A composition comprises metaldehyde and/or hexamethylenetetramine and/or an oxime, and a material which produces sparks upon combustion. The spark producing material may be one of a number of finely powdered metals or metal compounds, such as magnesium, titanium, hafnium, niobium, tantalum etc. The composition may also comprise a colour producing material, colour enhancing material and adhesive. Preferably, the colour producing material is a compound of barium, boron, copper, lithium, sodium or strontium. The colour enhancing material may comprise chlorine, such as chlorinated rubber, whilst the adhesive can be one or more of dextrin, shellac, gum arabic, acaroid resin and nitrocellulose. An inorganic perchlorate and/or an inorganic nitrate can also be included in the composition. In another aspect, a pyrotechnic device comprises the aforementioned composition. Preferably, the pyrotechnic device is an indoor firework. The composition may be rolled to form a pill or tablet. The use of the composition to make a pyrotechnic device is also claimed.
COMPOSITION AND PYROTECHNIC DEVICE

This invention relates to new compositions of matter comprising metaldehyde and/or hexamethylenetetramine and/or an oxime such as dimethylglyoxime. It relates also to pyrotechnic devices comprising such compositions of matter which are useful, primarily, but not exclusively, for application indoors in a domestic environment.

The use of metaldehyde in pyrotechnic items and fireworks for indoor application (known in the art as “indoor fireworks”) has been known for many decades. Up to now, the devices have been fairly limited. One such device simply produces metaldehyde snow by the process of sublimation. Other devices produce steady flames, which may be coloured by the addition of compounds of, for example, barium, lithium, sodium, or strontium, or produce flames, which may be natural or coloured due to the addition of, for example, the aforementioned compounds, but which have superimposed upon them a flashing or animating effect brought about by including a small quantity of a suitable inorganic chlorate and organic fuel into the composition.

The devices mentioned in the preceding paragraph are well known and produce their intended effects very satisfactorily. However, the development of such devices has stagnated, and as mentioned they have been available for many decades. Thus, consumers tend to view such devices with a degree of antipathy and their use in domestic entertainment has diminished as a result. There is therefore a need to expand the range of effects that can be produced by indoor fireworks so that the entertainment value that can be achieved is enhanced.

In accordance with one aspect of the invention, there is provided a composition comprising metaldehyde and/or hexamethylenetetramine and/or an oxime, and a material which produces sparks during combustion.

It has been found, rather surprisingly, that this type of composition does actually produce copious quantities of sparks when burning. It had not been realised that this would be the case because metaldehyde, hexamethylenetetramine and oximes burn very gently (hence making them suitable for use as the base material in indoor fireworks), producing virtually no pressure in the burning surface of the composition. As a result, significant ejection of
particles from the burning surface, which lead to the production of sparks, would not be expected. Instead, it was expected that the spark producing material would either be consumed during combustion or remain as a residue. By mixing metaldehyde and/or hexamethylenetetramine and/or an oxime with materials which generate sparks when heated in the flame produced when the metaldehyde and/or hexamethylenetetramine and/or oxime burns in air, the range of effects is enhanced and satisfies the need mentioned above.

In a typical embodiment, the metaldehyde and/or hexamethylenetetramine and/or oxime will be present as the majority component by weight.

Where an oxime is used, the oxime is typically dimethylglyoxime.

Experimentation associated with this invention has shown that the metaldehyde, hexamethylenetetramine or oxime may be used in the absence of the other two. Alternatively, any two or all three of the compounds may be used in any proportions together.

Typically, the spark producing material comprises one or more of: iron, steel, chromium, aluminium, magnesium, cobalt, titanium, hafnium, zirconium, niobium, tantalum, a zirconium-nickel alloy, zirconium hydride, titanium hydride, a magnesium-aluminium alloy, carbon, titanium carbonitride, titanium boride, zirconium boride, zirconium silicide and silicon carbide. The spark producing material will typically be employed in powdered form.

The reference to carbon in the above list of spark producing materials includes pure carbon and also other forms of carbon, such as wood charcoal, sugar charcoal, animal charcoal, graphite or anthracite.

In some of the preferred embodiments, the spark producing material comprises one or more of: magnesium grade 3 cut or atomised, magnesium grade 6 cut or atomised, titanium 250 mesh or finer, hafnium 40 microns or less, niobium 5 microns or less, tantalum 5 microns or less, iron 10 microns or less, magnesium-aluminium alloy (magnalium) 100 mesh or finer, titanium carbonitride 2 microns or less and aluminium 200 mesh or finer.
The spark producing material may be coated with a corrosion inhibitor, for example by chromating, molybdating, or by applying a coating of a salt of 3, 5-dinitrobenzoic acid or accaroid resin.

Other suitable ingredients to add colour to the spark producing flame may be included in the mixtures as desired. Thus, the composition may further comprise a material which produces a coloured flame during combustion. Such material typically comprises one or more of the following materials: a barium compound, a boron compound, a copper compound, a lithium compound, a sodium compound, and a strontium compound.

In preferred embodiments, the colour producing material comprises one or more of: copper oxalate, copper phthalocyanine, copper oxychloride, strontium carbonate, strontium formate, strontium oxalate, lithium carbonate and boron trioxide.

The composition may further comprise a colour enhancing material to assist colour production in the flame.

Typically, the colour enhancing material comprises chlorine. Preferably, the colour enhancing material is an organic material comprising chlorine, such as chlorinated rubber.

Other ingredients, for example an oxidant or a material which will decompose to yield a gas, may be added to the mixture to affect its character by way of flashing or animating effects or other modification to the spark effects.

For example, the composition may further comprise one or more of: an inorganic perchlorate, such as potassium perchlorate, an inorganic nitrate, such as potassium nitrate, or an organic compound, such as guanidine nitrate, guanidine thiocyanate or dicyandiamide.

In some embodiments, the composition further comprises an adhesive which may also serve as fuel for the inorganic nitrate or perchlorate. This is sometimes necessary to bind the ingredients together in the form of a pill or it may be required for purposes of granulation. In other embodiments the ingredients may be bound by compression, for example.
Particularly suitable adhesives have been found to be dextrin, shellac, gum Arabic, accaroid resin and nitrocellulose. However, sometimes only a very weak adhesive is required, for example in granulating some compositions. In this event it may be possible to employ one of the ingredients present for a non-adhesive purpose as the adhesive. An instance of this is where guanidine nitrate or thiocyanate, present to modify the character of the flame, is dissolved by adding water and the water is subsequently evaporated after granulating the wet mixture. If the guanidine nitrate or thiocyanate is present in sufficient quantity it maintains the integrity of the granules sufficiently to enable further processing into tablet form.

In accordance with a second aspect of the invention, there is provided a pyrotechnic device comprising the composition of the first aspect.

Typically, the pyrotechnic device is an indoor firework.

The pyrotechnic device may comprise mixtures of the composition produced as described above with reference to the first aspect as loose powder or confined in a container, for example made from a metal or plastic foil. In order to use the compositions in loose form the mixtures may be heaped up or spread out on a fireproof or fire-resistant surface and ignited.

Preferably, however, the composition will be consolidated in some way. Thus, in some cases, the composition is wetted with a suitable solvent for the adhesive employed and rolled to form a pill. In other cases, the composition is compressed dry to form a tablet.

When in the form of pills or tablets, one or more adhesives or pelleting agents may be included in the composition as a processing aid, as described above.

The pyrotechnic device may further comprise a spindle or hook embedded in the composition. The spindle or hook, which serves the purpose of suspending the composition, may be loosely embedded in the composition (for example, in a hole through a tablet or pill), or it may be fixed in place by adhesive or by friction (for example, by consolidating the composition around the spindle or hook).
If the composition is contained or formed into a pill or tablet the device may be ignited on a fireproof or fire-resistant base surface.

Thus, when in the form of a tablet or pill, the tablet or pill may be mounted on a base surface. When in the form of a tablet, the tablet may be mounted on the base surface in a flat configuration. Alternatively, the tablet may be mounted on the base surface on edge.

The tablet may be mounted on the base surface by simply putting it in place prior to ignition on the base surface which may be a flat surface, or the base surface may contain a groove or indentation, or a pattern of raised regions or a spigot or spigots to receive and retain the tablet. Alternatively, it may be affixed by a suitable adhesive, preferably an adhesive which is non-combustible and which is infusible. A suitable adhesive may comprise a resorcinol formaldehyde condensation product cured with paraformaldehyde, hexamethylenetetramine or an epoxy resin.

In another embodiment, the device comprises a support for suspending the composition above a base surface, the composition being mounted on the support. The support is typically mounted on the base surface or may instead be hand-held. In the case of a hand-held support, the support typically comprises a rod or wire having first and second portions, the composition being affixed to the first portion and the second portion providing a handle by which the rod or wire may be held, in use.

The composition is typically in the form of a pill or tablet which may be provided with one or more perforations to act as a point or as points of suspension. The inner portion or surface of the, or of each, perforation may be lined with a non-combustible infusible substance such as a ring or lining of metal, or non-combustible infusible polymer, or some substance based on plaster of Paris or similar material to provide for continuing support as the composition burns away.

If the composition is confined in a container, the device may comprise a support for suspending the container above a base surface, the container being mounted on the support. In this case, the support may comprise a rod or wire having first and second portions, the container being affixed to the first portion and the second portion providing a handle by which the rod or wire may be held, in use.
In this case, when the composition or container is fitted to a suitable support and the composition is ignited and burnt suspended in the air, the pyrotechnic device may produce a significantly different and sometimes more spectacular effect than when burnt on a surface.

Typically when the composition is burnt suspended in the air the display of sparks in the upwards direction exhibits considerable enhancement in the number of sparks and the height to which they ascend. Furthermore, a sideways motion of sparks emanating directly from the burning composition appears. These sparks are typically brighter and larger than the ascending sparks and may burn out by splitting into smaller sparks. Depending upon the manner of supporting the composition in the air, falling sparks may also appear. The quantity and quality of the display of sparks, particularly of the falling sparks, is typically less if the tablet is supported in the air on, for example, a spiral of wire than if the lower part of the tablet is completely free.

In a third aspect of the invention, the composition of the first aspect is used to make a pyrotechnic device.

In order to produce the compositions according to this invention, any suitable means of mixing may be employed, such as tumbling the weighed ingredients together or passing them several times through a suitably fine mesh sieve.

If the composition is to be used in a container it is usually poured in and simply tamped down or may be compressed to an appropriate extent dependent on the application. To form the compositions into pills a composition containing an adhesive is dampened with a suitable solvent such as water or alcohol and the damp composition is rolled in known manner into suitably sized pills. Alternatively, the composition can be formed into pills by means of a machine that produces spherical pellets. If tablets are required, the composition is either compressed in a mould or granulated and passed through a tabletting machine. The shape of the tablets can be chosen to suit any aesthetic or practical requirement. If the final pyrotechnic device is to be burnt suspended in the air then tablets, rather than pellets or contained powders, are usually the preferred form. The tablets can be burnt horizontally by for instance laying them on a wire spiral before ignition.
Alternatively, the tablets can be suitably affixed to a non-combustible rod which in use can be held in or positioned on a suitable support, or they can be dropped into a slot cut in a non-combustible plate, either device being suspended in a suitable orientation in the air. Yet again perforated tablets can be suspended in the air from a spigot or hook or be fitted with a spindle or hook by which the tablet may be suspended, in use.

This invention is described further by the following examples which are given solely to provide more detail and not for any purpose of restriction.

Example 1

A mixture was made by passing the following quantities of ingredients three times through a 60 mesh BS sieve.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
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<tbody>
<tr>
<td>Metaldehyde</td>
<td>89g</td>
</tr>
<tr>
<td>Copper phthalocyanine</td>
<td>2g</td>
</tr>
<tr>
<td>Magnesium grade 3 cut</td>
<td>9g</td>
</tr>
</tbody>
</table>

The mixture was formed into tablets approximately 3mm thick by consolidation in a 12mm diameter mould. The tablets were cut diametrically in half, affixed along their straight sides to metal rods and burnt suspended in the air. They produced a flame with a hint of green and many white sparks.

Example 2

The procedure described in Example 1 was repeated with the magnesium replaced by the same quantity of 300 mesh titanium. The burning tablets produced longer lasting sparks than the tablets from Example 1. Many sparks fell in excess of 150mm.
Example 3

A mixture of the following quantities of ingredients was produced in the same manner as described in Example 1.

Metaldehyde 76g
5 Copper oxalate 9g
Magnesium grade 3 cut 15g

The mixture was formed into tablets as described in Example 1. When undivided tablets were burnt flat on a non-inflammable surface they produced a flame with a green tip. Bright flashes occurred from time to time with white ash floating in the air. When divided tablets were attached to metal rods and burnt suspended in the air a spectacular white sparking effect was produced with a yellow flame.

Example 4

A mixture according to the following prescription was prepared in the way described in Example 1.

15 Metaldehyde 87.0g
Guanidine nitrate 11.2g
Copper oxychloride 1.0g
Titanium 300 mesh 0.8g

The mixture was granulated through a sieve of 2.0mm mesh opening having first dampened it with water. The wet granules were dried and formed into tablets of diameter 12mm and thickness approximately 2mm by passing them through a commercial tabletting machine. The tablets were mounted on edge on a non-combustible infusible board. When burnt they produced a green-blue animated flame and white sparks.
Example 5

The following quantities of ingredients were processed as described in Example 4.

Metaldehyde  88.0g
Guanidine nitrate  11.0g
5 Hafnium < 40 microns  1.0g

The tablets were burnt on edge on a non-combustible infusible board and produced a rather transparent animated flame surrounded by silver sparks.

Example 6

The following quantities of ingredients were processed as described in Example 4.

10 Metaldehyde  77.5g
Guanidine nitrate  19.0g
Strontium carbonate  2.0g
Titanium 300 mesh  1.5g

When burnt flat on a non-combustible infusible board the tablets produced an orange animated flame with a red tip and silver sparks.

Example 7

Example 6 was repeated except that lithium carbonate replaced strontium carbonate. When burnt on edge on a non-combustible infusible board the tablets produced a red animated flame and silver sparks.

Example 8

The following quantities of ingredients were processed in the manner of Example 1.

Metaldehyde  88g
Guanidine nitrate  11g
Niobium < 5 microns  1g
The divided tablets, affixed by their straight edges to metal rods, were burnt suspended in
the air by holding the free end of each rod in the hand. They produced a bushy flame full of
golden sparks with bright sparks falling down.

**Example 9**

Example 8 was repeated replacing niobium by tantalum of similar particle size. The result
was the same.

**Example 10**

The following quantities of ingredients were processed in the manner of Example 1 except
that the tablets were not divided or affixed to rods.

10 Metaldehyde 92g
Iron < 10 micron 8g

When burnt flat on a non-combustible infusible board the tablets produced a conical
shaped flame with many golden sparks. Some sparks coruscated in the characteristic way
of burning iron. When burnt on edge on the board the size of the flame and quantity of
sparks was much increased.

Some tablets were perforated axially by drilling with a 2.0mm diameter drill. Spigots 20mm
long and 1.5mm diameter were fixed symmetrically into the tablets with resorcinol-
formaldehyde adhesive. The tablets were suspended freely in the air by placing each end
of the spigots into wire loops held 150mm above a flat surface. When burnt the tablets
developed a flame with a spectacular display of sparks moving mainly upwards and
downwards but to some extent sideways as well.
Example 11

The following quantities of ingredients were processed as described in Example 4.

Metaldehyde 52.0g
Copper oxychloride 10.0g
5 Strontium formate 4.0g
Potassium perchlorate 22.0g
Chlorinated rubber 4.0g
Aluminium 200 mesh to dust 8.0g
Dextrin 4.0g

10 The tablets were burnt flat on a non-combustible infusible board and produced a green-blue flame, blue flashes, and silver sparks.

Example 12

The following quantities of ingredients were processed as described in Example 4.

Metaldehyde 65.0g
15 Potassium perchlorate 22.0g
Strontium oxalate 2.0g
Chlorinated rubber 2.0g
Titanium 300 mesh 4.5g
Dextrin 4.5g

20 When burnt flat on a non-combustible infusible board the tablets produced red flashes and branching silver sparks.

Example 13

The following quantities of ingredients were processed in the manner of Example 1 except that the tablets were used undivided and were not affixed to rods.

25 Metaldehyde 95g
Titanium carbonitride < 2 microns 5g
When burnt on edge on a non-combustible infusible board the tablets produced a natural coloured flame and bright golden sparks.

**Example 14**

The following quantities of ingredients were mixed as described in Example 1.

5 Metaldehyde 95g
Titanium < 250 mesh 5g

The mixture was formed into ring shaped tablets by compression in a mould such that their outside diameter was 15mm, their inside diameter was 5mm and their thickness was 3mm. 3mm long ferrules of outside diameter 4.5mm diameter and with a hole diameter of 1mm were fixed into the ring shaped tablets with resorcinol-formaldehyde resin. Two types of ferrule were used, one made from phenolic resin and the other made from casting powder based on anhydrous calcium sulphate. The tablets were suspended freely in the air at a height of 200mm by means of a metal rod pushed through the ferrules.

When burnt a spectacular display of sparks was produced in which golden sparks rose and silver sparks fell. There was a less pronounced sideways movement of silver sparks.

**Example 15**

The following quantities of ingredients were mixed as described in Example 1.

Metaldehyde 94g
Magnesium grade 6 atomised 6g

The mixture was formed into tablets approximately 3mm thick by consolidation in a 12mm diameter mould. Half of the tablets were divided and burnt in the manner described in Example 1. The remainder were left undivided and not affixed to rods.

The undivided tablets were burnt on edge on a non-combustible infusible board. They produced faint sparks shooting rapidly in straight lines to distances often in excess of 100mm. The combustion ended in a burst of fire and a shower of low density ash rising in the air. When the divided tablets were burnt faint sparks shot out to a distance often in
excess of 100mm and bright flashes of light about 3-4mm across appeared around the tablets.

**Example 16**

The following quantities of ingredients were processed and burnt in the manner described in Example 15.

- Metaldehyde: 95g
- Magnesium aluminium alloy: 5g
- Magnesium (magnalium) < 15 microns

The undivided tablets produced faint sparks which shot out to at least 20mm from the tablets. The divided tablets produced faint sparks which shot out to at least 20mm from the tablets. Bright silver flashes surrounded the tablets.

**Example 17**

The following quantities of ingredients were processed and burnt in the manner described in Example 15.

- Dimethylglyoxime: 95g
- Magnesium grade 6 atomised: 5g

When the undivided tablets were burnt they produced faint sparks shooting out to about 25mm from the tablets. The combustion ended in a burst of flame and some low density ash which rose in the air. The divided tablets shot faint sparks out to a distance of about 140mm and bright flashes appeared around the tablets.

**Example 18**

Example 16 was repeated except that the metaldehyde was replaced by dimethylglyoxime. The results were similar although the flame size was somewhat larger than with metaldehyde as the fuel.
Example 19

The following quantities of ingredients were processed as described in Example 4.

- Metaldehyde: 64g
- Potassium nitrate: 25g
- Lithium carbonate: 3g
- Titanium 250 mesh: 4g
- Dextrin: 4g

When burnt the tablets produced silver sparks with the background of a reddish coloured flame which was slightly animated.

Example 20

The following quantities of ingredients were processed as described in Example 1.

- Hexamethylenetetramine: 95g
- Titanium 250 mesh: 5g

When the divided tablets were burnt suspended in the air by holding the free end of each rod in the hand, they produced a display of silver sparks.

Example 21

The following quantities of ingredients were processed as described in Example 1 except that the tablets were not divided nor affixed to rods.

- Metaldehyde: 95g
- Magnesium aluminium alloy (magnalium) < 100 mesh: 5g

When burnt on edge silver sparks were produced which often split into several sparks.

Example 22

Example 17 was repeated with the 95g of dimethylglyoxime being replaced by 85g of
metaldehyde and 10g of dimethylglyoxime.

When burnt, the undivided tablets produced faint sparks shooting out to distances often in excess of 80mm. The divided tablets produced faint sparks shooting out to distances sometimes in excess of 90mm and bright flashes of light appeared around the tablets.

Example 23

Example 20 was repeated with the 95g of hexamethylenetetramine being replaced by 85g of metaldehyde and 10g of hexamethylenetetramine.

When the divided tablets were burnt suspended in the air by holding the free end of each rod in the hand they produced a display of silver sparks.

Example 24

Example 17 was repeated with the 95g of dimethylglyoxime being replaced by 90g of dimethylglyoxime and 5g of hexamethylenetetramine.

The undivided and divided tablets produced the same effect as described in Example 17 when burnt.

Example 25

The 89g of metaldehyde in Example 2 was replaced by a mixture of 5g of hexamethylenetetramine, 8g of dimethylglyoxime and 76g of metaldehyde.

The burning tablets produced sparks with similar characteristics to those of example 2, but all trace of colouration to the flame due to the copper phthalocyanine was absent.

In the above examples, in the event that the spark producing materials are subject to corrosion, as the case may be with, for example iron and magnesium, the materials can be coated either chemically or physically, to inhibit any deleterious effect. Examples of chemical coating are the known processes of chromating or molybdating. Examples of physical coating are the known processes of applying coatings of salts of 3, 5-

dinitrobenzoic acid and accaroid resin.
Those skilled in the art will appreciate that the spark producing materials used in the preceding examples may be replaced with any of steel, chromium, cobalt, zirconium, a zirconium-nickel alloy, zirconium hydride, titanium hydride, carbon, titanium boride, zirconium boride, zirconium silicide and silicon carbide.

Similarly, those skilled in the art will appreciate that the colour producing materials used in the preceding examples may be replaced with any of a barium compound, a boron compound, a sodium compound, boron trioxide, copper oxalate and strontium oxalate.

In terms of adhesives, those skilled in the art will appreciate that in place of dextrin, any of shellac, gum Arabic, accaroid resin and nitrocellulose may be used.

Where guanidine nitrate has been used, this may be replaced with guanidine thiocyanate or dicyandiamide.
CLAIMS

1. A composition comprising metaldehyde and/or hexamethylenetetramine and/or an oxime, and a material which produces sparks during combustion.

2. A composition according to claim 1, wherein the spark producing material comprises one or more of: iron, steel, chromium, aluminium, magnesium, cobalt, titanium, hafnium, zirconium, niobium, tantalum, a zirconium-nickel alloy, zirconium hydride, titanium hydride, a magnesium-aluminium alloy, carbon, titanium carbonitride, titanium boride, zirconium boride, zirconium silicide and silicon carbide.

3. A composition according to claim 1 or claim 2, wherein the spark producing material comprises one or more of: magnesium grade 3 cut or atomised, magnesium grade 6 cut or atomised, titanium 250 mesh or finer, hafnium 40 microns or less, niobium 5 microns or less, tantalum 5 microns or less, iron 10 microns or less, magnesium-aluminium alloy (magnalium) 100 mesh or finer, titanium carbonitride 2 microns or less and aluminium 200 mesh or finer.

4. A composition according to any of the preceding claims, wherein the spark producing material is coated with a corrosion inhibitor, for example by chromating, molybdatating, or by applying a coating of a salt of 3, 5-dinitrobenzoic acid or accaroid resin.

5. A composition according to any of the preceding claims, further comprising a material which produces a coloured flame during combustion.

6. A composition according to claim 5, wherein the colour producing material comprises one or more of the following materials: a barium compound, a boron compound, a copper compound, a lithium compound, a sodium compound, and a strontium compound.

7. A composition according to claim 5 or claim 6, wherein the colour producing material comprises one or more of: boron trioxide, copper oxalate, copper oxychloride, copper phthalocyanine, lithium carbonate, strontium carbonate, strontium formate, and strontium oxalate.

8. A composition according to any of claims 5 to 7, further comprising a colour enhancing
material.

9. A composition according to claim 8, wherein the colour enhancing material comprises chlorine.

10. A composition according to claim 9, wherein the colour enhancing material is an organic material comprising chlorine, such as chlorinated rubber.

11. A composition according to any of the preceding claims, further comprising one or more of: an inorganic perchlorate, such as potassium perchlorate, an inorganic nitrate, such as potassium nitrate, or an organic compound, such as guanidine nitrate, guanidine thiocyanate or dicyandiamide.

12. A composition according to any of the preceding claims, further comprising an adhesive.

13. A composition according to claim 12, wherein the adhesive comprises one or more of: dextrin, shellac, gum Arabic, acaroid resin, and nitrocellulose.

14. A pyrotechnic device comprising the composition of any of claims 1 to 13.

15. A pyrotechnic device according to claim 14, wherein the pyrotechnic device is an indoor firework.

16. A pyrotechnic device according to claim 14 or 15, wherein the composition is rolled to form a pill.

17. A pyrotechnic device according to claim 14 or claim 15, wherein the composition is consolidated to form a tablet.

18. A pyrotechnic device according to claim 16 or claim 17, wherein the pill or tablet comprises at least one perforation for suspending the tablet above a base surface.

19. A pyrotechnic device according to claim 18, wherein the inner surface of the, or of each, perforation is lined with a non-combustible, infusible substance.

20. A pyrotechnic device according to any of claims 14 to 17, further comprising a spindle
or hook embedded in the composition.

21. A pyrotechnic device according to claim 16 or 17, wherein the tablet or pill is mounted on a base surface.

22. A pyrotechnic device according to claim 21 when dependent on claim 17, wherein the tablet is mounted on the base surface in a flat configuration.

23. A pyrotechnic device according to claim 21 when dependent on claim 17, wherein the tablet is mounted on the base surface on edge.

24. A pyrotechnic device according to any of claims 21 to 23, wherein the base surface is a flat surface.

25. A pyrotechnic device according to any of claims 21 to 23, wherein the base surface contains a groove or indentation, or a pattern of raised regions or one or more spigots to receive and retain the tablet.

26. A pyrotechnic device according to any of claims 21 to 25, wherein the tablet is affixed to the base surface by an adhesive.

27. A pyrotechnic device according to any of claims 14 to 20, wherein the device comprises a support for suspending the composition above a base surface, the composition being mounted on the support.

28. A pyrotechnic device according to claim 27, wherein the support comprises a rod or wire having first and second portions, the composition being affixed to the first portion and the second portion providing a handle by which the rod or wire may be held, in use.

29. A pyrotechnic device according to claim 27, wherein the support is mounted on the base surface.

30. A pyrotechnic device according to claim 14 or claim 15, wherein the composition is confined in a container.

31. A pyrotechnic device according to claim 30, wherein the device comprises a support for
suspending the container above a base surface, the container being mounted on the support.

32. A pyrotechnic device according to claim 31, wherein the support comprises a rod or wire having first and second portions, the container being affixed to the first portion and the second portion providing a handle by which the rod or wire may be held, in use.

33. Use of the composition of any of claims 1 to 13 to make a pyrotechnic device.

34. A composition substantially as hereinbefore described.

35. A pyrotechnic device substantially as hereinbefore described.
Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

<table>
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<tr>
<th>Category</th>
<th>Relevant to claims</th>
<th>Identity of document and passage or figure of particular relevance</th>
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<tr>
<td>X</td>
<td>1-33</td>
<td>GB2153809 A (PYRO-CHEMIE) Whole document relevant</td>
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<td>SU1798346 A1 (UNIV KARAGANDIN) See especially WPI Abstract Accession Number 1994-157619 [19]</td>
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<td>JP58041791 A (KANEKO) See especially WPI Abstract Accession Number 1983-37864K [16]</td>
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<td>X</td>
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<td>US5071495 A (WILLER ET AL.) See especially column 1, line 64 to column 2, line 53</td>
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<td>X</td>
<td>1-33</td>
<td>SU1833354 A3 (LASHKOV ET AL.) See especially WPI Abstract Accession Number 1995-059618 [08]</td>
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Categories:

| X | Document indicating lack of novelty or inventive step |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. |
|   | Member of the same patent family |
| A | Document indicating technological background and/or state of the art. |
| P | Document published on or after the declared priority date but before the filing date of this invention. |
| E | Patent document published on or after, but with priority date earlier than, the filing date of this application. |

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

C06B; F42B

The following online and other databases have been used in the preparation of this search report:

WPI, EPDOC, TXTE
### International Classification:

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