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PREVENTION OF SEIZURE OF METAL PARTS

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The invention relates to means for preventing seizure of parts secured together in intimate contact under high pressure such, for example, as engine spark plugs or other threaded parts, fittings for chemical apparatus, etc.

The object of the invention is to provide a composition and method applicable to interfitting parts to facilitate separation when disassembly becomes necessary.

More particularly, the invention is designed especially for use in situations where interfitting parts are subjected to high temperatures and/or corrosive influences tending to cause seizure.

One field of use where the invention has been found of especial utility is in connection with the mounting of spark plugs or other threaded parts in aviation engines. Such engines are normally subjected to high temperatures and, because of the nature of their use, require frequent overhaul or inspection. It is often found that the threaded elements have seized to such an extent that damage and loss is caused in disassembly. It is common practice to try to remedy the difficulty by applying to the threads lubricants containing graphite, mica, or other fillers to form a film between the contacting surfaces. None of these, however, of which we are aware, meets all the desirable requirements.

In accordance with the present invention, zinc oxide is employed as the base or "filler." This has proven to be very effective in preventing seizure or "freezing" of the parts to which it is applied. It is furthermore not subject to change at high temperatures under the conditions of use, is electrically non-conducting, can be obtained of a fineness desirable not to cause interference between the parts, and possesses non-corrosive properties.

The oxide may be applied in any suitable manner, but for convenience in application it is preferably formed into a soft paste by mixing it with a liquid vehicle. Such vehicle should volatilize without carbonization, hence should preferably not be one of the lubricating oils since these are subject to carbonization under high temperatures leaving an undesirable residue of carbon and/or bonding the lubricating filler in such manner that the individual particles of the latter are prevented from functioning in the desired manner. Furthermore, the vehicle or liquid constituent should be only slightly volatile at relatively low temperatures in order not to be subject to evaporation on exposure under ordinary atmospheric conditions, thereby causing the compound to become too viscous for proper application or to

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"cake." It should also be wholly inert to the surfaces or non-corrosive in contact therewith and be non-injurious to users. It must also be inert as to the zinc oxide.

Both the zinc oxide and the vehicles herein disclosed are electrically non-conducting, a distinct advantage in application to electrical parts, such as spark plugs, when, in applying the composition, some is inadvertently smeared into the spark gap of the plug.

Preferably, we employ an organic liquid vehicle which boils at a temperature in the neighborhood of 250°–350° C. or higher, and one which completely vaporizes without decomposition (and therefore leaves no carbonaceous residue).

A number of substances having the desired properties are available, especially in the group of higher boiling esters of carboxylic acids. Among these may be mentioned tributyrin, $C_{15}H_{26}O_6$, and dibutyl phthalate, $C_{16}H_{22}O_4$.

The amount of the vehicle to be used varies, of course, with the consistency desired in the resultant paste. With the vehicles mentioned, the amount of vehicle required will be about twice, by weight, that of the oxide. As a specific example, we have had satisfactory results from the use of dibutyl phthalate and zinc oxide in the proportion by weight of 540 grams dibutyl phthalate and 300 grams zinc oxide, these ingredients being thoroughly mixed to form a homogeneous paste. These proportions result in a paste of suitable consistency to be readily applied to screw threads.

In order to eliminate probability of abrasion, the zinc oxide employed must be free of corrosive impurities such as sulphur compounds, and is preferably of small particle size, particularly for application to delicate or closely fitting parts. Oxide having an average ultimate particle size of 0.35–0.45 microns has been found satisfactory even though there may be some few coarser grains up to approximately 2.5 microns. A finer grade of oxide has also been used successfully which ranges in particle size from 0.11–0.17 microns.

In actual practice, as applied to the threads of aircraft engine spark plugs, we have found that, after being subjected to the extreme heat of such an engine, our compounds leave on the thread surfaces a dry and powdery coating of unbonded, finely divided zinc oxide which greatly facilitates disengagement by reducing the torque necessary for removal and thereby lessening the danger of marring or damaging the parts. Examination of the disengaged threaded parts indicates no rust or corrosive attack and no abrasive effects.

The zinc oxide compound does not sinter, as do some metal-containing greases, does not swell when heated or react with incidental iron oxide as does mica, and does not yield carbonaceous or corrosive byproducts. The vehicle is innocuous while it remains on the parts, but disappears when subjected to high temperatures without leaving any deleterious residue. The viscosity of the paste, furthermore, is not affected to a material extent by atmospheric temperature changes and the composition is therefore adapted for use in various climates.

While we have herein disclosed specific details by way of illustration of our invention, it is not intended thereby to restrict the scope of the invention further than is required by the terms of the appended claims in view of the prior part.

We claim:

1. The method of preventing seizure of the surfaces of metal parts held in engagement under high pressure comprising applying to such parts a paste consisting substantially of zinc oxide and an organic liquid capable of being vaporized at temperatures of upwards of 250° C. without leaving carbonaceous residue, then heating to drive off said liquid leaving a coating of dry zinc oxide on said surfaces, said liquid being one of the group of high-boiling esters of carboxylic acids consisting of di-butyl phthalate and tri-butyrin.

2. A composition for use in preventing seizure of metal parts comprising a pasty mixture composed substantially of zinc oxide and an organic liquid chemically inert to zinc oxide and the metal of said parts, said liquid being non-injurious to workmen and boiling at upwards of 250° C. without leaving a carbonaceous residue, said liquid being one of the group of high-boiling esters of carboxylic acids consisting of di-butyl phthalate and tri-butyrin.

3. A composition for use in preventing seizure of metal parts consisting substantially of a pasty mixture of zinc oxide and dibutyl phthalate.

4. A composition for use in preventing seizure of metal parts consisting substantially of a pasty mixture of zinc oxide and tributyrin.

5. A composition for use in preventing seizure of metal parts consisting substantially of zinc oxide and dibutyl phthalate in the proportions approximately of 300 grams zinc oxide and 540 grams dibutyl phthalate.

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