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(54) FLASH SOCKET

(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 photographic apparatus and more particularly, to a flash socket for receiving a photoflash unit.

It is an object of the present invention to provide an improved flash socket for receiving a flash unit.

According to the present invention there is provided a flash socket for receiving a flash unit having a projecting base recessed on one wall thereof and insertable into the socket, a wall of the socket having a portion which projects into the socket so as to cooperate with the recessed wall of the base to permit insertion of the base into the socket only in a predetermined orientation, the projecting portion having electrical contacts arranged to mate with contacts in the recessed wall of the base.

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

Figure 1 is a view of a camera incorporating a flash socket to a first embodiment of the present invention and showing, in phantom, a flash unit adapted for use with the camera;

Figure 2 is a front view of a multilamp flash unit adapted for use with the flash socket of the present invention;

Figure 3 is a schematic of the electrical circuit of the multilamp flash unit of Figure 2;

Figure 4 is a perspective view of one end of the multilamp flash unit of Figure 2;

Figure 5 is a perspective view of a flash socket according to the present invention, partially cut away to reveal its inner structure, and a portion of one end of the multilamp flash

unit of Figure 2;

Figure 6 is a view along the line 6-6 of Figure 5;

Figure 7 is a view along the line 7-7 of Figure 5;

Figure 8 is a perspective view of a camera equipped with a flash socket according to a second embodiment of the present invention, showing in phantom an electronic flash unit adapted for use with such camera;

Figure 9 is a perspective view of an electronic flash unit with a base adapted for insertion into a flash socket according to the second embodiment of the present invention;

Figure 10 is a front view of the flash unit shown in Figure 9; and

Figure 11 is a perspective view similar to Figure 5 of a socket according to the second embodiment of the present invention.

As photographic apparatus is well known, this description is directed in particular to elements forming part of, or cooperating more directly with, the socket of the present invention. Elements not specifically shown or described herein are understood to be selectable from those known in the art.

Referring now to Figure 1, a camera 10 includes a body 12, a shutter release 14, a lens 16 and a viewfinder 18. Camera 10 also includes a socket, shown generally as 20, which is adapted for receipt of a flash unit 30, shown generally in phantom.

Flash unit 30, shown in Figures 2-4, for use with socket 20 will now be described. Flash unit 30 has a body 32, which is generally rectangular and, in which are included a plurality of individual flashlamps 34 with an associated reflector 36. In a preferred embodiment, flash unit 30 comprises eight such individual flashlamps, four of them oriented in an upward direction as illustrated in Figure 2 with four oriented in a downward direction, all eight located on one face of the array. Unit 30 further includes a projecting base 38, of which, in a preferred embodiment of the unit, two are

formed; one on each of the two opposite ends of body 32. Base 38 is generally rectangular in shape and includes a front surface 40 and a rear surface 42. Cam surfaces 44 and retaining surfaces 46 are formed in front surface 40, also defines a central recess 48 and a pair of side recesses 50. The inner surfaces defining the side recesses 50 are separated by a transverse dimension d_1 (Figure 4). Cam surface 52 and retaining surface 54 are formed in rear surface 42, which also defines an elongate recess 56. The length of recess 56 is d_2 (Figure 5). Base 38 further includes electrical contacts 58, 60 and 62 which are positioned within central recess 48. Contacts 58 and 62 are generally rectangular and extend parallel on a wall that defines recess 48. Contact 60 has a generally T-shaped form, with a central portion 64 and an end portion 66. Central portion 64 is generally parallel with contacts 58 and 62. End portion 66 extends perpendicularly to central portion 64 but is separated from the ends of contacts 58 and 62.

Figure 3 shows the electrical circuit of unit 30. Contact 58 of one base 38 is connected to one terminal 68 of each of lamps L_1 , L_2 , L_3 and L_4 and to contact 62 in the second base 38. Contact 62 of one base 38 is connected to one terminal 70 of each of lamps L_1 , L_2 , L_3 and L_4 and to contact 58 in the second base 38. A second terminal 72 of each of lamps L_1 and L_1' is connected to contact 60. A second terminal 72 of each of the remaining lamps 34 is sequentially connected to contact 60 by means of an internal switching mechanism. Associated with six of the lamps 34 are switches made of a material that is normally not electrically conductive but that becomes conductive when illuminated. Preferred are compounds of silver such as silver carbonate, silver chlorate or silver oxide but other materials may also be used. Switch S_1 , associated with lamp L_1 , mechanically connects contact 60 and terminal 72 of lamp L_2 . Similarly, switch S_2 connects contact 60 and terminal 72 of lamp L_3 and switch S_3 connects contact 60 and terminal 72 of lamp L_4 .

For operation, an electric pulse, of suitable magnitude, is applied to contacts 58 and 60 and thereby to terminals 68 and 72 of lamp L_1 . Lamp L_1 will fire and in so doing, will illuminate and cause switch S_1 to close, thereby connecting terminal 72 of lamp L_2 to contact 60. In sequence, the four lamps in the top of the array will be fired by four successive electric pulses. Unit 30 may then be inverted relative to the socket 20 to permit firing of the other four lamps.

Socket 20, as may best be seen in Figures 5-7, includes a lower section 100 and an upper section 130, each of which is preferably formed by moulding a suitable material such as a polycarbonate plastic or similar material known in the art. Lower section 100 includes a bottom wall 102, two pairs of upstanding resilient

fingers 104 and 106 and three electrical contacts 108, 110 and 112. Each of fingers 104 and 106 extends generally upward from bottom wall 102 and terminates in an engaging projection 114, including cam surface 116 and latch surface 118. Each of electrical contacts 108, 110 and 112, as may best be seen in Figure 7, is formed of an upright section 120, a middle section 122 and an end 124. Upright section 120 extends through and is retained by bottom wall 102. Middle section 122 is generally triangular in shape and extends into the interior of socket 20. End 124 is positioned in engagement with the lower surface of upper section 130. Resilient fingers 104 face in a generally parallel direction as do resilient fingers 106, with engaging projections 114 on resilient fingers 104 being opposed to engaging projections 114 on resilient fingers 106. The inner surfaces of resilient fingers 104 are separated by a distance d_3 , while the outer surfaces of resilient fingers 106 are separated by a distance d_4 . Distance d_3 is slightly greater than distance d_1 on array 30, while distance d_4 is slightly less than distance d_2 .

Upper section 130 includes a top wall 132, a front wall 134, a pair of side walls 136, a rear wall 138 and a bottom wall 140. Front wall 134, side walls 136, rear wall 138 and bottom wall 140 form a generally rectangular body extending downwardly from top wall 132. Upper section 130 further includes a generally rectangular flange 142, formed at the intersection of top wall 132 with front wall 134, side walls 136 and rear wall 138. Flange 142 extends generally upwardly from top wall 132. Access openings 144 in bottom wall 140, front wall 134 and rear wall 138 permit access to the interior of upper section 130 for resilient fingers 104 and 106 in lower section 100. Front wall 132 includes a projecting portion 146, which extends into the interior of upper section 130 and above flange 142, which terminates in bottom wall 140, and in which are formed access openings 148 through which electrical contacts 108, 110 and 112 extend.

With access openings 148 located in the interior surface of projecting portion 146, the mating contacts 58, 60 and 62 on the base will be in the recess 48 for the projecting portion 146. They will then be protected from stray static electricity sources, such as fingers.

During assembly of socket 20 in camera 10, lower section 100 and upper section 130 will be assembled together to form socket 20 by insertion of resilient fingers 104 and 106 through access openings 144 and electrical contacts 108, 110 and 112 through access openings 148. Upper and lower sections 100 and 130 can now be releasably connected by screw or rivet connectors or permanently bounded together by an adhesive, sonic bond or other similar method as is known in the plastics art. Socket 20 can then be mounted in camera 10, with top wall 132 flush with the top wall of

body 12. Alternatively, upper section 130 of socket 20 could be integrally formed with the top wall of body 12, with lower section 100 being assembled with and connected to upper section 130.

When the photographer wishes to take a picture with artificial illumination, a flash unit, such as the flash array, an electronic flash unit or any other similar flash unit, is attached to camera 20 by inserting base 38 into socket 20. If base 38 is inserted in the correct orientation with respect to socket 20, projecting portion 146 is received by central recess 48. Cam surfaces 44 and 52 engage cam surfaces 116 on resilient fingers 104 and 106 and initially move resilient fingers 104 and 106 laterally outward against their inherent bias. As base 38 is inserted further into socket 20, cam surfaces 44 and 52 of base 38 disengage from cam surface 116, thereby allowing resilient fingers 104 and 106 to move inwardly toward each other. Latch surfaces 118 engage retaining surfaces 46 and 54, as is shown in Figures 6 and 7. Due to the inward bias of fingers 104 and 106 and the slope of surfaces 46, 54 and 118, base 38 is urged downwardly into a firmly seated position within socket 20. Unit 30 may be easily removed by exerting a lateral force thereon thereby camming latch surfaces 118 and fingers 104 and 106 outwardly, out of engagement with retaining surfaces 46 and 54 on base 38 of the unit 30.

If the operator attempts to insert base 38 in an incorrect orientation with respect to socket 20, the asymmetrical shape of socket 20, include the position of projecting portion 146 relative to central recess 48 and the positioning and separation of resilient fingers 104 and 106 relative to recesses 50 and 56, prevents insertion and retention of base 38 in socket 20. If unit 30 is presented to socket 20 with base 38 in an incorrect orientation, projecting portion 146 will not be received by central recess 48, thereby preventing easy insertion of base 38 into socket 20. Moreover, if the operator forces base 38 into socket 20, cam surfaces 116 on resilient fingers 104 and 106 may be initially cammed in an outwardly direction but their inward bias will exert a continuous upward force on base 38 and latch surfaces 118 will not engage retaining surfaces 46 and 54 on base 38. Therefore, flash unit 30 will not be securely retained by socket 20.

During insertion of base 38 into socket 20, it may be seen that T-shaped end portion 66 of contact 60 first comes into contact with all three of electrical contacts 108, 110 and 112. This is a desirable configuration of the electric circuit, in that the contact 110 may be a ground contact within camera 10 and, by means of portion 66, any electrostatic charge on the array may be drained off to prevent premature firing of lamps 34. On further insertion of base 38 into socket 20, it may be seen that T-shaped end portion 66 disengages from contacts 108

and 112 whereas central portion 64 of contact 60 remains in engagement with contact 110. Upon full insertion of base 38, contacts 58 and 62 will be engaged with contacts 108 and 112, respectively with contact 60 engaged with contact 110, thereby ensuring correct electrical connection of the array of lamps 34 in unit 30 with the electrical source in the camera. In a preferred embodiment, camera 10 includes a piezoelectric crystal which is struck synchronously with actuation of the shutter mechanism, thereby generating a pulse of electrical energy that is applied to one of the lamps in array. However, it may be seen that socket 20 and base 38 of the present invention may be utilized as well with a battery contained within either camera 10 or unit 30, as long as correct synchronization of flash firing and shutter actuation is maintained.

As has been noted earlier, a preferred embodiment of the array includes a base 38 located at opposed ends of body 32. Each base 38 includes identical components with the electrical contacts 58 and 60 controlling the firing of the four flashlamps located at the opposite end of array. Thus, it may be seen that the lamps farthest away from lens 16 will be fired during each actuation of the camera, thereby minimizing the possibility of "red eye". By means of the internal switching mechanism in the array described earlier, only one of the lamps is fired during each actuation of the camera with the internal switching mechanism ensuring correct sequencing of the lamp firing. Upon completion of the firing of four lamps, unit 30 may be detached from camera 10, inverted and re-inserted to present four new flashlamps in correct position for firing. Thus, the new flash unit and socket disclosed herein ensure the correct positioning of the flashlamps for firing and the correct sequencing of each flashlamp within the array.

In Figures 8 to 11, which illustrate the second embodiment of flash socket according to the present invention, similar parts have been given like reference numerals. Parts which differ have been given similar reference numerals with the prefix "2".

Referring to Figure 8, a camera 10 includes a body 12, a shutter release 14, a lens 16 and a viewfinder 18. Camera 10 also includes a socket, shown generally as 220, in accordance with a second embodiment of the present invention, which is adapted for receipt of a flash unit, shown generally as 230.

Referring now to Figures 9 and 10, the flash unit 230, which is an electronic flash unit, for use with socket 220 will now be described. Electronic flash unit 230 consists of a body 232, which is generally rectangular and in which is included an electronic flash tube 234 and reflector 236. Electronic flash unit 230 further includes a base 238 extending from body 232. Base 238 is the same as the base of flash unit 30 except that it includes a pair of

(12)

lugs 268 that extend outwardly along side surfaces 41 of base 238.

Similarly the socket 220 is the same as the socket 20 of the previous embodiment except that it has a pair of recesses 135 located on side walls 136. Recesses 135 extend in a generally inward direction from top wall 132 of upper section 130. Lugs 268 on base 238 of electronic flash unit 230 are of such a size and orientation as to be accepted within recesses 135 in socket 220. Thus, base 238 of electronic flash unit 230 may be securely mounted in socket 220 and will be retained therein by the fingers 114, 116 and will make contact with the contacts 108, 110 and 112. However, by comparison of base 238 on electronic flash unit 230 with the socket 20 illustrated in Figure 5, it may be seen that lugs 268 will strike flange 142 in upper section 130 and thereby prevent insertion of base 238 of electronic flash unit 230 into that socket. It is thus seen that any camera not adapted for use with electronic flash unit 230 will incorporate a socket 20 such as is illustrated in Figure 5; thereby preventing coupling of electronic flash unit 230 with that camera. Similarly, any camera in which the electronic flash unit may be utilized will incorporate a socket 220 having recesses 135; thereby permitting coupling of electronic flash unit 230 to that camera.

While recesses 135 have been shown as positioned in side walls 136 and lugs 268 in side surfaces 41, this has been done for convenience only. Recesses 135 could be positioned anywhere along flange 142 and could be of any number and size, so long as mating lugs 268 are provided in a corresponding location on base 238 of any flash unit to be utilized with socket 220, so that the flash unit may be coupled to the socket. Thus it may be seen that, by different combinations of recesses and lugs, a multiplicity of flash units can be developed, with some flash units being interchangeably usable on more than one camera whereas other flash units are acceptable by only selected cameras.

It will also be appreciated that the described socket 220 will accept a flash unit 30 as shown in Figures 2 to 4 of the drawings.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the scope of the invention as defined in the appended claims.

WHAT WE CLAIM IS:-

1. A flash socket for receiving a flash unit having a projecting base recessed on one wall thereof and insertable into the socket, a wall of the socket having a portion which projects into the socket so as to cooperate with the recessed wall of the base to permit insertion of the base into the socket only in a predetermined orientation, the projecting portion having electrical contacts arranged to mate with contacts in the recessed wall of the base.
2. A flash socket as claimed in Claim 1, the socket having two pairs of resilient fingers for engaging and releasably retaining a correctly inserted base of a flash unit, the first pair of fingers being spaced differently from the second pair.
3. A socket as claimed in Claim 2 and defined by a two part body, the resilient fingers being provided on a first section and the projecting portion being formed on a second interfitted section.
4. A socket as claimed in Claim 1, 2 or 3 of rectangular shape and having an elongate dimension perpendicular to an optical axis of photographic apparatus associatable therewith, the projecting portion being located at the front of the socket.
5. A socket as claimed in Claim 1, 2, 3 or 4 wherein the projecting portion also projects above the socket.
6. A socket as claimed in Claim 4 or Claims 4 and 5 wherein further recesses are provided in the short dimension sides of the rectangular socket to enable the socket to receive bases having mating lugs.
7. A socket as claimed in any preceding Claim wherein the electrical contacts of the projecting portion extend from apertures therein.
8. A socket as claimed in any preceding Claim wherein that face of the projecting portion, which faces into the socket is recessed and has the electrical contacts located therein and extending therefrom.
9. A flash socket for receiving a flash unit having a projecting base correctly insertable into the socket in a predetermined orientation, substantially as hereinbefore described with reference to and as illustrated in Figures 1, 5, 6, 7 and 11 or Figures 8, 12, 13 and 14 of the accompanying drawings.

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Similarly the socket 220 is the same as the socket 20 of the previous embodiment except that it has a pair of recesses 135 located on side walls 136. Recesses 135 extend in a generally downward direction from top wall 132 of upper section 130. Lugs 268 on base 238 of electronic flash unit 230 are of such a size and orientation as to be accepted within recesses 135 in socket 220. Thus, base 238 of electronic flash unit 230 may be securely mounted in socket 220 and will be retained therein by the fingers 114, 116 and will make contact with the contacts 108, 110 and 112. However, by comparison of base 238 on electronic flash unit 230 with the socket 20 illustrated in Figure 5, it may be seen that lugs 268 will strike flange 142 in upper section 130 and thereby prevent insertion of base 238 of electronic flash unit 230 into that socket. It is thus seen that any camera not adapted for use with electronic flash unit 230 will incorporate a socket 20 such as is illustrated in Figure 5; thereby preventing coupling of electronic flash unit 230 with that camera. Similarly, any camera in which the electronic flash unit may be utilized will incorporate a socket 220 having recesses 135; thereby permitting coupling of electronic flash unit 230 to that camera.

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It will also be appreciated that the described socket 220 will accept a flash unit 30 as shown in Figures 2 to 4 of the drawings.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the scope of the invention as defined in the appended claims.

WHAT WE CLAIM IS:-

1. A flash socket for receiving a flash unit having a projecting base recessed on one wall thereof and insertable into the socket, a wall of the socket having a portion which projects into the socket so as to cooperate with the recessed wall of the base to permit insertion of the base into the socket only in a predetermined orientation; the projecting portion having electrical contacts arranged to mate with contacts in the recessed wall of the base.

2. A flash socket as claimed in Claim 1, the socket having two pairs of resilient fingers for engaging and releasably retaining a correctly inserted base of a flash unit, the first pair of fingers being spaced differently from the second pair.

3. A socket as claimed in Claim 2 and defined by a two part body, the resilient fingers being provided on a first section and the projecting portion being formed on a second interfitting section.

4. A socket as claimed in Claim 1, 2 or 3 of rectangular shape and having an elongate dimension perpendicular to an optical axis of photographic apparatus associatable therewith, the projecting portion being located at the front of the socket.

5. A socket as claimed in Claim 1, 2, 3 or 4 wherein the projecting portion also projects above the socket.

6. A socket as claimed in Claim 4 or Claims 4 and 5 wherein further recesses are provided in the short dimension sides of the rectangular socket to enable the socket to receive bases having mating lugs.

7. A socket as claimed in any preceding Claim wherein the electrical contacts of the projecting portion extend from apertures therein.

8. A socket as claimed in any preceding Claim wherein that face of the projecting portion, which faces into the socket is recessed and has the electrical contacts located therein and extending therefrom.

9. A flash socket for receiving a flash unit having a projecting base correctly insertable into the socket in a predetermined orientation, substantially as hereinbefore described with reference to and as illustrated in Figures 1, 5, 6, 7 and 11 or Figures 8, 12, 13 and 14 of the accompanying drawings.

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