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LUBRICANT COMPOSITION

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This invention relates to lubricant compositions; more particularly to lubricant compositions for use in the pressure forming of pulverized materials into compact bodies, and to methods for making such compositions.

An object of this invention is the provision of an improved composition for use as a lubricant on material forming apparatus, and efficient methods for compounding such compositions.

The composition provided by this invention is especially adapted to the production of magnetic cores of the well known insulated dust type. In the manufacture of these cores small particles of magnetic metal or alloy are coated with a suitable binder and then compressed into a body. In the usual compressing operation a measured quantity of the coated particles are placed in a die cavity, compacted with a forming member forced into the cavity at high pressure, and finally removed from the cavity in the form of a composite body or core. For many core types a very high forming pressure is required and values in excess of 200,000 pounds per square inch are employed regularly.

During the compressing operation the binder covered metal particles tend to bond themselves to the walls of the die and it is desirable to use some preventive agent on the die members to avoid this action. The lubricants that are ordinarily used on material forming operations, such as mineral oil or grease, are not satisfactory for this purpose and an agent having unusual properties is required on dust core forming apparatus to prevent the above described bonding action under the substantial forming pressures normally employed and the highly abrasive action of the metal particles in motion. The action of the protective agent becomes more critical as the size of the metal particles used for the cores is reduced and agents that are usable for pressing relatively coarse particles are not successful when used with finer particles. Particles around 120 mesh in size and coarser have been pressed with zinc stearate or petrolatum as a die coating. However, many cores are made with dust that is 400 mesh in size and smaller, and these prior agents are not suitable with the finer dust because the fine particles become cemented to the die members under pressure and the cores crack on removal from the die. Another important limitation in the selection of a die coating agent for this purpose is the possibility that the agent will become mingled with the dust and be incorporated in the core body. The presence of foreign materials in the core body is to be avoided because of their influence on the magnetic and electrical properties of the completed core.

In accordance with this invention, a composition that is suitable for use with all sizes of particles is provided by compounding stearic acid, spermaceti, lanolin, borax and water into a paste-like mass or emulsion. The composition is spread in a thin coating or layer on the walls of the die cavity and on the forming member before the particles are placed in the cavity and the composition facilitates compression of even the finest dust into a core having high mechanical strength and good service properties.

For use in forming cores from fine insulated dust particles, the following composition gives the best results:

	Parts by weight
Stearic acid	25
Spermaceti	5
Lanolin	5
Borax	2
Water	30

However, some variation in the above ingredient proportions is permissible and in general the following ranges are satisfactory:

	Parts by weight
Stearic acid	20 to 30
Spermaceti	4 to 6
Lanolin	4 to 6
Borax	1 to 3
Water	25 to 35

Because the various ingredients mutually contribute to the desired action in the compressing operation, it is important to provide every ingredient in the proper quantity at all portions of the pressure cavity surface. To accomplish this, the composition should be highly uniform. The necessary uniformity can be provided by first mixing the stearic acid and spermaceti in the form of small pieces, then adding molten lanolin, and finally adding the borax in water solution. In one satisfactory procedure the preferred composition was prepared as follows: Twenty-five pounds of stearic acid and five pounds of spermaceti were shredded into small chips and thoroughly mixed together. The five pounds of lanolin were heated to a temperature slightly above the melting point and then poured slowly into the mixed chips. The mixture was stirred during the addition of the molten lanolin to effect its thorough distribution. The two pounds of borax were dissolved in 30 pounds of water, with the aid of gentle heating. The borax solution was then heated to a tempera-

ture between 125° F. and 150° F. and poured slowly into the mixture at that temperature. The mass was mechanically agitated during the addition of the warm borax solution and agitation was continued until a complete emulsion was formed.

The resultant composition has a paste-like consistency, and its viscosity is affected by the proportion of water used. Variations in consistency that may be desired for different fields of service can be secured by changes in the proportion of water employed, but in all cases an adequate quantity of water should be used and sufficient agitation applied both during and after the actual mixing operation to insure formation of a homogeneous emulsion.

The above proportions and process provide a composition that is especially suitable for use in pressing fine insulated metal particles into magnetic cores. The consistency of this particular composition is suitable for convenient application on the surface of the forming die cavity and compressing member by means of a stiff brush or rubber paddle. Subsequent wiping with a soft cloth removes excess composition and spreads the film evenly on the die members. As the dust particles are compressed in the cavity, the compound forms a continuous and tough film which effectively resists the abrasive action of the moving particles and facilitates the necessary shifting of the outer strata of particles adjacent to the die surfaces. The film withstands the frictional heat developed during compression of the dust and adheres to the die members with the result that the completed core is readily removed from the cavity without any straining or cracking of the core. Due to the close adherence of the film to the die members, very little of the composition is incorporated in the core body and due to the properties of the composition ingredients, this addition does not detract from the normal electrical or magnetic qualities of the core.

It will be apparent that some modifications of the above specifically described composition and process can be adopted to meet particular conditions, and it is to be understood that the invention is limited only by the scope of the appended claims.

What is claimed is:

1. A composition suitable for lubricating die members used in compressing finely divided particles of material into composite bodies, comprising 20 to 30 parts stearic acid, 4 to 6 parts spermaceti, 4 to 6 parts lanolin, 1 to 3 parts borax, and a sufficient quantity of water to form a homogeneous emulsion of said ingredients.

2. A composition for lubricating die members used in compressing finely divided particles of material into composite bodies, comprising 25 parts stearic acid, 5 parts spermaceti, 5 parts lanolin, 2 parts borax, and a sufficient quantity of water to form a homogeneous emulsion of said ingredients.

3. A composition suitable for lubricating die members used in compressing finely divided particles of material into composite bodies comprising from 20 to 30 parts stearic acid, 4 to 6 parts spermaceti, 4 to 6 parts lanolin, 1 to 3 parts borax, and 25 to 35 parts water.

4. A lubricating composition comprising 25 parts stearic acid, 5 parts spermaceti, 5 parts lanolin, 2 parts borax, and 25 parts water.

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