

# PATENT SPECIFICATION

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## (54) IMPROVEMENTS IN OR RELATING TO PYROTECHNIC DEVICES

(71) We, HAROLD BERLINSKI, of Coneybury, Mogador, Lower Kingswood, Tadworth, Surrey KT20 7HL (formerly of 5 The Drive, Coulsdon, Surrey),  
5 RICHARD ANTHONY IRTHING WILSON, of 18C Queen's Mansions, Brighton Road, Croydon, Surrey, and MARTIN FREDERICK BLAKE, of 23 Kidderminster Road, Croydon, Surrey, all Subjects of the Queen of  
10 Great Britain and trading as LE MAITRE (LIGHTING & EFFECTS) of 316 Purley Way, Croydon, Surrey, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by  
15 which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to improvements in pyrotechnic devices and is particularly,  
20 but not exclusively, concerned with such devices intended for use in producing stage effects such as, for example, flashes, explosions or smoke effects.

It has been known for many years to  
25 produce flash effects by means of a reusable heat-resistant container in which a length of fuse-wire is connected between electrical terminals and covered with a measure of magnesium-based flash powder.  
30 When a voltage is applied across the terminals, the fuse-wire becomes hot and melts and ignites the flash powder. Such known devices require the fuse-wire to be inserted and secured to the terminals  
35 by an operator each time the device is to be used and also require the operator to introduce the measure of flash powder over the fuse-wire usually from a bulk supply of such powder. This can be a highly  
40 dangerous operation as an accidental spark can cause the bulk supply to ignite or the measure of powder being introduced to ignite. Also the storage of such powder is dangerous and can cause problems.

45 It is an object of the present invention

to provide a pyrotechnic device in the form of an expendable sealed cartridge.

According to the present invention there is provided a pyrotechnic device comprising a hollow receptacle, a pair of electrical  
50 contact pins extending through a wall of the receptacle for insertion into an electrical socket and exposed internally of the receptacle, a fuse-wire secured and electrically  
55 connected between the exposed parts of the contact pins internally of the receptacle, a charge of pyrotechnic material within the receptacle and in contact with the fuse-wire and a closure for the  
60 receptacle of a weaker material than the remainder of the receptacle such that it will break or rupture under the pressure generated by ignition of the pyrotechnic material.

The pyrotechnic material is selected for  
65 the desired properties such as, for example, generating a flash of light, an explosion or thunder-clap, a cloud of smoke or whatever other theatrical effect it is intended to produce by igniting the charge.

Advantageously, the closure comprises  
70 paper adhesively secured to the receptacle to close the latter and confine the charge of material.

With advantage, there is provided an  
75 electric socket adapted to receive the contact pins of a pyrotechnic device according to the invention, the socket being associated with an electric circuit incorporating a transformer and arranged to apply a  
80 voltage through the socket to the contact pins which voltage is stepped-down with respect to the main supply and, desirably, is of the order of 1½ volts.

One embodiment of the invention will  
85 now be described by way of example, reference being made to the accompanying drawings in which:—

Fig. 1 is a cross-sectional view of a  
pyrotechnic device according to the pre- 90

sent invention, and

Fig. 2 is a block schematic diagram to a smaller scale illustrating electrical equipment for receiving and igniting the device 5 of Fig. 1.

The pyrotechnic device of this example comprises an open-topped hollow receptacle 1 of cylindrical configuration formed from a non-combustible, electrically insulating material such as, for example, polypropylene. Two spaced electrical contact pins 2 extend through the base of the receptacle for insertion into an electrical socket and are exposed internally of the receptacle where they are connected to a fuse indicated generally at 3. The fuse 3 comprises a length of fuse-wire 4 surrounded intermediate its length by a substance 5 known as "match" compound such as is used for the heads of matches. This match compound may be a sodium or potassium chlorate/lead mononitro-resourcinol compound applied to the fuse-wire 4 in liquid form and allowed to dry to a thickness of the order of 1/6th inch. The ends of the fuse-wire 4 are soldered to the exposed inner ends of the contact pins 2. The fuse 3 may be a commercially available electric fuse head detonator. A measured charge 6 of pyrotechnic material is disposed in the receptacle 1 with the fuse 3 therein and in contact therewith. The pyrotechnic material may be any suitable material for the theatrical effect to be generated, for example, a magnesium/perchlorate based material for generating a flash. The receptacle is sealed by a closure 7 of a material and thickness selected so as to readily break or rupture under the influence of the pressure generated by ignition of the charge 6 and release the ignition gases. Suitably, the closure 7 is a disc of paper adhesively secured to the periphery of the open end of the receptacle 1. The pyrotechnic device is therefore an expendable sealed cartridge which can be sorted with a degree of safety and which makes it readily apparent when unauthorised access has been had to the pyrotechnic material either by keeping account of the number of cartridges in store or by noting any fracture or breakage of the closure 7 of a cartridge. Also, in use the pyrotechnic charge 6 is never freely exposed to the environment but is always protected.

In order to ignite the charge, there is provided a socket 8 in a housing 9. The socket 8 is shaped as a cylindrical recess 10 to receive the receptacle 1 with only a small clearance and has in the base of the recess 10 two electrical sleeves 11 to receive and engage the contact pins 2. The sleeves 11 are connected to an electrical

circuit within the housing 9, the circuit including transformer means whereby a stepped-down voltage is applied across the sleeves 11. A suitable voltage is  $1\frac{1}{2}$  volts at 6 amps.

In this example, the socket housing 9 is connected by a plug-in pair of leads 12 to a further transformer housing 13 intended to be connected to the A.C. mains supply by plug-in leads 14 to produce two outputs to leads 12 and 12a at 50 volts, only one output at 50 volts being shown utilised in the present example. Each output pair of leads 12 and 12a is associated with a switch 15 on the housing 13 operable by an operator to ensure that the socket housing 9 is electrically isolated from the mains at the time a pyrotechnic device is being inserted into the socket 8 to prevent inadvertent ignition of the charge in a cartridge.

When it is desired to generate a theatrical effect, the operator connects the transformer housing 13 to the mains supply through leads 14 and ensures the switch 15 is open. Socket housing 9 is then connected to the housing 13 by leads 12 and a cartridge is inserted into the socket 8. The device is then ready for use, the socket housing 9 being located at the place where the effect is to be generated. When the switch 15 is closed, 6 volts is applied across the fuse-wire 4 which is selected to melt at this applied voltage with the result that the match compound 5 ignites and in turn ignites the charge 6. The resulting rapid combustion shatters the closure 7 and the theatrical effect is generated. The apparatus can readily and speedily be prepared for another effect by removing the expended cartridge and inserting a fresh cartridge, the switch 15 being open during this operation.

It will be appreciated that the fuse-wire 4 is selected to have characteristics such as resistance and cross-section in relation to the voltage to be applied thereacross to ensure that the coating 5 ignites rapidly when the voltage is applied and the ignition of the charge 6 is initiated. The use of the device according to the invention is not limited to low voltage applications but can be used with quite high voltages with an appropriately selected fuse-wire and appropriate safeguards for the operator.

#### WHAT WE CLAIM IS:—

1. A pyrotechnic device comprising a hollow receptacle, a pair of electrical contact pins extending through a wall of the receptacle for insertion into an electrical socket and exposed internally of the receptacle, a fuse-wire secured and electrically connected between the exposed parts of the contact pins internally of the re-

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- ceptacle, a charge of pyrotechnic material within the receptacle and in contact with the fuse-wire and a closure for the receptacle of a weaker material than the remainder of the receptacle such that it will break or rupture under the pressure generated by ignition of the pyrotechnic material.
2. A pyrotechnic device according to Claim 1 in which the fuse-wire is coated with a compound selected to be more readily inflammable than the major part of the charge of pyrotechnic material to initiate combustion of the charge.
3. A pyrotechnic device according to Claim 1 or 2 in which the closure comprises paper adhesively secured to the receptacle to close the latter and confine the charge of material.
4. A pyrotechnic device constructed, arranged and adapted to operate substantially as herein described with reference to the accompanying drawings.
5. A pyrotechnic device according to any one of the preceding claims in combination with an electric socket adapted to receive the contact pins of the device and associated with an electric circuit incorporating a transformer and arranged to apply a voltage through the socket to the contact pins which voltage is stepped-down with respect to the mains supply.

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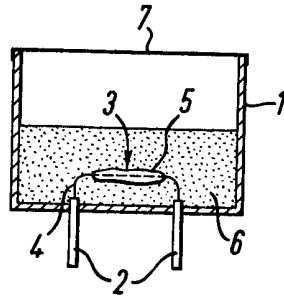


FIG.1

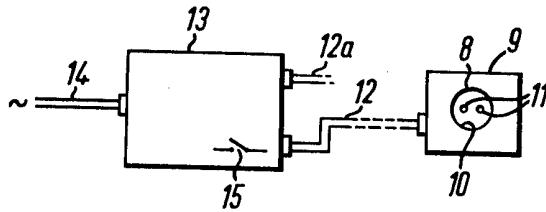


FIG.2