June 28, 1932. R. L. HILL 1,864,905

WATERPROOF CARTRIDGING FOR EXPLOSIVES

Filed March 26, 1930

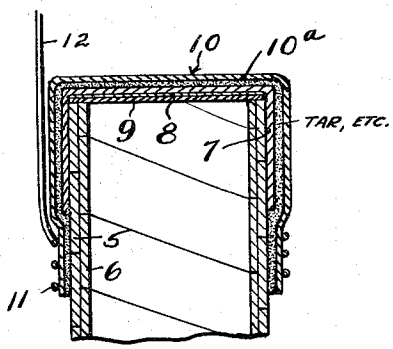


Fig. 1.

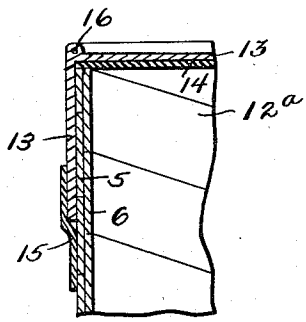


Fig. 2.

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Patented June 28, 1932 1,864,905

UNITED STATES PATENT OFFICE

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WATERPROOF CARTRIDGING FOR EXPLOSIVES

Application filed March 26, 1930. Serial No. 439,077.

This invention relates to a means of cartridging explosives, so that they will be thoroughly protected against considerable water pressures for desirable lengths of time.

In blasting under wet conditions, in the past, the consideration has had to be whether a given explosive will be sufficiently water resistant, rather than whether it is the most efficient, or the most economical. Accordingly, for instance, there are frequent cases where expensive gelatin dynamites are used for work which definitely demands black powder, or low density ammonium nitrate dynamites.

For several years I have been experimenting with numerous types of assemblies with the object of securing a construction which would efficiently resist the entrance of water or moisture, even in the presence of considerable pressures. I have extensive records of negative results, but met with a high degree of success with the constructions hereinafter described. In the solution of this problem, I was confronted by the necessity for reasonable economy in materials, manufacturing assembly and use as well as in the primary requisite of water resistance. Many ways may be resorted to for carrying out the invention, but for purposes of explanation, I have shown constructions which may be employed in the accompanying drawing, wherein,

Fig. 1 is a vertical sectional view illustrating an end closure for one form of container, and

Fig. 2 is a fragmentary sectional view upon an enlarged scale, illustrating a modified form of end closure.

Broadly stated, the invention resides in providing a tubular container of paper, which may be built up in any of the many ways common in the forming of paper cans, mailing tubes, and the like. The body of the container should consist of, at least, two plies of material of the nature of heavy paper, cardboard, chipboard or pressed pulp. In the accompanying drawing, I have shown a form of construction wherein the two plies 5 and 6 are spirally wound in opposite directions, and in overlapping relation, but any way of forming the body of the container may be resorted to, as long as it provides a structure of such weight and strength as to stand up under service conditions. Each ply of the material is impregnated with a suitable waterproofing composition, such as paraffin, and the plies are further waterproofed and sealed together with tar, asphaltum, and the like. The character of the material used and the number of plies are determined by the water pressure which the assembly must stand. As before stated, tubes of the general nature described have been used as the basis for certain forms of paper cans. However, I have found no form of paper can end closure which is, at the same time, water tight, resistant to water pressure, safe to use with explosives, and economically advantageous. It was in the provision of a suitable water tight closure, for a paper structure of this character, that I experienced the greatest difficulty in my experiments, which were prolific of many negative results, in connection therewith.

One form of suitable water tight end closure for an explosive cartridge of the character described, is illustrated in Fig. 1, where 7 designates a paper cap, shaped and dimensioned to fit upon the end of the tubular structure constituted by the plies 5 and 6. This cap may be reinforced, if desired, by an internal reinforcing disc of metal, indicated at 8, and I may apply a heavy coating of wax, tar, asphaltum, paraffin, or the like, indicated at 9, to the interior of the cap structure, so that when the cap is forced down upon the tube, this material will tend to make a water tight seal at the juncture of the end of the tube, with the cap. However, this sealing material 9, and the reinforcing disc 8, may be omitted, and the paper cap may be permitted to contact directly with the end of the tube. In either case, the assembly is dipped, after the cap has been placed in position, in a material which is highly adhesive, water resistant, and will not become brittle when subjected to the climatic conditions which the explosive cartridges may encounter. As the dip, I may use tar, asphaltum, wax, nitrocellulose solutions, or any other suitable

waterproofing composition having the characteristics specified. Around this dip 10*a* I fasten a cap 10, which may be made of paper but is, preferably, made of rubberized sheeting, this flexible cap being tied into the dipping material, and, preferably, before the setting of the latter, the tying strands being indicated at 11. If desired, I may leave the ends of these tying strands of such length as to constitute lowering cords 12, by which the cartridges may be lowered gently into bore holes, or equivalent lowering cords may be secured to the cartridges in any desired way.

In the form of the invention illustrated in Fig. 2, the tubular cartridge is indicated at 12*a*, and a metallic cap is indicated at 13. When a metallic cap is employed, I, preferably, use zinc, or lead, because they are non-sparking, and, consequently, are safe when used in connection with explosives. When metal caps are used, it is not always necessary to resort to the dipping, wrapping and tying operations, though these may be employed in conjunction with the metal caps, in the manner illustrated with respect to the paper caps, of Fig. 1. However, I have obtained good results by heavily painting or coating the interior of the metal caps with tar, asphaltum, or wax, indicated at 14, in Fig. 2, and covering the juncture of cap and tube with a water resistant, and adhesive tape 15.

In my investigations, I have found that my tubular bodies may have ample resistance against a given water pressure, and yet collapse slightly at the ends. This does no harm in the dipping, wrapping and tying method. In the case of soft metal caps, enough strength is provided to prevent such collapse, to a large extent. Even if the metal does collapse to some extent, it is resistant to water leakage, unless there is an actual fracture. However, if desired, I may provide the metal caps with reinforcing beads about their corners, and I may provide reinforcing rings, as indicated at 16, or I may use reinforcing discs, like the disc 8. The complete assembly is, preferably, dipped in some waterproofing medium, such as paraffin, because this tends to reinforce the other waterproofing steps. When it is reflected that an unprotected spot the size of a pin point may undo all waterproofing effects, and ruin an explosive charge, and bring about expensive misfires, the importance of adequate and complete waterproofing will be apparent. In a rigid or semi-rigid assembly of the nature of that herein described, there is always the possibility that some rupturing may occur if the cartridges are dropped into deep bore holes, unless the cartridge structure is very strong. Therefore, I, preferably, supply a lowering cord attached to each cartridge rather than to incur the expense of extra strong assembly.

It is to be understood that the invention includes within its purview whatever changes fairly come within either the terms or the spirit of the appended claims.

Having described my invention, what I claim is:

1. In a blasting cartridge, the combination with a preformed paper body, of sufficient rigidity to maintain its form in the absence of the explosive, a cap constructed to fit snugly upon and close the end thereof, a dipping of waterproof and adhesive material which extends to a point beyond the inner end of the cap, and a flexible wrapping of waterproof material outside of said dipping which encloses said cap and is embedded in the dipping material at a point inwardly of the inner edge of said cap.

2. In a blasting cartridge, the combination with a preformed paper body, of sufficient rigidity to maintain its form in the absence of the explosive, a cap constructed to fit snugly upon and close the end thereof, a dipping of waterproof and adhesive material which extends to a point beyond the inner end of the cap, a flexible wrapping of waterproof material outside of said dipping, and tying means for said flexible wrapping, inwardly of the inner end of the cap which forces said wrapping into the said adhesive material.

3. In a blasting cartridge, the combination with a preformed paper body, of sufficient rigidity to maintain its form in the absence of the explosive, a cap constructed to fit snugly upon and close the end thereof, a dipping of waterproof and adhesive material which extends to a point beyond the inner end of the cap, and a reinforcing means within said cap, a web of rubberized sheeting enclosing said cap extending beyond the inner edge of the same to lie upon the paper body, a relatively thick coating of a waterproof dipping material upon said cap and a part of said body and means for forcing said sheeting into said dipping material.

4. In a blasting cartridge, the combination with a tubular container of paper, of a cap adapted to fit snugly thereon, a body of sealing material within the cap, a dipping of waterproofing and adhesive material outside of the cap which extends to a point inwardly of the inner end of the cap, a wrapping of flexible waterproof material outside of said dipping material and means for constricting the inner portion of said wrapping.

5. In a blasting cartridge, the combination with a tubular container of paper, of a cap adapted to fit snugly thereon, a body of sealing material within the cap, a dipping of waterproofing and adhesive material outside of the cap which extends to a point inwardly of the inner end of the cap, a wrapping of flexible waterproof material outside of said dipping material, and a tying cord for binding the inner end of the wrapping means.

6. An explosive assembly comprising in combination a preformed paper body of suf-

ficient rigidity to maintain its form in the absence of an explosive content, a cap adapted to fit snugly upon and close the end thereof, a dipping of waterproof and adhesive material which extends to a point beyond the inner end of the cap, a wrapping of flexible waterproof material outside of said dipping material, and a tying cord for binding the inner end of the wrapping, the terminal end of which is left free and long enough to constitute a lowering cord for the explosive assembly.

In testimony whereof I affix my signature.

ROY LINDEN HILL.