Binder for pyrotechnic charges
DE 4343725 A1

ABSTRACT

A binder for pyrotechnic charges, e.g. signal charges, solid fuel, fireworks etc., contains polyvinyl butyral (PVB). Pref. PVB is added to the charge in amts. of 0.2-5 (pref. 1-2) wt.%, esp. in the form of a 2-10 (pref. 5-7) wt.% soln. in ethanol. The alcoholic soln. may also contain cellulose nitrate, with ethyl glycol as plasticiser.

DESCRIPTION

The invention relates to a binder for pyrotechnic compositions according to the preamble of claim 1.

Such pyrotechnic include sets of signals that come about in distress signal handling capability, solid propellants and effect or decoration kits for fireworks, flares in the civil and military engineering etc.

The diverse set of compilations are known from the prior art. When signal sets fuels, oxidants and chlorine donor for red, green or blue colors are constructed as far as possible on the same basis. Otherwise, it is stored in certain additives designed to bring a special effect. Depending on the particular use here the range is much wider. Among the aggregates and the binder can be expected, whose job it is, among other things, to ensure the strength of the pyrotechnic actuators, such. As the strength of rolled or pressed sugar-coated or fireworks stars or signal sets.

In addition to this urgent task the binder further set specific needs required of him. They should by solubility in various media, enable granule formation of pyrotechnic materials, so that this gain for a better flow properties and thus a mechanized dosing and tablettability is achieved. They must continue to create the conditions for the pyrotechnic composition that, wetted with the solvent, these systems adherent to roll on a core during coating.

The binder also have the task of minimizing hazardous dust particles of pyrotechnic.

In addition, binders act differently capable of dissipating energy in the combustion of pyrotechnic and thereby determine the burn-off, the light output and color, ie a total pyrotechnic effect.

There are known binder and application, which reduce the burn rate of the pyrotechnic composition and thus act as retardants, but also those that activate the set, ie increase the burning rate. In each case, and depending on the usage is to decide on the particular application.

Pyrotechnic how to find such. As in distress signal means use and there are as parachute flares or torches standard equipment on ships shall be in line with the international IMO Resolution particularly high requirements in terms of light intensity, focal length, color quality and burn evenly. For example, strong spray and radio emission glowing effect and the rate arrears in torches are prohibited, while these properties often desirable for decoration fireworks. By using suitable binder can effectively influence and control these processes.

In the selection of the binder are also critical residues occurring during the thermal decomposition of the pyrotechnic composition. Although known binders often have the advantage that they are relatively inexpensive and, in conjunction with water as solvent a cost effective alternative, such. As dextrin, lactose, sticky rice, starch or gum arabic. However,

CLAIMS

1. binder for pyrotechnic actuators, such as sets of signals, solid propellants, fireworks decoration sets or the like, wherein the binder is polyvinyl butyral.

2. The binder of claim 1, characterized in that the pyrotechnic polyvinyl butyral in proportions between 0.2 wt% and 5 wt%, preferably% to 2% is added between 1 wt.

3. A binder according to claim 1 or 2, characterized in that the polyvinyl butyral is dissolved in a solvent.

4. A binder according to claim 3, characterized in that the solvent is added in a proportion of 2 to 10 wt%, preferably 5 to 7% by weight.

5. A binder according to claim 3 or 4, characterized in that the solvent is ethanol.

6. Binder according to claim 3 or 4, characterized in that dissolved in the alcohol solvent contains cellulose nitrate.

7. A binder according to claim 6, characterized in that the cellulose nitrate dissolved in polyvinyl butyral is plasticized with ethylene glycol.
these binders show when using metals as fuel their limits. They also dry slowly, this lengthy drying in the mentioned use of fine metal powders does not run as fuel necessarily easily.

Likewise binder based on rubber acaroides dissolved in ethanol are known which are specially used in the manufacture of fireworks stars in coating pans. Although these binders are functionally suitable, but have the major disadvantage of inadequate solubility and get away with it due to longer drying times plasticity with respect to water-soluble binder systems close.

The use of water-soluble and alcohol-soluble binder is a high level of knowledge of the matter and good observation skills, especially in the production of sugar-coated Fireworks Star and drying, ahead.

Other binders such as, for. Example, polyurethanes, polyacrylates, polyvinyl acetates, phenolic resins or epoxy resins, are allocated to certain uses. They usually desensitize very strong and are not easily in their application and processing as well as in the thermal decomposition.

The invention has for its object to provide a binder for powerful pyrotechnic compositions that affect their favorable simplify particular the production, processing, storage and drying and improve specific properties of the pyrotechnic composition, in particular its performance parameters and pyrotechnic effects.

According to the invention this object is achieved in that the binder used is polyvinyl butyral.

The polyvinyl butyral is blended in an amount between 0.2 wt% and 5 wt%, preferably between 1 weight% and 2% by weight in the pyrotechnic composition.

For other production and uses, it is also useful to the polyvinyl butyral in a solvent, preferably ethanol, and to solve it so in an appropriate concentration and stakes admit the pyrotechnic composition and mix intensively. The solvent is added in a proportion of between 2 to 10 wt%, preferably 5 to 7% by weight.

Due to the good tolerability of the polyvinyl butyral combinations such. As are matching with cellulose nitrate solutions, ie cellulose nitrate dissolved in alcohol and plasticized with ethylene glycol, meaningful.

Polyvinyl butyral over other binder in pyrotechnics significant advantages. These include:

- Polyvinyl butyral is an extremely fine-grained, free-flowing powder with a bulk density of about 0.25 grams per cubic centimeter. This means that only very small percentages required in the mixture of pyrotechnic materials for a pyrotechnic composition with very good distribution in the set;
- It has very good solubility for example in ethanol with this excellent adhesion, sticking and binding properties in the pyrotechnic composition, which leads to a very large homogeneity of the pyrotechnic;
- Allows for the mixture of pyrotechnic materials a very good granule formation;
- Is it favorably influenced the burnoff of the pyrotechnic composition;
- In color sets for signal averaging or fireworks high luminous efficacy is made possible with high color intensity;
- Only because of the short transition from plastic to solid state extremely low drying times can be achieved;
- Allows a very solid structure with pressed or rolled pyrotechnic compositions, such as fireworks stars, so that these high stress resist: Are these sentences used as pyrotechnic ammunition fired from a cartridge in the gun cup a pyrotechnic weapon, so they resist easily the local high gas pressure; pyrotechnics fireworks, such as fireworks star withstand rockets or fireworks bombs the high stresses during ignition of the bursting charge;
- By a different dosage of the binder in the various layers of the pyrotechnic composition is an intermittent "vibrant" combustion possible, which is a highlight in any fireworks;
- The resulting from the use of decomposition products are safe unlike some other binders.

In the following examples are given for pyrotechnic compositions, such as are. As for torches, verschießbare from as stun guns pyrotechnic ammunition and usable on a core of sugar-coated fireworks star.

First Example

For a hand torch with red paint during burn a mixture of powdered magnesium, strontium nitrate, potassium nitrate and about 1% polyvinyl butyral (marketed by Hoechst AG under the name Mowital) are added. This mixture is about 60 grams of ethanol per kilogram. Similarly, the addition of the same amount of a 10% plasticized nitrocellulose lacquer solution is possible. These components are thoroughly mixed in a vessel and give an excellent granules for further processing into compacts with high strength properties; these compacts can be stored easily and have good burn evenly on high light output and high color intensity under different climatic conditions.

Second Example

For a pyrotechnic ammunition with green color during combustion of a mixture of magnesium powder, barium nitrate and about 1% polyvinyl butyral added again. After adding a solvent of ethanol and cellulose lacquer, as above, the mixture is
well worked out, so that above results in a granule. This is pressed into aluminum sleeves. This set burns with intense green color. By replacing the barium nitrate against other components, a combustion can be achieved with a different color, such as, for example, strontium nitrate in a burn with intense red color. Such pyrotechnic ammunition can be fired from guns also or the like, resulting from the binding properties of the Polyvinylbutyrales and the homogeneity of the compact is no problem with the pressure.

Third example

For the production of yellow combustive fireworks stars a mixture of fine aluminum-magnesium powder, barium nitrate, cryolite and sodium oxalate is added about 2% by weight of polyvinyl butyral.

In a coating pan this mixture on seeds, such as rapeseed, mustard or Milökörner is applied by intensive mixing. The adhesive property of the polyvinyl butyral allows you to roll up or sugarcoating in the boiler easily to the desired size of the firework, so that through intermediate set and Anfeuerungssystem, in which also used as a binder polyvinyl butyral, round stars for firecrackers or fireworks bombs can be produced. Such stars have extremely low drying times to a maximum of 24 hours and can then be further processed. Because of their high internal strength they show themselves resistant to Zerlegerladungen in or fireworks fireworks bombs.

Fourth example

For a green and intermittently combustive fireworks star of a mixture of fine aluminum powder magnesium, barium nitrate and polyvinyl chloride may be added about 1.5% by weight of polyvinyl butyral and processed as above by adding a solvent in a coating pan and there applied to corresponding cores.

In such pyrotechnics another advantage of polyvinyl butyral can be exploited, which is that you can make with different percentage additions of the binder in pyrotechnic mainly white, but red, yellow and green stars with intermittent or "vibrating" combustion which always leads to a climax in any fireworks.

PATENT CITATIONS

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<th>Cited Patent</th>
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<th>Publication date</th>
<th>Applicant</th>
<th>Title</th>
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<tr>
<td>DE2644987C1 *</td>
<td>Oct 6, 1976</td>
<td>Apr 30, 1992</td>
<td>Dynamit Nobel Ag</td>
<td>Nitrocellulosefreies Treibladungspulver</td>
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<tr>
<td>DE2659539C1 *</td>
<td>Dec 30, 1976</td>
<td>Sep 24, 1992</td>
<td>Dynamit Nobel Ag</td>
<td>Verfahren zur Herstellung von Treibmittelkoerper fuer huelsenlose Munition mit definierter Porositaet</td>
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* Cited by examiner

CLASSIFICATIONS

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LEGAL EVENTS

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<td>Aug 1, 1996</td>
<td>8131</td>
<td>Rejection</td>
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