United States Patent Office 3,249,538 Patented May 3, 1966

3,249,538

LUBRICATING METHOD AND COMPOSITION

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No Drawing. Continuation of abandoned application Ser. No. 11,161, Feb. 26, 1960. This application Mar. 5, 1964, Ser. No. 349,731
Claims priority, application Germany, Oct. 14, 1958, K 35,974; Feb. 27, 1959, K 37,104
12 Claims. (Cl. 252—18)

This application is a continuation of copending application Serial No. 11,161, filed February 26, 1960, for "Lubricating Concentrate," and now abandoned. Application Serial No. 11,161 is a continuation-in-part of Serial No. 845,320, filed October 9, 1959, for "Non-Inflammable Lubricating Composition," and now abandoned.

The present invention relates to a lubricating concentrate, and more particularly to a concentrate which can be diluted and used for lubricating purposes, the diluted lubricating composition being non-inflammable and having excellent lubricating properties.

Mineral oil is most commonly used for lubricating purposes. These mineral oils, however, have the disadvantage of being flammable and this is an extremely important disadvantage for many purposes.

Synthetic lubricating oils which have advantages from the point of view of being difficultly flammable have other disadvantages particularly poisonous effect, aside from the fact that at high temperatures, particularly in mine fires, a flaming or burning is not prevented. Moreover, the known lubricating oils have the disadvantage that they cannot be concentrated, which of course means that considerable costs are involved in transporting the same in order to have a sufficient amount available for lubrication purposes.

In my parent application Serial No. 845,320, now abandoned, I described aqueous lubricating compositions based upon emulsions of molybdenum disulfide. As set forth in this application the composition comprises a non-inflammable water base lubricating composition containing as main lubricating component finely divided particles of molybdenum disulfide distributed therethrough. The amount of molybdenum disulfide should be approximately 5% by volume.

Most preferably the molybdenum disulfide particles are in such extremely finely divided form that with the water an aqueous colloidal dispersion of the molybdenum disulfide is formed. In other words, the particle size of the molybdenum disulfide should be colloidal.

The properties of the lubricating oil composition can be improved by the addition thereto of a viscosity-increasing agent, such as one or more of the following:

Sorbitol
Polyvinylpyrrolidone (Kollidon)
Polyalkylene glycols
Polymerization products of acrylic acid
Polyvinyl alcohols and derivatives thereof
Sodium salt of cellulose oxy-acetic acid
Emulsifiable mineral oils

In addition, improved properties of the lubricating composition can be obtained by the addition thereto of a corrosion-inhibiting agent. A particularly suitable combustion-inhibiting agent for this purpose is an aqueous alkaline solution of hydrazine hydrate.

Example 1

An aqueous dispersion is prepared of the following composition:

94% by volume water

5% by volume molybdenum disulfide (colloidal size particles)
0.5% by volume mineral oil
0.5% by volume of an aqueous alkaline hydrazine hydrate solution having the following composition:
- 250 cc. hydrazine hydrate
- 75 cc. sodium hydroxide solution in water (50 g./l., or the equivalent amount of potassium hydroxide solution)
- 2 cc. sodium phosphate solution (10 g./100 cc. distilled water)
- 175 cc. distilled water or condensed water.

Example 2

A dispersion is prepared from the following composition:

79% by volume water
5% by volume molybdenum disulfide (in colloidal particle size)
15% by volume sorbitol
0.5% by volume mineral oil
0.5% by volume of an aqueous alkaline hydrazine hydrate
- 250 cc. hydrazine hydrate
- 75 cc. sodium hydroxide solution in water (50 g./l., or the equivalent amount of potassium hydroxide solution)
- 2 cc. sodium phosphate solution (10 g./100 cc. distilled water)
- 175 cc. distilled water or condensed water.

The flammability of the above-described lubricating compositions is so low that for all practical purposes it may be considered that these compositions are completely non-burnable. The chemical and physical properties of these lubricating compositions differ considerably from those of the normal mineral oil lubricating compositions. The composition of the present invention will not burn even at relatively high temperatures.

Although the above lubricating compositions have good properties they do not give the best possible lubricating effect because in addition to the molybdenum disulfide, oil and other additives ordinarily used which either simultaneously with or later are either emulsified or dissolved along with the molybdenum disulfide. This results in the need for precautions which make the practical use of the composition difficult. In every case it is necessary to observe precautions due to complicated dosing, which requires the use of expensive and trained personnel.

It is therefore a primary object of the present invention to provide an improvement in molybdenum disulfide base lubricating compositions which avoids the above enumerated disadvantages.

It is a further object of the present invention to provide a molybdenum disulfide lubricating concentrate which can be diluted by inexperienced personnel when needed for lubricating purposes.

Other objects and advantages of the present invention will be apparent from a further reading of the specification and of the appended claims.

In accordance with the present invention a special concentrate is prepared and this concentrate can be simply mixed with water when the lubricating composition is desired and upon mixing with water is directly ready for use. Since water is of course available everywhere a considerable amount of transportation costs is avoided, the water being available at the place to which the concentrate is shipped, and because of the simplicity of mixing the concentrate composition with the water no skilled personnel is necessary for the final stage of the preparation of the lubricating composition.

With the above objects in view the present invention

mainly comprises a paste of molybdenum disulfide particles in water and a pulverulent, water-soluble substance which in water has a high viscosity.

Preferably the molybdenum disulfide has a particle size of the magnitude of about 0.6μ and is in a 10% colloidal solution in water, while the pulverulent, water-soluble paste-forming substance is a polymerisate such as polyvinylpyrrolidone, solid polymerization products of acrylic acid, of urea and of the sodium salt of cellulose oxy-acetic acid.

The relative quantity of molybdenum disulfide in the paste may vary considerably.

It is desirable to maintain a relatively high concentration of molybdenum disulfide so that the lubricating concentrate may serve for many different applications. Generally, without limiting the invention thereto, a concentration of between 2 and 5 percent molybdenum disulfide in the lubricating concentrate will be preferred, or even a somewhat higher concentration.

As stated further above, the particle size of the molybdenum disulfide is preferably of the magnitude of about 0.6μ. The smaller the individual molybdenum disulfide particles, the less will be the danger of sedimentation in the diluted lubricant.

The following examples are given to further illustrate the present invention. The scope of the invention is not, however, meant to be limited to the specific details of the examples.

Example 3

A paste is prepared of:

25 parts by weight of a polyvinylpyrrolidone polymerisate having a molecular weight of about 40,000,

200 parts by weight of an oil-in-water emulsion containing a corrosion inhibitor, and

100 parts by weight of a colloidal molybdenum disulfide solution containing 10% MoS_2.

Preferably the corrosion inhibitor in the oil-in-water emulsion is the aqueous alkaline hydrazine hydrate solution mentioned above.

Tubes filled with the above paste can be easily transported anywhere and the paste by portion-wise addition of water can be converted into a lubricating agent of any desired viscosity. Practically any viscosity according to the Englert values can be obtained.

Example 4

A concentrate is prepared of the following composition:

25 parts by weight of a polyvinylpyrollidone polymerisate having a molecular weight of about 40,000,

200 parts by weight of an oil-in-water emulsion containing a corrosion inhibitor, and

100 parts by weight of a colloidal molybdenum disulfide solution containing 20% MoS_2.

The following tables will show the relationship between the viscosity of the lubricating emulsion and the degree of dilution of the concentrate from which the lubricating emulsion has been formed. Table I shows for a given lubricating concentrate the relationship between dilution and viscosity at 20° C., and Table II for the same concentrate at 50° C.

TABLE I

Concentrate (Parts)	Water (Parts)	Viscosity (° E at 20° C.)	Specific Weight (at 20° C.)
1	1	92.20	1.024
1	2	17.30	1.016
1	4	4.83	1.008
1	9	1.80	1.001
1	19	1.30	0.998

TABLE II

Concentrate (Parts)	Water (Parts)	Viscosity (° E at 50° C.)	Specific Weight (at 50° C.)
1	1	31.40	1.003
1	2	6.30	0.005
1	4	2.20	0.987
1	9	1.31	0.980
1	19	1.20	0.977

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. Lubricating concentrate adapted when mixed with water in a ratio of one part of concentrate to 1–19 parts of water to form a water-base lubricating composition, said concentrate consisting essentially of a paste of a 10–20% colloidal solution of molybdenum disulfide and a pulverulent water soluble substance which in water has a high viscosity and being selected from the group consisting of sorbitol, water soluble polyvinylpyrrolidone, water soluble polyalkylene glycols, water soluble polyacrylates, water soluble polyvinyl alcohols, the sodium salt of cellulose oxy-acetic acid and mineral oils, in a ratio of about 25 parts of said pulverulent water soluble substance per each 100 parts of said colloidal solution.

2. Lubricating concentrate adapted when mixed with water in a ratio of one part of concentrate to 1–19 parts of water to form a water-base lubricating composition, said concentrate consisting essentially of a paste of a 10–20% colloidal solution of molybdenum disulfide, an emulsion consisting essentially of oil in water and containing hydrazine hydrate as corrosion inhibiting agent, and a pulverulent water soluble substance which in water has a high viscosity and being selected from the group consisting of sorbitol, water soluble polyvinylpyrrolidone, water soluble polyalkylene glycols, water soluble polyacrylates, water soluble polyvinyl alcohols, the sodium salt of cellulose oxy-acetic acid and mineral oils, in a ratio of about 25 parts of said pulverulent water soluble substance to 200 parts of said oil-in-water emulsion to 100 parts of said colloidal solution.

3. A lubricating concentrate adapted when mixed with water in a ratio of one part of concentrate to 1–19 parts of water to form a water-base lubricating composition, said concentrate being in the following proportions:

25 parts by weight of polyvinylpyrrolidone having a molecular weight of approximately 40,000,

200 parts by weight of an emulsion consisting essentially of oil in water and containing an effective amount of aqueous alkaline solution of hydrazine hydrate as corrosion-inhibiting agent, and

100 parts by weight of a colloidal aqueous solution of molybdenum disulfide containing 10% of MoS_2.

4. A lubricating concentrate adapted when mixed with water in a ratio of one part of concentrate to 1–19 parts of water to form a water-base lubricating composition, said concentrate being in the following proportions:

25 parts by weight of polyvinylpyrrolidone having a molecular weight of approximately 40,000,

200 parts by weight of an emulsion consisting essentially of oil in water and containing an effective amount of aqueous alkaline solution of hydrazine hydrate as corrosion-inhibiting agent, and

100 parts by weight of a colloidal aqueous solution of molybdenum disulfide containing 20% of MoS_2.

5. A liquid non-inflammable water base lubricating composition consisting essentially of water and a minor amount of finely divided particles of molybdenum disulfide dispersed therethrough, and an effective amount of at least one viscosity-increasing substance selected from the group consisting of sorbitol, water soluble polyvinylpyrrolidone, water soluble polyalkylene glycols, water soluble polyacrylates, water soluble polyvinyl alcohols, the sodium salt of cellulose oxyacetic acid and mineral oils.

6. A liquid non-inflammable water base lubricating composition consisting essentially of water, finely divided particles of molybdenum disulfide dispersed therethrough in an amount of approximately 5% by volume, and an effective amount of at least one viscosity-increasing substance selected from the group consisting of sorbitol, water soluble polyvinylpyrrolidone, water soluble polyalkylene glycols, water soluble polyacrylates, water soluble polyvinyl alcohols, the sodium salt of cellulose oxyacetic acid and mineral oils.

7. A liquid non-inflammable water base lubricating composition consisting essentially of water, finely divided particles of molybdenum disulfide dispersed therethrough in an amount of approximately 5% by volume, and an effective amount of at least one viscosity-increasing substance selected from the group consisting of sorbitol, water soluble polyvinylpyrrolidone, water soluble polyalkylene glycols, water soluble polyacrylates, water soluble polyvinyl alcohols, the sodium salt of cellulose oxyacetic acid and mineral oils and also containing as corrosion-inhibiting agent an aqueous alkaline solution of hydrazine hydrate.

8. A liquid non-inflammable water base lubricating composition consisting essentially of water, finely divided particles of molybdenum disulfide dispersed therethrough in an amount of approximately 5% by volume, approximately 15% by volume of sorbitol as viscosity-increasing agent, approximately 0.5% by volume of an aqueous alkaline solution of hydrazine hydrate as corrosion-inhibiting agent, and approximately 0.5% by volume of mineral oil.

9. A liquid non-inflammable water base lubricating composition consisting essentially of water, finely divided particles of molybdenum disulfide dispersed therethrough in an amount of approximately 5% by volume, approximately 15% by volume of sorbitol as viscosity-increasing agent, approximately 0.5% by volume of an aqueous alkaline solution of hyrazine hydrate as corrosion-inhibiting agent, said solution being formed of substances in the proportions of 250 cc. hydrazine hydrate, an aqueous alkaline solution selected from the group consisting of 75 cc. of sodium hydroxide solution containing 50 g. of sodium hydroxide per liter and the equivalent amount of potassium hydroxide solution, 2 cc. of sodium phosphate solution containing 10 g. of sodium phosphate per 100 cc. of water, and 175 cc. of water, and approximately 0.5% by volume of mineral oil.

10. Method of lubricating, comprising the steps of applying to elements to be lubricated a liquid water-base lubricating composition consisting essentially of water, an effective amount of finely divided particles of molybdenum disulfide dispersed therethrough, an effective amount of at least one viscosity-increasing substance selected from the group consisting of sorbitol, water soluble polyvinylpyrrolidone, water soluble polyalkylene glycols, water soluble polyacrylates, water soluble polyvinyl alcohols, the sodium salt of cellulose oxyacetic acid and mineral oils, and also containing as corrosion-inhibiting agent an effective amount of an aqueous solution of hydrazine hydrate.

11. Method of lubricating, comprising the steps of applying to elements to be lubricated a liquid water-base lubricating composition consisting essentially of water, an effective amount of finely divided particles of molybdenum disulfide dispersed therethrough, an effective amount of at least one viscosity-increasing substance selected from the group consisting of sorbitol, water soluble polyvinylpyrrolidone, water soluble polyalkylene glycols, water soluble polyacrylates, water soluble polyvinyl alcohols, and the sodium salt of cellulose oxy-acetic acid, and mineral oils, and also containing as corrosion-inhibiting agent an effective amount of an aqueous solution of hydrazine hydrate.

12. Method of lubricating, comprising the steps of applying to elements to be lubricated a liquid, non-inflammable, water base lubricating composition consisting essentially of water, finely divided particles of molybdenum disulfide dispersed therethrough in an amount of approximately 5% by volume, approximately 15% by volume of sorbitol as viscosity-increasing agent, approximately 0.5% by volume of an aqqueous alkaline solution of hydrazine hydrate as corrosion-inhibiting agent, and approximately 0.5% by volume of mineral oil.

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