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[45] Patented **June 15, 1971**
[73] Assignee **Eastman Kodak Company**
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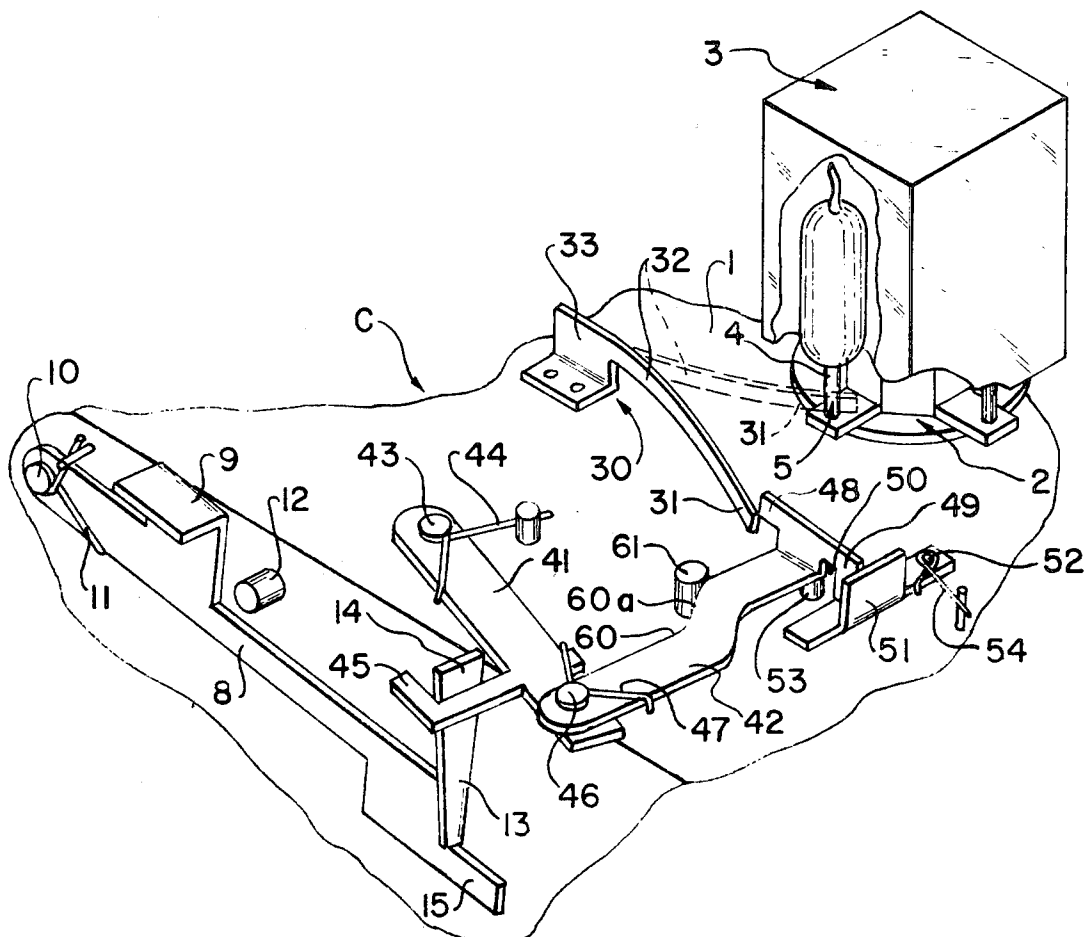
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[54] **APPARATUS FOR ACTUATING FIRING OF PERCUSSION-IGNITABLE FLASHLAMPS AND OPERATING MECHANISM THEREFOR**
3 Claims, 9 Drawing Figs.

[52] U.S. Cl..... 95/11.5
[51] Int. Cl..... G03b 15/04
[50] Field of Search..... 95/11.5;
240/1.3; 431/92, 93

[56] **References Cited**
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590,204 9/1897 Blackmore..... 95/11.5
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ABSTRACT: A spring member is mounted in a photographic apparatus in a manner such that, in its rest position, it supports a striker element at a location closely spaced to the firing locus for the primer of a percussion-ignitable flashlamp. An operating mechanism is responsive to a continuous movement of a shutter-release to energize and release the spring member creating sufficient inertia that the striker element moves into percussion impact with a flashlamp primer located at the firing locus. The striker element then returns quickly to the spaced location from the firing locus. In another embodiment restoring spring force and the inertia of the striker element propel the strike into a triggering zone to trigger release of a pre-loaded lamp firing element in a multilamp flash unit. The striker then returns to a position spaced from the trigger zone to allow indexing of the flash unit.



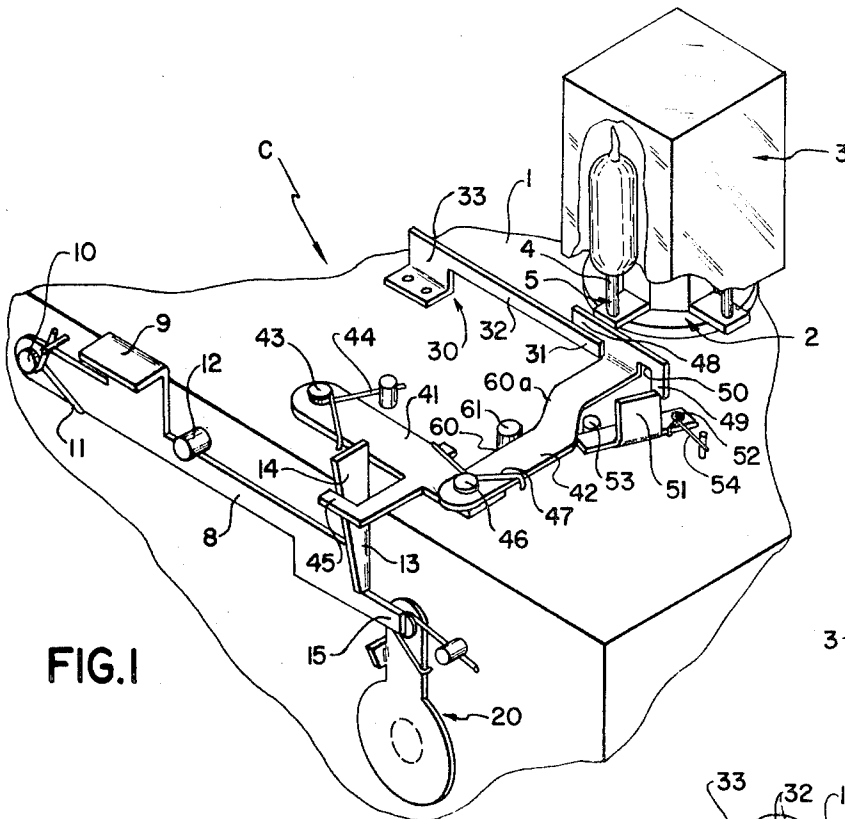


FIG. 1

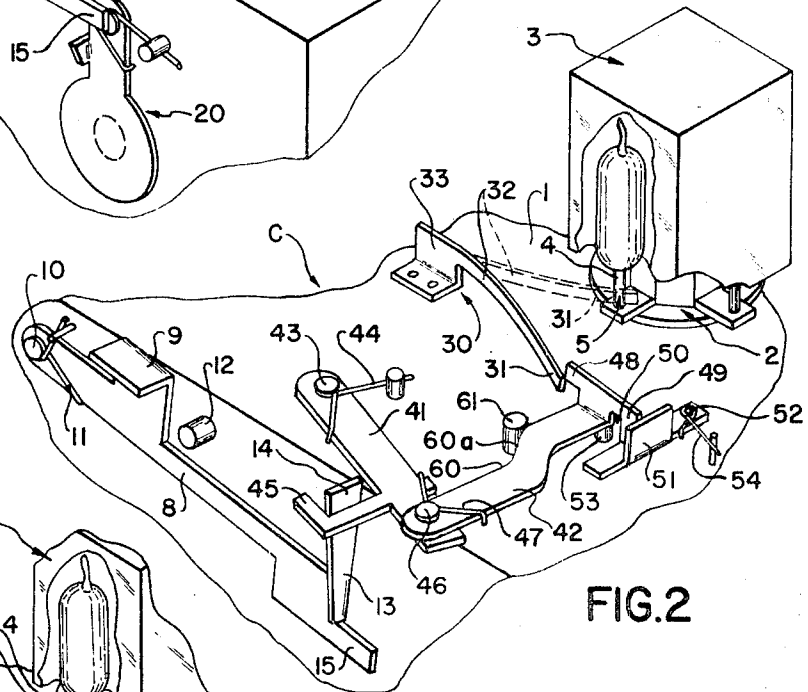


FIG. 2

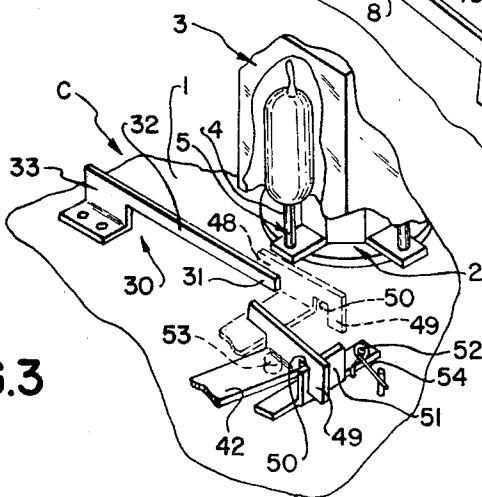


FIG. 3

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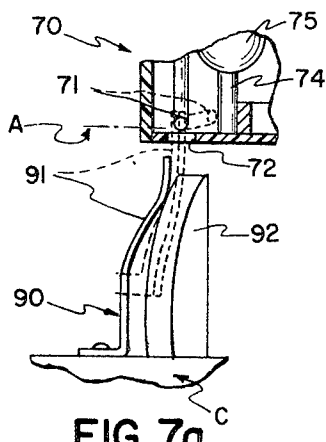


FIG. 7a

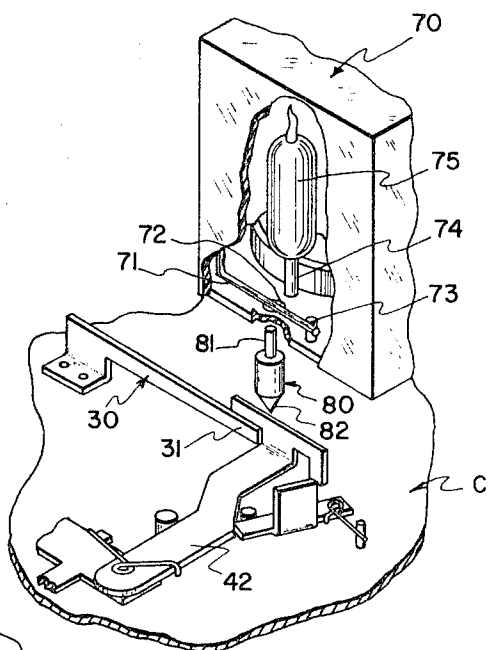


FIG. 4

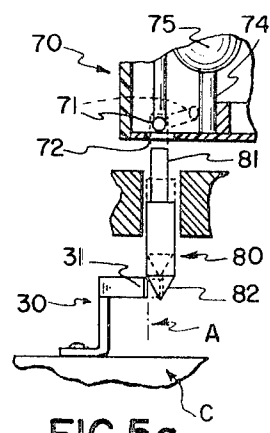


FIG. 5a

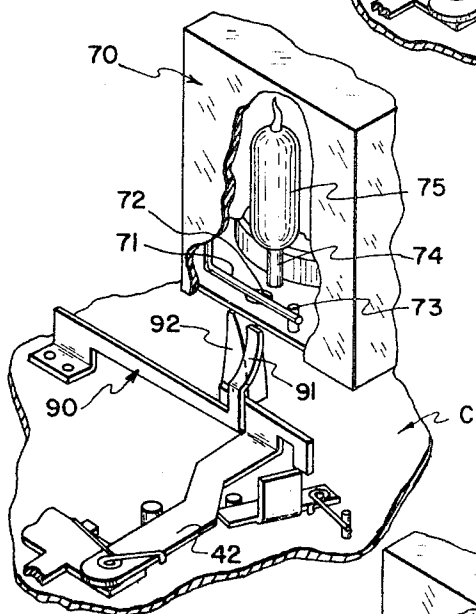


FIG. 6

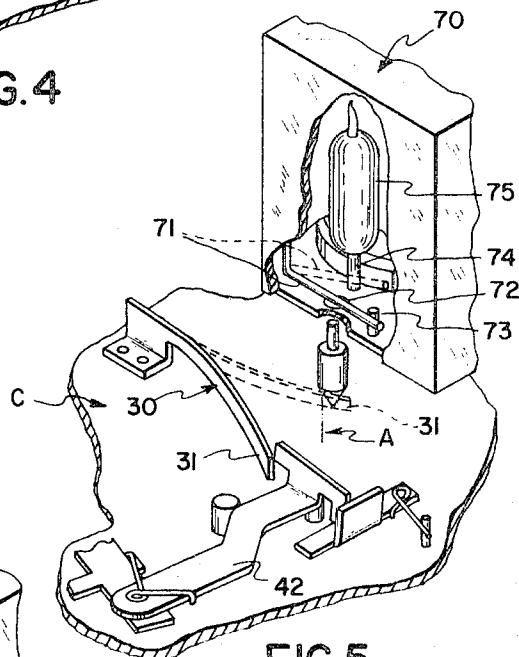


FIG. 5

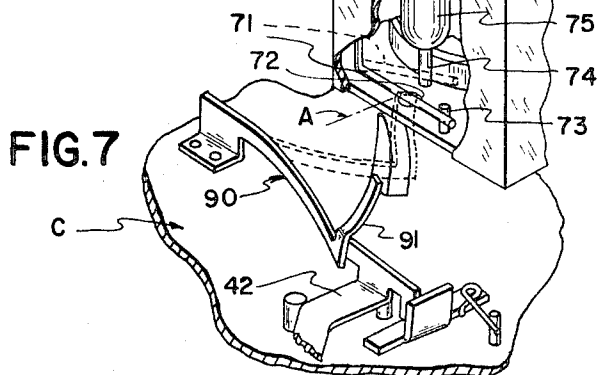


FIG. 7

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APPARATUS FOR ACTUATING FIRING OF PERCUSSION-IGNITABLE FLASHLAMPS AND OPERATING MECHANISM THEREFOR

CROSS-REFERENCE TO RELATED APPLICATIONS

Reference is made to copending U.S. application Ser. No. 765,930, entitled "Multilamp Flash Unit," filed Oct. 8, 1968, in the name of David E. Beach and U.S. application Ser. No. 813,524, entitled "Percussive Flash Unit with Energized Striker," filed Apr. 4, 1969 in the names of Joseph V. Poweska and Jeffrey R. Stoneham.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to photographic apparatus and more particularly to apparatus for use in firing percussion-ignitable photoflashlamps.

2. Description of the Prior Art

Before the development of electrically ignitable flashlamps, it was common practice to provide illumination for photographic purposes by igniting a small powder charge. Devices having means for striking a fulminate or percussion cap were utilized to ignite such flash-powder charges, one such device being disclosed in U.S. Pat. No. 942,941.

With the development of electrically ignitable flashlamps of the type having combustibles enclosed in a light-transmitting envelope, the use of such flash-powder charges decreased because of the safety and convenience of flashlamps. However, the electrically ignitable flashlamps used with most present photographic apparatus have the disadvantage of requiring an electrical source and circuit.

Recently a flashlamp has been developed which utilizes a percussion-ignitable primer charge to ignite combustibles enclosed in a light-transmitting envelope. A plurality of these lamps have been assembled in a multilamp package wherein each lamp has its own reflector and in which either a firing tube for each lamp extends through a common bottom wall of the unit or the primer elements are located within the multilamp package, with a separate firing element for each lamp also provided in a preloaded condition within the flash unit. Such percussion-firable multilamp photoflash units and suitable bases and sockets for supporting the units for ignition and indexing rotation in photographic apparatus are disclosed in copending U.S. application Ser. No. 765,930, entitled "Multilamp Flash Unit" and in copending U.S. application Ser. No. 813,524, entitled "Percussive Flash Unit with Energized Striker."

When considering the prior art, it is apparent that the old techniques for firing powder charges are not suitable for use with the compact and automatic present-day photographic apparatus because, among other reasons, such prior art devices did not provide for facile removal and insertion of lamps, indexing rotation of multiple lamp units or the energization and release of a percussion striker in synchronism with other cyclic functions of the modern photographic apparatus.

SUMMARY OF THE INVENTION

The present invention is therefore addressed to the problem of providing a device which can be advantageously incorporated in photographic apparatus for use in firing percussion-ignitable flashlamps of the types described above. One embodiment of the present invention provides a striker mechanism including a spring member, which is mounted in photographic apparatus so that, in the rest or deenergized condition, the striking element of the mechanism is spaced from a firing locus, thereby allowing facile insertion, removal and indexing of flash units of the type having primer tubes extending through the base of the unit. The striking element can be moved from a rest position to an energized position and thereafter released for percussion contact with a flashlamp primer in synchronism with each picture-taking cycle. Upon release of the striker element, restoring spring forces of the

spring member and inertia propel the striker element past the rest position to a firing locus for percussion with an inserted lamp. Thereafter, restoring spring forces of the striker mechanism again return the striker element to the rest position, allowing facile removal, insertion and indexing of inserted lamps.

In another embodiment of the present invention the striker element is used to apply the actuating force which releases a separate, preloaded lamp firing element in another type of flash unit. In this embodiment the released striker moves momentarily into an actuating zone camming an actuating plunger momentarily up into the flash unit to release the lamp firing element. The return of the striker to its deenergized position effects quick return of the plunger from within the flash unit thereby facilitating indexing of the flash unit.

The present invention also provides an operating mechanism for energizing and releasing a striker mechanism by movement transmitted from the shutter release of a photographic apparatus.

It is therefore an object of the present invention to provide an improved striker mechanism for firing percussion-ignitable flashlamps.

Another object of the present invention is to provide a striker mechanism for use in actuating firing elements of a flash unit of the type having percussion-ignitable flashlamps and preloaded firing elements.

It is a further object of the present invention to provide, for use in photographic apparatus, such a striker mechanism that does not interfere with insertion, removal or indexing of the flashlamps.

It is another object of the present invention to provide an improved striker actuating mechanism for use in the firing of percussion-ignitable flashlamps.

It is yet another object of the present invention to provide a simple, compact and readily fabricated striker mechanism for use in automatically firing percussion-ignitable flashlamps in synchronism with the cyclic operation of a photographic camera.

Still another object of the present invention is to provide means in a camera which energizes and releases a striking mechanism by means of the movement transmitted from a single cyclic movement in the photographic apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects and advantages of the present invention will become apparent to one skilled in the art from the following detailed description read in conjunction with the attached drawings wherein like reference numerals indicate like elements and wherein:

FIG. 1 is a perspective view of a portion of a photographic apparatus embodying the present invention and in which the percussion striker mechanism and striker actuating mechanism are in rest positions;

FIG. 2 is a perspective view of the apparatus shown in FIG. 1, but with the percussion striker mechanism and striker actuating mechanism moved to energized positions;

FIG. 3 is a perspective view of a portion of the apparatus shown in FIG. 1, but showing the location of the striker actuating mechanism during movement from the energizing position shown in FIG. 2 back to the initial position shown in FIG. 1;

FIG. 4 is a perspective view of another embodiment of the present invention with a striking mechanism similar to FIGS. 1-2 and in the rest position;

FIG. 5 is a perspective view of the apparatus shown in FIG. 4, but with the striker in the energized position;

FIG. 5a is a side view, partially in section, of the apparatus shown in FIGS. 4 and 5 and showing the striker movement during its actuation of a flash unit;

FIG. 6 is a perspective view of another embodiment of the present invention with a striking mechanism similar to that shown in FIGS. 1 and 2 and in the rest position;

FIG. 7 is a perspective view of the apparatus shown in FIG. 6 but with the striker in the energized position; and

FIG. 7a is a side view, partially in section, of the apparatus shown in FIGS. 6 and 7 and showing the striker movement of that embodiment during its actuation of a flash unit;

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 one embodiment of the present invention is shown as it can be embodied in photographic apparatus, in the instance a camera C. Because photographic cameras of the type hereinafter described are generally known, the present description will be directed in particular to camera elements forming a part of or cooperating more directly with the present invention, elements not specifically shown or described herein being understood to be selectable from those known in the art.

Referring to FIG. 1 it can be seen that on a suitable frame 1 within the camera, a socket 2 is mounted. The socket 2 is adapted for receiving a percussion-ignitable multilamp photoflash unit 3 and indexing the unit to position the primers 4 of the unit lamps at a firing locus 5. Various camera mechanisms are known for providing indexing rotation of the socket 2 in synchronism with other cyclic operations of the camera C.

Also mounted on the camera frame 1 is a shutter release lever 8 that has a pressure tab 9 which is usually located on the exterior of the camera housing. The shutter release lever 8 is pivotally mounted on pin 10 with its free end biased upwardly as viewed in FIG. 1 by spring 11. Stop 12 limits the upward movement of the lever 8. Spaced from the pressure tab 9 on lever 8 are formed an upwardly extending ramped member 13, which has an inclined surface 14, and a shutter actuator arm 15.

In FIG. 1, a shutter 20 is shown as being actuatable directly by downward movement of the lever arm 15; however, it will be apparent to one skilled in the art that the shutter 20 can be operated by a spring actuator which is cocked by the film advancing movements in the camera and merely triggered by movement of arm 15.

Referring now to FIGS. 1 and 2, it can be seen that a striker mechanism designated generally 30 is mounted on frame 1 in the vicinity of firing locus 5. In the illustrated embodiment, the striker mechanism comprises an integral spring member with a striking portion 31 joined by a flexure arm 32 to a columnar upright portion 33 that is rigidly secured to frame 1. The striker mechanism 30 is shown in its rest or deenergized position in FIG. 1 and in this position the spring member is not distorted or stressed. It can be seen that the striking portion 31, as well as the other portions of the striking mechanism 30, is located at a position spaced from the firing locus 5. In this position, the striking mechanism does not interfere with the removal or insertion of flash unit 3 or with the indexing rotation of the flash unit 3 by socket 2.

It can be seen in FIG. 2 however that when the striker mechanism has been withdrawn from the rest position and released, its mounted location is such with respect to firing locus 5, that the restoring forces of the spring member whip portion 31 past the rest position and into percussion impact with a primer 4 located at firing locus 5. This percussion impact ignites the primer 4 and its lamp. The spring forces of the striker mechanism 30 quickly return the striking portion 31 to its rest position after percussion thereby allowing facile removal or indexing of the flash unit 3.

It will of course be appreciated that the striker mechanism 30 need not be a unitary spring member as shown in the drawings. The striker mechanism could, for example, be comprised of a substantially rigid striking element, pivotally supported on the frame and engaged by a spring member in a manner such that in the rest position of the spring-striker element system the entire striking mechanism is spaced from the firing locus like striker mechanism 30. It will also be appreciated that flexure, torsion and spring members of all types, can be used in the practice of the present invention and are considered to be within the scope thereof.

Referring now to FIGS. 1-3, the novel operating mechanism for withdrawing the striker to its energized condition and then releasing the striker will be described.

The disclosed embodiment of the operating mechanism includes a two-piece linkage having a follower arm 41 and drive arm 42. The follower arm 41 is pivotally mounted at one end to frame 1 by pin 43 and urged counterclockwise, as viewed from the top in FIG. 1, by spring 44. The arm 41 includes a follower extension 45 which is adapted to contact and follow the inclined surface 14 of ramped extension 13 of the shutter release lever 8.

The drive arm 42 is pivotally mounted on pin 46 located at the movable end of follower arm 41 and is also urged in a counterclockwise direction by spring 47. At the opposite end of drive arm 42 from pin 46 are formed a drive extension 48 and a return-guide extension 49. By referring to FIGS. 1-3, it can be seen that a guide notch 50 is formed in the bottom of return-guide extension 49. It can also be seen in FIGS. 1 and 2 that drive arm 42 includes a cam surface 60 along one edge adapted to follow a post 61 formed on frame 1. The arms 41 and 42 are supported for sliding movement by suitable bearing surfaces in the camera which are not shown.

Again referring to FIGS. 1-3, it can be seen that a movable guide 51 is pivotally mounted on a post 52 in a position to cooperate with drive arm 41. The guide 51 is urged in a clockwise direction towards stop 53 by spring 54.

The function and manner of cooperation of the structural elements described above will become apparent from the following description of the operation of the present invention with reference to FIGS. 1-3.

In FIG. 1, the camera 10 is in a stage of cyclic operation that is ready for picture-taking with an unused flashlamp of unit 3 indexed so that its primer 4 is at the firing locus. Upon depression of pressure tab 9 of shutter release 8, the extension 15 moves downward to actuate shutter 20. Concurrently with the movement of extension 15 towards shutter 20, the downward movement of ramped member 13 causes follower extension 45, engaging the inclined surface 14 of member 13, to pivot in a clockwise direction around pin 43 against the pressure of spring 44.

As follower arm 41 pivots on pin 43 drive arm 42 is moved rearward by pin 46, with the edge 60 following against post 61 because of the force applied by spring 47. As the drive arm 42 moves rearward, the drive extension contacts the movable end of striker 30 and moves the striker away from the firing locus towards its energized position. Also during rearward movement of the drive arm, the follower extension 49 moves guide 51 out of the rearward path of travel against the force of spring 54. When drive arm 42 has been withdrawn to the point where post 61 contacts the portion 60a edge 60, the arm 42 pivots clockwise on pin 46 against spring 47 and releases striker 30.

The striker mechanism then returns towards its rest or unstressed position because of the restoring forces in the spring material; and the inertia of the striker mechanism's return carries portion 31 past the rest position and into percussion contact with primer 4, as indicated by the dotted lines in FIG. 2. It is to be noted that the space between the rest position of striker portion 31 and the firing locus is desirably selected so that the velocity of the striker portion has not decreased considerably from that attained as it passes the rest position. After percussion with the primer 4, the spring forces quickly return striker mechanism 30 to its rest position.

It is pointed out that by appropriate construction of cam surfaces 14 and 60, the release of the striker, and hence firing of the lamp, can be synchronized with the actuation of shutter 20.

At a point of rearward travel after drive extension 48 has released striker 30, the return-guide extension 49 of arm 42 moves beyond guide 51; and the spring 54 then move guide 51 against stop 53 and into alignment with guide notch 50 formed in return-guide extension 49.

When actuating pressure is removed from tab 9, the shutter release is moved back towards post 12 by spring 11 and ramped extension 13 is moved upward allowing spring 44 to pivot the follower arm 41 in a counterclockwise direction. The follower arm 41 pivots, the drive arm 42 is moved forward towards the firing locus 5; however, during this return movement, the drive arm 42 follows guide 51 which has moved into alignment with notch 50 as shown in FIG. 3. When the spring 43 has moved drive arm 42 to the point where its return-guide extension 49 has passed off the front of guide 51, the drive extension 48 of arm 42 has moved forward of striker 30 and the spring 47 returns the drive extension 48 to a position between the striker 30 and the firing locus 5 in readiness for the next firing cycle.

It will of course be appreciated that the striker operating mechanism described above can cooperate similarly with other structure in photographic apparatus which have a cyclic movement like the shutter release lever 8. For example, a spring loaded shutter driver could be provided with camming structure, adapting it to cooperate with striker actuating mechanism in the manner shown and described. In such a modification, the striker would be energized and released during the movements of the shutter driver and returned to the position shown in FIG. 1 during cocking of the shutter driver.

Referring to FIG. 4 another application of the novel striker mechanism of the present invention can be seen, in this instance as it can be used to actuate percussion lamp firing release of a preloaded firing element in the type of percussion-ignitable flash unit described in U.S. application Ser. No. 813,524, entitled "Percussion-Ignitable Flash Unit Having Contact-Actuable, Pre-Energized Strikers and Photographic Apparatus Using Such Units" filed in the names of Joseph V. Poweska and Jeffrey R. Stoneham.

In such a flash unit 70, a plurality of preloaded spring firing elements 71 are located over actuating holes 72 and held in stressed condition by lugs 73. Upon upward movement of the elements 71 above lugs 73, the elements 71 spring into percussion contact with the primer elements 74 of the lamps 75.

In accordance with this embodiment of the present invention a plunger element 80 is mounted for sliding, generally vertical movement in the top portion of camera C. The plunger 80 comprises an upper narrowed portion 81 and a lower end formed with a ramped surface 82 shaped and located to cooperate with striking portion 31 of striker 30.

By referring to FIGS. 5 and 5a it can be seen that when drive arm 42 of the striker operating mechanism has withdrawn and released striker mechanism 30, the striker portion 31 moves into the actuating zone A and along ramped surface 82, forcing the portion 81 of the plunger 80 upward through the aligned hole 72 of flash unit 70. In this manner the portion 81 moves the aligned firing element 71 over lug 73 thereby releasing the element 71 to spring into percussion contact with primer 74 of an indexed lamp 75.

It will be apparent that as the striker 30 quickly returns to its deenergized position in the manner described above, the plunger 80 will return by gravity or by means of an appropriate spring member, not shown, to the position shown in FIG. 4. Therefore, quickly after flash actuation, the flash unit 70 is free for indexing rotation without interference from the actuating mechanism.

It will of course be appreciated that the striker mechanism

30 can be modified to impart a movement to the flash unit in a generally vertical rather than horizontal plane and that for this purpose a projection or extension on the striking portion 31 can be provided to deliver the actuating force to firing element 71 directly, without intermediate plunger 80.

Such an embodiment is shown in FIGS. 6 and 7 wherein a striker mechanism 90 is located beneath the opening 72 of flash unit 70 and includes a flexible, upwardly extending actuating extension 91. A ramped member 92 is provided to cooperate with extension 91 upon movement of the striker to the actuating zone A. Upon withdrawal and release of striker 90, the actuating extension 91 moves past rest position shown in FIG. 6 into contact with ramp 92 and is directed up through the opening 72 to the position shown in dotted lines in FIG. 7. The actuating zone A for striker 90 is in this instance within the flash unit at the location where extension 91 contacts and releases firing element 71. Again, quickly after triggering the element 71, the restoring spring forces of striker 90 return to the striker and extension 91 rest position shown in FIG. 6 so that indexing rotation of the flash unit 70 can be accomplished without interference with the actuating mechanism.

It will of course be appreciated that the entire striker also could be relocated to provide a directly upward striking movement, rather than a horizontal movement as shown.

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

I claim:

1. Apparatus for use in the firing of percussion-ignitable multilamp photoflash units of the type having a plurality of lamps each with a percussive primer and a preenergized firing element located in firing relation with respect to each flashlamp primer and openings into the unit for facilitating actuation of the firing elements, said apparatus comprising:

- a. means for detachably supporting a flash unit on said apparatus with a flashlamp located at a firing site; and
- b. a striker mechanism including a striker portion movable between an actuating zone whereat release of the firing element for a flashlamp at said firing site is effected and an energized position withdrawn from said actuating zone and a spring portion operatively associated with said striker portion and mounted with respect to said actuating zone so that in the deenergized condition of said spring portion said striker portion is spaced from said actuating zone.

2. The invention defined in claim 1 further wherein said striker portion includes means, movable into an opening in a supported flash unit, for releasing a firing element of the flash unit.

3. The invention defined in claim 1 wherein said apparatus further includes an actuator member mounted for movement between a position within the opening of a supported flash unit and a position withdrawn from that flash unit, said actuator member having means for cooperating with said striker mechanism to effect movement of said actuator member to the position within the opening of supported flash unit in response to movement of said striker portion into said actuating zone.