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GRINDING COMPOSITION VEHICLE

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This invention relates to grinding compositions and more particularly it is concerned with carrier bases for use in the preparation of grinding compositions employed in the grinding and lapping of metals and with grinding compositions incorporating such carriers.

Heretofore, two general types of carrier bases have been prepared; water base compositions and oil base compositions. Whichever base type is used, it is important that the abrading power of the composition containing the abrasive be uniform for a substantial period of time, preferably limited only by the life of the finely divided abrasive itself.

A water base vehicle containing an abrasive dispersed therein fails in this respect because the heat generated during the grinding operation causes the evaporation of water, thus tending to dry out the dispersion. Fresh moisture may, of course, be added from the bath but the dry abrasive left from the dried-out portion will then be added to the grinding composition so that the abrading force gradually increases during grinding and the required uniformity is lost. Another objection to water base compounds is freezing. The use of anti-freeze compounds and compounds to lessen the tendency of these dispersions to dry out have been suggested; however, it is well known that none have been entirely satisfactory.

On the other hand, an ordinary oil base vehicle containing an abrasive dispersed therein, although it does not dry out, is unsatisfactory because it remains on the gears after grinding and requires expensive treatment such as baths in naphtha or the like to remove all traces of abrasive followed by soap spray or other means to remove the naphtha followed by still a third bath in oil to cover the freshly-ground surface with a protective oil coating. The grease which is generally used in oil base dispersions acts as a lubricant during the grinding operation and, as a consequence, the abrasive grains do not break down but continue to cut and imbed themselves in the article being ground. It is, therefore, necessary to finish grind or lap with a finer grade of abrasive to obtain the proper finish or polish.

Prior to my invention many attempts have been made to combine the desirable qualities of oil or grease base vehicle with those of a water base vehicle. For example, it has been attempted to render the latter vehicle emulsifiable by the addition of an emulsifier thereto. In all of the prior art attempts, however, one adjustment of ingredients or of a process step made to correct a defect would cause a new defect to appear in the end product, whereupon new adjustments or changes would have to be made but these in turn would cause still different defects. For example, a grease or oil base heavy enough to keep its body at grinding temperature might stick and resist demulsification so much as to make it impossible to wash the composition off after grinding but an increase or change of the emulsifying agent might in turn lower the lubricating power below requirements and then if an oil or lubricant were added, this would in turn thin the composition below the required viscosity or perhaps destroy the uniformity of the dispersion of abrasive particles.

It is, therefore, a primary object of my invention to provide a vehicle which obviates the disadvantages of the prior art which will flow at grinding temperatures so as to spread abrasive particles uniformly over all of the contacting parts of the two surfaces that are being ground or lapped together. It is another object of this invention to provide a lapping vehicle which will not dry out. It is yet another object of the present invention to provide a lapping vehicle which is self-cleaning. Yet another object of my invention is to provide an abrasive composition wherein the abrasive particles will be held in suspension uniformly throughout the life of the abrasive particles.

These and other objectives and advantages are attained by the present invention which may briefly be described as a process for the preparation of a carrier base or a lapping vehicle comprising a non-viscous mineral oil as the major component together with minor quantities of a fatty oil, an oil-soluble petroleum sulfonate, and a grease.

The proportions of the different components used in preparing my lapping vehicle may be varied over a wide range, depending in part upon the particular use the lapping vehicle is to be put. In general, suitable proportions of the fatty oil and petroleum sulfonate may range from about 5 to about 25% and about .5 to about 5% respectively, based upon the total weight of the vehicle. Preferred proportions of these two components is somewhat more limited, ranging from about 10 to 15% and about 1 to 2% on the same weight basis and in the same order.

The amount of grease added may vary from about 1 to 5%, however, this figure is largely dependent upon the total quantity of the alkaline earth metal soap contained in the grease and as a result I prefer to state this variable in terms of the soap content. As a general rule the amount of soap used may vary from about .2% to about .8%, the preferred range varying from .2% to .5%.

A quantity of a light non-viscous hydrocarbon oil having an initial boiling point of at least 400° F. and a viscosity of about 30–70 SSU at 100° F. such as diesel fuel is employed in conjunction with the above-mentioned components in sufficient quantity to make 100%. The purpose of the light non-viscous hydrocarbon oil is to maintain fluidity under all conditions so that the vehicle mixes readily and instantly with the lapping agent, flows readily to the grinding surface, does not dry out or form a gum and is sufficiently light to carry away the abraded metal continuously and allows for quick and easy cleaning of the metal surface.

The fatty oil used must be a free-flowing, non-drying and non-gumming oil. Suitable oils of this classification include sperm oil, neatsfoot oil, lard oil, synthetic esters, etc.

As mentioned above suitable cations of the soaps are the alkaline earth metals calcium, barium, strontium and magnesium. These soaps provide a soft or loosely flocculent particle which supplies a desirable type of suspending medium for the lapping agent or abrasive as well as to furnish a certain degree of reserve alkalinity. Of the different types of soaps which may be used I prefer a calcium soap, mainly because it is readily available as a component of a normal cup grease and is low in cost. A preferred method of adding the soap is by using a cup grease of which the desired soap is a component. A convenient grease to use is that ordinarily known as a #2 cup grease, however, either #1 or #4 cup greases may be used if desired. Since these different cup greases contain a different amount of soap, the amounts of cup greases used may be adjusted accordingly so that the

final composition will contain the desired amount of soap.

Sulfonates which are suitable include alkyl sulfonates, alkaryl sulfonates, the so-called mahogany and petroleum soaps, and the like. The mahogany soaps may include sulfonates produced in conventional sulfuric acid refining of lubricating oil distillates and from the industrial use of fuming sulfuric acid in the refining of petroleum. The industrial production of mahogany sulfonates from petroleum is well understood in the art and is described in the literature. Other sulfonates which may be used include the sulfonates which are formed by neutralizing alkaryl sulfonic acids. The alkaryl sulfonic acids are produced by sulfonating an alkaryl hydrocarbon which in turn was produced by alkylating an aromatic hydrocarbon. Methods of preparing such sulfonates are well known to those skilled in the art and forms no part of this invention. Two sulfonates which I have found particularly useful in my invention are sodium dodecylbenzene sulfonate and Sonneborn's "Petronate H." Sodium dodecylbenzene sulfonate is prepared by neutralizing the sulfonic acid produced by sulfonating dodecylbenzene. Dodecylbenzene is available commercially and its physical properties are as follows:

Specific gravity at 16° C.	0.8742
Average molecular weight	232
A.S.T.M., D–158 Engler:	
I.B.P. ° F.	535
5 ° F.	545
10 ° F.	550
50 ° F.	560
90 ° F.	580
97 ° F.	592
F.B.P. ° F.	603
Refractive index at 20° C.	1.4885
Viscosity at 20° C. centipoises	14
Bromine number	0.16

Properties of Sonneborn's "Petronate–H" are as follows:

Sulfonates percent by weight	62
Mineral oil do	33
Water do	5
Molecular weight of sulfonate	440 to 470
Specific gravity, 60° F.	1.02
Flash point, ° F., open cup	450
Empirical formula	$C_{26}H_{42}SO_3Na$
SO_3 content percent	17.5
Ash content as Na_2SO_4 do	15.5

The sodium salts of the sulfonic acids are preferred because of their availability, however, other cations may be substituted for sodium such as the alkali and the alkaline earth metals. As mentioned above, the sulfonate must be oil-soluble.

As mentioned above, the amount of sulfonate used in the mixture varies from about 0.5 to 5 weight percent; preferably about 1 to 2 weight percent. If an amount of sulfonate in excess of 5 percent is used, the vehicle becomes water emulsifiable. On the other hand if less than 0.5 percent is used the vehicle does not offer sufficient rust protection.

The temperature used in the mixing operation is not critical but may vary from room temperature to about 200° F., however, for convenience I prefer to carry out the mixing operation at room temperature.

In order to disclose the nature of the present invention still more clearly, the following illustrative examples will be given in which parts given are parts by weight. A preferred method of preparing an abrasive composition is to first prepare the abrasive composition vehicle after which the abrasive material is added thereto.

Example 1

A vehicle composition is prepared by mixing the following components:

	Parts
Special diesel fuel	82.99
Lard oil	12.97
Sodium dodecylbenzene sulfonate	2.04
No. 1 cup grease	2.00

Example 2

A vehicle composition is prepared by mixing the following components:

	Parts
Special diesel fuel	82.99
Lard oil	12.97
Petronate H	2.02
No. 1 cup grease	2.02

Example 3

A vehicle composition is prepared by mixing the following components:

	Parts
Pale oil 40 SSU at 100° F.	83.00
Lard oil	12.97
Sodium dodecylbenzene sulfonate	2.03
No. 2 cup grease	2.00

Abrasive compositions may be prepared by incorporating an abrasive material in the foregoing carriers. Suitable abrasive materials including carborundum, emery, magnesium silicate, numerous forms of silica, lime, whiting, aluminum powders, crocus powder, roughes, pumice, tripoli, and the like. The abrasive may be relatively coarse or it may be fine. A coarse grade is generally used for grinding while finely ground materials are used in polishing operations. In general, suitable sizes vary from about 325 mesh down to particles of micron dimensions. As to the latter, I have used successfully abrasive materials the diameter of which average about .1 micron. As an illustration, the finishing of metal surfaces, particularly those where a perfectly flat surface is required such as valve seals or compressors, the usual methods is to roughly finish the surface using a coarse grinding medium. For the final finishing or re-finishing of used surfaces, a fine lapping action or polishing is required. This is accomplished by using some form of lapping agent in a finely-divided state having abrasive properties which is dispersed or carried in the vehicle. As to the amount of the abrasive material used, that may vary from about 1 to 10 weight percent of the total composition. The preferred quantity varies from 2 to 3 weight percent.

Example 4

A grinding composition is preferred by mixing 35 parts of the carrier base as prepared in Example 1 with one part of 325 mesh carborundum. The abrasive grains are added to the carrier base and the mixture is sufficiently agitated so as to disperse the abrasive in the base uniformly. There results a grinding composition having a creamy consistency which has substantially no tendency of imbedding the abrasive in the metal during use, thus leaving clean metal surfaces and which does not break down during grinding under high degrees of grinding pressure.

Example 5

A lapping composition is prepared by mixing 35 parts of the carrier base of Example 2 with 1 part of a carborundum lapping agent the average particle size of which was 21 microns in diameter. This is approximately a 650 mesh product. The abrasive material is added to the carrier base and the mixture is sufficiently agitated so as to disperse the abrasive in the base uniformly. The resulting lapping composition has a creamy consistency and there is no tendency of imbedding the abrasive in the metal during use thus leaving clean metal surfaces. This

product does not break down during grinding under high degrees of grinding pressure.

While particular embodiments of the invention have been described, it will be understood, of course, that the invention is not limited thereto since many modifications may be made, and it is, therefore, contemplated to cover by the appended claims any such modifications as fall within the true spirit and scope of the invention.

The invention having thus been described, what is claimed and desired to be secured by Letters Patent is:

1. A non-emulsifiable abrasive composition vehicle comprising 93.3 to 65 weight percent of a mineral oil having an SSU viscosity at 100° F. of from 30 to 70, 5 to 25 weight percent of a fatty oil selected from the group consisting of sperm oil, neatsfoot oil, and lard oil, 0.5 to 5 weight percent of sodium dodecylbenzene sulfonate, and an amount of cup grease, containing from 10 to 30 weight percent of an alkaline earth metal soap, characterized further in that said amount of cup grease will provide from 0.2 to 0.8 weight percent of soap in said composition.

2. A non-emulsifiable abrasive composition vehicle comprising 88 to 85 weight percent of a mineral oil having an SSU viscosity at 100° F. of from 30 to 70, 5 to 25 weight percent of a fatty oil selected from the group consisting of sperm oil, neatsfoot oil, and lard oil, 0.5 to 5 weight percent of sodium dodecylbenzene sulfonate, and an amount of cup grease, containing from 10 to 30 weight percent of an alkaline earth metal soap, characterized further in that said amount of cup grease will provide from 0.2 to 0.5 weight percent of soap in said composition.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 23,082	Zimmer et al.	Jan. 25, 1949
1,855,195	McClaughry	Apr. 26, 1932
1,986,243	Arveson	Jan. 1, 1935
2,230,556	Zimmer	Feb. 4, 1941
2,394,790	Lieke	Feb. 12, 1946
2,556,289	Morway et al.	June 12, 1951
2,606,872	Gasser et al.	Aug. 12, 1952
2,610,151	Putnam et al.	Sept. 9, 1952
2,629,692	Lieke	Feb. 24, 1953
2,677,618	Deiman	May 4, 1954
2,780,598	Cafcas	Feb. 5, 1957