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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Photographic Camera

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 Hubert Beard Sapp, Jr., Edmund Frank Deffenbaugh and Roy Elmer Merkel) 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 camera with a built-in photoflash system for accepting multilamp photoflash packages.

There has been developed a disposable multilamp photo-flash unit or package having a plurality of photo-flash lamps. The present invention is concerned with means in a photographic still camera having a socket for accepting such a multilamp package and a mechanism for automatically indexing the package to successively place unfired lamps in the camera flash circuit with successive operations of the camera. As such, a means according to the present invention is particularly suited to a motor driven camera and includes socket means to detachably receive a multilamp package with one of the lamps in the flash circuit, and means operatively connected to the shutter mechanism for automatically indexing the package by rotation to place an unfired freshlamp in the flash circuit after the prior flash exposure has been taken.

In accordance with the present invention there is provided a photographic camera comprising means for setting a shutter operating mechanism after each exposure, a rotatable socket for receiving a unitary package containing a plurality of flashlamps with a selected lamp in a photoflash circuit

to flash the lamp in timed relation with the shutter operating mechanism and drive means interconnected with the shutter operating mechanism to rotate the socket and received package to place the other lamps successively in the photoflash circuit during the resetting of the shutter operating mechanism.

In the accompanying drawings:—

Fig. 1 is a perspective view of a photographic still camera constructed in accordance with one form of the present invention;

Fig. 2 is an exploded view of the camera shown in Fig. 1;

Fig. 3 is an elevation of the camera with a section through the receiving socket arrangement taken on the line 3-3 of Fig. 1;

Fig. 4 is a section taken on the line 4-4 of Fig. 6;

Fig. 5 is a section taken on the line 5-5 of Fig. 8 and showing one stage of operation; and

Figs. 6, 7 and 8 are top view elevations of the camera with the housing removed showing various stages of camera operation.

As illustrated, a photographic roll film still camera 20 comprises a light tight camera body 21 having a picture-taking or lens axis 22 on which are located the usual focusing lens and film plane for holding a frame of a roll of photosensitive film (not shown). The shutter mechanism and diaphragm, co-operating with the present invention and to be described in more detail, are also positioned to be in operative relationship with the axis 22 to expose a frame of film located at the film plane.

Accessibly located on the top wall of the camera body 21 is a socket 23 for receiving a disposable multilamp photoflash unit or package 24 which includes four photoflash

[Price 4s. 6d.]



about

lamps 25 (AG-type) ordinally mounted in a vertical position above a vertical axis of rotation on a substantially square base 26, with the lamp lead-in wires extending below the base 26 and secured to a contact ring 17. Individual light reflectors are positioned behind each lamp 25 and an overall light transmitting protective cover 27 is provided. The base 26 defines four lamp sides and includes a depending centre post 28 of tubular shape with four retaining lugs 29, each extending radially outwardly toward a respective lamp side and having upper and lower ramped surfaces. The socket 23 defines an opening, corresponding to the cross-sectional shape of the post 28 and lugs 29 as shown, for receiving the package 24 in any one of four predetermined positions in which one of the lamps 25 faces forwardly; i.e., in the direction of the picture-taking axis 22, from the camera 20 as shown.

Film Wind and Shutter Mechanisms

In order to wind the roll film along the film plane for positioning successive frames of film on the film plane, there is provided an accessible film winding spring control knob 30. The control knob 30 energizes a spring driven motor drive to wind film and set the camera shutter operating mechanism, which is released by an accessible body release member 31 to expose the positioned film frame by admitting light along the axis 22 for a predetermined period of time.

A film winding mechanism suitable for use with the camera of the present invention is described and claimed in our co-pending application No. 5458/64 (Serial No. 992,223). Referring to Figs. 6-8, the mechanism is schematically shown to include a film take-up spring drive motor 34 rotatable through the gearing arrangement described in said co-pending application to selectively wind film on to a take-up reel after each exposure. The spring motor 34 also operates through coaxial gears 33-35 which act to set a shutter mechanism as the film is being wound.

The shutter mechanism comprises a shutter driver 36 which is movable about a pivot pin 32. A toothed rack section 38 on the driver 36 is engaged by a gear wheel 35 whenever the winding motor 34 is operated to move the driver 36 to the position shown in Fig. 6 against the bias of a strong operating spring assembly 50-73, which serves an additional purpose to be described in more detail. The shutter itself comprises a pivotable impact shutter blade 40 having an ear 41 in the path of movement of a finger 42 on the driver 36. A lighter spring 43 normally holds the blade 40 in a position covering the exposure aperture, and a latch 45 on the body release 31 is normally in the path of movement of finger 42 to prevent shutter operation until

the body release 31 is depressed. Upon release of the shutter driver 36 by depressing the body release 31 against a retaining spring (not shown), to move latch 45 out of the path of movement of finger 42, the action of spring assembly 50-73 causes the driver 36 to move rapidly to the right in a direction controlled by an island 37 (Fig. 6) to the position shown in dotted lines in Fig. 7. This motion causes finger 42 to strike ear 41 and move the shutter blade 40 off the exposure aperture against the bias of spring 43 for a predetermined period of time, the shutter blade 40 returning to cover the aperture by operation of the spring 43.

To return the driver 36 to its initial position by the motor drive after each exposure as thus described, the spring assembly 50-73 causes the driver 36 to move around island 37 to the position shown in solid lines in Fig. 7, thereby enabling rack 38 to engage gear 35, which is being driven by the spring motor, to return driver 36 through the positions shown in Fig. 8 to the cocked position shown in Fig. 6.

Lamp Socket Assembly

Referring now to Figs. 2 to 5, the unit receiving socket comprises a socket receiver 51 defining an upper access opening 52 for receiving the package base 26. In Fig. 2, the upper half of the socket receiver 51 is shown broken away from the lower half thereof. The intermediate portion of the receiver 51 defines recessed ribs 55 about which is positioned an annular helical spring 54. A centre stabilizing spindle 56 within the ribbing space is positioned to be insertable into the hollow centre post 28 of a multilamp package. When the post 28 of a package is inserted into the socket opening 52, the retaining spring 54 engages the four retaining lugs 29 on the upper ramped surfaces releasably to retain the package in the socket. During the insertion, the spring 54 is expanded outwardly by the lower ramped surfaces which extend outside ribs 55, until the package is fully seated, and the spring 54 then returns to engage the upper ramped surfaces.

An annular thrust bearing or washer 57 of low friction material is positioned between the lower portion 53 of receiver 51 and the camera body 21 to permit ready rotation of receiver 51 relative to the camera body. The upper portion of socket receiver 51 and camera body 21 define an annular groove 49 which receives the contact ring 17 of the inserted package 24.

A vertically slideable control pin 60, mounted axially below the socket base 53, includes a wing top 61 which extends into the base 53 and is exposed through slots in the centre stabilizing spindle 56. The upper surface of the wing 61 is engageable by the inserted centre post 28. The socket

receiver 51 defines an upper bearing surface for the control pin 60, and a bracket 162, which includes a bore hole 163 for receiving the lower portion of pin 60, defines a lower bearing surface. Both bearing surfaces and all slots in intermediate parts permit vertical sliding movement of pin 60, as well as rotation of pin 60 with the receiver 51.

Engageable with the lower end of the pin 60 is a plate spring 64 which urges the pin 60 upwardly for engagement with the centre post 28. However, spring 64 is weaker than retaining spring 54 so that the spring 64 does not automatically release an inserted unit from the retaining spring 54.

In order to eject an inserted package from the receiving socket, there is provided an accessible ejector button 77 (see particularly Fig. 2) having a ramp surface 78 co-operating with a collar 79 on the pin 60. The button 77 slides along bracket 162 by a lug 80 in a slot 81 in the bracket 162, and a spring 82 acts on the inner edge of lug 80 to urge the button 77 outwardly. Pressing the button 77 manually against the bias of the spring 82 causes the pin 60 to be moved upwardly by engagement of the ramp 78 with the collar 79, thereby causing the wing top 61 to push the inserted package out of the socket receiver 51.

According to this embodiment, the shutter mechanism described above may also be adjusted for either flash operation or daylight operation, depending upon the presence of a package in the receiving socket. As shown here, there is provided a resilient bell crank lever 85 pivoted in the bracket 162 and having one arm 86 biased toward and engageable with a step portion 87 on the control pin 60. The other arm of the lever 85 defines an inertia stop 88 which may be selectively movable into the path of movement of ear 41 of shutter blade 40 to arrest movement of the shutter blade after actuation and thereby shorten the opening time of the shutter.

The arm 86 engages the step portion 87 when no package is inserted and the control pin 60 is in its uppermost position, thereby limiting shutter speed to a speed suitable for daylight operation, say 1/80 sec. When a package is inserted into the socket and the control pin 60 is caused to move down, the step portion moves out of the path of arm 86 and the bell crank lever 85 is moved by its bias to the right (Fig. 3) to move the stop 88 out of the shutter blade path, thereby enabling the shutter blade to move its full stroke and to operate at a slower speed suitable for flash operation, say 1/40 sec.

Flash Operation

In order to provide for flash pictures, a lamp firing circuit is built into the camera

body. The circuit comprises a source of electric potential, shown as batteries 90 (Fig. 2), one terminal of which is connected to camera ground and the other terminal of which is connected to a resilient contact arm 91 forming part of a flash synchronizing switch. The contact arm 91 is operatively engageable with a fixed contact 93, which in turn is electrically connected to an exposed lamp terminal 94. Lamp terminal 94 physically engages one lead-in wire of the forward-facing lamp 25 of an inserted package 24, whereas the other lead-in wire is engaged by a second lamp terminal 95 connected to camera ground to complete the circuit. The terminals 94, 95 are positioned in the annular groove 49.

Flash is synchronised with camera exposure by a pivoted control cam 96 having a control end 97 normally held in the path of movement of the finger 42 by the bias of a spring 98. When the body release 31 is depressed, the movement of the shutter driver 36 causes the cam to rotate in a clockwise direction (Fig. 2) until contact arm 91 engages contact 93 to complete the lamp firing circuit.

Socket and Lamp Package Indexing Mechanism

The package-receiving socket assembly 23 (and inserted multilamp package 24) is automatically indexed or repositioned by the spring motor drive through driver 36 to present a fresh lamp in the electrical firing circuit during film wind and resetting of the camera. In the embodiment shown, the spiral spring drive 73 is provided to achieve this result. The drive spring 73, which is biased in a wound position on a rotatable drum 72, is unwound against the bias as film is wound and the shutter cocked or set. During exposure, the drive spring 73 acts to operate driver 36 and, during film wind, the drive spring 73 is used to automatically rotate the socket 23 ninety degrees to place a subsequent fresh lamp 25 in the lamp circuit for the next exposure.

As a part of the indexing mechanism, a rotatable socket driving gear wheel 58 is located below the receiver 51. Gear wheel 58 includes an upper annular four wave cam surface 63 which is engageable by four equi-spaced rollers 59 mounted in supports 62 fixed to the bottom surface of the receiver 51.

Referring to Fig. 2, an idler gear wheel 66 mounted on a bearing pin 65 on the camera body engages gear wheel 58, and idler gear wheel 66 is in turn engaged by a rotational drive gear wheel 67 mounted on a bearing pin 71.

Mounted coaxially of the gear wheel 67 is a ratchet element 68 defining, with gear wheel 67, ratchet teeth 69 which cause gear 67 to be rotated in one direction (counter-

clockwise as shown in Fig. 6) with element 68 and remain stationary whenever element 68 is rotating in the opposing direction. Ratchet element 68 is keyed to a drum 72 for rotation therewith, and an intermediate spring 76 urges element 68 into operative engagement with the gear wheel 67. A screw 74 is provided to retain these parts.

The surface of drum 72 is provided with a slot 72a which anchors the inner end 73a of spring 73 to the drum, and the outer end 75 of spring 73 is operatively connected to the driver 36 through the wire 50.

Thus, movement of the driver 36 to the left by operation of gear wheel 35 (Figs. 7-8) causes the spring 73 to unwind and drum 72 to be rotated in a counterclockwise direction with simultaneous rotation of the gear wheel 58. Movement of the driver 36 to the right (Figs. 6-7), by permitting spring 73 to rewind, causes drum 72 to rotate in a clockwise direction but without rotation of the gear 58.

To ensure proper positioning of the socket assembly 23 during indexing, there is provided a pair of positioning pins 101 (Fig. 2), the upper ends of which engage a four wave cam surface on the lower side of gear 58, the lower cam surface corresponding with cam surface 63 but having a greater amplitude. The lower ends of pins 101 fit within openings 103 in the bracket 162 and are urged upwardly by relatively strong spiral springs 102. In this manner, whenever the driver 36 is moved to the position shown in solid in Fig. 8, the gear 58 is rotated at least beyond the bottom peak of the lower cam surface (Fig. 5), and the pins 101, being urged upwardly, by strong springs 102, cause the gear 58 to continue rotating until a lower cam valley is reached with a corresponding lamp position facing forwardly.

Referring to Figs. 3-5, space is provided below gear wheel 58 so that an inserted package 24 may be grasped manually and rotated by hand through any one of the selected positions by movement of rollers 59 relative to the cam surface 63. In this case, gear wheel 58 will oscillate vertically during manual rotation, and pins 101 will ensure proper positioning. Similarly, camera operation is not prevented, even though the inserted package 24 is held stationary.

Camera Operation

In order to operate the photographic camera according to the preferred embodiment with photoflash from a multilamp package, the base 26 of a multilamp flash unit 24 is placed in the socket assembly 23 with an unfired photoflash lamp facing forwardly in the direction of the picture-taking axis 22 and the lead-in wires of the lamp engaging the exposed flash circuit terminals 94, 95. This position is indicated by the

single dot facing forwardly on the receiver 51, as shown in Fig. 6. As the unit base 26 is inserted, the control pin 60 is moved downwardly to automatically adjust the shutter speed for flash operation in the manner described.

Because of the motor drive, the camera is at this time otherwise ready for operation, motor 34 having wound the film and cocked the driver to the position shown in Fig. 6. The camera is now ready for operation with augmenting flash.

This is accomplished by aiming the camera in the desired direction and depressing the body release member 31 downwardly to a fully depressed position. This motion initially releases the finger 42 of the cocked driver 36, which rapidly strikes the shutter ear 41 by spring 73 to cause the shutter blade 40 to uncap the diaphragm aperture according to the predetermined time. Simultaneously, finger 42 also strikes the circuit switch cam ear 97 to complete the flash circuit and fire the lamp 25 in the circuit in timed relationship with the uncapping of the exposure aperture to take the "flash picture". This is shown by the dotted lines in Fig. 7. Immediately thereafter, spring 73 causes driver to be moved around the island 37 to the position shown in solid in Fig. 7, thereby engaging gear wheel 35. During this entire motion, drum 72 is rotating in a clockwise direction but gear wheel 58 (and socket assembly 23) remain stationary.

After the "flash picture" has been taken and the body release member 31 is allowed to return to its original position by its retaining spring, spring motor 34 acts to move driver 36 back along island 37 to the left to the position shown in full lines in Fig. 8. During this motion drum 72 and gear wheel 58 are being rotated in a counterclockwise direction to bring the second position (shown by two dots) into the flash position, while pins 101 ensure a complete quarter turn rotation of gear 58. Since rollers 59 are in the valleys of cam surface 63, receiver 51 and package 24 are also rotated to place the second lamp in the flash circuit.

At this time, an unfired flash lamp 25 of the multilamp package is in the flash circuit and the camera is again ready for operation in the manner described. After all four lamps in the inserted package have been used, or whenever daylight operation of the camera is desired, the ejector button 77 is depressed to push the package 24 out of the socket assembly 23 and reset the shutter mechanism for daylight operation.

WHAT WE CLAIM IS:—

1. A photographic camera comprising means for setting a shutter operating mechanism after each exposure, a rotatable



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clockwise as shown in Fig. 6) with element 68 and remain stationary whenever element 68 is rotating in the opposing direction. Ratchet element 68 is keyed to a drum 72 for rotation therewith, and an intermediate spring 76 urges element 68 into operative engagement with the gear wheel 67. A screw 74 is provided to retain these parts.

The surface of drum 72 is provided with a slot 72a which anchors the inner end 73a of spring 73 to the drum, and the outer end 75 of spring 73 is operatively connected to the driver 36 through the wire 50.

Thus, movement of the driver 36 to the left by operation of gear wheel 35 (Figs. 7-8) causes the spring 73 to unwind and drum 72 to be rotated in a counterclockwise direction with simultaneous rotation of the gear wheel 58. Movement of the driver 36 to the right (Figs. 6-7), by permitting spring 73 to rewind, causes drum 72 to rotate in a clockwise direction but without rotation of the gear 58.

To ensure proper positioning of the socket assembly 23 during indexing, there is provided a pair of positioning pins 101 (Fig. 2), the upper ends of which engage a four wave cam surface on the lower side of gear 58, the lower cam surface corresponding with cam surface 63 but having a greater amplitude. The lower ends of pins 101 fit within openings 103 in the bracket 162 and are urged upwardly by relatively strong spiral springs 102. In this manner, whenever the driver 36 is moved to the position shown in solid in Fig. 8, the gear 58 is rotated at least beyond the bottom peak of the lower cam surface (Fig. 5), and the pins 101, being urged upwardly, by strong springs 102, cause the gear 58 to continue rotating until a lower cam valley is reached with a corresponding lamp position facing forwardly.

Referring to Figs. 3-5, space is provided below gear wheel 58 so that an inserted package 24 may be grasped manually and rotated by hand through any one of the selected positions by movement of rollers 59 relative to the cam surface 63. In this case, gear wheel 58 will oscillate vertically during manual rotation, and pins 101 will ensure proper positioning. Similarly, camera operation is not prevented, even though the inserted package 24 is held stationary.

Camera Operation

In order to operate the photographic camera according to the preferred embodiment with photoflash from a multilamp package, the base 26 of a multilamp flash unit 24 is placed in the socket assembly 23 with an unfired photoflash lamp facing forwardly in the direction of the picture-taking axis 22 and the lead-in wires of the lamp engaging the exposed flash circuit terminals 94, 95. This position is indicated by the

single dot facing forwardly on the receiver 51, as shown in Fig. 6. As the unit base 26 is inserted, the control pin 60 is moved downwardly to automatically adjust the shutter speed for flash operation in the manner described.

Because of the motor drive, the camera is at this time otherwise ready for operation, motor 34 having wound the film and cocked the driver to the position shown in Fig. 6. The camera is now ready for operation with augmenting flash.

This is accomplished by aiming the camera in the desired direction and depressing the body release member 31 downwardly to a fully depressed position. This motion initially releases the finger 42 of the cocked driver 36, which rapidly strikes the shutter ear 41 by spring 73 to cause the shutter blade 40 to uncap the diaphragm aperture according to the predetermined time. Simultaneously, finger 42 also strikes the circuit switch cam ear 97 to complete the flash circuit and fire the lamp 25 in the circuit in timed relationship with the uncapping of the exposure aperture to take the "flash picture". This is shown by the dotted lines in Fig. 7. Immediately thereafter, spring 73 causes driver to be moved around the island 37 to the position shown in solid in Fig. 7, thereby engaging gear wheel 35. During this entire motion, drum 72 is rotating in a clockwise direction but gear wheel 58 (and socket assembly 23) remain stationary.

After the "flash picture" has been taken and the body release member 31 is allowed to return to its original position by its retaining spring, spring motor 34 acts to move driver 36 back along island 37 to the left to the position shown in full lines in Fig. 8. During this motion drum 72 and gear wheel 58 are being rotated in a counterclockwise direction to bring the second position (shown by two dots) into the flash position, while pins 101 ensure a complete quarter turn rotation of gear 58. Since rollers 59 are in the valleys of cam surface 63, receiver 51 and package 24 are also rotated to place the second lamp in the flash circuit.

At this time, an unfired flash lamp 25 of the multilamp package is in the flash circuit and the camera is again ready for operation in the manner described. After all four lamps in the inserted package have been used, or whenever daylight operation of the camera is desired, the ejector button 77 is depressed to push the package 24 out of the socket assembly 23 and reset the shutter mechanism for daylight operation.

WHAT WE CLAIM IS:—

1. A photographic camera comprising means for setting a shutter operating mechanism after each exposure, a rotatable

socket for receiving a unitary package containing a plurality of flashlamps with a selected lamp in a photoflash circuit to flash the lamp in timed relation with the shutter operating mechanism and drive means interconnected with the shutter operating mechanism to rotate the socket and received package to place the other lamps successively in the photoflash circuit during the resetting of the shutter operating mechanism.

2. A photographic camera according to claim 1, wherein the shutter operating mechanism is reset by means of a drive motor.

3. A photographic camera according to claim 1, or 2, wherein the drive means comprises a rotatable drum and a spiral spring mounted on the drum with one end of the spring interconnected to the shutter operating mechanism, unwinding of the spring acting to rotate the socket and winding of the spring actuating the shutter operating mechanism.

4. A photographic camera according to claim 3, wherein the drive means includes a gear wheel rotatable in a predetermined direction and ratchet means which is engaged by the drum to rotate the gear wheel in said direction for rotating the socket.

5. A photographic camera according to claim 4, wherein the gear wheel has a wave

cam surface and pin means engaging the cam surface position the socket in a selected position corresponding to the placing of lamp in the circuit.

6. A photographic camera according to claim 5, including roller means operative to overcome the pin means and permit socket rotation by hand.

7. A photographic camera according to claim 6, wherein the interconnecting means comprises an arm operatively connected at one end to the shutter drive and at the other end to the spring means.

8. A photographic camera according to any one of the preceding claims 2 to 7, wherein the drive motor also actuates a film winding mechanism.

9. A photographic camera according to any one of the preceding claims, wherein the shutter operating mechanism includes a main shutter driver having a reset position, and the drive means is operatively connected to the main shutter driver.

10. A photographic camera according to claim 1, constructed and adapted to operate substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

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