

July 29, 1969

H. G. GANSER ET AL
SERIES FLASH-LAMP UNIT

3,458,270

Filed June 2, 1967

2 Sheets-Sheet 1

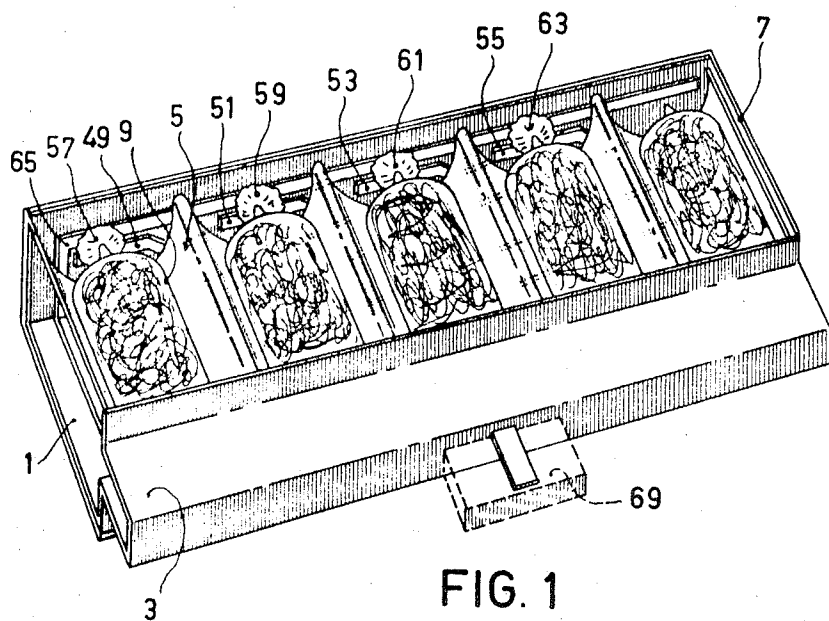


FIG. 1

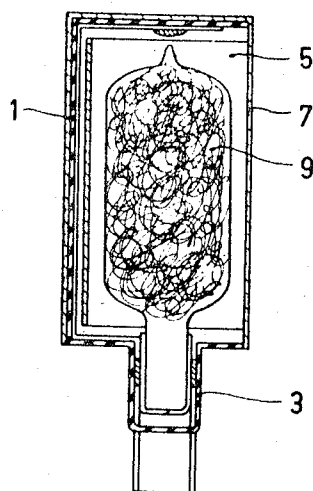


FIG. 2

INVENTORS
HANS G. GANSER
ERHARD KAUFER
HANS J. LYOTIN
BY

Frank R. Dufour
AGENT

July 29, 1969

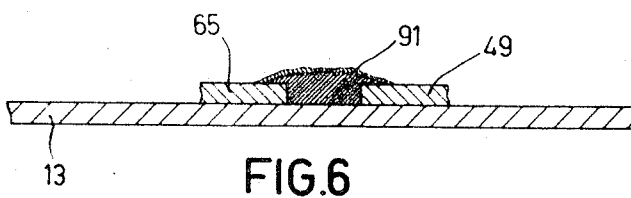
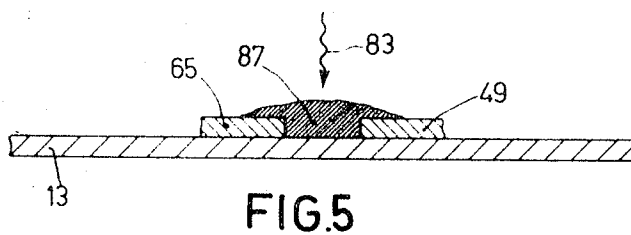
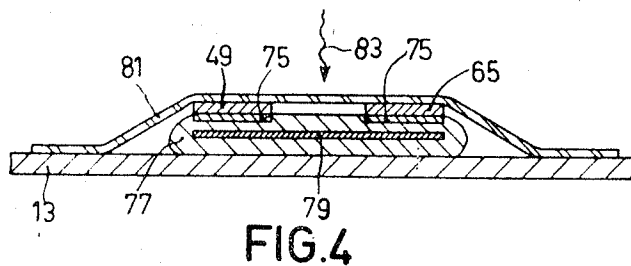
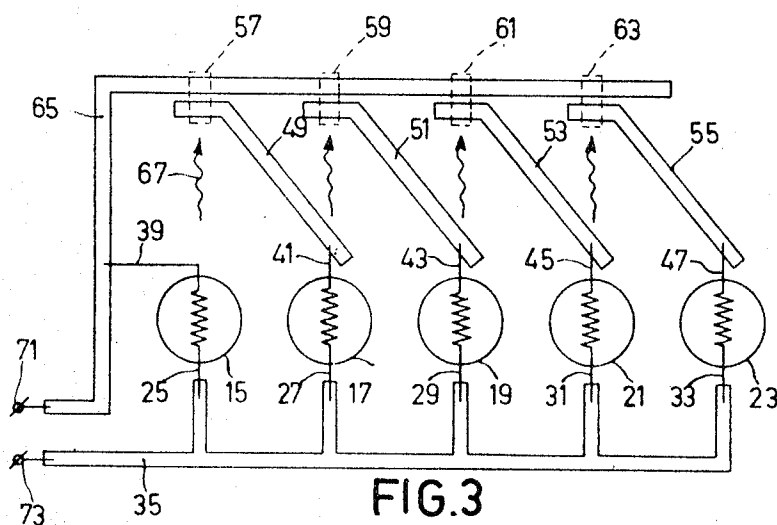
H. G. GANSER ET AL

3,458,270

SERIES FLASH-LAMP UNIT

Filed June 2, 1967

2 Sheets-Sheet 2



INVENTOR, S
HANS G. GANSER
ERHARD KAUFER
BY HANS J. WOTIN

Frank R. Ingber
AGENT

1

3,458,270

SERIES FLASH-LAMP UNIT

Hans Gunther Ganser, Stolberg, and Erhard Kauer and Hans Jurgen Lydtin, Aachen, Germany, assignors, by mesne assignments, to U.S. Philips Corporation, New York, N.Y., a corporation of Delaware

Filed June 2, 1967, Ser. No. 643,158

Claims priority, application Germany, June 4, 1966, N 28,629

Int. Cl. F21k 5/02; G03b 15/04, 9/70

U.S. Cl. 431-95

3 Claims

ABSTRACT OF THE DISCLOSURE

A series flash unit for use with a plurality of flashlight lamps has a switching means whereby part of the radiant energy developed in firing one lamp actuates a substantially non-moving switch member connecting an adjacent lamp to be ready for operation. Initially the member mechanically connects and electrically insulates two electrodes. Subsequently, in a thermal or chemical reaction to the thermal energy, the member becomes low-ohmic and electrically conductive.

The invention relates to a series flash unit employing several flashlight lamps which are provided in it and are to be fired successively, in which part of the thermal energy developed in firing a flashlight lamp actuates a switch for making the next flashlight lamp ready for operation.

In the known flash units a bimetallic element is associated with every flashlight lamp and is deformed by the radiant energy generated in firing a flashlight lamp. This bimetallic element actuates a switching device which is constructed from several parts, of which at least one is spring-loaded. After the actuation by the bimetallic elements the two parts of the switching device to be connected are automatically forced against each other. In the known series flash units, the fired flashlight lamps are exchanged for new ones.

It is the object of the invention to provide a series flash unit of a very simple construction without movable switching components and which can be manufactured cheaply and can be thrown away after the lamps have been fired.

The series flash unit according to the invention is characterized in that every switch is spaced from the surface of the associated lamp and comprises a switching member which connects two electrodes; the member becomes low-ohmic and conductive only as a result of radiant heat generated in firing a lamp and thereby connects the electrodes in an electrically conductive manner.

In contrast with the known series flash unit, the switching member in the flash unit, according to the invention, is spaced from the surface of the lamp and is preferably arranged on the wall of the housing; this switch responds to the thermal radiation, and then connects the two electrodes of the switch directly together without any intermediate steps. So a multiple switching device as in the known flash unit is not necessary.

According to a first embodiment, the switch which responds to thermal radiation is in the form of a fuse switch, which consists of a low-melting-point metal alloy which is kept spaced from the electrodes by a low-melting-point insulating layer. The metal layer melting as a result of the action of the radiant heat forms a soldered joint between the electrodes.

In the unmelted condition, the low-melting-point insulating layer of colophony, for example, ensures an absolute insulation between the electrodes of the switch to be connected. A material for the low-melting-point metal

2

alloy of the switching member may be Wood's alloys, Lipowitz alloys, Rose alloys, Newton alloys, which are good electrical conductors. In this example it is to be preferred that the switching member comprises a radiation-absorbing layer at least on its side facing the lamp.

According to a second embodiment of the new flash-light unit, the switch consists of a mass which, at least on the side facing the lamp, becomes a good electrical conductor by a chemical reaction caused as a result of the action of radiant heat, and thus forms a low-ohmic connection between the electrodes. For this purpose several metal compounds are to be considered which are first high-ohmic and are then decomposed or dissociated by the absorption of radiation and then separate the low-ohmic metal. It is to be noted that the released metal on cooling does not again become oxidized and high-ohmic.

Particularly favourable for this purpose is, of course, a noble metal compound. In particular a silver compound Ag_2O was considered. It has been found, however, that the radiant energy generated is not entirely sufficient to dissociate a contact mass which consists of pure Ag_2O so completely that a low-ohmic connection is produced. If, however, an organic binder, for example, polyvinyl resin, is added to the pure Ag_2O , a chain of reduction and oxidation reactions, which occur simultaneously and exothermally, is produced by the absorbed radiant energy, the end product of which is inter alia metallic conductive silver.

Because the switches in the series flash unit according to the invention do not comprise any movable components, the electrodes of the switch to be connected are preferably included in a printed circuit which is provided on the wall of the housing of the flash unit.

In order that the invention may readily be carried into effect, it will now be described in greater detail, by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a front view of a series flash unit according to the invention,

FIGURE 2 is a cross-sectional view of the same unit,

FIGURE 3 shows the arrangement of the electrodes and switching contacts in the device according to the invention,

FIGURE 4 is a first embodiment of a fuse switch, and FIGURES 5 and 6 show a second embodiment of a chemical switch.

The series flash unit according to the invention as shown in FIGURES 1 and 2 comprises a housing 1, a base 3, a reflector 5 formed as one unit, and a transparent cap 7. The base 3 is recessed for inserting the flashlight lamps either rigidly or detachably. The base 3 has such a shape, and the wall 13 of the housing comprises a printed circuit in such manner that the inserted lamps, 15, 17, 19, 21, 23 are connected in the manner as shown in FIGURE 3.

The current wires 25, 27, 29, 31, 33 of the flashlight lamps are connected to a common electrode 35. The current wires 41, 43, 45, 47 of the lamps are then connected by means of electrodes 49, 51, 53, 55 to switches 57, 59, 61, 63 which are shown in broken lines. By means of these switches the electrode 65 may be connected. Only the current wire 39 is directly connected to the electrode 65. When the flash unit is used, the electrodes 35 and 65 are connected to an ignition current source (battery+ignition capacitor) and consequently the lamps are ready for being fired.

Each of the switches 57, 59, 61 and 63 is constructed so that it is actuated by the radiant heat (arrow 67) which is generated when a lamp is fired, and consequently causes the next flashlight lamp to be ready for operation. For example, as a result of firing the lamp 15, the switch 57 is actuated so that the electrodes 49 and 65 are connected

low-ohmic. When subsequently the electrodes 35 and 65 are again connected to an ignition current source, the next lamp 17 is fired so that the next switch 59 is actuated by the generated radiant heat of the lamp 17, and so on.

In the embodiment shown, the housing 1 comprises a connection member 69 shown in broken lines which in known manner is provided with contacts to be connected to an ignition current source, said contacts being connected to the connections 71 and 73 of the electrodes shown in FIGURE 3.

In a first embodiment shown in FIGURE 4, the switch responding to radiant heat is shown as a fuse switch. Reference numbers 49 and 65 denote two copper electrodes to be connected which are prepared with a low-melting-point, low-ohmic Wood's metal 75. Below this metal an insulating layer 77 of colophony and a contact strip 79 which likewise consists of Wood's metal and is provided on the wall 13 of the housing are arranged. The assembly is covered by a radiation-absorbing blackened foil 81.

The radiant energy which is generated on firing a flashlight lamp and which impinges upon the switch 81 in the direction of the arrows 83 is absorbed by the foil in such manner that the Wood's metal 75, 79 and the layer 77 melt, so that a low-ohmic soldered joint is formed between the electrodes 49 and 65.

In the second embodiment shown in FIGURES 5 and 6, the switch which responds to the radiant heat is a chemical switch. This switch again comprises the electrodes 65 and, for example, 49 to be connected. A mass 87 of a noble metal compound preferably Ag_2O , is provided, while dispersed in an organic binder, such as polyvinyl resin, in such manner that the electrodes are covered. If in this case the radiant energy generated on firing a flashlight lamp impinges upon the mass 87 consisting of Ag_2O , this silver compound which in itself is high-ohmic, is decomposed and deposits on at least the surface facing the source of radiation a layer of high-ohmic silver metal. This silver layer is denoted in FIGURE 6 by 91 and it connects the two electrodes.

In the last example, a noble metal compound was chosen; in other circumstances compounds of base metals may be chosen which are dissociated by radiant heat and then deposit the readily conducting metal. In choosing such a metal compound it should be observed, however, that the reaction products create a reducing atmosphere to avoid reoxidation.

In the embodiments shown in FIGURES 1 and 2, the switches as shown in FIGURES 4, 5 and 6, are provided just above the lamp on the wall 13 of the housing. In fact, at that area no separate reflector is present between the housing and the lamps.

If desired, said switches may alternatively be provided in the vertical part of the wall of the housing. In this case it is necessary, however, to perforate the reflector at the areas between a lamp and the wall of the housing, in order that a part of the radiant energy of a lamp can pass through the reflector 5.

What is claimed is:

1. A flash unit in which a plurality of flashlamps are mounted to a base and are connectible between main conductors in a primary parallel circuit to be fired separately and successively, the unit including switch means for closing a secondary circuit associated with each lamp, which lamp is subsequently flashable by the closing of the primary circuit, each switch means comprising a non-moving member mechanically connecting and electrically insulating one electrode of the associated lamp with a main conductor, the member (a) being adjacent an earlier flashable lamp, and (b) chemically reactive to radiant light energy from the flash of said flashable lamp, whereby at least a portion of the member dissociates becoming electrically conductive.

2. A series flash unit as claimed in claim 1, characterized in that the mass consists substantially of a noble metal compound and an organic binder, for example, polyvinyl resin.

3. A series flash unit as claimed in claim 2, characterized in that the compound is Ag_2O .

References Cited

UNITED STATES PATENTS

2,762,889	9/1956	Waller	200—142
2,863,021	12/1958	Green	200—126 X

FOREIGN PATENTS

12,315	9/1886	Great Britain.
1,192,047	4/1965	Germany.

JAMES W. WESTHAVER, Primary Examiner

U.S. Cl. X.R.

95—11.5; 240—1.3