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METHOD AND COMPOSITIONS FOR USE IN TREATING AND DEFORMING METALS

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This invention relates to the art of treating and deforming metal and is particularly concerned with the provision of an improved composition and method for treating the surface of the metal and mechanically working the same as by means of such operations as are involved in the drawing, rolling, stamping or other alteration of the physical shape of the metal.

The invention is especially useful in the treating and working of ferriferous metal and will be specifically described with this field of usefulness in mind.

The mechanical working of ferriferous metal articles by processes that have come to be known as "cold" processes, in recent years has come to be of steadily increasing importance. Many of such "cold" processes include phosphatizing of the metal surface followed by the application thereto of various lubricants to the phosphatized surface prior to the actual step or steps of deformation. Where phosphatizing procedures have been employed it has generally been customary to make use of solutions which produce on ferriferous surfaces relatively heavy non-metallic coatings consisting principally of zinc or manganese phosphate. Such phosphatized metal surfaces, for all practical purposes, are essential in the mechanical working of ferriferous metal according to the so-called "cold" processes. However, there are certain inherent disadvantages incident to the use of such "cold" processes of the type referred to. Some of these are: (1) before phosphatizing the metal it is normally imperative to subject the surface to a vigorous precleaning step; (2) relatively long periods of time are required to produce suitable phosphate coatings; (3) the solutions involved are normally used hot, i. e., at or near the boiling point; (4) after formation of the phosphate coating an additional step is necessary consisting of the impregnation of the phosphate coating with a drawing lubricant. For reasons such as these, the so-called "cold" processes are usually not feasible or practicable for mills or plants where relatively high-speed manufacturing procedures are employed.

With the foregoing in mind, the principal object of our invention will be better understood and more fully appreciated and may be said to involve the provision of new compositions as well as a new method for treating and deforming metal which considerably shortens the time involved without in any way sacrificing the many advantages which are incident to previous procedures involving initial phosphate coating plus subsequent lubrication thereof.

The present invention is based upon the discovery that the advantages incident to the two stage procedure heretofore in use, i. e., first, the phosphatizing and, second, the lubrication of the phosphatized coating, can be obtained in a one-step procedure by subjecting the metal to be deformed to the action at room temperature of a non-aqeuous solution and then drying the metal.

Briefly stated, our improved solution is substantially non-aqueous and consists essentially of the following

principal ingredients in approximately the proportions indicated, i. e., from 1 to 3% of an acid of phosphorus from the class consisting of ortho-phosphoric acid and hypo-phosphorous acid; from 5 to 30% of a saturated straight chain fatty acid or its glyceride having a chain length of at least 12 carbon atoms; from 20 to 30% of blending solvent; and at least 50% of mineral spirits, the latter constituting essentially the remainder of the composition. It is important also that the composition be further characterized by containing not over approximately 2% water.

Typical examples of the saturated straight chain fatty acids useful with our invention are stearic acid, lauric acid, myristic acid and the glycerides of these acids are examples of suitable glycerides. Typical examples of suitable blending solvents are methyl isobutyl carbinol, butyl Cellosolve, butyl Carbitol, hexyl Cellosolve, etc. Typical examples of suitable mineral spirits are kerosene, Stoddard solvent, high flash naphtha from both petroleum and coal tar origin, hydrogenated petroleum solvent, etc. The main requirement is that the solvent evaporate at a reasonable rate so that it leaves a film of the other ingredients on the surface to be treated.

Typical examples of improved treating solutions or compositions useful with our invention are as follows:

Formula No. 1

Stearic acid	g	10
Butyl Cellosolve	ml	30
85% phosphoric acid	ml	2

High flash naphtha to make 100 ml.

Formula No. 2

Lauric acid	g	10
Hexyl Cellosolve	ml	15
Methyl isobutyl carbinol	ml	15
85% phosphoric acid	ml	2

Kerosene to make 100 ml.

Formula No. 3

Tallow	g	20
Butyl Cellosolve	ml	20
Pine oil	ml	15
85% phosphoric acid	ml	2

555 Process oil (a petroleum solvent naphtha) to make 100 ml.

Formula No. 4

Myristic acid	g	10
Hypo-phosphorous acid	ml	2
Butyl Cellosolve	ml	25

555 Process oil (a petroleum solvent naphtha) to make 100 ml.

In order to carry out the process of the present invention it is merely necessary to apply the solution to the article to be deformed by immersion, spraying, or otherwise, and then to allow it to remain on the surface until reaction has occurred and the residue on the surface has lost most of its volatile matter. This process of reaction and loss of volatile material described for brevity as "drying" may, if desired, be accelerated by heat. For instance, wire to be reduced in diameter may be immersed in the solution of Formula No. 1 for one to two minutes. Adequate provision should be made so that all portions of the wire will be in contact with the treating solution. Upon removal the wire may be dried in an oven over period of ten minutes at 220° F. or it may, if desired, be allowed to stand at room temperature overnight. In either case it is then properly prepared for the drawing operation.

As pointed out previously no pre-cleaning is necessary unless the article is grossly contaminated. Quite

naturally if heavy mill scale is present, such heavy mill scale should be removed by pickling or sand blasting. However, if relatively light deposits of rust are present, it is not necessary to pickle or sand blast. If the material is contaminated by grease, etc., normally it is not necessary to remove this contamination as the treating bath acts as a cleaner in addition to conditioning the metal surface for subsequent drawing.

We claim:

1. A composition for coating metal, said composition including, as its essential and principal ingredients, from 1 to 3% of an acid of phosphorus from the class consisting of ortho-phosphoric acid and hypo-phosphorous acid; from 5 to 30% of a material from the class consisting of saturated straight chain fatty acids and their glycerides characterized by having a chain length of at least 12 carbon atoms; from 20 to 30% of blending solvent; and at least 50% of mineral spirits, the content of which latter constituting essentially the remainder.

2. The composition of claim 1 which is further characterized by having a content of water of not over 2%.

3. In a method of deforming metal the steps which comprise treating the metal with the composition of claim 1 and drying the surface so treated prior to deformation thereof.

4. The method of claim 3 in which drying is accomplished by heating the metal.

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