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CUTTING OIL

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This invention relates to a cutting oil or other type of oil which is used to cool and lubricate tools used in the process of metal cutting, drilling and grinding.

The functions of cutting oils are to cool the cutting tool at its engagement with the work, to lubricate the points of contact between the cutting tool and the metal chips being formed, to aid in producing a smooth untorn surface, and to flush away the scraps and metal particles which tend to clog the tool and interfere with its smooth operation.

Satisfactory cutting oils flow toward the work from the point of application, have high heat absorbing power, contain no corrosive or acid forming ingredients and stand up under the high temperatures incidental to their use. Animal oils have high lubricating qualities under the conditions of metal cutting and possess the characteristic of flowing toward and clinging to the work. Lard oil is an example of an animal oil which has long been used as a cutting lubricant. However, animal oils generally have a tendency to develop free fatty acid of corrosive effect on metals, their character changes with re-use particularly with respect to cooling effect and they are costly as compared with mineral oils.

It is well known that mixtures of animal oil and mineral oil partake of the desirable qualities of the former and consequently such mixtures as mineral-lard oils have been extensively used in metal cutting practice. It is also known that the presence of sulfur in animal-mineral cutting oils further increases the tendency of the oil to flow toward the work, and improves their lubricating qualities, various cutting oils containing sulfur or sulfur compounds having been manufactured in the past.

Sulfur is not soluble in ordinary mineral oil to an appreciable extent, therefore it has been the practice in making sulfur base cutting oils to first dissolve the sulfur in a suitable amount of fatty oil such as lard oil, fish oil, corn oil and various animal or vegetable drying or semi-drying oils, thereafter compounding the solution with mixtures of mineral oil and animal oil and grease as desired.

Such sulfurized cutting oils are generally dark and objectionable in color, have a disagreeable odor and are more or less unstable due to the tendency of the sulfur to settle out. Therefore it has been the practice to limit the amount of sulfur incorporated in the oil to minimize the objectionable features, thus limiting the desirable qualities which might be imparted if a greater amount of sulfur were used.

It is the primary object of the present invention to produce a superior type of sulfur base cutting oil which is stable under working conditions and substantially free from objectionable color and odor.

Another object of the invention is to provide a sulfur base cutting oil in which the sulfur is more permanently incorporated in the cutting oil by the aid of solvents other than the animal and vegetable oils previously disclosed, whereby a greater proportion of sulfur may be used.

Another object of the present invention is to utilize a new type of mineral oil solvent for sulfur in the manufacture of sulfur base cutting oils.

We have discovered that mineral oils which are high in unsaturated constituents have an excellent solvent action on sulfur for the purpose of forming cutting oils.

Thus for example, those mineral oils which are soluble in liquid sulfur dioxide have been found to be capable of dissolving sulfur to an extent greatly in excess of the solubility of sulfur in ordinary mineral oils. A convenient source of such mineral oils may be the by-product of the Edeleanu process of treating oils in which the oils are extracted by means of liquid sulfur dioxide to remove the portions soluble therein which process is described in Edeleanu Patent No. 911,553, issued February 2, 1909. The portions of mineral oils which are dissolved by the sulfur dioxide are known as sulfur dioxide extracts after they have been freed from the sulfur dioxide and consist largely of unsaturated constituents and are suited for the carrying out of the present invention.

It has also been found that naphthalene added to a cutting oil has the property of facilitating a solution of sulfur and holding the sulfur in the cutting oil in a more stable form.

The present invention will best be understood, together with various further objects and advantages of the invention, from the description of a preferred form or example of a cutting oil embodying the invention. For this purpose, we have hereinafter described the composition of a preferred cutting oil.

In the preferred form of the invention, the cutting oil consists of a composition including sulfur dioxide extract, naphthalene, sulfur, lard oil and raw degras, the materials preferably being used in the following proportions:

Formula	Percentage by weight
Sulfur dioxide extract from 140 vis. oil	55.5
Lard oil	20
Raw degras	15
Sulfur (flowers)	7
Naphthalene	1
Pine oil	1.5
	100

Viscosity of the oil is in seconds Saybolt at 100°.

The process of forming a cutting oil of the above composition is as follows:

The ingredients, with the exception of pine oil, are mixed together in a kettle, or other apparatus, and the mixture is heated rapidly to 350° F. with continuous stirring. Before the temperature of 350° F. is reached, the sulfur will generally have been entirely dissolved. However, the heating is continued in order to fix the sulfur in solution as it is further found that otherwise, there is a tendency towards precipitation of a part of the sulfur when the oil is finally cooled.

After the temperature of 350° F. is obtained in the mass, the mixture is permitted to cool to approximately 150° F. and blown at that temperature with air for about one hour, after which the mixture is further cooled, the pine oil added, and sent to storage. The cutting oil thus prepared is a highly concentrated base which is diluted for use with four to ten parts of mineral oil of any suitable viscosity.

Sulfur dioxide extract is used instead of ordinary mineral oil, because its high unsaturated nature makes it a particularly effective solvent for the sulfur. The proportions of sulfur used in the above described composition are such as would require excessive amounts of animal or vegetable fatty oil before solution in ordinary mineral oil mixtures could be effected. Thus, in the typical formula illustrated much higher percentages of lard oil and degras or much smaller proportions of sulfur would be necessary if ordinary mineral oil were substituted in place of the sulfur dioxide extract.

The function of naphthalene is to aid in putting the sulfur into solution. Ordinarily, sulfur does not dissolve until temperatures considerably above its melting point (about 250° F.) are reached, and then only very slowly. However, when naphthalene is added, the sulfur dissolves rapidly and is completely in solution when a temperature of about 220° F. is reached, the further heating above this point being for the purpose of fixing the sulfur in solution as described.

It has been found that rapid solution of sulfur at comparatively low temperatures effected by the use of naphthalene, avoids to a large degree, development of disagreeable odors in the finished product. Such gaseous sulfur compounds as may be produced are effectively removed by the air blowing step and the purpose of the addition of pine oil is to impart a pleasant odor to the final product.

While specific ingredients and proportions have been given here for the purpose of illustration, it is understood that the invention is not necessarily limited thereto, but is of the scope of the claims set forth as follows:

We claim:

1. A cutting oil including mineral oil soluble in liquid sulfur dioxide, and sulfur.

2. A cutting oil comprising mineral oil soluble in liquid sulfur dioxide, sulfur and animal oil.

3. A cutting oil comprising animal oil, mineral oil soluble in liquid sulfur dioxide, sulfur and naphthalene.

4. A cutting oil base comprising animal oil, mineral oil soluble in liquid sulfur dioxide, vegetable oil and sulfur.

5. A cutting oil having approximately the following composition:

	Per cent
Mineral oil soluble in liquid sulfur dioxide	55.5
Lard oil	20
Degras	15
Sulfur	7
Naphthalene	1
Pine Oil	1.5

6. A cutting oil comprising a mineral oil soluble in liquid sulfur dioxide, pine oil and sulfur.

Signed at Richmond, California this 7th day of January 1929.

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