United States Patent Office 2,941,944 Patented June 21, 1960

2,941,944

SOLUBLE OIL COMPOSITION

William Denis Ervine, Tolworth, England, assignor to Esso Research and Engineering Company, a corporation of Delaware

No Drawing. Filed Mar. 15, 1956, Ser. No. 571,601

Claims priority, application Great Britain Mar. 29, 1955

1 Claim. (Cl. 252—33.3)

This invention relates to so-called soluble oils which are readily emulsified with water. Particular soluble oils are used as cutting oils or as textile oils.

The invention is particularly concerned with the provision of improved soluble oils containing minor proportions of triethanolamine benzoate, which may be made up with water to form aqueous emulsions having good wetting power and anti-corrosion properties.

The principal function of a cutting fluid is the removal of heat from the metal being cut and the tool which is cutting it. This is necessary to avoid drawing the temper of the tool and distorting the workpiece. A cutting fluid must also, however, act as a lubricant to facilitate the motion of metal chips along the tool face to prevent the development of such high friction that welding takes place.

To fulfill these two functions, cutting fluids are commonly emulsions of emulsible oils, the oils acting as the lubricant, and water acting as the coolant. The oils used are preferably mineral lubricating oils, to which known emulsifying agents have been added. They should preferably have viscosities of between 70 and 200 S.U.S. at 100° F. Those having viscosities between 100 and 125 S.S.U. at 100° F. are particularly preferred.

Such fluids containing from about 3 to 80 parts of water per part of oil, are apt to be corrosive to the metal surfaces they encounter, but it has now been discovered that the incorporation of minor proportions of triethanolamine benzoate greatly reduces the tendency to cause corrosion.

In its preferred embodiment, therefore, the invention comprises an improved soluble oil comprising a lubricating oil having a viscosity between 70 and 200 Saybolt Universal seconds at 100° F., preferably between 100 and 125 S.U.S., an emulsifying agent such as an oil-soluble metal petroleum sulphonate, preferably oil-soluble sodium petroleum sulphonates especially those having molecular weights between 350 and 450, and a minor proportion of triethanolamine benzoate.

The lubricating oil used for preparing these improved soluble oils may be hydrocarbon oils or synthetic oils from any source, but mineral oils are preferred.

In addition to these essential ingredients, the soluble oil composition may also contain other materials commonly used in soluble oils.

For example, it is to be preferred that the soluble oil contains an emulsion stabiliser such as an alkali metal or alkaline earth metal naphthenate, preferably sodium naphthenate, or diethylene glycol or a lower aliphatic alcohol such as methyl, ethyl, isopropyl or butyl alcohol.

Anti-foaming agents such as silicone oils or vegetable waxes, particularly candelilla wax, may be incorporated.

For certain applications where heavy duty conditions are encountered, it may be desirable to include an oiliness or extreme pressure agent. Typical agents which may be used are isopropyl oleate, tricresyl phosphate, chlorinated wax and fatty oils or sulphurised or phosphorised fatty oils.

Where transparent emulsions are desired, sodium rosinates may also be added.

Fungicides such as sodium ortho phenylphenate may also be incorporated to inhibit the growth of undesirable organisms.

The amount of triethanolamine benzoate required is generally between 0.05 and 5.0% by weight of the soluble oil, amounts between 0.25 and 2.5% by weight being particularly preferred. It is most conveniently incorporated in the oil by forming it in situ. For example, benzoic acid may be dissolved in the lubricating oil and the necessary amount of triethanolamine may be added to neutralise this acid together with any naphthenic, fatty or rosin acids that may be present.

Tests were conducted on a soluble oil composition containing sodium benzoate as the inhibitor as described and claimed in the specification of our earlier Patent No. 689,740, a soluble oil containing triethanolamine, and soluble oils containing triethanolamine benzoate according to the present invention, alone or with sodium benzoate. Each composition was prepared from samples of the same mineral lubricating oil, oil-soluble sodium petroleum sulphonates, naphthenic acids, caustic soda and water, and each composition also contained a small proportion of isopropyl alcohol.

SOLUBLE OIL CONTAINING SODIUM BENZOATE AS THE INHIBITOR

A soluble oil composition was prepared, having the following formulation:

82.5% spindle oil (a mineral lubricating oil of viscosity 100 S.S.U. at 100° F.).
13.0% oil-soluble sodium petroleum sulphonates of molecular weight approximately 420 (in the form of a 70% solution of the sulphonates in a mineral oil of viscosity 100 S.S.U. at 100° F.).
2.5% naphthenic acids.
0.4% caustic soda.
1.6% water.

To which is added:

0.3% benzoic acid.
0.1% caustic soda.
1.0% water.
0.9% isopropyl alcohol (99%).

The method of preparing the soluble oil was to blend together a major proportion of the spindle oil with the sulphonates and naphthenic acids, with heating to about 80 to 85° C., to dissolve the sulphonates. The caustic soda in aqueous solution was then added to react with the naphthenic acids, after which the benzoic acid in solution of the rest of the spindle oil was introduced. The temperature was then allowed to drop down to about 40° C., before the addition of the 1% water and 0.9% isopropyl alcohol.

SOLUBLE OIL CONTAINING TRIETHANOLAMINE AS THE INHIBITOR

A soluble oil was prepared having the following formulation:

82.5% spindle oil (as used in the previous composition).
13.0% oil-soluble sodium petroleum sulphonates (70% concentration in mineral oil, as in previous composition).
2.5% naphthenic acids.
0.4% caustic soda.
1.6% water.

To which is added:

1.0% triethanolamine.
0.9% isopropyl alcohol (99%).

The method of preparation was similar, except that triethanolamine was used instead of benzoic acid.

Two further soluble oil compositions were then prepared according to the present invention.

Example I

A soluble oil was prepared having the following formula:

82.5% spindle oil (as used in the previous compositions).
13.0% oil-soluble sodium petroleum sulphonates (70% concentration in mineral oil, as in previous compositions).
2.5% naphthenic acids.
0.4% caustic soda.
1.6% water.

To which is added:

0.3 triethanolamine.
0.3% benzoic acid.
1.0% water.
1.0% isopropyl alcohol (99%).

Example II

A soluble oil was prepared having the following formula:

82.5% spindle oil (as used in the previous compositions).
13.0% oil-soluble sodium petroleum sulphonates (70% concentration in mineral oil, as in previous compositions).
2.5% naphthenic acids.
0.4% caustic soda.
1.6% water.

To which is added:

0.3 triethanolamine.
0.2% caustic soda.
0.5% benzoic acid.
1.0% water.
1.0% isopropyl alcohol (99%).

Each of the four compositions mentioned above was subjected to the corrosion test standardised by the Institute of Petroleum under the number I.P. 125/52. According to this test, gray cast-iron plates of dimensions 4" x 4" x ¼" were polished with a No. "0" emery paper, and were cleaned first with acetone and then with filter paper. On each plate was placed 2 grams of steel millings, and the plates were placed in a test chamber where the temperature was controlled at 65° F., and the relative humidity was controlled at 52%. The steel millings on each plate were flooded with 2 mgm. of prepared emulsions of the appropriate soluble oil compositions, and the plates were left in the test chamber for 24 hours. At the end of this period the steel millings were removed from the plates, and the plates were washed first with acetone, then with benzene, and were finally gently rubbed with filter paper soaked in benzene. The surface of the cast-iron plates were inspected for corrosion, and were

rated according to the area attacked and the intensity of the corrosion in that area.

The first figure given represents the area attacked as follows:

0 represents less than 1/6.
1 represents 1/6 to 1/3.
2 represents 1/3 to 2/3.
3 represents greater than 2/3.

The second figure indicates the intensity in which:

0 represents hardly perceptible corrosion.
1 represents slight corrosion.
2 represents heavy corrosion.

Each of the four soluble oil compositions whose preparation has been described above was separately tested in the form of their emulsions made from hard water (London water), with soft water (Birmingham water), and with distilled water, and the results were as follows:

	Hard water	Soft water	Distilled water
Soluble oil containing Sodium Benzoate	0.0	1.1	2.2
Soluble oil containing Triethanolamine	1.3	0.0	2.2
Soluble oil of Example I	0.0	0.0	0.0
Soluble oil of Example II	0.0	0.0	0.0

It will be seen that the compositions prepared according to the present invention give hardly perceptible corrosion over a very small area of the plates.

The present invention accordingly comprises an improved soluble oil composition containing a mineral lubricating oil having a viscosity between 70 and 200 S.S.U. at 100° F., an emulsifying agent and a minor proportion of triethanolamine benzoate.

The soluble oil composition may also contain a minor proportion of sodium benzoate as described and claimed in British Patent No. 689,740 issued July 14, 1950.

The present invention also comprises soluble oil emulsions formed from 3 to 80 parts by volume of water per part by volume of the soluble oil composition.

What we claim is:

A soluble oil composition consisting essentially of a base stock consisting of about 82.5% of a mineral lubricating oil having a viscosity of about 100 S.S.U. at 100° F., about 13% of a 70% oil solution of an oil soluble sodium petroleum sulfonate having a molecular weight of approximately 420, about 2.5% of naphthenic acids, about 0.4% caustic soda and about 1.6% water, and in addition to said base stock, about 0.3% triethanolamine, about 0.2% caustic soda, about 0.5% benzoic acid and about 1% each of water and isopropyl alcohol.

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