



PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Photoflash Device

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 (Assignees of DAVID EASTON BEACH) 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:—

This invention relates to flash photography, and more particularly, to a photoflash device for accepting a multi-lamp flash package as disclosed, for example, in our copending application No. 52324/65 (Serial No. 1131106).

In accordance with the present invention there is provided a photoflash device comprising rotatable socket means to receive a detachable multi-lamp package containing a plurality of photoflash lamps and individual reflectors, drive means urging the socket means toward rotation in a predetermined direction through predetermined positions to sequentially place the lamps of a received package in a photoflash circuit, means to hold the socket means in one of the predetermined positions, and electrically controlled means responsive to the firing of a lamp in the photoflash circuit to release the holding means and permit rotation of the socket means to a subsequent position.

In the accompanying drawing:—

Fig. 1 is a perspective view of a photoflash device constructed in accordance with one form of the present invention, together with a disposable multilamp photoflash package suitable for use therewith;

Fig. 2 is a partial perspective view, to an enlarged scale, of the drive mechanism employed in the device of Fig. 1; and (Fig. 3 is a schematic view showing the electrical control means.

Referring to Fig. 1, a flash device comprises a body portion 10, an attaching portion 11, and a socket portion 12 to receive a multilamp photoflash package 13. The body portion 10

contains the operating mechanism and electrical control means hereinafter described. The attaching portion 11 may, as shown, suitably comprise an attaching foot for use with accessory shoes of photographic cameras, although any known arrangement for attaching the flash device to a camera may be used.

The socket portion 12 is configured to receive the disposable multilamp photoflash package 13 and to automatically index the package after each operation in timed relation with camera exposure. While the package 13 is more fully described in our copending application No. 52324/65 (Serial No. 1131106), it is shown here to comprise a plurality (4) of flash lamps 14 of known manufacture and individual dish-shaped reflectors 15 mounted on an attaching base within a light transmitting protective cover. The attaching base includes a central connecting post 17 and an annular depending contact ring 16 about which are wrapped the pairs of lead-in wires of the photoflash lamps.

The socket portion 12, as shown, includes a rotatable receiving socket 18 defining a central access opening to receive the package connecting post 17 and an annular recess 19 to receive the contact ring 16 of the flash package 13. Referring also to Fig. 2, a pair of fixed electrically conductive terminals 20, 21 from the flash circuit are positioned in the annular recess 19 to engage the pair of lead-in wires of a photoflash lamp 14 facing in the direction of desired light emission. The package 13 is attached in a fixed position relative to socket 18 for rotation therewith, and a means within the socket 18 for detachably retaining the package 13 in a fixed position relative to the socket portion is disclosed in our copending application No. 52324/65 (Serial No. 1131106).

In the embodiment shown, the attaching foot 11 includes a central contact 41 (see Fig. 3) for engagement with a like contact in an accessory shoe. However, so that the flash de-

vice may be used with cameras which are not provided with a contact in the accessory shoe there is also included a cable socket 22 for insertion of a plug 24 to connect an electric cable 23, for example, a Continental connector, to the photographic camera by means of a plug 25.

As shown in Fig. 2, a drive mechanism includes a drive control cam disk 30 which is fixed to the socket 18 for rotation therewith. The disk 30 and socket 18 are supported by means of a shaft 31 which is mounted for rotation within a bearing support 32. To produce the rotation, there is provided a helical drive spring 33 having its lower end fixed to the bearing support 32 and the upper end fixed to the lower surface of the control cam disk 30. The cam disk 30 defines a cam slot 34 to control the rotation produced by the spring 33. The drive spring 33 is tensioned by insertion of a package 13 into the socket 18 in a fixed position relative to the socket, and manually rotating the package (together with the socket 18 and disc 30) in a counterclockwise direction (looking down) to the position shown in Fig. 2. The drive spring 33 then tends to rotate the socket 18 and inserted package 13 in the clockwise direction to place the lamps 14 in the photoflash circuit by successive engagement of the lead-in wires of each successive lamp 14 with the fixed terminals 20, 21.

In order to control rotation in relation to camera operation, there is provided a pivoted metering lever or arm 35 having mounted at one end a pin 37 cooperating with and moving within the cam slot 34. Metering lever 35 is biased, as shown in Fig. 3, in a clockwise direction about its pivot by means of a tension spring 36.

The cam slot 34 defines a plurality (4) of control shoulders 38 engaged by the pin 37 to prevent socket rotation at each successive lamp position. To permit indexing of the package after each camera operation, the spring 36 urges the lever 35 in a clockwise direction to move pin 37 from engagement with a shoulder 38 into the continuous portion of slot 34, thereby enabling the drive spring 33 to rotate the inserted package 13 and disc 30 in a clockwise direction until the pin again engages a subsequent shoulder 38.

Control of the metering lever 35 after each operation of the device is accomplished by an electrical circuit which also forms the photoflash synchronizing circuit to fire the lamp in the circuit in timed relation with camera operation. As shown, the electrical control includes an electromagnet 39 which selectively controls the position of a permanent magnet 40 fixed to the other end of the metering lever 35. In relation to the remainder of the flash synchronizing circuit, the attaching foot 11 defines the electrical ground which is engaged to camera ground represented by the accessory

shoe. The central contact 41 is engageable with a like contact in the accessory shoe to complete the circuit to a flash synchronizer switch forming a part of the photographic camera. The central contact 41 is fixed to a movable contact 42 which, with ground terminal 43, forms the socket 22 for using the cable connector 23. A spring 44 is provided to urge the central contact 41 downwardly, while insertion of plug 24 retracts central contact 41 upwardly against the bias of spring 44 to prevent electrical contact through the attaching foot 11 whenever the cable connector 23 is used.

The flash lamp 14 engaged by the terminals 20, 21 is positioned in the flash circuit as shown, and connected electrically in parallel therewith is a coil 45 of the electromagnet 39. A source of electric potential 50, suitably batteries, is provided to fire the lamp 14 in timed relation with camera operation whenever the synchronizing switch of the camera is closed to complete the circuit.

The soft iron core of electromagnet 39 is provided with a pair of magnetic North and South engagement poles 46, 47 oriented with corresponding like poles 48, 49 of the permanent magnet 40. Whenever a good flash lamp 14 engages terminals 20, 21, a circuit continuity exists through the lamp, and most of the current passes through the lamp 14. In this manner, there is no current through coil 45 to energize electromagnet 39. Normally, the magnetic attractive force of permanent magnet 40 is stronger than spring 36, and metering lever 35 is thus urged to the position shown in Fig. 3, with magnet 40 adjacent the soft iron core of electromagnet 39. In this position, pin 37 is engaged by a shoulder 38. However, when the flash lamp 14 is fired, all of the circuit current then passes through the electromagnet coil 45 to create a magnetic force at poles 46, 47. Because the adjacent poles of the electromagnet 39 and permanent magnet 40 are like poles, the magnet 40 is repelled, and spring 36 urges pin 37 out of engagement with the engaged shoulder 38.

As an added feature there may be included an indicator light 51 which is lit whenever there is circuit continuity by a good flash lamp 14 in the circuit.

The presence of an unfired lamp 14 in the circuit enables the magnet 40 to be attracted toward the core of electromagnet 39 against the bias of spring 36, thereby causing pin 37 to come into engagement with a shoulder stop 38 and prevent socket rotation. When the lamp 14 in the circuit is fired in timed relation with camera operation, magnet 40 is repelled and pin 37 moves from shoulder 38 into the main portion of cam slot 34 to permit drive spring 33 to rotate the socket 18 and inserted package 13. As the next subsequent shoulder 38 approaches pin 37, the next subsequent lamp 14 moves into the flash circuit by engagement of its lead-in wires with the terminals 20, 21.

When this occurs and the synchronizing switch of the flash circuit is opened, the current through coil 45 is again zero, and magnet 40 is attracted toward the core 39 to enable pin 37 to engage the subsequent shoulder 38 and terminate rotation.

The coil 45 of the electromagnet 39 is preferably of a delay acting type, as for example by adding a shorted loop, so that the developed magnetic field to actuate indexing is delayed say 10 to 15 milliseconds, or after peak light output from the fired lamp has occurred. Similarly, the characteristics of drive spring 31 and the shape of cam slot 34 determine the cycle time required for rotation to the next lamp position. It is possible, therefore, to provide a shutter synchronizing switch which is closed during the entire period in which the shutter is open and thereby provide light from more than one lamp 14 by setting the shutter at a speed slower than the predetermined cycle time. For example, the cycle time for socket rotation may be 35 milliseconds including delay time. Thus, the shutter synchronizing switch will still be closed whenever shutter speeds are 1/30 second or slower, and the next subsequent lamp will also be fired during the same exposure, thereby providing additional light to augment scene light.

In order to visually indicate whenever the inserted flash package has been completely used, we have provided, as described and claimed in our copending application No. 3551/69 (Serial No. 1156902) a terminal end 59 in the cam slot 34, which is located after the shoulder 38 corresponding the last lamp position at about one half the distance to the first shoulder 38.

As shown in Fig. 3, the cam disc 30 is in position for firing the first of the four lamps in the circuit, in which the first shoulder 38 is engaged by pin 37. The other three shoulders 38 ensure that the other lamps are successively located in the firing position where they face in the direction of desired light emission. However, when all four lamps have been fired, the pin 37 engages the terminal end 59, and the rotation of the socket 18 is stopped before it reaches its original position in which the first lamp would once more be in the firing position. This absence of a lamp in the firing position readily indicates complete use of the package within the socket, and the package 13 can then be removed by pulling the connecting post 17 of the package 13 out of the socket 18.

If desired, the flash device may be included within the body of a photographic camera to provide a built-in flash system. In this case, the number of lamps fired for each exposure may be controlled by providing a selector

which will vary the switch closing time as desired.

WHAT WE CLAIM IS:—

1. A photoflash device comprising rotatable socket means to receive a detachable multi-lamp package containing a plurality of photoflash lamps and individual reflectors, drive means urging the socket means toward rotation in a predetermined direction through predetermined positions to sequentially place the lamps of a received package in a photoflash circuit, means to hold the socket means in one of the predetermined positions, and electrically controlled means responsive to the firing of a lamp in the photoflash circuit to release the holding means and permit rotation of the socket means to a subsequent position. 65
2. A photoflash device according to claim 1, wherein the electrically controlled means retains the holding means in a released position whilst the photoflash circuit is closed so that the number of lamps sequentially fired during the time the photoflash circuit is closed depends on the length of time the photoflash circuit is closed. 70
3. A photoflash device according to claim 1 or 2, wherein the socket means comprises a rotatable socket receiver to detachably retain a package in fixed relation thereto and a cam disk rotatable with the socket receiver, the cam disk defining a cam slot having a plurality of shoulders spaced along the slot, and the holding means comprises a pin engageable with the shoulders to hold the socket means in the predetermined positions. 75
4. A photoflash device according to claim 3, wherein the pin is movable from an engaged shoulder for rotation of the disk, until the pin engages a subsequent shoulder, by means of an arm having a permanent magnet fixed thereto, and the electrically controlled means comprises an electromagnet which, upon firing of the lamp in the photoflash circuit, is energised and repels the permanent magnet to cause the arm to move the pin from the engaged shoulder. 80
5. A photoflash device according to claim 3 or 4, wherein the cam slot has a terminal end which, after all of the lamps in the package have been fired, is engaged by the pin to terminate movement of the socket means between two of said predetermined positions. 85
6. A photoflash device according to claim 1, constructed and adapted to operate substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings. 90
7. A photographic camera having incorporated therein a photoflash device according to any one of the preceding claims. 95

When this occurs and the synchronizing switch of the flash circuit is opened, the current through coil 45 is again zero, and magnet 40 is attracted toward the core 39 to enable pin 37 to engage the subsequent shoulder 38 and terminate rotation.

The coil 45 of the electromagnet 39 is preferably of a delay acting type, as for example by adding a shorted loop, so that the developed magnetic field to actuate indexing is delayed say 10 to 15 milliseconds, or after peak light output from the fired lamp has occurred. Similarly, the characteristics of drive spring 31 and the shape of cam slot 34 determine the cycle time required for rotation to the next lamp position. It is possible, therefore, to provide a shutter synchronizing switch which is closed during the entire period in which the shutter is open and thereby provide light from more than one lamp 14 by setting the shutter at a speed slower than the predetermined cycle time. For example, the cycle time for socket rotation may be 35 milliseconds including delay time. Thus, the shutter synchronizing switch will still be closed whenever shutter speeds are 1/30 second or slower, and the next subsequent lamp will also be fired during the same exposure, thereby providing additional light to augment scene light.

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If desired, the flash device may be included within the body of a photographic camera to provide a built-in flash system. In this case, the number of lamps fired for each exposure may be controlled by providing a selector

which will vary the switch closing time as desired.

WHAT WE CLAIM IS:—

1. A photoflash device comprising rotatable socket means to receive a detachable multi-lamp package containing a plurality of photoflash lamps and individual reflectors, drive means urging the socket means toward rotation in a predetermined direction through predetermined positions to sequentially place the lamps of a received package in a photoflash circuit, means to hold the socket means in one of the predetermined positions, and electrically controlled means responsive to the firing of a lamp in the photoflash circuit to release the holding means and permit rotation of the socket means to a subsequent position.

2. A photoflash device according to claim 1, wherein the electrically controlled means retains the holding means in a released position whilst the photoflash circuit is closed so that the number of lamps sequentially fired during the time the photoflash circuit is closed depends on the length of time the photoflash circuit is closed.

3. A photoflash device according to claim 1 or 2, wherein the socket means comprises a rotatable socket receiver to detachably retain a package in fixed relation thereto and a cam disk rotatable with the socket receiver, the cam disk defining a cam slot having a plurality of shoulders spaced along the slot, and the holding means comprises a pin engageable with the shoulders to hold the socket means in the predetermined positions.

4. A photoflash device according to claim 3, wherein the pin is movable from an engaged shoulder for rotation of the disk, until the pin engages a subsequent shoulder, by means of an arm having a permanent magnet fixed thereto, and the electrically controlled means comprises an electromagnet which, upon firing of the lamp in the photoflash circuit, is energised and repels the permanent magnet to cause the arm to move the pin from the engaged shoulder.

5. A photoflash device according to claim 3 or 4, wherein the cam slot has a terminal end which, after all of the lamps in the package have been fired, is engaged by the pin to terminate movement of the socket means between two of said predetermined positions.

6. A photoflash device according to claim 1, constructed and adapted to operate substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

7. A photographic camera having incorporated therein a photoflash device according to any one of the preceding claims.



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