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AMMUNITION LUBRICATION

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This invention relates to the lubrication of ammunition and particularly to the lubrication of projectiles or bullets.

The need for bullet lubrication is especially pronounced when the bullet has a lead surface, or a plating over lead which is cut through by the rifling. However, the present invention, while especially desirable for lead bullets, both plated and unplated, is likewise applicable to jacketed bullets and cartridge cases. Lubricants hitherto used have consisted chiefly of mixtures of waxes and greases selected and proportioned to provide melting points high enough to withstand the conditions of ammunition storage. The common method of application is to dip the bullets in a bath of a lubricant which has been rendered fluid by heating. An unnecessarily large quantity of lubricant adheres to the bullet and renders it disagreeable to handle and liable to catch foreign matter in its greasy surface. In certain types of firearms the excess lubricant is positively detrimental, since it collects and congeals in the action, causing failures to function. Efforts have been made to lubricate bullets by the application of a lubricant dissolved in a volatile solvent but, with lubricants hitherto known, this method has not been satisfactory, it having been found impracticable to deposit from solution a sufficient amount of lubricant and at the same time to give the bullet a dry surface and a desirable appearance.

The present invention comprises the discovery of bullet lubricating materials which can be applied either by the hot dip method or by the solution method and form over the bullet an adequate film of a lubricating material which is dry to the touch and does not retain foreign matter but, nevertheless, under the high pressure conditions of its projection through a gun barrel affords a wholly adequate lubrication. The characteristic ingredient of these lubricants is a higher alcohol or alcohol derivative, such as an acid, ether, ester or ester salt. Such alcohols are not commercially available in a pure condition, the available materials being secured by fractional distillation between certain temperatures and containing varying amounts of different alcohols. In this specification and the claims annexed thereto, particular alcohols will be named, but it is to be understood that these names merely identify commercial mixtures or "cuts" in which, as indicated by melting point, the named alcohol predominates. Alcohols having sixteen or more carbon atoms to the molecule form excellent bullet lubricants; also of substantial importance are the acids, ethers, esters and ester salts, mixtures of alcohols with such acids, ethers, esters and ester salts; and emulsions of any of these substances in water, lacquer or other dispersing medium. For the purpose of this specification and the claims, any such alcohol, alcohol mixture, alcohol derivative, mixture of alcohol and its derivative, or emulsion, will be called an "alco-lubricant." For ammunition lubrication the lubricant is preferably in the solid phase at ordinary temperatures. These lubricants may be applied either by the hot dip method or the solvent method. Frequently the solvent method is preferred on account of the tendency of the higher alcohols to break down into lower ones at melting temperatures. Desirable solvents include any solvent for oils, fats and waxes, having a suitable volatility. Among such solvents may be mentioned the aliphatic hydrocarbons derived from petroleum, such as benzine; such aromatic hydrocarbons as benzol, toluene and xylene; and such chlorinated hydrocarbons as carbon tetrachloride, chloroform, ethylene di chloride, and tri chlor ethylene.

Palmityl alcohol forms an excellent bullet lubricant for application either by the solvent method or the hot dip method. Various commercial cuts having melting points between those of palmityl and stearyl alcohol and mixtures of these cuts are likewise desirable. Stearyl alcohol, melting point about 139° F., has excellent lubricating properties. All of these and other alcohols may be converted wholly or partially into esters, such as the abietic, sulphuric, phosphoric, stearic or hydroxy stearic esters, or into neutral salts of such esters. For example, neutral salts of the sulphuric acid esters may be formed by the treatment of the alcohols with concentrated sulphuric acid, oleum, or chlor sulphonic acid, and the subsequent neutralization with organic or inorganic salt forming compounds such as soda ash. An abietic ester may be formed by the addition to such an alcohol as stearyl of a suitable amount of resin or abietic acid. Many of the ethers are likewise useful, particularly in conjunction with alcohols and/or the esters. Acids such as palmitic and stearic acid have likewise been found to impart desirable properties to alcohols, such for example as a cut consisting chiefly of stearyl and palmityl having a melting point of about 130° F. The addition of such phenols as beta naphthol improves the properties of many alco-lubricants,

and many of them may be emulsified in water or other dispersing medium with desirable results.

It is sometimes practicable to apply a lubricant which is in a fluid state at ordinary temperatures. This is done for example in match shooting where a very high degree of accuracy is required and a lubricant can be applied immediately before cartridges are loaded into the firearm. Under these and other conditions where a liquid lubricant is feasible, lauryl and other alcohols of similar carbon content yield excellent results.

The aforementioned alcohols and/or alcohol derivatives may also be used in conjunction with comparatively high melting point waxes, such as high melting petroleum derivatives, ozocerite, and the ozocerite mixtures commercially known as ceresin, beeswax, carnauba wax, candelilla wax, bayberry wax, Chinese insect wax, and such synthetic waxes as the chlorinated aromatic hydrocarbons, for example, naphthalene, and the hydrogenated oils, such as castor oil and cottonseed oil.

As illustrations of the many alco-lubricants adapted to bullet lubrication, mention is made of the following:

Palmityl alcohol.—This alcohol may be applied either by the hot dip method or from solution in any of the solvents heretofore mentioned, for example carbon tetrachloride. There is secured a hard dry adhesive film of good appearance, excellent lubricating power and satisfactory resistance to moderately elevated temperatures.

Alcohol mixtures.—There are available various cuts having melting points between those of palmityl and stearyl alcohol. A very desirable cut, for application either by the hot dip method or from solution, has a melting point of about 120° F. Such a lubricant when applied to bullets remains firm and hard at a somewhat higher temperature than palmityl alcohol.

Another commercial cut has a melting point of about 130° F. This cut produces a very hard film. Its adhesive quality may be improved by an admixture of a lower melting point cut.

Stearyl and higher alcohols.—These alcohols are preferably applied by the solution method on account of their tendency to break down when heated to melting. For some purposes it is desirable that they be admixed with the lower alcohols. As heretofore mentioned, such lower alcohols as lauryl are very desirable lubricants and form suitable admixtures with the higher alcohols when a solid lubricant is desired.

The esters.—The surface characteristics and adhesion of mixtures in which stearyl and higher alcohols predominate are improved by the presence of suitable amounts of esters, or the alcohol may be entirely converted into the ester; for example, to an alcohol cut having a melting point between 130° and 140° F. may be added a mixture of equal parts of resin or abietic acid and the alcohol cut, in the proportions of five parts of the alcohol to one part of the resin or abietic acid and alcohol mixture, and the resulting material dissolved in carbon tetrachloride. A superior high melting point lubricating film results from the application of this solution.

Mixtures of alcohols and/or alcohol derivatives with waxes.—A suitable wax, such as ozocerite, melting at about 150°, or paraffin, melting at about 135°, may be mixed with an alcohol cut having a melting point between 120° and 140° F. in the proportions of 25% to 75% of wax and 25% to 75% of the alcohol, and the resulting material applied from solution in toluene or carbon tetrachloride. This lubricant spreads upon the bullet with a continuous dry adhesive film which is not affected by moisture or the elevated temperatures of accelerated deterioration tests, and ammunition lubricated therewith can be fired through a barrel rapidly and in large quantities with superior and sustained accuracy.

The use of alcohols and alcohol derivatives as ammunition lubricants being wholly new, the appended claims are to be broadly construed.

What is claimed is:

1. A lubricant for ammunition comprising a mixture of palmityl and stearyl alcohols.

2. A lubricant for ammunition consisting essentially of a mixture of alcohols having a melting point of about 130° F.

3. A lubricant for ammunition which is in the solid phase and substantially dry surfaced under atmospheric conditions and consists essentially of a mixture of monohydric alcohols having a melting point not less than 120° F.

4. A lubricant for ammunition which is in the solid phase and substantially dry surfaced under atmospheric conditions and consists essentially of a mixture of monohydric alcohols, and a wax, and has a melting point not less than 120° F.

5. A lubricant for ammunition which is in the solid phase and substantially dry surfaced under atmospheric conditions and contains stearyl alcohol as its essential ingredient.

6. A lubricant for ammunition which is in the solid phase and substantially dry surfaced under atmospheric conditions and contains as its essential ingredient an alcohol having not less than 14 carbon atoms in the molecule.

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