Patented Mar. 28, 1944 2,345,199

UNITED STATES PATENT OFFICE

2,345,199

EMULSIFIABLE LUBRICANT

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No Drawing. Application July 1, 1942, Serial No. 449,315

4 Claims. (Cl. 252—49)

The present invention relates to improvements in compounds suitable for use as lubricants and as vehicles and carriers for lubricants, cleaners and the like, and more particularly in emulsified compositions suitable for lubricants, which may be used with water alone or in conjunction with various lubricant oils to form emulsion lubricants. The compounds of the present invention have widely extended uses, not only as cutting oils, drawing oils and the like, but also for the direct lubrication of bearings, gears and the like, particularly when one or more of the bearing or gear surfaces is a composition embodying synthetic resins. It is also useful for the treatment of fibers, such as binder twine and the cores of wire ropes and generally for the incorporation of small proportions of oil or oily material in textile fibers.

In preparing the base compositions in accordance with the present invention, I employ, in combination, the glycerine mono-esters of the higher fatty acids (commonly called "monoglycerides") together with an ethanolamine soap of higher fatty acids. In general, I prefer to form a combination containing these two substances and a relatively small amount of water as compared with the amount of water used in forming the final emulsion, thereby forming a concentrate or base, which is convenient in commercial handling. This concentrate or base may then be diluted with water and such additions made to it as are desired.

The mono-glyceride employed in accordance with the present invention may be a glycerol mono-ester of a higher fatty acid or of mixtures of such fatty acids. Thus, glycerine mono-esters of oleic, stearic, or other common higher fatty acids may be used, as may be the glycerine mono-esters derived from cocoanut oil fatty acids, cottonseed oil fatty acids, soybean oil fatty acids, linseed oil fatty acids, or the like. Thus, the mono-glyceride of soybean oil fatty acids has been found suitable and reference will be made to it in connection with the specific examples hereinafter given. However, it will be understood that mono-glycerides of other fatty acids or fatty acid mixtures may be employed in its place, in whole or in part, as hereinbefore indicated.

The ethanolamine employed in the production of the ethanolamine soap may be the mono-, di- or triethanolamine. In general I prefer to use technical triethanolamine which usually contains varying quantities of the mono- and diethanolamines.

The ethanolamine soap employed in carrying out the invention may likewise be prepared from any suitable higher fatty acid, such as oleic acid, stearic acid, soybean oil fatty acids, rape seed oil fatty acids or the like, or mixtures thereof. In general, I find the tri-ethanolamine soap of oleic acid to be satisfactory for use and it will be referred to in the illustrations hereinafter given. It will be understood, however, that other ethanolamine fatty acid soaps, as hereinbefore indicated, may be used in its place.

In some cases I prefer to use an excess of triethanolamine over that required to form a soap with the higher fatty acid employed. The triethanolamine soap of oleic acid or other fatty acid of approximately the same molecular weight are readily formed by reaction of approximately 2 parts of the fatty acid and 1 part of triethanolamine. With fatty acids of different molecular weights, and with other ethanolamines, corresponding variations in the proportion of the ethanolamine are made.

The composition containing the mono-glyceride and the ethanolamine soap, with or without an excess of the ethanolamine, may suitably be admixed with about an equal quantity of water to form a base or concentrate. This base or concentrate alone, when diluted with water, forms a stable emulsion which is an excellent lubricant for both metal and composition bearings and for other purposes. Even in great dilution, when the diluted mixture contains as little as 1% of the mixture or 2% of the concentrate or base, a highly adherent, tenacious oil film is formed. Thus, a concentrate prepared in accordance with the present invention and containing 50% water was diluted, using 5 parts of the concentrate and 95 parts of water, and the resulting dilute emulsion was employed in tests for the lubrication of the heavy duty composition bearings of the synthetic resins type employed for steel rolling mills, such as those commercially known as Ryertex bearings. On a Timken extreme pressure machine, on such bearings, the diluted mixture or emulsion aforesaid operated at 24,000 pounds per square inch for over three hours without seizing. Other tests on the same equipment, under standard test conditions, with the same mixture, gave pressures of 60,000 pounds per square inch without seizing. Tests have shown that the emulsions of the above composition in water, containing as little as 1 to 5% solids, have similar qualities of extreme pressure lubricants in metal to metal bearings, particularly in precision bearings of the heavy duty type such as those known as Morgoil

mill bearings and this has been confirmed in actual practical operation in rolling mills, strip mills, and the like.

The emulsions of the present invention, even when very dilute, are stable and form extremely tenacious, oily films on bearing surfaces or other metal surfaces with which they come in contact. They are hence extremely useful as cutting oils and also for treating metal and other parts when it is desired to leave a protective ioly film coating thereon. Thus, dilute aqueous emulsions of the base of the present invention hereinbefore referred to, containing 1 to 10% of the base are extremely effective lubricants for lathe work, screw cutting, milling, hobbing and drilling operations and other metal cutting operations and leave the pieces of work with a tenacious oily film, cool, and with an unusually bright finish (particularly in handling non-ferrous metals such as aluminum). In some cases higher proportions of base, say up to 30%, have been used.

Similarly, the aqueous emulsions prepared in accordance with the present invention have been used in chemical apparatus to provide an oily film which is readily removable by water, and which prevents corrosion. Thus in equipment employed for handling highly alkaline or caustic solutions, such as viscose handling equipment, to avoid corrosion between successive operations, the equipment may be washed, and then flushed with a dilute aqueous emulsion prepared in accordance with the present invention, leaving an oily film on all the parts treated. Subsequently this oily film may be readily removed by flushing with plain or distilled water.

As is readily apparent, the emulsions of the present invention may be used alone or with oils such as mineral oils or vegetable oils to form cutting oil emulsions or to form emulsions for the treating of textiles. The materials prepared in accordance with the present invention are not only readily emulsifiable themselves; but they aid in the emulsification of fatty and mineral oils and produce excellent stable emulsions therefrom. If desired, small proportions of wetting agents, such as those of the sulfated higher alcohol type, sulfonated fatty oils or the like may be incorporated in the base or concentrate prepared in accordance with the present invention. Usually but an extremely small amount of such wetting agents is employed, say 1 to 2%, or not over about 5% on the base or concentrate.

The following are illustrative examples of emulsifiable lubricants prepared in accordance with the present invention. In the examples given, the proportions relate to the solids or constituents other than the water used in connection therewith.

Example 1

A composition is prepared containing about 77% of mono-glycerides of soybean oil fatty acids (glycerine mono-ester of soybean fatty acids) and about 23% of triethanolamine soap of oleic acid. This mixture is emulsified with about an equal quantity of water, preferably distilled, by putting the mixture through a colloid mill, homogenizer or other efficient emulsifying equipment.

The resulting base or concentrate may then be admixed with water, using proportions thereof from 1 to 10% or more of the mixture. It readily emulsifies on mixing. A mixture of 10% of the base and 90% of water forms an effective extreme pressure lubricant.

Example 2

A mixture was prepared containing about 73% of mono-glyceride of soybean oil fatty acids, about 22% of triethanolamine soap of oleic acid and about 5% of triethanolamine. This mixture was emulsified with an equal quantity of distilled water to form a base or concentrate for easy handling.

The resulting base, when mixed with 9 to 20 times its weight of water, was an effective extreme pressure lubricant. An emulsion made by mixing 5% of the base or concentrate and 95% of water, in a Timken test on a molded composition bearing of the phenolic resin-fibrous type for steel mine use, ran to a bearing pressure of 24,000 pounds per square inch for 3 hours before seizing; and a like emulsion ran to 60,000 pounds per square inch for the standard test conditions of ten minutes, without seizing and with a low temperature rise. Another emulsion containing 10% of the base or concentrate and 90% of water, in a Timken extreme pressure test on hardened steel bearings, under standard conditions (800 R. P. M.) ran to 12,000 pounds per square inch without seizure.

The mono-glyceride of soybean oil fatty acids referred to in the above examples may be replaced by the corresponding compounds of other fatty acids, as hereinbefore indicated, and the same is true of the triethanolamine soap of oleic acid referred to in illustration.

The relative proportion of the mono-glyceride and triethanolamine soap may be varied widely. Thus of the non-aqueous constituents of the base or concentrate (hereinafter designated "solids"), from 25 to 90% may be mono-glyceride, although in general I prefer that 50% or more thereof be used. From 65 to 80% is preferred. The proportion of uncombined triethanolamine (excess triethanolamine over that required to form the soap) may vary from 0 to 10 or 15%; in general, if present, from 5 to 10% is preferred.

The proportion of the base or concentrate present in the final emulsion employed may vary widely, depending on the use to which it is put. From 2 to 10 parts of the base or concentrate in 100 parts of emulsion is in general satisfactory, although larger or smaller proportions may be used, if desired. Mineral oils, vegetable oils, or sulfonated vegetable oils may be incorporated in the final emulsion to form cutting oils or textile oils and are readily emulsified by the base or concentrate on admixture with water. The proportion of such oils may vary widely, depending on the intended use, say from 2 to 15% or more. A minor proportion of the base or concentrate, say 10 to 30% may also be added to light mineral oils, such as kerosene, spindle oil or the like, to form oils suitable for lapping and like purposes.

In the base or concentrate, minute proportions of wetting agents may sometimes be incorporated to secure better adherence to metals. Thus from 1 to 5% of wetting agents of the aerosol type, sulfated higher alcohols, sulfonated oils or the like may be added. Small proportions of the higher glycols may also be included such as diethylene glycol, triethylene glycol, proylene glycol and the like, and appear to increase the oiliness and reduce the tack of the residual film left on the work. From 0.5 to 5% of such glycol, preferably diethylene glycol, based on the final emulsion, may be used. Preferably I employ about 2%. The resulting lubricant is particularly useful in machining or like operations where an extremely high finish is to be left on the work.

Either the wetting agent or the glycol or both may be incorporated in the emulsion lubricant, which may contain an excess of triethanolamine over that required to form the fatty acid soap or not, as desired. The lubricant may thus be varied to adapt it to specific uses, as desired.

Where triethanolamine is referred to above, it is to be understood that technical triethanolamine may be employed in the proportions set forth, or equivalent proportions of the mono- or diethanolamines may be used.

It is to be understood that the specific details of the examples above set forth are not to be regarded as limitations on the scope of the invention except in so far as included in the accompanying claims.

I claim:

1. A lubricant base composition comprising a stable emulsion of water and a mixture of a glycerine mono-ester of a higher fatty acid and an ethanolamine soap of a higher fatty acid combined in such relative proportions that the former constitutes from 50 to 90% of the said mixture, said base composition being capable of being diluted with water to form a lubricating composition in stable aqueous emulsion form having as its essential lubricant and film-forming constituents the aforesaid glycerine mono-ester and ethanolamine soap.

2. A lubricant base composition comprising a stable aqueous emulsion of a mixture of a glycerine mono-ester of a higher fatty acid and a triethanolamine soap of a higher fatty acid combined in such relative proportions that the former constitutes from 50 to 90% of the said mixture, said base composition being capable of being diluted with water to form a lubricating composition in stable aqueous emulsion form having as its essential lubricant and film-forming constituents the aforesaid glycerine mono-ester and triethanolamine soap.

3. A lubricant base composition comprising a stable aqueous emulsion of a mixture of a glycerine mono-ester of a higher fatty acid, a triethanolamine soap of a higher fatty acid and free triethanolamine combined in such relative proportions that the glycerine mono-ester constitutes from 50 to 90% of the said mixture and the free triethanolamine from 5 to 10%, said base composition being capable of being diluted with water to form a lubricating composition in stable aqueous emulsion form having as its essential lubricant and film-forming constituents the aforesaid glycerine mono-ester and triethanolamine soap.

4. A lubricant base composition comprising a stable aqueous emulsion of a mixture of a glycerine mono-ester of a higher fatty acid and a triethanolamine soap of a higher fatty acid combined in such relative proportions that the former constitutes from 25 to 90% of the said mixture, said base composition being capable of being diluted with water to form a lubricating composition in stable aqueous emulsion form having as its essential lubricant and film-forming constituents the aforesaid glycerine mono-ester and ethanolamine soap.

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