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3,345,146

COMPOSITION FOR ACCELERATED GRINDING

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No Drawing. Continuation of application Ser. No. 276,103, Apr. 26, 1963. This application Mar. 16, 1965, Ser. No. 440,271
Claims priority, application France, Apr. 27, 1962, 895,899, Patent 1,256,683
4 Claims. (Cl. 51—304)

This application is a continuation of application Ser. No. 276,103, filed Apr. 26, 1963, and now abandoned.

The present invention relates to a composition for the accelerated grinding of high-speed mechanisms.

It was already proposed to use certain lubricant material for grinding of various mechanisms; these lubricants consist generally of lubricant oils, in combination ether with animal fat, mineral oils, sulphur and zinc oxide, or with a neutral soap and titanium oxide, or contain a colloidal dispersion of iron oxides or sulphids. These known lubricants are however hardly suitable for grinding purposes, since they generally leave permanently an amount of abrasive on the article being ground, even after a sufficient grinding of the interfaces has been achieved. It has also been mentioned that the simultaneous use of zinc oxide and sulphur, or of a neutral soap and titanium oxide may result in a reduction of the abrasive effect after a certain utilisation time, the tests effected to this end have however shown that the results obtained were not satisfactory.

Lately, the French patent specification No. 1,256,683, filed Feb. 12, 1960, has disclosed a method and a composition for accelerated grinding, wherein a coating is applied onto the friction surfaces of the finish-machined pieces, consisting of a colloidal composition containing at least one polar oil and a metalloid such as sulphur, phosphourous or chlorine, adapted to combine in the heat with the metal to form a salt, the mechanism being set up and operated in order to determine through friction the amount of heating necessary for the reaction. According to the French patent mentioned above, the grinding agent used is a composition comprised of oleic acid, castor oil, sulphur fixed on the oleic acid, and lead stearate as a thickening agent. Operating according to the conditions stated in said French patent specification, very satisfactory results were obtained, as shown by comparative tests with conventional methods. The method requires, however, on one hand, the provision of a normal lubrication during grinding, and, additionally on the other hand, that the abrasive paste formed by the grinding composition with the metal particles derived from the contacting surfaces must be removed after a certain time. The operation for the removal of this paste is a major disadvantage, since it requires the draining in the heat of the polluted oil, followed by rinsing, also in the heat, with a detergent oil, before putting the pieces again in motion with the normal operating oil.

From the statement given above relating to the known art, it clearly follows that, up to the present, no entirely satisfactory grinding composition is available; this is also true even with the composition disclosed in the above mentioned French patent specification, since the chemical actions as described therein do not occur in a reliable manner, so that the desired results will not be positively obtained.

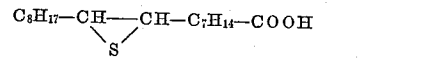
During the various studies, researches and tests carried out by the applicant, it was discovered that the above mentioned drawbacks could be avoided and the grinding time substantially reduced by using an abrasive consisting of a metal oxide incorporated in a lubricating paste comprised of a polar compound onto which is chemically fixed a metalloid adapted to readily separate, in the "nascent"

state, from the acid, under the effect of the operating temperature, to form with said metal oxide a salt melting at a temperature to lower than the melting point of the surface or of the surfaces to be polished, the melting point of the metal oxide being higher than that of said surfaces.

The composition may, besides, contain a certain amount of a thickening agent, such as a petroleum jelly such as that sold under the trademark "Vaseline."

As a metal oxide, use is advantageously made of the iron oxide (Fe_2O_3)—haematite, preferably as the product marketed and sold under the trademark "Synthetic Colcothar," the melting point of which is 1535° C., approximately. The amount of iron oxide to be used may vary in a wide range, from 1 to 30% by weight, but should remain substantially lower than the percentage corresponding to the combination with oxygen of the total amount of the metalloid, said amount being also a function of the desired grinding time.

As a "metalloidized" polar compound, use is preferably made of the oleic acid onto which a sulfur atom is fixed by a loose double bond. The compound may be termed a "sulfurous oleic acid" (or even thiooleic acid) and corresponds substantially to the following developed formula:



The thiooleic acid—or sulfurous oleic acid—wherein the sulfur is fixed by the loose double bond, as mentioned above, is prepared by heating together equimolecular proportions of oleic acid and sulfur at a temperature higher than 115° C., but not exceeding 150° C.

It is also possible to use a polar composition containing castor oil and sulfurous oleic acid, as well as a thickening agent such as the lead stearate: an advantageous formulation of the corresponding composition corresponds to 1 to 20 parts, by weight, of natural or synthetic iron oxide and 99 to 80 parts, by weight, of a mixture comprising:

	Parts by weight
Castor oil	30
Lead stearate	10
Sulfurous oleic acid	60
"Mother-Vaseline"	10

Such a composition is suitable when the grinding operation is not liable to cause any gumming due to the presence of castor oil.

The method of using the composition according to the invention comprises applying a coating of said composition by means for instance of a chamois leather, to the friction surfaces, preliminarily washed for instance with trichloroethylene or a similar substance, and subsequently effecting the grinding, while normally lubricating in the hydrodynamic phase, under a certain pressure during the operation. This normal lubrication is ensured either in the casing containing the moving pieces to be polished, or in a set-up casing, in the case of an individual piece to be treated, by means of an ordinary lubricant admixed with—preferably sulfurous—oleic acid. In the case of an engine, the grinding is of course effected with the ignition and fuel supply cut off, for instance at the end of the production line.

Example

By way of example of a composition for grinding engines, the following formulation has been used:

	Grams
"Vaseline" (trademark)	500
Sulfurous oleic acid	500
"Synthetic Colcothar"	(1)

[1] 5% i.e. 50 grams.

placing in the casing a S.A.E. 20 lubricating oil in the

proportion ranging from 1 to 99 parts mixed to an oleic acid in the proportion ranging from 99 to 1 parts, a preferred composition containing 60 part of S.A.E. 20 oil and 40 part of sulfurous oleic acid.

By heating said thiooleic acid at temperatures higher than about 300° C., active sulphur becomes free. Said zone of temperatures in existing when carrying out a grinding operation with the composition and according to the method as indicated herein above, due to the intense friction between both surfaces and the iron oxide abrasive (Fe_2O_3, haematite), and iron sulfide embeds in the cavities formed on the surfaces and fills them up. This phenomenon is completed by an attack on the surface asperities by the active sulfur released in the nascent state, forming at the same time an iron sulfide. The iron oxide of above composition the initial melting point of which was about 1600° C., turns progressively, during the grinding operation, into iron sulfide whose melting point is about 1200° C. The amounts of iron oxide and thiooleic acid used are such that, as shown above, only a portion of the acid sulfur will combine with the iron oxide to yield sulfur, while other oxide particles which were not initially converted into iron sulfide continue to come into contact with the surface asperities, thus favouring the renewal in the vicinity of these asperities, of new reactive iron sulfide molecules, whereby the grinding process is accelerated. It is thus seen that after a certain interval of time, the abrasive iron oxide disappears, without it being necessary to take any particular steps, and it is therefore possible to "grade" at will the grinding operation. Besides, the removal of the abrasion remainders—which have no more abrasive properties—may be effected either immediately or at a subsequent moment during the running of the engine, resulting in a highly advantageous industrial convenience.

An internal combustion engine treated according to the conditions of the invention was ground in less than 4 hours, whereas 6 hours at least were required when using the grinding compounds, such as, for instance, those disclosed in above-mentioned French patent specification. This may be accounted for, to a certain extent, by the fact that, in the physical and chemical grinding process according to the invention, the polishing operation through

abrasion may be effected in a reciprocating motion (which is the true motion of the pieces submitted to grinding in such an engine), rather than as presently done, by means of rotating motion, preferably in a single direction.

The composition according to the invention thus enables, with respect to the known grinding agents using sulfur and iron oxide, to reduce the time required for the grinding operation, while positively eliminating any extensive, untimely and detrimental abrasive action.

What is claimed is:

1. An abrasive composition for accelerated grinding of surfaces and adapted for use with lubricating oil consisting essentially of 1 to 20 parts by weight of ferric oxide and 99 to 80 parts by weight of a mixture of sulfurous oleic acid, petroleum jelly, lead stearate and castor oil.

2. An abrasive composition for accelerated grinding of surfaces consisting essentially of lubricating oil, sulfurous oleic acid and 1 to 30% by weight of ferric oxide the amount of sulfurous oleic acid present being substantially less than the amount of ferric oxide and the remainder being lubricating oil.

3. An abrasive composition for accelerated grinding of surfaces consisting essentially of 500 grams of sulfurous oleic acid, 50 grams of ferric oxide and 500 grams of petroleum jelly.

4. The method of accelerated grinding of metal parts comprising cleaning the surfaces to be polished, applying thereto a grinding composition in lubricating oil, said grinding composition consisting essentially of sulfurous oleic acid and ferric oxide, grinding said parts to raise the temperature thereof to above about 300° C., said grinding step causing friction to provide nascent sulfur, and progressively forming iron sulfide during the grinding operation.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,345,146 October 3, 1967

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It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the printed specification, line 8, for "1,256,683" read -- 1,359,624 --.

Signed and sealed this 3rd day of December 1968.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents