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METAL FORMING AND DRAWING LUBRICANT AND METHOD OF PRODUCING THE SAME

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This invention relates to an improved method of and composition for treating steel rods or wire preparatory to drawing the same through diameter reducing dies, it being an object of the invention to provide such rods or wires with an improved coating by which, during the drawing operation, metal to metal contact is minimized, the life of the dies prolonged and scoring or galling of the rods or wire prevented.

In the art of wire and rod drawing, it is an accepted practice to apply various soap powders, such as metallic stearates or palmitates to lime-coated rods or wire immediately prior to the passage of the latter through forming dies. While these lubricants are quite satisfactory for the purpose specified, the present invention provides an equally satisfactory lubricant from an operating standpoint and, in addition, provides a lubricant which may be produced and utilized at lower costs than lubricants of comparable performance hitherto accepted for this purpose.

Lime in a finely divided state is widely used when mixed in a dry condition with powdered soaps as a steel wire drawing lubricant. The mixture has been mainly mechanical without any attempt having been made to obtain improved distribution and relative order of the components of the mixture.

It is a primary object of the invention to improve such a lubricant by distributing the soap uniformly in the form of a coating over the surfaces of the individual particles of lime. Therefore, in accordance with the present invention, I dissolve a soap of desired quantity in a suitable solvent and to this soap solution there is added a proper quantity of hydrated lime, the mixture being agitated to insure distribution of the soap on the lime particles and after which the solvent is removed. The resulting dry product is then comminuted or powdered for use in the die box of a wire drawing machine.

As a typical example of a lubricant forming the present invention and the method for producing the same, the following is offered.

Example 1

	Parts by weight
A sodium soap made from a fatty acid of 40.8 titre	2
Isopropyl alcohol (technical grade)	10
Hydrated lime	10

In producing this composition, the lime is preferably introduced while the solution of the soap and solvent is heated to a temperature of approximately 176° F. as gelation takes place when a solution of this concentration cools. After lime has been added and thoroughly stirred into the hot solution, a stiff paste is formed. The isopropyl alcohol may then be evaporated and the resulting dry cake reduced to a comminuted or powdered form. This powder is characterized by having an affinity for water rather than being water repellent. Examination of the lubricant discloses that the lime particles are substantially completely coated with the soap.

As a variation in the above composition of the lubricant, the lime may be coated with aluminum stearate in a similar manner and a suitable solvent for the aluminum stearate employed, as follows:

Example 2

	Parts by weight
Commercial aluminum stearate	2
Naptha (dry cleaner's)	15
Hydrated lime	10

A gelatinous solution of aluminum stearate is produced when the aluminum stearate is heated with the solvent to a temperature of approximately 200° F. The lime is added by stirring the heated solution until a paste-like composition obtains, the solvent being then suitably evaporated, producing a coating of aluminum stearate on the particles. Upon cooling, a cake is formed, as in Example 1, and the cake is ground to a powdered form. The lubricant produced in accordance with Example 2, as contrasted with the lubricant produced by Example 1, possesses water-repellent properties. This latter property is important for certain operations wherein drawn wire is stored and care is exercised to minimize corrosion or oxidation.

Both sodium and aluminum soaps, as such, are quite widely used as lubricants in wire drawing operations. However, the lubricants and methods of forming the same as defined above, render such sodium and aluminum soaps more effective due to their availability at the surface. To illustrate, a widely used drawing lubricant is composed of four parts of a blended soap and six parts of lime. The ratio here is one part of combined soap to 1.5 parts of lime. As distinguished from this, the compositions of the present invention utilize one part of soap and 5 parts of lime with at least equivalent results as a drawing lubricant. The lubricants produced by the present invention are therefore economical to use and permit of even further additions of inex-

pensive lime, by mere dry mixing, at the time of use in the drawing machines. These advantages are obtained by making the lubricant available or present on the surfaces of lime particles.

Other common soaps can be employefd such as ammonium soaps, potassium soaps, amine soaps and other suitable metallic soaps such as calcium and magnesium soaps. In the case of soaps made with volatile alkaline agents, such as ammonium and volatile amines, the coating on the lime will be the fatty acid which remains or the calcium soap caused by reaction of the fatty acid or soap with the lime. The latter reaction depends on the factors such as the particular solvent used and the solution temperatures employed.

Example 3

	Parts by weight
Stearic acid	1 to 5
Aqua ammonia (26° Bé.)	Trace to 1
Water	10 to 50
Hydrated lime	10 to 20

In compounding the above lubricant, the solution-forming constituents are boiled to disperse stearic acid as ammonium soap, the solution being cooled and the lime added. It is within the scope of the invention to employ a relatively non-volatile solvent such as a high boiling petroleum oil whereby a pasty form of the lubricant may be obtained and employed for certain uses, particularly for the purpose of securing a bright finish on the drawn steel. Where a sticky or tacky finish on the wire is desired, as in contrast with the hard dry finish obtained with the lubricant powder disclosed in Example 2, the following may be employed:

Example 4

	Parts by weight
Naphtha	44
Stearic acid	9
Petrolatum (140° F. M. P.)	2
Hydrated lime	45

In this example, a non-volatile petroleum oil may be substituted, if desired, for the petrolatum. Also, other finely divided, substantially grit-free pigments may be substituted for lime.

While I have stressed the use of the lubricants in connection with the drawing of rods or wires, it will be understood that the compounds may be adapted for other metal working or forming operations, such, for instance, as in the stamping of sheet metal. In the latter use, the lubricant powder specified above may be dispersed in a liquid adjuvant and painted or spread on the metal sheets prior to their stamping.

While I prefer to use a finely divided hydrated lime in the compositions above set forth for the reason that the same may be conveniently and economically obtained, nevertheless, it will be understood that in lieu of such lime, I may utilize precipitated calcium carbonate, precipitated barium sulphate, clays or bentonite.

What is claimed is:

1. A lubricant in dry comminuted form for application to the surfaces of metals to facilitate working, shaping or forming thereof by the use of mechanical appliances composed of hydrated lime in a finely divided state intimately admixed with a soap distributed uniformly over the surface of the individual lime particles by means of a solvent solution of the soap from which the solvent subsequently is removed from the mixture.

2. A metal forming and wire drawing lubricant in a dry comminuted form composed of an intimate mixture of a finely divided grit-free base material of the class consisting of hydrated lime, calcium carbonate, barium sulphate, clay and bentonite and composed of a multitude of small solid particles, and a soap distributed uniformly over the surface of the individual particles of said material by means of a solvent solution of the soap from which the solvent subsequently is removed from the mixture.

3. A wire or rod drawing lubricant in dry comminuted form composed of an intimate mixture of finely divided hydrated lime and a soap distributed uniformly over the surface of the individual particles of lime by means of a solvent solution of the soap from which the solvent subsequently is removed from the mixture, said lubricant mixture containing one part of soap to five parts of lime by volume.

4. A wire or rod drawing lubricant in dry comminuted form composed of an intimate mixture of a body of finely divided hydrated lime and a soap distributed uniformly over the surface of the individual particles of lime by means of a solvent solution of the soap from which the solvent subsequently is removed from the mixture, lime being the predominating ingredient by weight.

5. A lubricant in dry comminuted form for use in metal forming operations composed of a mixture of finely divided hydrated lime and a coating of metallic stearate distributed uniformly over the surface of the individual particles of lime by means of a solvent solution of the soap from which the solvent subsequently is removed from the mixture, the ratio of the lime to the metallic stearate being approximately five to one.

6. The method of producing a metal forming and drawing lubricant which comprises producing a heated solution of sodium soap and a removable solvent therefor, adding to the solution while hot finely divided hydrated lime, mixing the lime thoroughly and uniformly into the solution by agitation, removing the solvent, and drying the remaining materials to form a solid body, and reducing said body to a finely divided comminuted form.

7. The method of producing a metal forming and drawing lubricant which comprises heating a mixture composed of a soap and a removable organic solvent therefor to a temperature sufficiently high to produce a solution of the soap in said solvent, adding to the heated solution a body composed of finely divided hydrated lime and stirring said body uniformly into said solution to form a stiff paste, removing the solvent from the mixture and drying the remaining materials to a cake-like form, and powdering the cake by comminuting the same.

8. The method of producing a metal forming and wire drawing lubricant composed of finely divided hydrated lime wherein the individual lime particles are coated with a uniformly applied soap, comprising heating a mixture composed of soap-forming materials and a volatile organic solvent therefor to a temperature sufficiently high to reduce said materials to a liquid form, adding finely divided hydrated lime to said mixture in a quantity sufficient to form a thick paste of uniform consistency, removing the solvent from the paste, drying the paste to a cake-like form and reducing the cake to a powdered form by comminution.

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