United States Patent Office 3,391,036 Patented July 2, 1968

3,391,036
RIOT CONTROL CHARGES

Peter James Robert Bryant, Salisbury, Albert Richard Owen, Bridgwater, Somerset, and Frank Sidney Scanes, Salisbury, England, assignors to the Secretary of State for Defence in Her Britannic Majesty's Government of the United Kingdom of Great Britain and Northern Ireland, London, England

No Drawing. Filed Dec. 23, 1966, Ser. No. 604,492
6 Claims. (Cl. 149—19)

The invention relates to methods for subduing or controlling agitated or aggressive people, such as rioters or lawbreakers, by means of chemical agents hereinafter called riot-control agents which are dispersed into the atmosphere.

British patent specification No. 967,660 describes riot control apparatus comprising a container which houses a charge containing a riot-control agent which is o-fluoro-, o-chloro-, o-bromo-, o-nitro-, o-cyano- or o-hydroxy-malononitrile and which has means for emitting the charge so that it is dispersed in a particulate form into the surrounding atmosphere. In a preferred form of apparatus described the charge consists of an ortho-substituted benzal malononitrile riot-control agent admixed in a self-combustible composition which evolves gas on combustion in which the ortho-substituted benzal malononitrile is entrained without complete decomposition, and suitable self-combustible compositions which may be admixed with the riot-control agent to form the charge are described. Such charges are most often composed of mixture of dry, powdered constituents which have to be used in a consolidated state in order to control their rate of burning. In practice, the consolidation by pressing or pelleting the powdered charge can only be carried out satisfactorily in a cylindrical mould and a strict limitation is consequently placed upon the design of the charge container. This design limitation often prevents containers intended for use as projectiles from being formed in the most advantageous shape; for example, a cylindrical hand grenade can be thrown only by a lobbing action, which restricts its range considerably. Furthermore, the packaging and storage of cylindrical containers is inefficient.

It is an object of the present invention to provide an ignitable or self-combustible riot-control charge containing one of said ortho-substituted benzal malononitrile riot-control agents which charge does not require conventional consolidation within a charge container, and which may be filled into a charge container of any desired shape. The present invention also aims at providing such charges which have sufficient cohesive strength and inertness to be capable of use without requiring to be housed in a container.

According to the invention, an ignitable or self-combustible riot-control charge comprises o-fluoro-, o-chloro-, o-nitro-, o-cyano- or o-hydroxy-benzal (alternatively named benzylidene) malononitrile admixed with a polyester resin to yield a charge which may be formed into any desired shape and subsequently hardened to a solid, cohesive mass.

The ignitable charge in addition preferably contains an oxidising agent and a combustible organic fuel for example, lactose, sucrose or wheat starch. A small quantity of a stabilizer may be included, for example a metal oxide or carbonate, and also an inert absorbent material such as kaolin may be added in minor proportion to avoid local drowning of the charge owing to melting of one of the constituents.

The oxidising agent is preferably an inorganic oxidising agent such as a nitrate, chlorate or perchlorate and the proportion of oxidising agent is chosen to give the ignitable charge a desired rate of burning. A large excess of oxidising agent over that proportion required for complete combustion of the charge is undesirable as the charge would then be objectionably friction sensitive.

The polyester resin is preferably one which will set i.e. cure, at temperatures below about 60° C. and most conveniently at room temperature in a reasonably short period of time i.e. up to about four hours. A typical polyester resin which may be used in the riot-control charge provided by the present invention consists of 30% styrene and 70% of a polyester consisting of linear condensation products of propylene glycol with phthalic or maleic acid. However, a wide variety of commercially available polyester resins may be used includes A250, 262/32, and 2591 (British Resin Products Ltd.); SR17438, 17449, 18979, 19095, 19229 (Bakelite Ltd.); Crystic 189, 195, 197 and Marco 5B.28D (Scott Bader and Co.

The curing of the polyester resin may be initiated by a peroxide catalyst such as methyl ethyl ketone peroxide. A suitable commercially-available catalyst is Cellobond X7764 (British Resin Products). A promoter such as cobalt naphthenate may be used advantageously and a suitable commercially-available promoter is Cellobond X7761 (British Resin Products).

The polyester resin may replace part or all of the proportion of fuel provided in self-combustible charges described in British patent specification No. 967,650 in addition to acting as a binder for the other charge ingredients.

When admixed with the said ortho-substituted benzal malononitrile derivatives and any desired additional ingredients, the polyester resin yields a charge which is initially in a plastic condition and which consequently may be readily filled into containers of any shape and therein finally set to a solid charge. This solid charge has better storage characteristics than prior charges since the polyester resin tends to encapsulate and thus protect the other ingredients of the charge from the storage environment. Furthermore, the resistance of the new charges to water is improved by the resinous coating, and the hazards, from dust for example, of handling these charges are much reduced.

The ignitable charges provided by the present invention are solid when set and have considerable cohesive strength owing to the presence of the polyester resin and it is clearly within the scope of the present invention to provide unconfined free-burning blocks of resin-bonded charges which are water-proof, require no special packaging and are strong enough to be propelled by conventional methods.

A typical example of a process for preparing the ignitable charges provided by the invention will now be described.

The finely-divided solid components of the charge are sieved to remove objectionable aggregates and weighed quantities are mixed by hand or in a drum mixer and the mixture is sieved once more. An excess of the polyester resin is then weighed out and a catalyst and any promoter required is added at this stage. The correct amount of catalysed resin is then poured into a mechanical mixer (for example, a Beken Duplex Mixer) and the mixed solid components are added. Mixing is carried out for at least 15 minutes to yield a plastic composition which may be filled into a container of any desired shape by any suitable method (e.g. hand-stemming, pouring or extrusion chosen to suit the viscosity of the plastic composition).

A typical composition range by weight for ignitable charges in accordance with the invention is as follows:

	Percent
o-Substituted benzal malononitrile	25–40
Polyester resin	15–30
Oxidizing agent	20–35
Oxidizable fuel	0–15

Other conventional additives, including inert absorbents such as kaolin, may be included in the charges.

Particular examples of ignitable charges will now be described. Proportions are given as percentages by weight.

Example 1

	Percent
o-Chloro benzal malononitrile	[illegible]
Polyester resin (British Resin Product's A262/32)	[illegible]
Potassium chlorate oxidizing agent	[illegible]
Lactose fuel	[illegible]
Kaolin	[illegible]

This charge has a burning rate of 0.15 g./cm.²/sec. and disperses into the atmosphere unchanged up to about 90% of its o-chloro-benzal malononitrile content.

Example 2

	Percent
o-Chloro benzal malononitrile	[illegible]
Polyester resin (British Resin Product's A262/32)	[illegible]
Potassium chlorate oxidising agent	[illegible]

This charge is a slower burning charge than that of Example 1 (having a burning rate of 0.015 g./cm.²/sec.) in which conventional fuel has been replaced completely by polyester resin.

Example 3

	Percent
o-Chloro-benzal malononitrile	[illegible]
Polyester resin (British Resin Product's A262/32)	[illegible]
Potassium chlorate oxidising agent	[illegible]
Lactose fuel	[illegible]

The burning rate of this composition is 0.67 g./cm.²/sec.

Example 4

	Percent
o-Chloro-benzal malononitrile	[illegible]
Polyester resin (British Resin Product's A262/32)	[illegible]
Potassium chlorate oxidising agent	[illegible]
Kaolin	[illegible]

The burning rate of this composition is 0.015 g./cm.²/sec.

Example 5

	Percent
o-Chloro-benzal malononitrile	[illegible]
Polyester resin (British Resin Product's A262/32)	[illegible]
Potassium chlorate oxidising agent	[illegible]
Lactose fuel	[illegible]

The burning rate of this composition is 0.052 g./cm.²/sec.

Example 6

	Percent
o-Chloro-benzal malononitrile	[illegible]
Polyester resin (British Resin Product's A262/32)	[illegible]
Potassium chlorate oxidising agent	[illegible]
Lactose fuel	[illegible]

The burning rate of this composition is 0.45 g./cm.²/sec.

Ignitable charges in accordance with the invention may be ignited in any convenient way, for example by means of a percussion cap, a pull wire friction ignition device or match composition.

However, in accordance with a feature of the invention, these ignitable charges may be ignited by a polyester resin-bonded match composition which, in turn, is first struck by a polyester resin-bonded striker composition. Two typical examples of such match compositions have the following composition by weight:

Composition 1

	Percent
Cascophen resin	37.5
Hardener	7.5
Kaolin	10.0
Potassium chlorate	45.0

Cascophen Resorcinal Resin is manufactured by Leicester Lovell and Company Ltd.

Composition 2

	Percent
Cascophen resin	37.5
Hardener	7.5
Potassium chlorate	55

A typical striker composition contains by weight:

Polyester resin	50
Red Phosphorus	50

We claim:

1. An ignitable or self-combustible riot-control composition which comprises, o-fluoro-, o-chloro-, o-bromo-, o-nitro-, o-cyano-, or o-hydroxy-benzal malononitrile admixed with a polester resin.

2. An ignitable or self-combustible riot-control composition which comprises by weight about 25–40% o-fluoro-, o-chloro-, o-bromo-, o-nitro-, o-cyano-, or o-hydroxy-malononitrile, about 15–30% polyester and about 20–35% oxidising agent.

3. A composition as claimed in claim 2 and in which the oxidising agent is potassium chlorate.

4. A composition as claimed in claim 2 and in which said polyester resin consists by weight of about 30% styrene and about 70% of the linear condensation products from propylene glycol and phthalic or maleic acid.

5. A composition as claimed in claim 2 and which contains up to 15% by weight of an oxidisable fuel.

6. A composition as claimed in claim 5 in which said fuel is lactose.

References Cited

UNITED STATES PATENTS

3,314,835 4/1967 White et al. ..... 167—40

BENJAMIN R. PADGETT, *Primary Examiner.*