March 5, 1929. W. L. WEDGER 1,704,231

SAFETY RAILWAY SIGNAL TORPEDO AND PROCESS OF MAKING THE SAME

Filed April 18, 1927

Fig. 1.

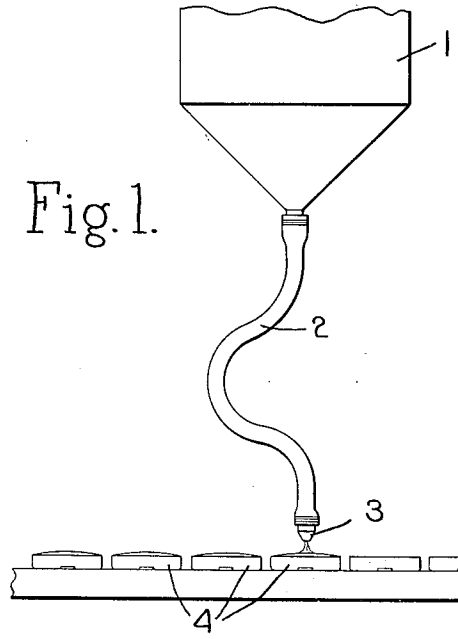


Fig. 2.

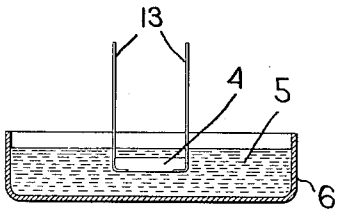


Fig. 3.

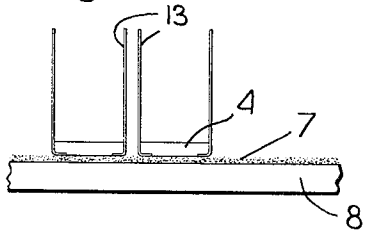


Fig. 4.

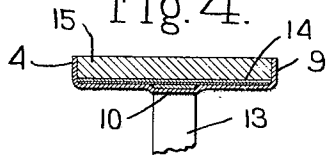


Fig. 5.

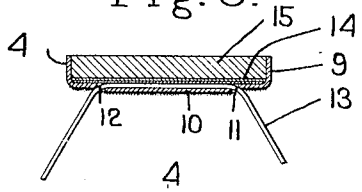


Fig. 6.

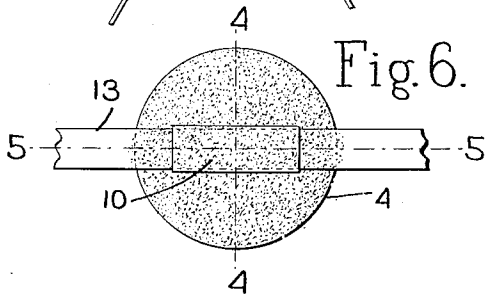


Fig. 7.

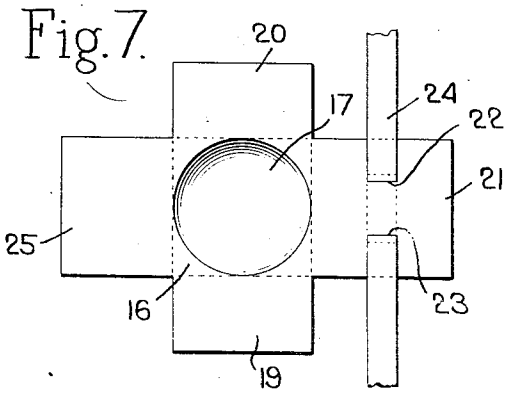
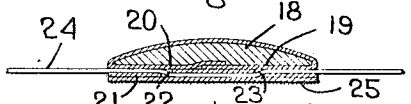


Fig. 8.



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Attys.

Patented Mar. 5, 1929. 1,704,231

UNITED STATES PATENT OFFICE.

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SAFETY RAILWAY SIGNAL TORPEDO AND PROCESS OF MAKING THE SAME.

Application filed April 18, 1927. Serial No. 184,493.

This invention relates to improvements in safety signal track torpedoes and the process of manufacture thereof.

The explosive composition heretofore used in railway signal torpedoes comprises essentially potassium chlorate as the oxidizing agent, sulphur as the reducing agent, common sand as an abrasive to generate friction and increase sensitiveness to the impact of the locomotive wheel, and dextrine to serve as a binder when the explosive is moulded while in plastic form in or to fit the containers thereof.

One of the objects of the invention is to provide a railway signal torpedo of greater efficiency, by the employment of a well-balanced, chemical formula, constituting the explosive thereof, which develops a louder noise than has heretofore been obtained in torpedoes of the usual weight and size used by railroads, and to provide a torpedo possessing greater stability to friction and concussion than those of the character above described.

This is accomplished in the present invention by employing potassium perchlorate wholly or mainly in place of potassium chlorate as the oxidizing agent. Potassium perchlorate contains a larger amount of available oxygen than potassium chlorate, but is less sensitive and not liable to spontaneous ignition. When ignited with sulphur, however, it produces a more powerful explosive by reason of the greater quantity of oxygen liberated to combine with the sulphur and other reducing ingredients which may be employed. The increased volume of noise produced by torpedoes embodying the present invention insures the report being heard in the cab of the locomotive. The use of potassium perchlorate as the oxidizing agent of the explosive composition provides complete immunity from all danger of dissociation of the explosive ingredients during manufacture and subsequent storage and also prevents the possibility of what is termed "en masse" or sympathetic detonation to a very large extent.

In order to increase the sensitiveness of the torpedo a small quantity of a supplemental and more active agent than sulphur is employed, such for example, as antimony sulphide, or a small quantity of potassium chlorate or both. When antimony sulphide is employed a more pronounced flash is obtained upon the detonation of the torpedo which serves as a visual signal in addition to the oral signal produced by the detonation of the torpedo.

It is well known by chemists that sulphur is liable to become acid when exposed to the humidity of the atmosphere and that when such acid comes in contact with a potassium chlorate explosive, spontaneous ignition takes place. Therefore, regardless of the non-acid qualities of the sulphur in the explosive composition of a torpedo when manufactured there is every probability that if the torpedo is subjected to a humid atmosphere, slow generation of free acid will follow, and either cause spontaneous ignition, or gradually reduce the oxygen from the potassium chlorate, thereby rendering the torpedo inert.

Another object of the invention is to provide means for preventing the action of such acid upon the oxidizing agent. This is accomplished in the present invention by introducing into the explosive composition an antacid, to prevent the generation of acidity, preferably a small quantity of an alkaline carbonate, such as calcium carbonate being employed.

In some makes of torpedoes comprising an explosive composition embodying sulphur and potassium chlorate as the active ingredients thereof, dextrine is omitted and the explosive enclosed in loose or granular form in suitable containers. But in explosive plastic compositions in which dextrine is employed, and which are moulded to fit containers for the purpose of convenience in handling and uniformity of charge, the explosive composition is moistened with water to reduce its sensitiveness to fire or explosion during the process of moulding, and also to render the dextrine ingredient sufficiently adhesive to hold the plastic in its moulded form when dry. Such an explosive composition, when dry, is sensitive to explosion from friction or concussion, but when moistened with water becomes inert from such influences, and this results in the failure of the signal during service. To prevent this condition occuring during wet weather, it becomes necessary thoroughly to waterproof the case or container of the explosive composition and it is found

to be very difficult to attain during manufacture, and to maintain in service, a sufficient imperviousness to water.

Another object of the invention is to provide a railway signal torpedo comprising an explosive composition which is so thoroughly waterproof in itself that external waterproofing is unnecessary. This is accomplished in the present invention by impregnating the granular explosive composition thoroughly with a water-repellant material, such as a shellac solution in alcohol.

A further object of the invention is to provide a novel external coating for the torpedo, including the case, and the contents thereof, which is impervious to water, which furnishes a hard, tough covering for the entire torpedo to enable it to withstand rough usage in transportation and handling while in service on railroads and which, during the manufacture, will harden or set more promptly than coatings heretofore employed. Preferably a special wax-like composition is used which is hard at atmospheric temperature, but will flow readily when subjected to a temperature well and safely below the lowest possible ignition temperature of the explosive composition. When this coating is in a liquid state the torpedo may be dipped in it momentarily and the coating will harden very quickly after removal therefrom, thus avoiding the long delay which is required for the evaporation of moisture or solvents used in usual types of coatings for torpedoes. Furthermore, when the torpedo is coated by such composition its base can be placed upon a suitable sanding-board and the grains of sand thereupon will become partially, but firmly embedded in the coating, thereby providing a roughened or abrasive base which will be less likely to slip upon the rail. No further dipping or waterproofing is required and the usual lead strap of the torpedo may be folded around it within a few minutes after the dipping is completed and the torpedo packed in a suitable case for shipment.

One of the principal objects of the invention is to provide a process of manufacturing torpedoes in which the ingredients of the torpedo are mixed in a sufficient amount of volatile liquid to permit the explosive composition to be poured into suitable moulds. By thus in effect suspending the ingredients of the torpedo in a suitable volatile liquid during the process of manufacture thereof, the maximum degree of safety of manufacture is attained, and a much more uniform and homogeneous composition is produced when the composition is deposited from such suspension in the mould or the torpedo case by the vaporization of the suspending liquid. Torpedoes poured and moulded in this manner can be readily distinguished from other torpedoes by the smoothness of the surface of the granular composition and by the uniformity of appearance as readily as clay deposited from a free flowing mixture can be distinguished from a granular mixture of clay in only a sufficient quantity of water to make it plastic and mouldable.

In the process of manufacturing torpedoes in accordance with the present invention I preferably employ a suitable alcohol in sufficient quantity to impart fluidity to the mixture of ingredients of the torpedo, such fluidity preferably being approximately that of freely flowing molasses. By thus maintaining the mixture in a fluid condition a suitable water-repellant material, such as a shellac solution in alcohol may be introduced into the liquid which, upon the evaporation of the liquid, will thoroughly impregnate the ingredients of the explosive composition and render the composition itself water-repellant and external waterproofing, therefore, unessential.

In the present manufacture of railway torpedoes employing potassium chlorate wholly as the oxidizing agent, heretofore described, great danger from fire and possible explosion exists in the mixing and moulding of the chlorate compound, especially should it become dry from the partial evaporation of the water moistener, and the same danger exists in the handling of the dry plastics during the process of assembling the torpedo.

I have discovered that where a volatile flammable liquid, such as alcohol, is employed in sufficient quantity to render the mixture fluid, as above described, and where the volatile liquid is subject to ignition at a very low temperature upon approach of the flame, danger of explosion of the composition by ignition is prevented, as the vaporization caused by the flame maintains a temperature at the exposed surface of the explosive mixture well below the ignition temperature of such mixture, and that the flame from the alcohol, or other liquid, can readily be extinguished by a fire extinguisher or by water, sand, or other usual means, thereby imparting a large measure of safety to the process of manufacture.

When the liquid composition above described is poured into the mould, or into torpedo shell, as the case may be, the denatured alcohol, or volatile liquid, very rapidly evaporates; consequently, the torpedoes can be manufactured much faster than those in which the composition is made plastic by the addition of dextrine and water and which usually require drying for several hours instead of the few minutes required for the evaporation of the alcohol. Furthermore such evaporation does not require application of heat above the usual room temperature.

An illustration of the torpedo embodying the invention and suitable mechanism for performing the process herein described is illustrated in the accompanying drawings, in which,

Fig. 1 shows a series of torpedo cases arranged in a suitable support with a hopper and a suitable conduit leading therefrom for depositing the flowing composition into the cases;

Fig. 2 illustrates the torpedo being dipped in the liquid wax-like coating material;

Fig. 3 shows the torpedoes after having been removed from the wax-like composition and deposited upon the sanding-board;

Fig. 4 is a longitudinal, diametrical, sectional view of a torpedo embodying the present invention;

Fig. 5 is a similar illustration of the torpedo at right angles to the construction illustrated in Fig. 1, showing the manner in which the strap is secured to the torpedo case;

Fig. 6 is a bottom plan view of the torpedo;

Fig. 7 is a plan view of a different form of torpedo case; and,

Fig. 8 is a longitudinal sectional view through a torpedo having the casing illustrated in Fig. 7.

Torpedoes embodying the present invention, as heretofore stated, comprises potassium perchlorate as the oxidizing agent, sulphur as the reducing agent, white quartz or sand as the abrasive ingredient, and preferably a small quantity of calcium carbonate as the antacid, and desirably a small quantity of antimony sulphide as an additional reducing agent. These materials, which are of granular form, desirably are thoroughly mixed together in dry form and thereafter suspended in a volatile liquid solution which serves to complete the homogeneity of the mixture. The volatile liquid is permitted or caused to evaporate thereby depositing the granular ingredients as a residue in more intimately mixed and homogeneous condition than has heretofore been accomplished. The torpedo thus produced may, therefore, be defined as comprising an explosive granular composition of residual homogeneously deposited ingredients thereby distinguishing the more intimately mixed homogeneous composition produced by such residual deposition from a liquid from usual compositions which are produced from a plastic mixture of the ingredients.

Shellac desirably is employed as a water-repellant material and is dissolved in alcohol in the approximate proportion of one and one-half pounds of shellac to one gallon of alcohol, denatured alcohol or wood alcohol. This solution of shellac in alcohol is added and stirred in the above granular ingredients until the mixture attains a consistency of freely flowing molasses and the mass thoroughly stirred. If it is desired to render the torpedo still more sensitive to the impact of the locomotive wheel, a small quantity of a chemical more susceptible to the influence of friction and concussion, such as potassium chlorate or similar ingredient, may be added to act as a "booster" to the perchlorate compound. When the mixture has been stirred sufficiently to render it thoroughly homogeneous, it is placed in a receptacle or tank 1 from which it is permitted to flow into a preferably flexible tube 2 having a suitable nozzle 3. By pinching the tube between the thumb and fingers the flow of the liquid composition from the nozzle can be controlled. A series of torpedo cases 4 may then be mounted upon a suitable table or support and the nozzle held over each torpedo case until it is filled.

In view of the contraction due to the evaporation of the solvent, it is usually desirable to fill the torpedo cases entirely full. Of course, suitable moulds may be employed for the explosive composition, instead of the torpedo cases, and this is desirable in manufacturing certain types of torpedoes.

As soon as the torpedo cases have been filled evaporation of the solvent begins and in a very short time the alcohol, or other volatile liquid, will have evaporated. Such evaporation may, of course, be facilitated by exposure to artificial heat. As soon as the liquid has vaporized from the composition, the torpedoes may be coated. While such coating is not essential to torpedoes which have been impregnated with a water-repellant material as herein described, it still is desirable as a further protection to the torpedo, and also aids in securing the strap to the casing, and further enables the base of the casing to be "sanded". After the torpedo case has been filled, the straps of the torpedo may be bent upwardly so that they can be conveniently grasped by the hand and the torpedo 4 dipped in a bath 5 of a liquid wax-like coating composition contained in a receptacle 6.

A preferred coating composition comprises wax, rosin, a suitable binder, and red pigment, in such proportions to become liquid at a relatively low temperature such as one hundred twenty-five to one hundred forty-five degrees Fahrenheit. It should be sufficiently fluid when warm not only to coat a fibrous casing, but to impregnate the edges thereof to a considerable depth. Such a composition will harden very quickly when exposed to usual atmospheric temperatures, such hardening usually requiring from fifteen to twenty minutes. This composition at atmospheric temperatures is hard, but not brittle and forms an excellent protective coating for the torpedo.

When the torpedo 4 is removed from the

coating bath 5 it desirably is placed base downwardly upon a layer of sand 7 sprinkled over a sanding-board 8. As the coating is plastic, when the torpedo is thus placed upon the sand, the grains of sand become partially embedded in the coating so that when the coating hardens such grains of sand are firmly retained in it, but project a sufficient distance therefrom to present an abrasive surface such as is usually employed to prevent torpedoes from slipping upon the rail, but the sanding operation by this method is much more rapid than has heretofore been accomplished where the coating composition comprises water or a solvent which must be vaporized.

A desirable form of torpedo embodying the present invention is illustrated in Figs. 4 and 5 which comprises a cup-shaped, preferably cylindrical, receptacle or case 9 having the central portion 10 of its base depressed and provided with apertures 11 and 12 to receive a usual strap 13 of pliable or resilient metal, such as lead, or a spring having suitable means of attachment to the rail.

In view of the fact that the specifications for standard track torpedo constructions promulgated by the American Railway Association requires that the explosive composition must not be in direct contact with any metal portion of the torpedo, a fibre disk 14 is inserted in the receptacle or case to prevent contact of the explosive composition with the metal strap 13. The explosive composition 15 desirably is poured into the receptacle 14 thus formed in the manner above described and when hardened by the evaporation of the volatile liquid contained presents a smooth surface by which it can be readily recognized from torpedoes in which the explosive composition is prepared in plastic form in the usual manner heretofore employed.

Inasmuch as the explosive composition in the preferred form of torpedo is impregnated with water-repellant material it is unnecessary to provide such a torpedo with usual waterproof coating. However, as a matter of practice, it is desirable to provide an exterior coating of wax-like material as above described in order to protect the torpedo from damage in handling and also to provide means for securing to the base of the torpedo an abrasive adapted to reduce the likelihood of slippage of the torpedo upon the rail.

The torpedo illustrated in Figs. 4 and 5 may, therefore, be coated and the base thereof sanded in the manner above described, the sanded base of the torpedo being illustrated in Fig. 6 of the drawing.

Another form of torpedo, which may be made in accordance with the present invention, is illustrated in Figs. 7 and 8, in which Fig. 7 illustrates a fibre casing in the general form of a Latin cross with a central rectangular portion 16 having a spheroidal depression 17 to receive a mass of the composition which desirably is previously prepared in suitable moulds by pouring the composition into the same in the manner above described. In constructing a torpedo of this type the explosive composition 18, which may have been previously moulded, is placed within the spheroidal cavity 17, the side flaps 19 and 20 are then folded over, and desirably of such length that their free edges overlap when folded. The flap 21, having apertures 22 and 23 through which the strap 24 is threaded, is then folded down upon the flaps 19 and 20 and finally the end flap 25 is folded down upon the flap 21 as illustrated in Fig. 8. The torpedo case is then coated preferably with a wax-like composition and the base thereof sanded in the manner above described.

It will be understood that various changes in the proportions of the ingredients of the torpedo herein described may be made within the scope of the invention herein defined by the claims and that in the process of manufacture suitable changes and modifications may be made in the materials used and in the manner in which the same are treated within the spirit and scope of the following claims.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. A composition for a railway signal torpedo comprising potassium perchlorate as an oxidizing agent and sulphur as a reducing agent and also containing a small quantity of a supplemental, more active reducing agent than sulphur.

2. A composition for a railway signal torpedo comprising potassium perchlorate as an oxidizing agent and sulphur as a reducing agent and also containing a small quantity of a supplemental, more active reducing agent than sulphur, and also containing a small quantity of a more sensitive oxidizing agent than potassium perchlorate.

3. A composition for a railway signal torpedo comprising an explosive mixture containing sulphur, potassium perchlorate and a relatively small quantity of antimony sulphide.

4. A solid residual composition for a railway signal torpedo comprising a homogeneous residual composition formed of intimately mixed granular reducing and oxidizing ingredients thoroughly impregnated with and united by a water-repellant material and explosive only under the influence of friction or concussion.

5. A solid residual composition for a railway signal torpedo comprising a homogeneous mixture of granular sulphur and po-

tassium perchlorate thoroughly impregnated with and united by a water-repellant material and explosive under the influence of friction or concussion.

6. A solid residual composition for a railway signal torpedo comprising a homogeneous mixture of granular sulphur and potassium perchlorate together with a relatively small quantity of potassium chlorate and explosive under the influence of friction or concussion.

7. A solid residual composition for a railway signal torpedo comprising a homogeneous mixture of granular sulphur and potassium perchlorate together with relatively small quantities of potassium chlorate and antimony sulphide.

8. A railway signal torpedo having a shell containing a solid homogeneous composition comprising a granular mixture of sulphur and potassium perchlorate and impregnated with a shellac solution in alcohol and explosive under the influence of friction or concussion.

9. A railway signal torpedo having a shell containing a solid mass of explosive composition comprising a granular mixture of sulphur and potassium perchlorate intimately associated with each other and with an antacid and impregnated with and united by a water-repellant material.

10. The process of safely manufacturing an explosive granular composition which consists in mixing the ingredients of said explosive composition while suspended in a volatile slow burning, flammable liquid, ignitable upon approach of a flame at a temperature well below the temperature of ignition of said explosive mixture.

11. The process of safely manufacturing a normally stable, but explosive composition which consists in enveloping the exposed surface of the ingredients of said composition during manufacture, in a slow burning flammable vapor which will not readily communicate fire to the explosive.

12. The process of manufacturing torpedoes and the like which comprises mixing the ingredients of a granular or powdered explosive mixture in a slow burning flammable volatile liquid sufficient in quantity to enable the mixture to flow readily, pouring the same into suitable moulds and causing the vaporization of said volatile liquid.

13. The process of manufacturing torpedoes and the like which comprises mixing the ingredients of an explosive mixture in alcohol sufficient in quantity to enable the mixture to flow readily, pouring the same into suitable moulds and causing the vaporization of the said liquid.

In testimony whereof, I have signed my name to this specification.

WALTER L. WEDGER.