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Cook

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[54] **PROTECTIVE COATING FOR CASELESS AMMUNITION**

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[52] **U.S. Cl.** **102/38**; 102/DIG. 1; 102/DIG. 8

[51] **Int. Cl.** **F42b 5/02**

[58] **Field of Search** ..... 102/103, 100, 101, 99, 102/DIG. 8, DIG. 1, 38

[56] **References Cited**

UNITED STATES PATENTS

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1,865,157	6/1932	Woodford	102/92 X
2,800,457	7/1957	Green et al.	106/132 X
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[57] **ABSTRACT**

The propellant charge of a round of caseless ammunition is provided with a one or more layer coating of microcapsules containing silicone oil or the like to reduce transfer of external heat to the propellant.

6 Claims, No Drawings

PROTECTIVE COATING FOR CASELESS AMMUNITION

This invention relates to the coating of the propellant charge portion of a round of caseless ammunition to hinder external heat transfer to the propellant.

The concept of using caseless ammunition in conjunction with firearms is an old and very desirable one from a cost standpoint. Caseless ammunition, by eliminating the metal, plastic, or paper cartridge casing, is less expensive to manufacture, and does away with bothersome expended casings and the need to extract them from the firearm.

Caseless ammunition, however, by eliminating the casing, also presents problems relating to handling, moisture absorbtion, durability, and safety. The problem of safety relates to the possible premature ignition of the round when exposed to external heat either in the firing chamber, magazine, or even outside of the firearm.

Attempts have been made to solve the premature ignition problem by providing a protective coating for the propellant charge. Such solutions will be found in U.S. Pat. Nos. 3,212,440, issued Oct. 19, 1965 to J. B. Quinlan et al, disclosing a spray coating of methyl methacrylate and molybdenum disulfide or graphite; 3,397,637, issued Aug. 20, 1968 to J. Bobinski et al, disclosing a protective film of a cellulose derivative; 3,703,868, issued Nov. 28, 1972 to E. C. Braak, disclosing a polyolefine film protective coating; and 3,730,094, issued May 1, 1973 to J. B. Quinlan, disclosing a heat resistant explosive coating. The prior art solutions noted above have proven to possess unsatisfactory side effects, however, relating to unburned residue of the protective coating which residue remains in the firing chamber and gun barrel, and undesirable alteration of ballistic performance.

This invention relates to a thermally protective coating for the external surfaces of caseless ammunition propellant charges, which coating has as its major constituent a vaporizable material, such as silicone oil, wax, or the like, the material being microencapsulated in a skin of gelatin, polyvinyl alcohol, epoxy, or the like. The microcapsules can be applied to the propellant in a plurality of layers so that the overall weight of the coating is reduced, and interstitial air within the layers acts as a further heat transfer barrier. The individual capsules should be in very fine granular form having a diameter in the range of about 5 – 1,000 microns. The individual microcapsule would consist of a major portion of encapsulated material and a minor portion of encapsulating skin. The encapsulated material should exhibit poor heat transfer characteristics, and should, under the heat developed when the round of ammunition is fired, vaporize so as to leave little or no residue behind in the firing chamber and barrel. By using a low heat transfer material which vaporizes upon firing, additional protection is given to the barrel against wear imparted thereto by the hot, corrosive combustion gases as the vaporized material passes through the barrel. If, during handling, the round is subjected to external heat, the encapsulating skin may rupture, however, this will merely expose the encapsulated material under conditions where it is free to flow to provide a continuous barrier to further heat transfer. It will be noted that in a coating such as is proposed, of the three constituents, namely, encapsulated material, the encapsulating skin, and air, only the encapsulating skin is a potential residue-producing agent. For any thickness coating, however, the skin is present only in very small percentages and thus any residue possible therefrom will be present in very minor amounts as compared to a solid coating. Further, the encapsulating skin can, if desired, be made of a material such as gelatin or polyvinyl alcohol which will vaporize when subjected to heat generated when the cartridge is fired, thus leaving no residue behind.

Silicone oil-fired microcapsules suitable for use with this invention can be made generally in accordance with the teachings of U.S. Pat. Nos. 2,800,457, issued July 23, 1957 to B. K. Green et al., or 2,800,458, issued July 23, 1957 to B. K. Green. The microcapsules may be applied to the propellant charge with a suitable adhesive which is compatable with nitrocellulose and the encapsulating skin on the microcapsules. An acrylic resinous adhesive may be used for this purpose. The adhesive may be self curing or may cure at a relatively low temperature. Alternatively, the adhesive may be set by removal of a solvent or carrying agent. The microcapsules can be applied to the propellant by spraying, rolling, brushing, or the like. A multi-layered microcapsule protective coating can be applied to the propellant by first applying adhesive to the propellant, then applying a layer of microcapsules, and then repeating the adhesive-microcapsule applications step-wise until the desired thickness of protective coating has been provided.

The protective coating of this invention can be used with caseless ammunition of the telescoped variety wherein the projectile is telescoped into the bore of a hollow cylinder of propellant, or can also be used with the variety of caseless ammunition wherein the propellant charge is secured to the rear face of the projectile.

Thus, it will be readily apparent to those skilled in the art that the selection of microcapsules of sufficiently fine form can be made so as to permit the building up of several layers of microcapsules on the outside of a round of caseless ammunition thus permitting the formation of an excellent heat transfer barrier at relatively low total weight and under conditions involving a minimum of interference with the final action of the propellant burning. A round covered with such capsules will be highly resistant to ignition by radiant energy and will even resist exposure to flame for significant time periods.

Since many changes and variations of the disclosed embodiment of the invention may be made without departing from the inventive concept, it is not intended to limit the invention otherwise than as required by the appended claims.

What is claimed is:

1. In a round of caseless ammunition comprising a projectile and a compacted charge of propellant, the improvement comprising a protective coating comprising at least one layer of microencapsulated vaporizable low heat transfer liquid adhered to the outer surface of the propellant charge.

2. A round of caseless ammunition comprising a projectile, a compacted charge of propellant secured to said projectile, and a protective coating secured to an external surface of said propellant charge, said protective coating comprising a plurality of microcapsules of a vaporizable low heat transfer liquid.

3. A round of caseless ammunition comprising a projectile, a compacted charge of propellant secured to

said projectile, and a protective coating secured to said propellant charge, said protective coating comprising a plurality of microcapsules of silicone oil encased in an encapsulating material.

4. The round of ammunition of claim **3,** wherein said encapsulating material is selected from the group consisting of gelatin and polyvinyl alcohol.

5. A compacted charge of propellant material having a protective coating adhered to an external surface of said charge, said protective coating comprising a plurality of microcapsules of a vaporizable low heat transfer liquid.

6. The propellant charge of claim **5,** wherein said liquid is silicone oil.

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