

**EUROPEAN PATENT APPLICATION**

Application number: 85305729.7

Int. Cl.<sup>4</sup>: **F 42 B 4/00**  
**F 42 C 19/06, F 42 B 3/18**

Date of filing: 13.08.85

Priority: 29.01.85 IL 74188

Date of publication of application:  
06.08.86 Bulletin 86/32

Designated Contracting States:  
BE DE FR GB IT NL SE

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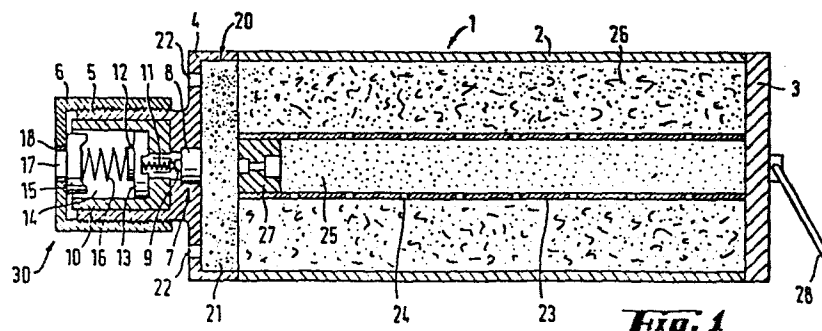
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**Laundryable pyrotechnic charge with electric fuze.**

An electric fired pyrotechnic grenade, e.g. for the generation of a smoke screen, comprising propellant and disperser charges ignitable by an electric squib. In the inoperative state the squib terminals are short-circuited whereby any unintentional firing by stray currents is pre-

vented. Preferably a Faraday Cage is provided to shield off the squib against radio frequency interference. It is further preferred to pack the disperser charge within an axial, perforated tube.



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A Pyrotechnic Grenade

Background of the Invention

The present invention relates to an improved  
pyrotechnical grenade and has for its object to provide  
5 such a grenade that combines storage safety with reliable  
operation. In the following the invention will be  
described with reference to smokescreen grenades,  
smokescreen being one of various conceivable pyrotech-  
nical effects that can be achieved in accordance with  
10 the present invention. It should, however, be under-  
stood that the invention is not limited thereto, exam-  
ples of other pyrotechnical effects that can be ac-  
hieved in accordance with the present invention being  
pyrotechnical illumination, riot control and the like.  
15 The modern battlefield environment is rapidly becoming  
highly saturated with portable weapons such as  
shoulder-fired missiles and rockets which can be de-  
ployed by individuals against armoured vehicles such as  
battle tanks and personnel carriers. A known counter-

measure to these various threats is use of smokescreen to reduce the visibility and allow a period in which an armoured vehicle can move unobserved into a new combat position.

5           For a smokescreen grenade to fulfill its purpose it has to combine safety means to avoid unintentional ignition during storage with an ignition mechanism that responds reliably to intentional ignition. Also the spreading of the smokescreen at the  
10 target area should proceed with the utmost speed and it is the object of the present invention to provide a pyrotechnic grenade that meets these requirements.

#### General Description of the Invention

In accordance with the invention there is  
15 provided a pyrotechnic grenade adapted to be launched from a launching tube by electric actuation, comprising a charge of pyrotechnic material, an ignitable charge adapted upon ignition to ignite the pyrotechnic material and to disperse a combustion product thereof  
20 (dispenser charge), a propellant charge adapted to eject the grenade from the launching tube and an electric squib having two electric terminals and adapted to ignite said dispenser and propellant charges, characterized in that means are provided by which said terminals are short-circuited in the unloaded state of the  
25 grenade (short-circuiting means), which short-circuiting means are adapted for cooperation with an electric terminal in said launching tube such that upon loading the grenade into the launching tube the short-  
30 circuit is opened.

In accordance with one embodiment of the invention said squib is enclosed within a metal casing which forms one terminal thereof while a second terminal protrudes therefrom in isolation from the casing, the squib being mounted within a metal base member of the grenade, and said short-circuiting means are adapted to establish in the unloaded state of the grenade electric contact between said second terminal and said metal base.

10 In accordance with one preferred embodiment of the invention there is provided a Faraday Cage adapted to shield off said squib against stray pulses resulting from radio frequency interference (RFI).

In accordance with another preferred embodiment of the invention the disperser charge is located within an axial, perforated tube (burster tube). It has been found in accordance with the invention that such a burster tube ensures immediate ignition of the pyrotechnic charge and a practically instantaneous dispersion of the combustion product thereof.

20 In accordance with yet another preferred embodiment of the invention the pyrotechnic grenade comprises a pyrotechnic delay unit whereby the disperser charge is ignited only when the grenade has moved a predetermined distance out of the launcher tube.

#### Brief Description of the Drawings

These and other features of the present invention will be better understood from the following description with reference to the accompanying drawings, which description and drawings are by way of example only. In the drawings:

Fig. 1 is an axial section of a pyrotechnic grenade according to the invention, showing the ignition unit in the unloaded stage;

5 Fig. 2 is an elevation, partially in section of the grenade of Fig. 1 showing the ignition unit in the loaded stage of the grenade;

10 Fig. 3 is an elevation, partially in section of a launcher tube for a grenade according to Figs. 1 and 2 and forming part of a launcher tube cassette (not shown); and

Fig. 4 is an elevation, partially in section of the launcher tube of Fig. 3 with a grenade according to Figs. 1 and 2 loaded therein.

#### Description of a Preferred Embodiment

15 The pyrotechnic grenade 1 shown in Figs. 1 and 2 - in this particular case a smokescreen grenade - comprises a cylindrical body 2 made predominantly of non-metallic material such as cardboard or plastic material and fitted at its front with an end plate 3  
20 and at its rear a terminal metal member 4 with an integral cup-shaped extension 5 having screwed thereon a metal cap 6 serving as Faraday Cage as will be explained below.

25 Inside a suitably shaped recess of terminal member 4 there is mounted an electric squib 7 comprising a metal casing 8 serving as a first electric terminal and a centrally located, protruding second terminal 9 which is electrically insulated from casing

8. Squib 7 is inserted into the accommodating recess in a tight fit so that electric current can flow between casing 8 and terminal member 4.

5 Inside cup-shaped extension 5 there is mounted a cup-shaped insulator member 10, extension 5 and insulator 10 having registering central bores accommodating between them a spring loaded metal pin 11 retained by means of head 12 at the rear side of a metal plate 13. Faraday Cage 6 and insulator member 10  
10 define between them an inner space 14 which accommodates a spring loaded contactor assembly comprising a metal plate 15, a metal spring 16 and metal plate 13.

Cap 6 comprises a central hole 17 lined with an insulator ring 18.

15 Adjacent the terminal member 4 the grenade 1 comprises a compartment 20 containing a propellant charge 21. On its rear side the terminal member 4 comprises a plurality of ports 22 arranged in a circular pattern and serving for the discharge of propulsion  
20 gases for the ejection of the grenade from the launcher tube as will be explained further below.

Centrally located within the cylindrical body 2 of grenade 1 is a perforated burster tube 23 having a plurality of perforations 24. The interior of burster  
25 tube 23 is packed with a disperser charge 25 while the space inside body 2 surrounding burster tube 23 is packed with the main pyrotechnic charge 26.

At the rear end of burster tube 23 there is fitted a pyrotechnic delay unit 27 of a kind known per  
30 se which is so designed that it is ignited by the squib only after the grenade has travelled a predetermined distance out of the launcher tube.

End plate 3 is fitted with a ring 28 serving as handle, e.g. when the grenade is lowered into a

launcher tube.

In the now following description the assembly of cup-shaped extension 5, Faraday Cage 6 with all the operative members they contain and squib 7 will be referred to collectively as ignition unit 30.

As can be seen from Figs. 2, 3 and 4, ignition unit 30 is adapted for cooperation with a pin-shaped terminal 31 forming part of a launcher tube 32. Launcher tube 32 may be part of a cluster of tubes combined in form of a cassette (not shown).

In the unloaded, inoperative state of the grenade shown in Fig. 1 metal plate 15 bears against the end wall of Faraday Cage 6 bridging the hole 17 thereof while at the same time the tip of the spring loaded pin 11 bears on the second terminal 9 of squib 7 while its head 12 bears on metal plate 13 which latter is in electric contact with metal plate 15 through the intermediary of the metal spring 16. In this way terminal 9 of squib 7 is in electric contact with Faraday Cage 6 which latter in turn is in electric contact with the cup-shaped metal extension 5 of terminal member 4 which in turn is in electric contact with metal body 8 of squib 7. In this way the terminals 8 and 9 of squib 7 are short-circuited and no stray electric current, whatever its source, can penetrate into the squib. In addition Faraday Cage 6 screens off any RFI so that stray electric pulses from that source are equally avoided. The overall consequence of all this is that in the inoperative state shown in Fig. 1 the electric squib 7 cannot be energized in any way.

This situation changes in the loaded, operative position shown in Fig. 2. In this position the pin-shaped terminal 31 of the launcher tube 32 penetrates into the ignition unit 30 via hole 17 being

insulated from Faraday Cage 6 by insulator ring 18. Terminal 31 lifts plate 15 from its seat against the action of spring 16 into an intermediary position inside chamber 14 as shown in Fig. 2 and it is easily understood that in this state terminals 8 and 9 of the electric squib 7 are no longer short-circuited. As is seen in Fig. 3 the launcher tube 32 comprises at its bottom around the pin-shaped electric terminal 31 a block 33 of insulating material which serves as seat for the ignition starter unit 30 of grenade 1. Block 33 is associated with metal contact fingers 34 supported by launcher tube 32 and adapted to hold the grenade 1 in position in the manner shown in Fig. 4. Terminal 31 is connected to one pole of an .pa electric circuit while the body of the metal launcher tube 32 is connected to the other pole, an insulator ring 35 insulating terminal 31 from the body of the launcher tube. The body of the launcher tube and fingers 34 thus form the second electric terminal.

In the loaded, operative state shown in Figs. 2 and 4 an electrical path is established from the metal body of the launcher tube 32 through the contact fingers 34 and the Faraday Cage 6 to the metal terminal member 4 of grenade 1 which latter in turn is in contact with metal body 8 of squib 7. Separately and in insulation therefrom terminal 31 is in contact with metal plate 15 which through the intermediary of spring 16, metal plate 13 and pin 11 is in contact with the second electric terminal 9 of squib 7. Consequently in the loaded state the squib 7 can be energized by an electric current flowing between the two poles of the electric circuit in consequence of the closure of a suitable contact and in this way the grenade can be fired in a controlled manner.

As is seen in Fig. 4, in the loaded state of the grenade 1 a sealed space is formed between the terminal member 4 and launcher tube 32. Consequently, upon ignition of the propellant charge 20 propellant gases burst out of ports 22 and a pressure builds up within said sealed space as a result of which the grenade 1 is ejected from the launcher tube. After a certain, predetermined delay the pyrotechnic delay unit 27 ignites disperser charge 25 which in turn ignites the pyrotechnic charge 26. Because of the special design of the burster tube 23 with its ports 24, the entire pyrotechnic charge is ignited nearly simultaneously whereby the non-metallic portion of body 2 is burst and the combustion product resulting from the ignition of the pyrotechnic charge is dispersed practically instantaneously.

When tube 32 forms part of a cluster of launcher tubes a plurality of pyrotechnic grenades may be fired sequentially or simultaneously, as may be required.

CLAIMS

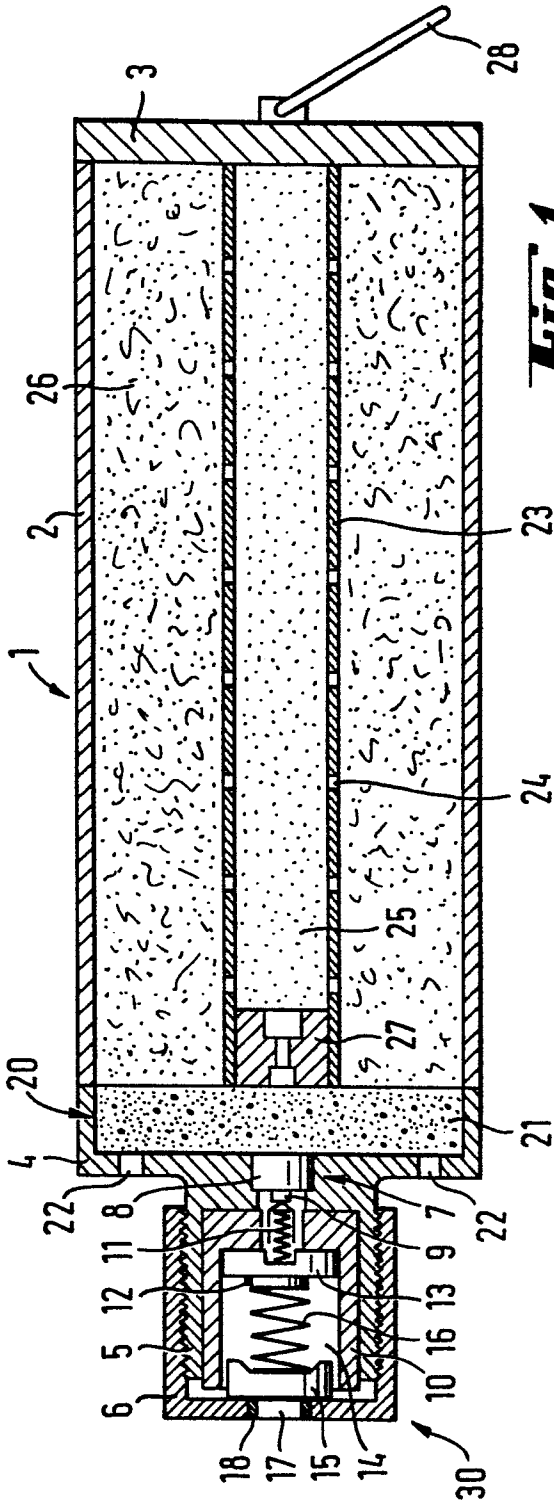
1. A pyrotechnic grenade adapted to be launched from a launching tube by electric actuation, comprising a charge of pyrotechnic material, an ignitable charge adapted upon ignition to ignite the pyrotechnic material and to disperse a combustion product thereof (dispenser charge), a propellant charge adapted to eject the grenade from the launching tube and an electric squib having two electric terminals and adapted to ignite said dispenser and propellant charges, characterized in that means are provided by which said terminals are short-circuited in the unloaded state of the grenade (short-circuiting means), which short-circuiting means are adapted for cooperation with an electric terminal in said launching tube such that upon loading the grenade into the launching tube the short-circuit is opened.

2. A pyrotechnic grenade according to Claim 1, characterized in that said squib is enclosed within a metal casing which forms one terminal thereof while a second terminal protrudes therefrom in isolation from the casing, the squib being mounted within a metal base member of the grenade, and said short-circuiting means are adapted to establish in the unloaded state of the grenade electric contact between said second terminal and said metal base.

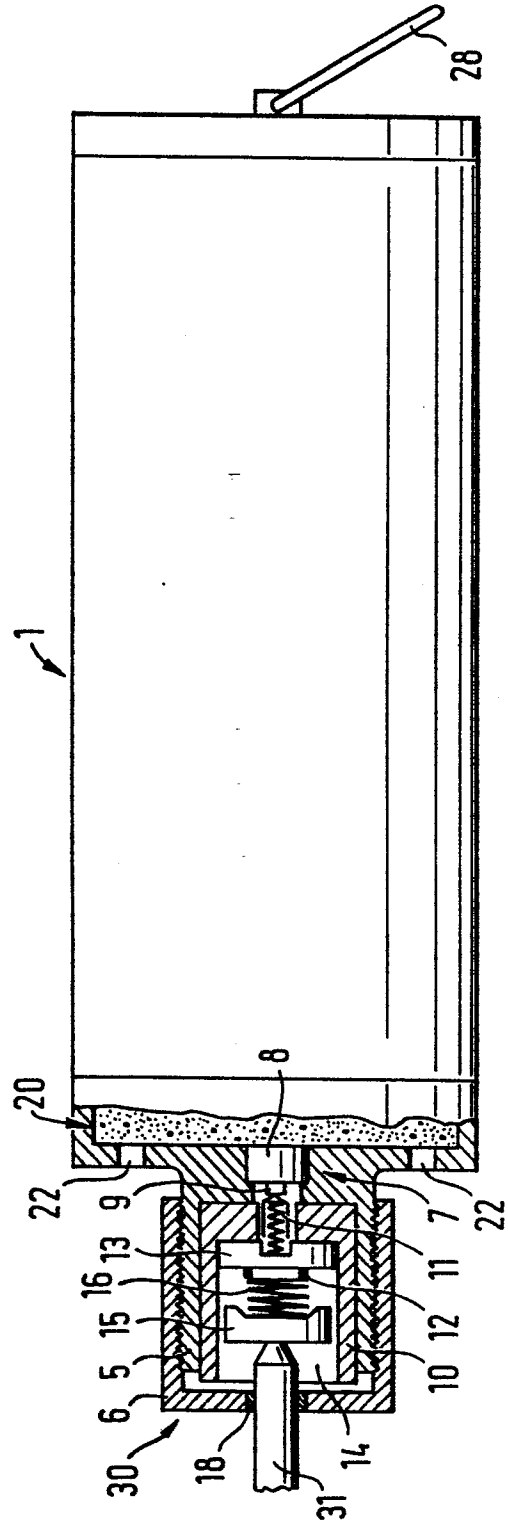
3. A pyrotechnic grenade according to Claim 1 or 2, characterized by the provision of a Faraday Cage adapted to shield off said squib against stray pulses resulting from radio frequency interference.

4. A pyrotechnic grenade according to any one of Claims 1 to 3, characterized in that said disperser charge is located within an axial, perforated tube.

5. A pyrotechnic grenade according to any one of the preceding Claims, characterized in that it comprises a pyrotechnic delay unit whereby the disperser charge is ignited only when the grenade has moved a predetermined distance out of the launcher tube.

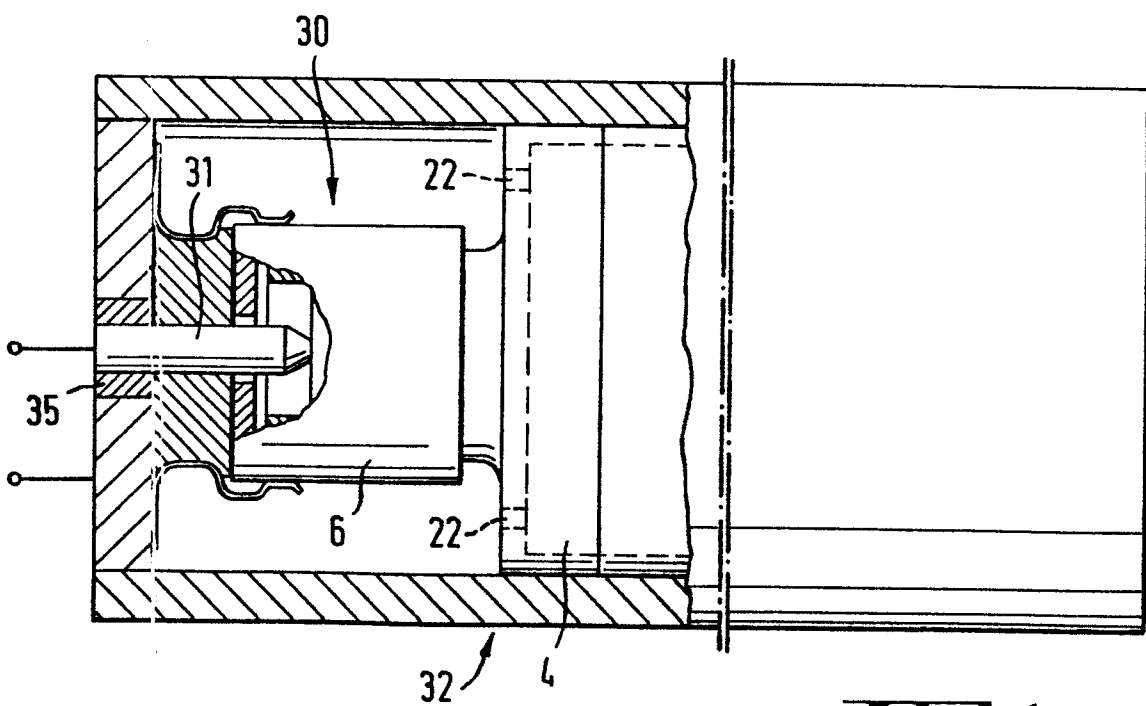
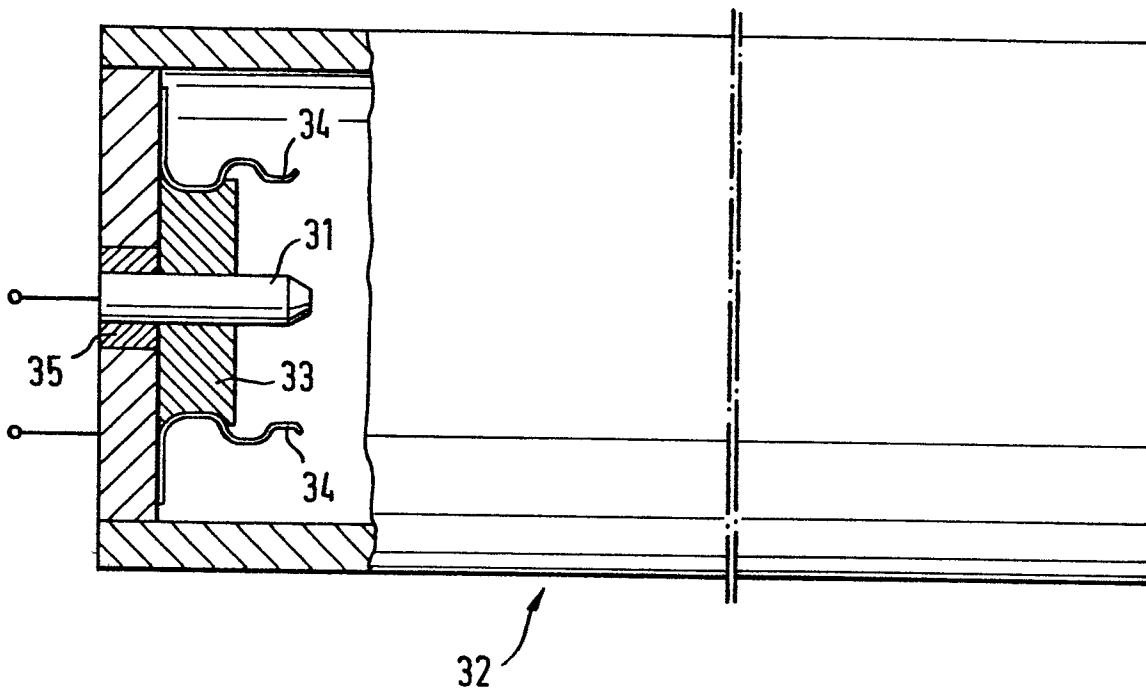


**Fig. 1**



**Fig. 2**

**Fig. 3**



**Fig. 4**