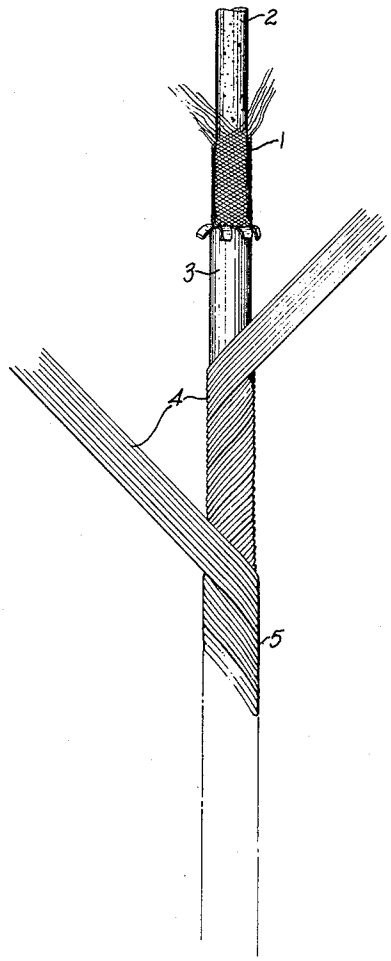
Nov. 3, 1964 J. M. SMITH 3,155,038

DETONATING FUSE

Filed Sept. 21, 1962



INVENTOR.
JOHN M. SMITH
BY Lindsey, Prutzman and Hayes
ATTORNEYS

United States Patent Office

3,155,038
Patented Nov. 3, 1964

3,155,038

DETONATING FUSE

John M. Smith, Simsbury, Conn., assignor to The Ensign-Bickford Company, Simsbury, Conn., a corporation of Connecticut

Filed Sept. 21, 1962, Ser. No. 225,299
5 Claims. (Cl. 102—27)

This invention relates generally to fuses of the type used to initiate explosives and is more particularly directed to the provision of an improved detonating fuse of the type generally referred to as textile detonating fuses.

It has been determined that a general purpose detonating fuse should have the following general characteristics: (*a*) the ability to be initiated by a blasting cap or other detonating device; (*b*) the ability to initiate itself either by a lap connection or a knot connection; (*c*) the ability to initiate all cap-sensitive explosives; and (*d*) the ability to initiate and propagate when wet or dry. It is a primary object of this invention to provide such an improved detonating fuse.

It is a further object of this invention to provide an improved detonating fuse that is economical to manufacture, reliable in use and comparatively safe to use in a wide variety of environments but one that requires only 20–25 grains per foot of explosive.

Other objects will be in part obvious, and in part pointed out more in detail hereinafter.

In the drawing, the single figure is a front plan view of the cord partially formed of a typical detonating fuse manufactured in accordance with the present invention.

In furtherance of the objects of this invention, an explosive detonating fuse has been developed having a woven or braided sheath 1 positioned around the explosive core 2. Depending upon the environmental conditions of the intended use of the cord, the textile sheath can, if desired, be provided with a plastic jacket such as a polyethylene jacket 3 over which is wrapped textile countering yarn 4. A wax or other coating 5 can be applied as the final outside covering. It is to be understood, however, that a primary advantage of the present invention is the provision of a detonating fuse that fulfills the stated objects while using only a textile sheath and that additional cord coverings are a matter of choice.

Turning now to a detailed consideration of the core 2, it is observed that the provision of a core which will insure the ability of the detonating fuse to meet the requirements of the stated objects is dependent upon the type of explosive utilized, the construction and arrangement of the core, and the core weight per foot of fuse. Turning first to the selection of a suitable explosive, it has been found that material known as pentaerythritol tetranitrate, commonly called PETN, produces unexpected advantages as the core load for the detonating fuse of this invention. Other known high explosives such as, cyclotrimethylene trinitramine (RDX), lead azide or styphnate, nitromannite, picyrl sulfone, or bis(trinitroethyl)urea represent additional explosive materials whose use in accordance with the present invention fails to insure compliance with all of the stated requirements.

The construction and arrangement of the core recognizes that the particle size of the explosive is of substantial importance. While exceptionally fine (superfine) particles of PETN would assist in meeting certain of the

listed requirements of the optimum detonating fuse and would permit reduction in the magnitude of the core load to weights in the order of 5 grains PETN or less per foot, such a particle size does not represent an economic practicality nor does it provide for reliable compliance with the stated requirement that the fuse must initiate all cap-sensitive explosives. However, merely increasing explosive particle size does not insure compliance with the stated requirements since the particles must be sufficiently fine to provide proper sensitivity of detonation propagation while being large enough to permit control of the core packing density as well as to facilitate manufacture of the core. Accordingly, the present invention provides a mixture of PETN particle sizes which, when homogeneously distributed in the core, insure compliance with the stated requirements, PETN having the following screen analysis as determined on United States standard screens has been determined to be preferred:

Percentage of Mixture Collected—

On a 30 mesh screen—0% maximum.
On a 50 mesh screen—5% maximum.
On a 100 mesh screen—25% ±10%.
On a 325 mesh screen—40% ±10%.

Percentage of Mixture That Passes—

Through a 325 mesh screen—35% ±10%.

Such a PETN mixture when provided as a white crystaline powder substantially free from visible mechanical impurities and having a density of approximately .8 to .9 gram per milliliter has been found to be the preferred mixture.

Turning now to the parameter of core weight, it has been found that the above-listed blend of particle sizes of PETN when used at a core weight of approximately 25 grains per foot provides an explosive detonating fuse which meets all of the stated requirements for a detonating fuse. It is to be realized, of course, that some variation can be effected in the core weight. For example, utilization of the preferred PETN mixture at a core weight of 20 grains per foot has been found to meet all of the stated criteria except that it was unable to reliably initiate all of the presently available explosive primers or detonators. Accordingly, it is believed that the minimum core load should exceed 20 grains per foot and should preferably be 25 grains per foot. A 25 grain load is also a practical maximum unless manufacturing costs are of little concern.

As will be apparent to persons skilled in the art, various modifications and adaptations of the invention above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

I claim:

1. An explosive detonation fuse comprising a continuous core of high explosive contained within a textile sheath, said core being a mixture of particles of pentaerythritol tetranitrate having a screen analysis of 100 percent particles which pass through a 30 mesh screen 35 percent (±10 percent) particles which pass through a 325 mesh screen and 65 percent (±10 percent) particles which collect on a 325 mesh screen arranged in a concentration of at least 20 grains per foot of cord length.

2. The explosive detonation fuse of claim 1 wherein

the particles of pentaerythritol tetranitrate collected on a 325 mesh screen include a minor proportion of particles that collect on a 100 mesh screen.

3. The explosive detonating fuse of claim 1 wherein the pentaerythritol tetranitrate particles are arranged in a concentration of at least 25 grains per foot of cord length.

4. An explosive detonation fuse comprising a textile sheath encasing a continuous core of at least 20 grains per foot of length of granular pentaerythritol tetranitrate having a mixture of particles of a size such that no particles are collected on a 30 mesh screen, a maximum of 5 percent of the particles are collected on a 50 mesh screen, 25 percent (±10 percent) of the particles are collected on a 100 mesh screen, 40 percent (±10 percent) of the particles are collected on a 325 mesh screen, and the remainder of the particles pass through a 325 mesh screen.

5. The explosive detonating fuse as set forth in claim 4, wherein the continuous core contains 25 grains of granular pentaerythritol tetranitrate per foot of length.

References Cited by the Examiner

UNITED STATES PATENTS

2,239,051	4/41	Pearsall et al.	102—27
2,891,475	6/59	Dolan et al.	102—27
2,992,087	7/61	Fassnacht	149—111 X

FOREIGN PATENTS

839,832	6/60	Great Britain.

OTHER REFERENCES

"Military Explosives," Dept. of the Army Technical Manual 9–1910, April 1955, p. 138 relied on.

SAMUEL FEINBERG, *Primary Examiner.*