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CUTTING OIL

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The invention relates in general to cutting oils and in particular to emulsifiable cutting oils.

In the fabrication of metals into stock materials, articles, machine elements, etc., by methods involving cutting, grooving, turning, milling, brooching, boring, hobbing, gear cutting, grinding, stamping, drawing, etc., operations, frictional forces are created which cause overheating and accelerated dulling of the cutting tools, dies, etc., used in such operations. Moreover, the metals being subjected to the aforementioned operations become overheated, thereby deleteriously affecting the uniformity and quality of the finished products.

In an attempt to combat these difficulties, it has been proposed to employ various oils and compositions containing oils for cooling and lubricating both the cutting tools, dies, etc., as well as the metal being worked upon. In general, there are four main types of cutting oils, to wit, (1) straight mineral oil, (2) mineral lard oil, (3) sulfurized mineral or mineral lard oil and (4) soluble oils (emulsifiable with water). The present invention is directed to the so-called soluble cutting oils which readily emulsify with cold or warm water.

The two primary functions of a cutting oil in the metal working arts are cooling and lubricating which in turn serve to increase production and yield products having a better surface finish. An ideal cutting oil should be endowed with the following characteristics: (1) high specific heat, (2) good wetting and spreading power, (3) adherence to the essential elements and a good film strength, (4) a viscosity permitting adequate flow, (5) stability, (6) free of fire hazards, (7) non-corrosive and (8) non-injurious to health. While many soluble cutting oils have been proposed and prepared, none of these have even remotely satisfied the foregoing characteristics.

It is the general object of this invention to provide cutting oils possessing the aforementioned characteristics.

A specific object of the invention is to provide an improved soluble oil which is readily emulsifiable with water to form an improved cutting oil.

Another object of the invention is to provide an emulsified cutting oil having improved cooling and lubricating properties.

A further object of the invention is to provide an emulsified cutting oil which is substantially non-corrosive in character.

Other objects of the invention will, in part, become obvious and will, in part, appear hereinafter.

According to the invention there is provided a readily emulsifiable or soluble cutting oil base comprising a water-insoluble soap of an acid selected from the group consisting of naphthenic acids and unsaturated higher fatty acids, an emulsifier and a mineral oil. While any suitable emulsifier may be employed, it is preferable to use a mixture comprising mahogany soaps and a sulfonated fatty material.

The invention accordingly comprises a composition of matter possessing the characteristics, properties and the relation of components which will be exemplified in the composition hereinafter described and the scope of the invention will be indicated in the claims.

In the preparation of the cutting oil of the invention, any suitable mineral oil may be employed depending on the particular use to which the product is to be applied. The lighter mineral oils such as white oil or paraffin oil have been found to function very successfully and their use for the purposes of this invention is preferred. Oils of this type render the degree of lubrication desired especially in combination or cooperation with the remaining components of the novel composition.

The function of the water-insoluble metallic soap of naphthenic acids or unsaturated fatty acid, is, inter alia, to render the composition non-corrosive in character as well as to enhance the emulsifiable properties of the oil. While the use of water-insoluble metallic naphthenates of zinc, lead, aluminum, calcium, chromium, etc. have proven successful, the use of zinc and/or lead naphthenate is highly preferred. Zinc, lead, calcium, aluminum, etc., soaps of oleic, linoleic and other unsaturated fatty acids may also be used in lieu of the naphthenates in certain instances. Regardless of which of the above or other suitable water-insoluble metallic soaps that may be used, it must be kept in mind that such soap must, to function properly, form a relatively thin solution in the mineral oil and must not form a gel therewith when used in the desired proportion.

The emulsifier may comprise mahogany soaps and/or any suitable sulfonated fatty material such as sperm oil, olive oil, cottonseed oil, neatsfoot oil, fish oils, cod oil, etc. These emulsifiers are, however, preferably used in combination with each other.

For a fuller understanding of the objects and purposes of the invention, reference should be had to the following examples of the soluble oil of the invention and which are given merely to

further illustrate the invention and should not be construed in a limiting sense.

Example I

	Per cent
Sulfonated sperm oil	40
Mineral oil	50
Zn naphthenate	10

The above soluble oil readily emulsifies with water at room temperature.

Example II

Part of the sulfonated sperm oil of Example I may be substituted with mahogany soaps as follows:

	Per cent
Sulfonated sperm oil	30
Mahogany soaps	10
Zn naphthenate	10
Paraffin oil	50

Example III

	Per cent
Mahogany soap	30
Paraffin oil	60
Zn naphthenate	10

The above composition is not soluble in cold water but may be emulsified in hot water.

Various vegetable and animal oils, such as rice bran oil, sperm oil, neat's-foot oil, lard oil, etc., may be included in the composition of the invention.

The soluble cutting oil base of the invention may be emulsified with water in any desired proportion depending upon the machining operation to be carried out. Moreover, the proportion of the soluble oil with respect to the water controls the type of emulsion produced. It has been found that both the oil-in-water and water-in-oil type emulsions are obtained depending upon the amount of soluble oil used. For example, the transition point of the composition of Example II has been found to lie between the range of 20%–25% emulsion concentration. When the amount of oil used is less than the transition point, the oil-in-water type emulsion is produced; whereas if the quantity of soluble oil is increased beyond the transition point, inversion takes place resulting in the water-in-oil type emulsion.

As hereinbefore mentioned, the type of emulsion selected will depend upon the nature of the machining operations to be carried out. In any event, both types of emulsions possess the aforementioned characteristics which advance the product of the invention closer to the so-called ideal cutting oil. In view of its non-corrosive character, the cutting oil of the invention may be used in fabricating non-ferrous metals as well as the ferrous metals and alloys.

The expression "soluble oil" and "soluble cutting oil base" is used herein to connote a composition which is emulsifiable with an aqueous medium to form an emulsified cutting oil of either a water-in-oil or oil-in-water type.

The expression "naphthenic acids" is employed herein to connote the mixture of acids of that name currently obtained in petroleum refining, as well as naphthenic acid or acids which are synthetically prepared or otherwise obtained. It is preferred, however, to use the naphthenic acids derived from the refining of petroleum in view of their relatively low cost.

Since certain changes may be made in the above composition of matter and different embodiments of the invention could be made without departing from its scope, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all the generic and specific features of the invention herein described and all statements of the scope of the invention, which as a matter of language, might be said to fall therebetween; and that they are intended to be inclusive in scope and not exclusive, in that if desired, other materials may be added to my novel composition of matter herein claimed without departing from the spirit of the invention. Particularly it is to be understood that in said claims, ingredients or components recited in the singular are intended to include compatible mixtures of said ingredients wherever the sense permits.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A soluble cutting oil base comprising a water-insoluble soap of an acid selected from the group consisting of naphthenic acids and unsaturated higher fatty acids, an emulsifier and a mineral oil.

2. A soluble cutting oil base comprising a water-insoluble soap of naphthenic acids, an emulsifier and a mineral oil.

3. A soluble cutting oil base comprising a water-insoluble soap of an unsaturated higher fatty acid, an emulsifier and a mineral oil.

4. A soluble cutting oil base comprising a water-insoluble soap of oleic acid, an emulsifier and a mineral oil.

5. A soluble cutting oil base comprising a water-insoluble soap of linoleic acid, an emulsifier and a mineral oil.

6. A soluble cutting oil base comprising a water-insoluble soap of an acid selected from the group consisting of naphthenic acids and unsaturated highly fatty acids, mahogany soaps and a mineral oil.

7. A soluble cutting oil base comprising a water-insoluble soap of an acid selected from the group consisting of naphthenic acids and unsaturated higher fatty acids, a sulfonated fatty material and a mineral oil.

8. A soluble cutting oil base comprising a water-insoluble soap of an acid selected from the group consisting of naphthenic acids and unsaturated higher fatty acids, sulfonated sperm oil, mahogany soaps and a mineral oil.

9. A soluble cutting oil base comprising zinc naphthenate, sulfonated sperm oil and a mineral oil.

10. A soluble cutting oil base comprising zinc naphthenate, mahogany soaps, sulfonated sperm oil and paraffin oil.

11. A soluble cutting oil base comprising zinc naphthenate, mahogany soaps and paraffin oil.

12. An emulsified cutting oil comprising an emulsion made up of water and a water-insoluble soap of an acid selected from the group consisting of naphthenic acids and unsaturated higher fatty acids, an emulsifier and a mineral oil.

13. An emulsified cutting oil comprising an emulsion made up of water and a water-insoluble naphthenate, an emulsifier and a mineral oil.

14. An emulsified cutting oil comprising an emulsion made up of water and a water-insoluble naphthenate, mahogany soaps and a mineral oil.

15. An emulsified cutting oil comprising an emulsion made up of water and a water-insolu-

ble naphthenate, a sulfonated fatty material and a mineral oil.

16. An emulsified cutting oil comprising an emulsion made up of water and a water-insoluble naphthenate, mahogany soaps, sulfonated sperm oil and a mineral oil.

17. An emulsified cutting oil comprising an emulsion made up of water and zinc naphthenate, mahogany soaps, sulfonated sperm oil and paraffin oil.

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