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(54) **SUSPENSION OF EXPLOSIVE COMPOSITION OF PILL FUSE HEAD FOR INDUSTRIAL ELECTRIC DETONATORS**

(57) The suspension of explosive composition of pill fuse heads for industrial electric detonators consisting of 30 - 60 wt. portions of potassium salt of dinitrobenzofuroxane, 15 - 35 wt. portions of potassium perchlorate, 5 - 20 wt. portions of zirconium, 5 - 20 wt. portions of boron, and 5 - 20 wt. portions of calcium silicide in a 1 - 5% solution of nitrocellulose or fluoroelastomer in an organic solvent. The organic solvent may be amyl acetate, butyl acetate, propyl acetate, or isomers thereof.

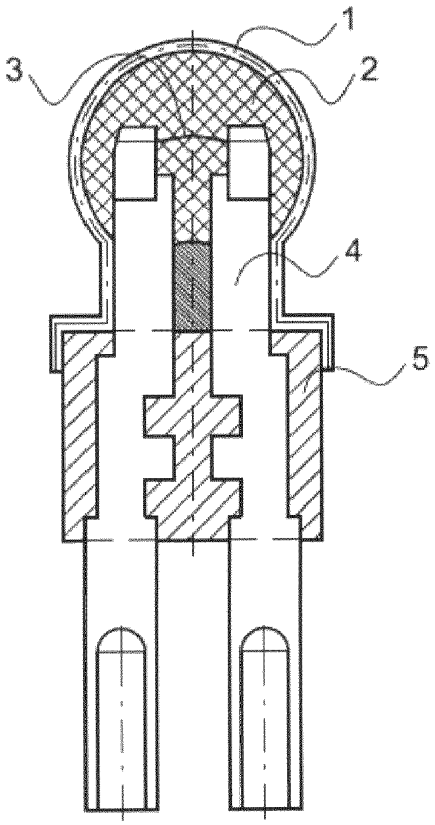

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Fig.1

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Description

Field of the Invention

[0001] The invention concerns the suspension of explosive composition of pill fuse head for industrial electric detonators created by dipping technology on its skeleton formed by metal lamellas and a resistance wire.

State of the Art

[0002] At present, suspensions of explosive compositions in solutions of nitrocellulose or fluoroelastomer in an organic solvent are used for the technology of the production of electric pill fuse heads by dipping. Those suspensions contain an explosive based on a lead salt and other components based on lead and non-lead oxidizers, metal powders, and binders, such as mentioned nitrocellulose or fluoroelastomer.

[0003] The dipping technology is based on simultaneous immersion of several thousand electric pill skeletons, formed by metal lamellas with a resistance wire, into a suspension of explosive composition, and thus the formation of electric pill fuse heads. These wet fuse heads are then dried out to remove the organic solvent, after which the fuse heads of the electric pills are provided with a lacquer layer of conventional lacquers to ensure mechanical and dimensional strength. In the dipping technology, suspensions of explosive composition must exhibit constancy of composition and sedimentation of the individual components must not occur.

[0004] The explosive composition of the pill fuse heads, after the organic solvents have been dried out, then coats the resistance wire, which is usually made of a NiCr alloy in a weight ratio of 80/20 and whose diameter ranges from 30 to 100 micrometres, or of a CuNi alloy containing 44% Ni, with a diameter of 170 micrometres. The explosive pill composition then determines the electrical parameters of the electric pill with respect to the resistance wire, such as: safe current and ignition current.

[0005] The electric pill thus formed can be used in an electric industrial detonator, where, after passing a predefined electrical impulse, the resistance wire of the electric pill is heated and subsequently the pill explosive composition is initiated, the burst of flame of which then transmits the heat burst to the pyrotechnic delay composition of the industrial electric detonator.

[0006] Therefore, the explosive composition must be sufficiently sensitive to the definably heated resistance wire of the electric pill to ignite it. The created burst of flame, formed by the explosive transformation of the individual components, then must not have an excessive pressure effect, but must have the calorific capacity to initiate the delay pyrotechnic composition of the electric detonator.

[0007] The above currently used formula of suspensions of the explosive composition of electric pill fuse heads is, however, unacceptable from the ecological point of view according to the current European legislation.

Principle of the Invention

[0008] The above shortcomings are eliminated by the suspension of explosive composition of pill fuse head for industrial electric detonators according to this invention, the essence of which is that it consists of 30 - 60 wt. portions of the potassium salt of dinitrobenzofuroxane, 15 - 35 wt. portions of potassium perchlorate, 5 - 20 wt. portions of zirconium, 5 - 20 wt. portions of boron, and 5 - 20 wt. portions of calcium silicide in 1 - 5% solution of nitrocellulose or fluoroelastomer in an organic solvent.

[0009] For proper function, it is withal advantageous, if the organic solvent is amyl acetate, butyl acetate, propyl acetate, or isomers thereof.

[0010] Such suspension of explosive composition has suitable rheological properties because its individual components do not sediment and it is technologically processable for multiple applications to the electric pill skeleton formed by metal lamellas with the resistance wire forming a bridge, where after the drying operation forms the electric pill fuse head.

[0011] The listed formula of the suspension of explosive composition applied to the resistance wire of the electric pill then, after drying the organic solvent and providing the lacquer layer, ensures the required sensitivity of the electric pill to initiation when heating the resistance wire of varying material composition and diameter, and the formed fumes after its explosive transformation generate regular burst of flame and allow regular ignition of the pyrotechnic delay composition in the electric detonator.

[0012] The concerned composition of the fuse head of the electric pill is harmless from the point of view of ecology because it does not contain any non-ecological components and does not create such by its explosive transformation. The explosive composition and its products after the explosive transformation are thus environmentally friendly.

[0013] The mentioned explosive composition can also be used as a separate electric pill or in an electric igniter assembly also for use in fireworks.

Brief Description of the Figures in the Drawing

[0014] The invention will be further elucidated with the aid of the drawing, in which Fig. 1 shows a vertical front cross section of the electric pill and Fig. 2 shows a vertical side cross section of this pill.

Examples of the Invention Design

[0015] The electric pill in Figs. 1 and 2 is formed by two metal lamellas 4 between which a resistance wire is arranged 3. Fixation of the lamellas 4 with the attached

resistance wire 3 is made by a plastic clip 5. The suspension of explosive composition 2 is applied to the resistance wire 3, or to the skeleton formed by endings of the lamellas 4 with the resistance wire 3, according to this technical solution and using the dipping technology. After drying out and removal of organic solvents, the explosive composition is provided with lacquer layer 1, in this case a nitrocellulose lacquer ensuring the mechanical strength of the electric pill fuse head thus formed.

Example 1

[0016] The suspension of the explosive composition 2 consists of 48 wt. portions of the potassium salt of dinitrobenzofuroxane, 25 wt. portions of potassium perchlorate, 9 wt. portions of zirconium, 9 wt. portions of boron, and 9 wt. portions of calcium silicide in a 1% solution of nitrocellulose in amyl acetate.

[0017] This suspension was applied by the dipping technology to a skeleton with a resistance wire 3 made of NiCr (80/20) alloy with a wire diameter of 30 micrometres, in which case the subsequently formed electric pill fuse head exhibited the parameters of safe current 0.18A and ignition current 1A.

Example 2

[0018] The suspension of explosive composition 2 consists of 48 wt. portions of the potassium salt of dinitrobenzofuroxane, 25 wt. portions of potassium perchlorate, 9 wt. portions of zirconium, 9 wt. portions of boron and, 9 wt. portions of calcium silicide in a 3% solution of fluoroelastomer in butyl acetate.

[0019] This suspension was applied by the dipping technology to a skeleton with a resistance wire 3 made of NiCr (80/20) alloy with the wire diameter of 55 micrometres, in which case the subsequently formed electric pill fuse head exhibited the parameters of safe current 0.45A and ignition current 1.5A.

Example 3

[0020] The suspension of explosive composition 2 consists of 55 wt. portions of the potassium salt of dinitrobenzofuroxane, 15 wt. portions of potassium perchlorate, 10 wt. portions of zirconium, 10 wt. portions of boron, and 10 wt. portions of calcium silicide in a 5% solution of nitrocellulose in amyl acetate.

[0021] This suspension was applied by the dipping technology to a skeleton with a resistance wire 3 made of NiCr (80/20) alloy with the wire diameter of 45 micrometres, in which case the subsequently formed electric pill fuse head exhibited the parameters of safe current 0.25A and ignition current 1.1A.

Example 4

[0022] The suspension of explosive composition 2 consists of 40 wt. portions of the potassium salt of dinitrobenzofuroxane, 15 wt. portions of potassium perchlorate, 15 wt. portions of zirconium, 15 wt. portions of boron, and 15 wt. portions of calcium silicide in a 5% solution of nitrocellulose in amyl acetate.

[0023] This suspension was applied by the dipping technology to a skeleton with a resistance wire 3 made of NiCr (80/20) alloy with the wire diameter of 100 micrometres, in which case the subsequently formed electric pill fuse head exhibited the parameters of safe current 1.2A and ignition current 3.5A.

Example 5

[0024] The suspension of explosive composition 2 consists of 55 wt. portions of the potassium salt of dinitrobenzofuroxane, 12 wt. portions of potassium perchlorate, 8 wt. portions of zirconium, 10 wt. portions of boron, and 15 wt. portions of calcium silicide in a 3% solution of nitrocellulose in butyl acetate.

[0025] This suspension was applied by the dipping technology to a skeleton with a resistance wire 3 made of CuNi (44% of Ni) alloy with the wire diameter of 170 micrometres, in which case the subsequently formed electric pill fuse head exhibited the parameters of safe current 4A and ignition current 25A.

Claims

1. The Suspension of Explosive Composition of Pill Fuse Head for Industrial Electric Detonators, **characterized by** consisting of 30 - 60 portions of the potassium salt of dinitrobenzofuroxane, 15 - 35 wt. portions of potassium perchlorate, 5 - 20 wt. portions of zirconium, 5 - 20 wt. portions of boron, and 5 - 20 wt. portions of calcium silicide in a 1 - 5% solution of fluoroelastomer in an organic solvent.

2. The Suspension of Explosive Composition of Pill Fuse Head for Industrial Electric Detonators according to Claim 1, **characterized by** the fact that the organic solvent is amyl acetate, butyl acetate, propyl acetate, or isomers thereof.

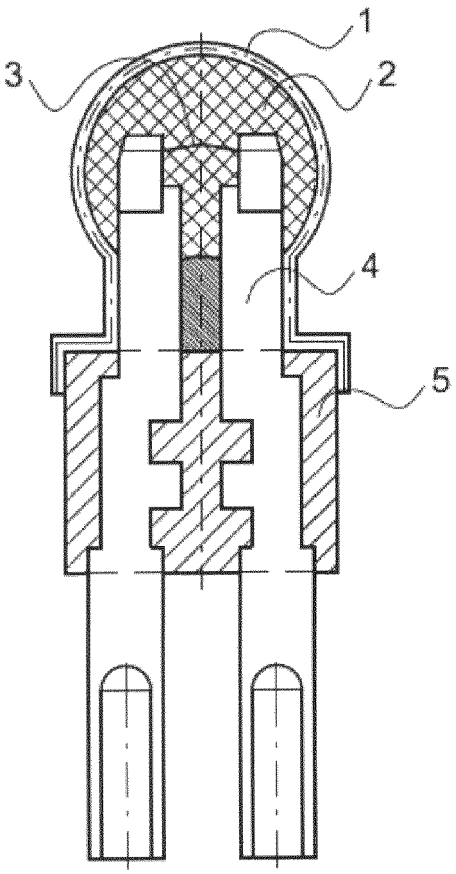

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Fig.1

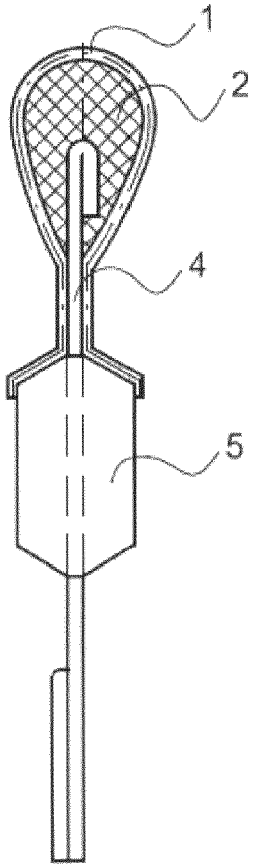

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Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 22 02 0161

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TECHNICAL FIELDS SEARCHED (IPC)

C06C
F42D
F42C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 December 2022	Kappen, Sascha

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