defined by the flash unit to position the connector operationally at any point on said path, and a bracket which is inseparable from the flash unit, said bracket being movable relative to the flash unit from an extended position towards a retracted position for clamping the flash unit to a photographic camera.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of an electronic flash unit mounted on a camera with a lower portion of the flash unit housing removed to show a flash-receiving socket located in the top of the camera to electrically connect the flash unit to a camera flash-firing mechanism located within the camera body;

Fig. 1a shows a partial perspective view of Fig. 1, to an enlarged scale;

Fig. 2 is a front elevation of the flash unit showing an electrical plug, in two alternative positions, insertable in the camera flash-receiving socket shown in Fig. 1, and an adjustable flash mounting bracket which is shown in an extended position;

Fig. 3 is a view of the bottom of the flash unit shown in Fig. 2, showing the flash-mounting bracket, the flash plug and a track on which the electrical plug is slidably mounted;

Fig. 4 is a perspective view of the bottom of the flash unit, partially in cross-section;

Fig. 5 is a view in cross-section of the plug

and the track on the line V—V of Fig. 4;

Fig. 6 is a front elevation of a part of the flash unit with the front wall thereof cut away, showing a flash control switch with a control button mounted on the side of the flash unit, the button being shown in its OFF position;

Fig. 7 is a view similar to the view shown in Fig. 6 showing the control button in its RELEASE position;

Fig. 8 is a view similar to the views shown in Figs. 6 and 7 also showing diagrammatically the flash unit circuitry connected to the control switch; the control button being in its ON position; and

Fig. 9 is an exploded perspective view of a part of the flash unit showing the control button and a part of the associated control switch, the flash-mounting bracket and the latch mechanism.

Because electronic flash units are well known, the present description will be directed in particular to elements forming part of, or cooperating more directly with, apparatus in accordance with the present invention. It is to be understood that flash unit elements not specifically shown or described may take various forms well known to those having skill in the art.

There is shown in Fig. 1 of the drawings a camera 10 having an enclosed generally light-tight housing 12. Mounted within a frontplate 14 thereof is a viewfinder 16 and a lens opening 18. A shutter release member 20, located within a top wall 22 of the camera 10, is operatively coupled to a shutter mechanism (not shown) located within the camera housing 12 in alignment with the opening 18 to regulate the amount of light, reflected from a scene to be photographed, and projected through the lens opening, the shutter being actuable in response to depression of the shutter release member.

Also located within the top wall 22 is a flash-receiving socket 24. The socket 24 has a front wall 26, a pair of spaced side walls 28, a rear wall 30, and a bottom wall 32, which together form a generally rectangular-shaped body surrounded by a raised flange 34.

The front wall 26 includes an enlarged section 35 which extends above the flange 34 and terminates in the bottom wall 32. Mounted within section 35 are three spaced electrical contacts 36a, 36b, 36c which extend generally into the interior of socket 24. Access openings in bottom wall 32 permit each of the electrical contacts to be connected to a flash-firing mechanism, not shown but located in the interior of camera 10, for triggering a flash device, such as electronic flash unit 40, on. For that purpose, resilient fingers 37 extend generally upward through access openings 38 in

bottom wall 32, front wall 26, and rear wall 30 and terminate in an engaging projection 39 to releasably retain the electronic flash unit which is described in further detail hereinafter.

Camera flash-firing mechanisms for triggering photographic flash devices are well known in the art and may take many forms. For example, the flash-firing mechanism may be of the type in which such a mechanism produces an electrical signal which is coupled directly to the terminals of a flash lamp.

On the other hand, the flash-firing mechanism may be of the type that produces an electrical signal that is applied to an electronic switching element, rather than directly to a flash device. For example, the electrical signal may be utilized to activate a trigger circuit of an electronic flash unit. The trigger circuit may, for example, include a trigger capacitor in series with the primary winding of a transformer, the transformer having a high voltage secondary winding connected to the flash trigger electrode. When the flash-firing mechanism of this type is activated, the electrical signal produced thereby operates to render the electronic switching element conductive. When this happens, the trigger capacitor discharges and due to the transformer a high voltage signal is applied to the trigger electrode to initiate firing of the flash-tube.

The flash unit 40 has a generally rectangular shaped housing 41 comprising a bottom wall 42, (shown in Fig. 3), a rear wall 43 (shown in Fig. 5), sidewalls 44 and a front wall 45 which surrounds a flash window 46 through which light emitted from a flashtube 47 (shown in Fig. 8) is directed.

The flash unit 40 may be clamped to various models of a particular type of camera, the models being of various sizes and the camera flash-receiving socket being located in a different position on each camera model. To achieve this result, the flash unit 40 includes a flash-mounting bracket 50 which is adjustable for clamping the flash unit 40 to cameras 10 having different thicknesses and an electrical plug 100 which is movable to be positioned in alignment with the camera flash-receiving socket 24. It shall be understood that the teachings of the present invention are in no way limited to the specific configuration illustrated for the flash-mounting bracket 50 or to the specific electrical plug 100 disclosed in the preferred embodiment. The specific configurations illustrated and described have been selected merely to illustrate operational coupling of the flash unit 40 to the particular type camera 10 illustrated in the drawings.

A pocket 52 for receiving the bracket 50 is

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formed of a top wall 53, a pair of spaced sidewalls 54, a front wall 55 spaced from the sidewall 44 and a bottom wall 56 within which is formed a rectangular opening 57 shown most clearly in Fig. 3.

The bracket 50 is L-shaped and comprises an elongate member 58 received within the pocket 52 and a forked member 59 having fingers 60 extending beneath the flash unit bottom wall 42 perpendicular to the member 58 and forming a platform upon which the camera 10 can be supported. The member 59 is forked to provide a suitably wide base to support the camera 10 yet to permit plug 100 to be positioned, within the fork, close to the sidewall 44 when the camera flash-receiving socket 24 is located toward the extreme right side, as viewed in Fig. 1, of the camera top wall 22. Mounted on the top of each finger 60 of the member 59, are resilient pads 61 which permit the member 59 to be fitted snugly underneath the camera 10 without marring or scratching the same. The pads 61 may be ribbed or knurled to provide a firmer grip for the flash unit 40 on the camera 10.

The bracket 50 is movable in a vertical direction as viewed in Fig. 2 over a range of positions between a fully retracted position, shown by dashed lines, in which the pads 61 on the bracket 50 abut the bottom wall 42 of the housing 41 are substantially in abutment therewith, and an extended position, shown by the solid lines. The bracket 50 can be adjusted to intermediate positions to mount the flash unit 40 on camera 10 of different thicknesses. A knurled control button 63 is slidably mounted within a rectangular opening 64 in the central portion of the front wall 55. The button 63 is movable between (1) a top, RELEASE position, shown in Fig. 7, in which the mounting bracket 50 is released for slidable movement in and out of the pocket 52, (2) an intermediate, OFF position, shown in Fig. 6, in which a flash unit battery 65 is electrically disconnected from a flashtube-firing circuit 66, the battery and firing circuit being shown in schematic form in Fig. 8, and (3) a bottom, ON position, shown in Fig. 8, in which the flash battery is electrically connected through a control switch 67 to the firing circuit to prepare the flash unit 40 for a flash-firing operation.

Referring to Fig. 9, the button 63 is integrally connected to one side of a flat, plate-like member 68 which is interposed between the front wall 55 and the member 58 for slidable movement therebetween. Integrally connected to the opposite side of the member 68, adjacent to the member 58, is a control member 69 having a pair of spaced finger members 70, 71, the ends of which define cam surfaces 70a, 71a, respectively. Integrally connected to the top

end of plate 68 is a control member 72 which has a sinusoidal portion 72a and which terminates in a finger 72b. The member 72 is made of a resilient material which by virtue of the portion 72a can be compressed in its axial direction. When the button 63 is in its OFF position, the end of the finger 72b is located adjacent to an abutment 55a on the front wall 55 and the member 72 is not compressed. However, when the button 63 is moved toward its release position, the finger 72b engages the abutment 55a and the portion 72a is progressively compressed as the button approaches its RELEASE position. As this happens, a bias force acts against the member 68, such that when operator finger pressure is removed from the button 63, the button is automatically returned from its RELEASE position to its OFF position under the influence of this bias force.

An elongate, rectangular opening 73 is formed in member 58. The opening 73 receives finger members 70, 71 which project therethrough as shown in Figs. 6 to 8. Two series of teeth 74, 75 are formed on the face of the member 58 remote from the member 68, a set extending on each side of the opening 73. As viewed in Figs. 6-8, the teeth 74, 75 are defined in the downward direction by gradually inclined ramp-like surfaces 76a and surfaces 76b which are perpendicular to the longitudinal axis of the member 58. The bracket 58 is biased in the downward direction, as viewed in Figs. 6-8, by a spring 77 shown diagrammatically in Fig. 9, the spring 77 being located between the top wall 53 and the top of the member 58 in a cavity therebetween.

The control switch 67 comprises a stationary contact 67a located within the flash unit 40 and an elongate contact 67b which is secured at one end to a stationary support member 78 so as to extend generally parallel to member 58. The switch contact 67b is shaped so that a V-shaped projection 67c thereon has its vertex extending into the opening 73, so as to be engaged by the cam surface 70a when the button 63 is in its ON position as shown in Fig. 8. A projection 67d serves to releasably retain the finger 70 in this engaging position when the button 63 is in its ON position by engagement therewith. The contact 67b is then deflected in a counterclockwise direction to engage the contact 67a, as shown in Fig. 8, to close the switch 67 so as to connect the battery 65 to the flash-firing circuit 66.

An L-shaped latch 79 which is mounted on a support member 78 as shown in Figs. 6-8, and has a member 79a extending generally parallel to the member 58. However, the top portion 79b of the member 79a, which terminates in a finger 80, is inclined towards the member 58 so

that the finger 80 extends into the opening 73 and corners 79c, 79d of the member 79a each engages, respectively, a one of the teeth 74, 75. In this manner, the latch 79 in combination with the member 58 and in particular with each set of teeth 74, 75, operates as a ratchet mechanism. That is, so long as the corners 79c, 79d engage the teeth 74, 75, the bracket 50 is prevented from moving in the downward direction as shown in Figs 6—8, but by virtue of the angle of the teeth 74, 75 the bracket is permitted to move in the opposite, upward direction even when the latch 79 engages the teeth on the member 58.

In view of this ratchet effect, for the bracket 50 to be free to move in the downward direction as shown in Figs 6—8 towards its extended position, the button 63 must be moved from its OFF position to its RELEASE position shown in Fig. 7. In its release position, the cam surface 71a engages the finger 80 and thereby deflects the member 79a in a counterclockwise direction whereby the corners 79c, 79d thereof are disengaged from the teeth 74, 75. The spring 77, is sufficiently strong to drive bracket 50 quickly to its extended position shown in Fig. 2. Once pressure is removed from the button 63, the resilient member 72 returns the button automatically to its normal OFF position as shown in Fig. 6.

When the bracket 50 is not in its extreme, recessed position, the platform 59 may be moved closer to the bottom of the flash unit 40 to adjust the space therebetween to the particular size camera on which the flash is to be mounted. This adjustment can occur since the corners 79c, 79d merely ride over successive teeth surfaces 76a, 76b, and do not operate to prevent such upward movement of the bracket 50.

A further feature of the present invention is that when bracket 50 is in its recessed position, the battery 65 may be automatically prevented from being connected to flash-firing circuit 66. This is important since if the battery 65 can not be connected to the flash-firing circuit 66, the battery can not be inadvertently drained of its power. This is shown most clearly in Fig. 6 in which the bracket 50 is shown in its recessed position and the button 63 is in its normal OFF position. When these conditions exist, the leg 70 is disengaged from the switch contact portion 67c whereby the switch 67 is open and the battery 65 is disconnected from the circuit 66. Furthermore, under these conditions the leg 71 engages a surface 82 which defines one end of the opening 73. Due to the ratched effect of the latch 79 and the teeth 74, 75, the bracket 50 is secured against movement from its recessed position, and the button 63 is prevented from being moved from its OFF

position directly to its ON position and the switch 67 is maintained in an open position.

Referring now to Figs 2 to 5 there is shown a flash unit plug 100 which is mounted for slidable movement along a track 102 across the bottom wall 42 of the flash unit 40 between the side 44 and the opposite side of the flash unit. The plug 100 includes a base 104 having front and rear surfaces 106, 108, respectively. A pair of spaced cam surfaces and retaining surfaces 110, 112, respectively, are formed on the front surface 106. These engage with the projection 39 shown in Fig. 1a to retain the flash unit plug 100 in the socket 24. The base 104 further includes electrical contact strips 113, 114 located on the front surface 106 as shown in Fig. 2. These strips are spaced so as to engage, respectively, the contacts 36a, 36b when the plug 100 is inserted into the socket 24. For the purpose of electrically connecting the flash unit 40 to the socket 24, only two of the three contacts 36a, 36b, 36c are utilized. The third contact may provide means for firing multiple flash bulb assemblies or other functions as required. The third contact is not used in the present invention and by virtue of the base 104 and the front and rear surfaces 106, 108, the plug 100 is configured such that when inserted into socket 24 an electrical signal produced by the camera flash-firing mechanism is applied to the contacts 113, 114.

The base 104 is integrally connected to a rectangular-shaped intermediate support member 115. The member 115 is located within a rectangular opening 116 formed in the bottom wall 42 of the flash unit 40. It is preferred that the width of the member 115 be only slightly less than the width of the opening 116 to permit free movement of such member therealong yet to guard against dirt, becoming wedged between the member 115 and the side of the opening 116 so as not to impede such movement.

As is shown most clearly in Fig. 5 the member 115 is integrally connected to a generally U-shaped member 117 defined by spaced, parallel legs 117a, 117b which are coupled together by a base portion 117c. The legs 117a, 117b are spaced to receive therebetween an interior flash unit wall 120 which extends generally from side 44 of flash 40 to the other side thereof parallel to the wall 42. The top 102a of the wall 120 faces the front wall 45 and as is most clearly shown in Fig. 5 is spaced from the front wall by a distance which permits the base 117c to be loosely received in such a space. The entire plug assembly, as is most clearly shown in Fig. 4, thus can be slidably moved from one end of the track 102 to the other end thereof guided by the wall 120.

Continuing to refer to Fig. 4, the aforementioned contact strips 113, 114 are

affixed to the U-shaped member 117 and terminate on the outer side of leg 117b thereof. The contact strips 113, 114 are wrapped around the member 117 as shown in Fig. 4 and follow the surface of the intermediate member 115 through the opening 116 wherein each of such strips terminates on the front surface 106 as shown in Fig. 2.

Electrical wires 124, 125 are connected at one end respectively to contact strips 113, 114 and are connected at the opposite end thereof to the flash-firing circuit 66, as shown in Fig. 8 so as to be electrically coupled to the flash trigger electrode 47a.

As the plug 100 is moved along the track 102 a certain amount of movement of wires 124, 125 occurs. Furthermore, a certain amount of slack or excess wire length will occur for those positions of the plug 100 along the track that are closest to the input connection to the flash circuit 66. It is preferred to isolate the wires 124, 125 from the interior of the flash unit 40 as much as possible to guard against snagging or catching of the wires 124, 125 as they move with or follow the plug 100. A wall 126 is spaced from the wall 120 towards the interior of the flash unit and extends from the back wall 43 to the front wall 45. The wall 126 and the combination of the plug assembly portion 117 and the wall 120 form a substantially enclosed elongate chamber 130. The chamber 130 serves to collect and to thereby confine any excess wire 124, 125 to this limited space within the interior of flash unit 40. Due to the inherent stiffness of the wires 124, 125 each wire is caused to fold back on itself as the plug 100 is moved so as to form a pair of open ended loops within the chamber 130, the size of these loops being determined by the location of the plug 100 along the wall 120. This effect is most clearly illustrated in Fig. 4. Wires 124, 125 may then be passed through openings in the wall 126 to be connected to the flash circuit 66. That portion of the wires 124, 125 between the wall 126 and the circuit 66 is held stationary and wire entanglement within the flash interior is prevented.

WHAT WE CLAIM IS:—

1. A photographic electronic flash unit comprising a flash tube, a trigger means for firing said flash tube, an electrical connector

for connecting the flash unit to a photographic camera, the connector having electrical contacts continuously connected to the trigger means, the connector being movable along a path defined by the flash unit to position the connector operationally at any point on said path, and a bracket which is inseparable from the flash unit, said bracket being movable relative to the flash unit from an extended position towards a retracted position for clamping the flash unit to a photographic camera.

2. An electronic flash unit as claimed in Claim 1, having a manual control switch having open and closed positions, an energy source being connectable to a flash tube in the closed position of the control switch, the control switch being prevented from moving to its closed position when the bracket is in the retracted position.

3. An electronic flash unit as claimed in Claim 2, wherein the bracket has a ratchet mechanism and a surface engageable by the control switch to prevent the control switch from moving to its closed position when the bracket is in the retracted position.

4. An electronic flash unit as claimed in Claim 2 or 3, wherein the control switch has a further release position whereat the bracket is released for movement relative to the flash unit.

5. An electronic flash unit as claimed in Claim 4, comprising resilient means urging the control switch from its release position to its open position.

6. An electronic flash unit as claimed in any preceding Claim, the path being defined by a channel comprising the outer walls of a housing for the flash unit and an interior wall therein extending along the path, and the connector comprising a generally U-shaped member guided within the channel and located on the interior wall.

7. An electronic flash unit as claimed in any preceding Claim, wherein the connector is provided with cam and retaining surfaces for engagement with cooperating members in a camera.

8. An electronic flash unit substantially as hereinbefore described, with reference to and as illustrated in Figure 1 and 2 to 9 of the accompanying drawings.

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for connecting the flash unit to a photographic camera, the connector having electrical contacts continuously connected to the trigger means, the connector being movable along a path defined by the flash unit to position the connector operationally at any point on said path, and a bracket which is inseparable from the flash unit, said bracket being movable relative to the flash unit from an extended position towards a retracted position for clamping the flash unit to a photographic camera.

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