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EXPLOSIVE PLASTIC FOILS CONTAINING GELATINIZED NITROCELLULOSE

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The invention relates to novel self-supporting, adherent explosive foils which are useful for explosive molding; explosive plating and explosive hardening of metals.

Explosive foils are known and consist primarily of explosives such as nitropentaerythrite and/or trimethylene trinitramine and binding agents such as caoutchouc, plastomers, synthetic resins, etc. and they can be rolled out in plastic, flexible and ductile foils. To be used, all the foils have to be applied onto the workpieces being processed and since the foils have to cover the entire workpiece, they must be cut or rolled to the shape of the workpiece. When the area of the workpiece is large, i.e. plating of large surfaces, foils of about one or more square meters have to be used. This requires either correspondingly wide rollers or if only small foils are available, the foils must be laid next to each other. As the foils are not directly connected to each other but are only arranged in loose contact to each other, they form seam junctions on the workpieces after the explosion which seams frequently cause fissures and cracks.

It is not hitherto been possible to use ordinary commercial gelatinous explosives for these purposes which appeared practical for reasons of economy and safety of operation. However, the gelatinous explosives could not be produced in self-supporting form and consequently are unsuitable for many purposes. Since these explosives have little cohesive properties, they cannot be produced as self-supporting foils of constant thickness, strips or other shaped structures.

It is an object of the invention to provide novel self-supporting explosive foils which adhere to metal workpieces.

It is another object of the invention to provide novel explosive foils which are plastic and moldable.

These and other objects and advantages of the invention will become obvious from the following detailed description.

The moldable, self-supporting adherent explosive foils of the invention are 2 to 20 mm., preferably 2 to 5 mm. thick and are comprised of an explosive mixture consisting of nitrocellulose gelatinized with an explosive liquid nitric acid ester, and an explosive substance from the group consisting of alkaline nitrates, ammonium nitrate, cyclotrimethylene trinitramine, nitropentaerythrite and mixtures thereof, and 5–45% ferric oxide, the content of inert substances being between 10–60%. The foils may also contain other usual inert ingredients.

The explosive foils of the invention are plastic and moldable and can be easily cut straight or diagonally with a knife. Since they are moldable, the contact surfaces of adjacent foils whether merely touching or overlapping can be rolled together at the seam junctions with a hand roller to obtain an uninterrupted connection. Therefore, any explosive surfaces of any desired dimension can be prepared and since the foils are interconnected by the rolling, seam junctions on the workpiece after the explosion are eliminated. Moreover, since the foils are of uniform thickness, the workpieces are uniformly affected which was not possible with prior art foils.

Another advantage of the foils is the fact that they

adhere to the work pieces at slight pressures and air between the workpiece and the explosive foil is eliminated by rolling the foil on the workpiece with a hand roller. After the explosion, the surface of the workpiece is entirely smooth and unroughened. Since the explosive foils do not need to be rolled into large pieces, wide roller frames are not required. The advantageous properties of the foils are completely unexpected.

The nitrocellulose can be gelatinized with any type of explosive liquid nitric acid esters i.e. blasting oils. Examples of suitable esters are nitroglycerine, nitroglycol, diglycoldinitrate, etc. The explosive mixture may contain about 1.5 to 5% nitrocellulose gelatinized with about 25–70% of the said blasting oil. Examples of explosives to be added to the gelatinized nitrocellulose are cyclotrimethylene trinitramine, nitropentaerythrite or alkaline nitrates, ammonium nitrate, or mixtures of two or more of them in amounts up to 40% etc.

The explosive mixture according to the invention further contains 5–45% preferably 20–35% ferric oxide. There may be added further inert substances especially talc in amount of 2 to 25%.

The total amount of inert ingredients should be between 10 to 60%.

The explosive foils may contain other conventional additives such as wood dust, diesel-oil, inert additives, such as diatomaceous earth, clay, chalk, etc.

The explosive foils are easily prepared by spreading the nitrocellulose over the liquid nitric acid ester in a mixing vessel and the mixture is gelatinized at room temperature. The other ingredients are added to the mixing vessel and the entire mixture is worked into a homogeneous mass. This mass can be immediately rolled out into foils 2 to 20 mm., preferably 2 to 5 mm., thick. The mass may also be extruded through a nozzle or a slit.

In the following examples there are described several preferred embodiment to illustrate the invention. However, it should be understood that the invention is not intended to be limited to the specific embodiments.

Example I

34 parts by weight of nitroglycol were placed in a mixing vessel and 1.4 parts by weight of nitrocellulose having a nitrogen content of 12.2% were spread thereon. The resulting mixture was gelatinized at room temperature and 18.4 parts of ammonium nitrate, 42.7 parts of ferric oxide, 2.5 parts of talc and 1 part of wood dust were added thereto and the mixture was worked into a homogeneous mass.

The resulting explosive mixture was rolled out on a roller frame into a foil sheet 5 mm. thick and 300 mm. wide and 600 mm. long. The said sheet was self supporting but non-resilient and could be easily cut with a knife. The sheet is sufficiently plastic and moldable so that overlapping edges of adjacent sheets can be hand rolled to a uniform thickness without a seam.

Example II

34 parts by weight of nitroglycol were placed in a mixing vessel and 2.5 parts by weight of nitrocellulose having a nitrogen content of 12.2% were spread thereon. After the resulting mixture was gelatinized at room temperature, 22.0 parts of ammonium nitrate, 25.0 parts of ferric oxide, 15.0 parts of talc and 1.5 parts of wood dust were added thereto and the mixture was worked into a homogeneous mass.

The explosive mixture was then rolled out on a roller frame into a foil sheet 5 mm, thick, 300 mm. wide and 600 mm. long. The said sheet was then rolled onto a V_2A steel sheet with a hand roller whereby the foil

sheet adhered firmly to the steel sheet. The steel sheet with the explosive foil sheet thereon was placed on a steel plate with a clearance angle of about 5° and then the explosive foil sheet was initiated with a No. 8 detonator. After the explosion, the steel sheet was completely and rigidly joined to the steel plate. The plating was satisfactorily smooth, bubble-free and free of oher defects.

Example III

Using the procedure of Example I, 28.35 parts by weight of nitroglycol and 2.1 parts by weight of nitrocellulose were gelatinized at room temperature and then 20.8 parts of ferric oxide, 12.5 parts of talc, 1.25 parts of wood dust and 35 parts of trimethylene trinitraamine were added and the mixture was worked into a homogeneous mass. The said explosive mass could be rolled out into foil sheets 2 mm. thick.

Example IV

Using the procedure of Example I, 34.0 parts by weight of nitroglycol and 2.5 parts of nitrocellulose having a nitrogen content of 12.2% were gelatinized at room temperature and then 25.0 parts of ammonium nitrate, 26.0 parts of ferric oxide, 11.0 parts of chalk and 1.5 parts of wood dust were added thereto and the mixture was worked into a homogeneous mass. The said explosive mixture could be rolled into a foil sheet of 4 mm. thickness.

Various modifications of the products of the invention may be made without departing from the spirit or scope thereof and it is to be understood that the invention is to be limited only as defined by the appended claims.

We claim:

1. Moldable, self-supporting, adhesive explosive foils 2 to 20 mm. thick and comprised of an explosive mixture consisting of nitrocellulose gelatinized with an explosive liquid nitric acid ester, and an explosive substance from the group consisting of alkaline nitrates, ammonium nitrate, cyclotrimethylene trinitramine, nitropentaerythrite and mixtures thereof, and 5 to 45% ferric oxide, the content of inert substances being between 10 to 60%.

2. The foil of claim 1 wherein the liquid nitric acid ester is nitroglycol.

3. The foil of claim 1 wherein the explosive substance is ammonium nitrate.

4. The foil of claim 1 wherein an addition of 2 to 25% talc is made.

5. The foil of claim 1 wherein the content of ferric oxide is 20 to 35%.

6. The foil of claim 1 having a thickness of 2 to 5 mm.

7. The foil of claim 1, wherein the foil contains an additive selected from the group consisting of wood dust and diesel oil.

8. A moldable, self-supporting adhesive explosive foil with a thickness of 2 to 5 mm. and comprised of an explosive mixture consisting of 1.0 to 5% nitrocellulose gelatinized with 25 to 70% of an explosive liquid nitric acid ester, up to 40% of an explosive selected from the group consisting of cyclotrimethylene trinitramine, nitropentaerythrite, ammonium nitrate, alkaline nitrates and mixtures thereof, 5 to 45% of ferric oxide and 2 to 25% talc, the total amount of inert ingredients being 10 to 60% of the foil.

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