United States Patent

[11] **3,562,508**

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[54] **FLASH UNIT**
6 Claims, 2 Drawing Figs.

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[51] **Int. Cl.** **F21k 5/02**
[50] **Field of Search** 431/93, 95

[56] **References Cited**

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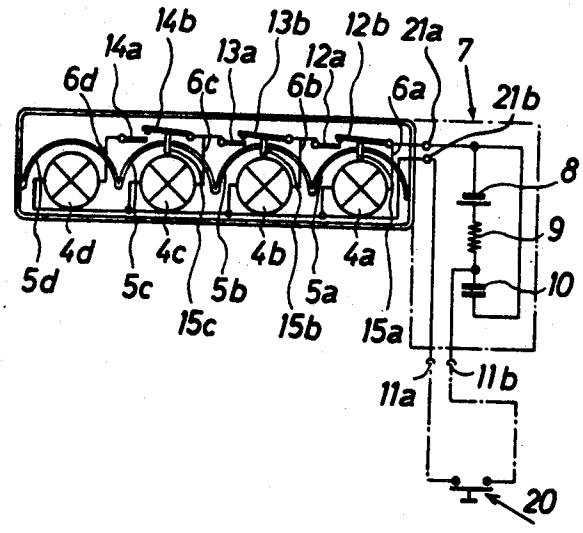
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ABSTRACT: Flash unit whose flash circuit comprises a series of parallel branches each having a flashbulb, and means for firing the flashbulb of the first branch. Each but the first branch further comprises a switch which is normally open but is closed on partial or complete melting of a switch opening member which is heated in response to firing of the flashbulb in the preceding branch of the flash circuit. This renders the flashbulb of the second branch ready for firing on renewed actuation of the firing means.



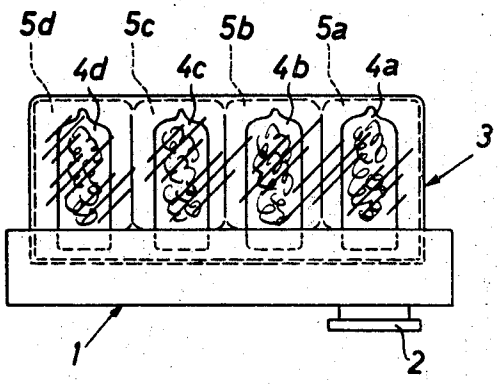


Fig.1

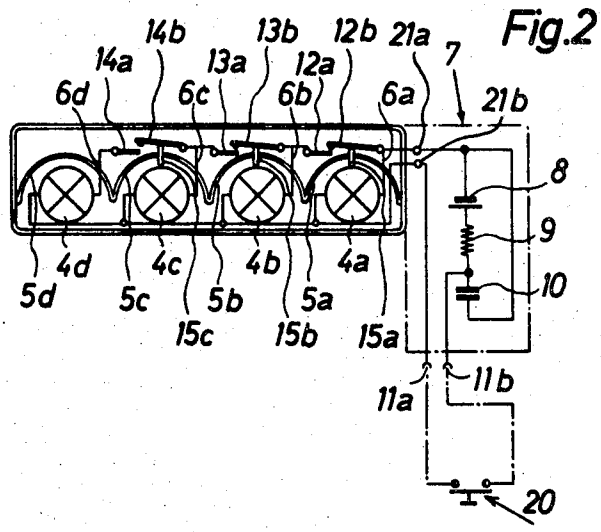


Fig.2

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FLASH UNIT

BACKGROUND OF THE INVENTION

The present invention relates to flash units in general, and more particularly to improvements in flash units of the type wherein an enclosure accommodates two or more expendable flashbulbs which can be fired successively. In certain conventional flash units of such character, the user must close a switch on firing of a flashbulb in order to connect the next-following flashbulb into the flash circuit. Other known types of flash units with two or more flashbulbs must be indexed in response to each firing of a flashbulb in order to place the next flashbulb into an optimum position with reference to the subject and to connect such next flashbulb into the flash circuit. Indexing mechanisms for flash units are rather expensive and prone to malfunction.

Accordingly, it is an important object of the present invention to provide a simple and inexpensive flash unit with two or more flashbulbs wherein the firing of a preceding flashbulb automatically results in connection of the next flashbulb into the flash circuit without necessitating the provision of indexing means and without requiring any manipulation of the flash unit for the express purpose of insuring that the next unexpended flashbulb is ready for firing in response to repeated completion of the flash circuit.

Another object of the invention is to provide a flash unit of the just outlined character wherein the flashbulbs can be placed close to each other and, once attached to their holder or support, need not change their position with reference to each other until the last flashbulb has been fired.

A further object of the invention is to provide a novel flash circuit for a flash unit of the above-outlined characteristics.

An additional object of the invention is to provide a flash unit which can be installed in or attached to the housing of a photographic camera and wherein spent flashbulbs can be replaced by a battery of fresh flashbulbs with little loss in time.

SUMMARY OF THE INVENTION

The invention resides in the provision of a flash unit whose flash circuit has a plurality of parallel branches including a first branch and a second branch each of which comprises a flashbulb. The second branch further comprises a switch and switch opening means consisting of fusible material which melts and thereby effects closing of the switch in response to heat developing on firing of the flashbulb in the first branch. The flash circuit further comprises customary means for firing the flashbulb in the first branch. On firing of such flashbulb, the flashbulb in the second branch is ready for firing because the switch closes automatically in response to complete or partial melting of the switch opening means.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved flash unit itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a front elevational view of a flash unit which embodies the present invention and comprises a row of four flashbulbs; and

FIG. 2 is a top plan view of the enclosure for the flashbulbs, further showing the details of the flash circuit.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a flash unit which comprises a holder or support 1 having a standard foot 2 which can be inserted into a shoe (not shown) provided on the housing of a photographic camera. The holder 1 accommodates a detachable enclosure 3 for a row of four flashbulbs 4*a*, 4*b*, 4*c*, 4*d* which are respectively located in front of arcuate reflectors 5*a*, 5*b*, 5*c*, 5*d*. The enclosure 3 preferably consists of transparent material and may be readily attached to or detached from the holder 1.

The flash circuit 7 of the flash unit is illustrated in FIG. 2. This circuit comprises four parallel branches 6*a*, 6*b*, 6*c*, 6*d* and these branches respectively comprise the flashbulbs 4*a*, 4*b*, 4*c*, 4*d*. Each of the branches 6*b*, 6*c*, 6*d* further comprises a normally open switch having a fixed first contact 12*a*, 13*a*, 14*a* and a resilient second contact 12*b*, 13*b*, 14*b* which tends to move into current-conducting engagement with the respective fixed contact. Pin-shaped reciprocable switch opening members 15*a*, 15*b*, 15*c* are provided to normally prevent movement of resilient contacts 12*b*—14*b* into engagement with the fixed contacts 12*a*—14*a*, and each of these switch opening members 15*a*—15*c* extends through an aperture provided therefor in the reflector 5*a*, 5*b*, 5*c* for the flashbulb 4*a*, 4*b*, 4*c* of the preceding branch 6*a*, 6*b*, 6*c*. The members 15*a*—15*c* respectively extend through apertures provided in the reflectors 5*a*, 5*b*, 5*c* and abut directly against the envelopes of the flashbulbs 4*a*, 4*b*, 4*c*. The means for firing the flashbulb 4*a* of the first branch 6*a* comprises a battery 8 or another suitable source of electrical energy connected in series with a charging resistor 9 and a synchronizing switch 20, whose contacts can be connected with the terminals 11*a*, 11*b* of the flash circuit 7. A capacitor 10 is connected in parallel with the battery 8 and resistor 9. The synchronizing switch 20 is installed in the camera and can be closed in automatic response to release of the shutter.

The resilient contacts 12*b*—14*b* are preferably constituted by small leaf springs of current-conducting material and each of the switch opening members 15*a*—15*c* consists of a fusible material which will melt (either in part or entirely) in response to heat developing on firing of the associated flashbulb 4*a*, 4*b*, 4*c*. The members 15*a*—15*c* are reciprocable in the apertures of the respective reflectors 5*a*—5*c* and are long enough to prevent closing of the respective switches until and unless they are caused to melt by direct exchange of heat with the associated flashbulbs. It will be noted that FIG. 2 illustrates an enclosure 3 which contains four fresh (unfired) flashbulbs 4*a*—4*d*. Each of the members 15*a*—15*c* may consist of a metallic or synthetic plastic material whose melting point is sufficiently low to insure closing of the respective switch in response to exchange of heat with a fired flashbulb.

If the user closes the synchronizing switch 20, the flashbulb 4*a* in the first branch 6*a* is fired and develops heat which melts the first switch opening member 15*a*. The latter permits the elastic contact 12*b* to engage the fixed contact 12*a* whereby the flashbulb 4*b* of the second branch 6*b* is ready for firing. Such firing will take place in response to renewed closing of the synchronizing switch 20. The same procedure is repeated in response to firing of flashbulbs 4*b* and 4*c*. When the flashbulb 4*d* has been fired, the enclosure 3 is detached from the holder 1 and is replaced by a fresh enclosure with one or more unexpended flashbulbs.

The terminals 21*a*, 21*b* of the enclosure 3 are automatically connected to complementary terminals in the holder 1 when the enclosure is fully inserted into the holder.

Of course, my invention is susceptible of many additional modifications without departing from the spirit of the present invention. For example the flash circuit 7 may be modified in such a way that each flashbulb which forms part of a second, third, etc. branch is ready for firing in response to firing of a single preceding flashbulb, i.e., it is not necessary that the circuit of the last flashbulb 4*d* shown in FIG. 2 be completed across all of the three switches. Also, the enclosure 3 may contain two, three, five or more flashbulbs which need not necessarily form a single row and which need not be of the same size and/or shape. Furthermore, the holder 1 may be made integral with the enclosure 3 so that it can be discarded in response to firing of the last flashbulb.

Moreover, the switch opening members 15*a*—15 *c* need not be placed into direct heat exchanging engagement with the

flashbulbs 4*a*—4*c*, as long as they are compelled to melt in response to heat developing on firing of such flashbulbs. However, the construction shown in FIG. 2 has been found to be very satisfactory because the members 15*a*—15*c* will melt without fail in immediate response to firing of the associated flashbulbs. Furthermore, such mounting of the members 15*a*—15*c* renders it possible to manufacture these members of a material which has a relatively high melting point.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of my contribution to the art.

I claim:

1. A flash unit, comprising a flash circuit having a series of parallel branches including a first branch and at least two additional branches, each of said branches comprising an electrically ignitable flashbulb and each of said additional branches comprising a biased-closed switch and expendable switch opening means consisting of fusible material which normally holds the respective switch open but which melts and thereby effects closing of the respective switch in response to heat developing on firing of the flashbulb in the preceding branch, means for firing the flashbulbs of successive branches, the flashbulb of each succeeding branch being ready for firing upon firing of the flashbulb in the preceding branch and resultant closing of the respective switch, and reflector means for each of said flashbulbs, each of said switch opening means comprising a pin extending through an aperture provided in the reflector means for the flash bulb in the preceding branch and bearing against such flashbulb prior to melting thereof.

2. A flash unit as defined in claim 1, wherein each of said switches comprises two contacts at least one of which tends to move into current-conducting engagement with the other contact, each of said pins preventing the movement of said one contact in the respective switch into engagement with the other contact of the respective switch prior to melting of such pin in response to firing of the flashbulb in the preceding branch.

3. A flash unit as defined in claim 1, wherein said means for firing comprises a source of electrical energy, a resistor and a synchronizing switch, all connected in series with the flashbulb of said first branch, and a capacitor connected in parallel with that part of said series circuit comprising said source of energy and said resistor.

4. A flash unit as defined in claim 1, further comprising a common enclosure for said flashbulbs and said switches.

5. A flash unit as defined in claim 4, further comprising a support for said enclosure, said support having a foot connectable with the shoe of a photographic apparatus.

6. A flash unit as defined in claim 1, wherein said flashbulbs are arranged in a row.