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LUBRICATING COMPOSITIONS

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This invention relates to lubricating compositions and more particularly it is concerned with compositions for use in machining operations, such as boring, tapping, milling, drilling, reaming, threading and the like. Such compositions are often referred to as cutting compounds.

A principal object of this invention is the provision of new compositions for use in machining operations, particularly the machining of metals and metallic objects. Further objects include:

(1) The substantial elimination of tearing and reduction of the possibility of scoring during metal machining;

(2) Increase in the ease with which smooth and highly polished machined surfaces may be obtained;

(3) Insurance of closer tolerance in sizes and finishes during machining operations;

(4) Prevention of gumming of chips with the resultant elimination of chip blocking when drilling through drill bushing into hard alloy steels or the like, resulting in highly polished holes of great precision;

(5) Extension of tool edge life such as lathe tools, drills, taps and the like, during metal working;

(6) Prevention of chattering in metal machining operations;

(7) Provision of new processes for accomplishing the objects listed above;

(8) Provision of new lubricating compositions which make possible the accomplishment of the objects noted above with the use of only a relatively small amount of the composition;

(9) Provision of new cutting compounds containing comminuted graphite in which the graphite is maintained in a relatively very high state of suspension.

These objects are accomplished according to the present invention by the preparation of lubricating compositions for use in machining operations comprising a petroleum lubricating oil, turpentine oil, comminuted graphite, magnetic precipitated iron oxide and a volatile, normally liquid chlorinated aliphatic hydrocarbon; and the use of such compounds during machining operations, such as turning, boring, broaching, deep slotting, milling, drilling, reaming, threading, tapping and the like.

The success of the present invention is due to a large extent to the discovery that the combination of turpentine, graphite and magnetic precipitated iron oxide in the presence of lubricating oil and a chlorinated hydrocarbon produces a cutting compound which appreciably increases machine tool life and, at the same time, reduces the possibility of tearing, scoring or similar undesirable features which are occasioned by the lack of proper coordination between the tool and the metal surface being worked upon. This unusual effect is apparently due to a combination of circumstances. Thus, the lubricating oil and graphite appear to serve as lubricants between the tool and the metal surface, the chlorinated hydrocarbon appears to maintain the comminuted graphite and iron oxide in a state of suspension or seething motion, so that it is highly effective as a lubricant, the turpentine appears to sharpen the product and the iron oxide acts as a polishing agent, making the working or cutting of the metal surface easier than is possible in the absence of the turpentine and iron oxide. In addition, experimental evidence indicates that the iron oxide serves to retain the graphite in suspension for a much longer period of time than is the case of compositions which do not include the oxide and makes it possible to resuspend the solid content of the products with much less agitation than is required in its absence.

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The new compositions of this invention may be more readily comprehended by reference to the following example.

A light petroleum lubricating oil having a viscosity of approximately 100° Saybolt at 100° F. with a flash test of 300° F. (open cup) and 200° F. (closed cup) is used as the basic ingredient of the composition. The following other ingredients are also used:

	Ounces
Gum spirits of turpentine	2
Air-floated Ceylon graphite of such size that 100% passes 170 mesh screen	3
Magnetic precipitated iron oxide of such size that only 0.10% residue remains on 325 mesh screen	1
Carbon tetrachloride	3

These latter four ingredients are mixed together thoroughly at room temperature and then sufficient of the petroleum lubricating oil is added to make a gallon.

The composition is applied intermittently to the metal work surface during a drilling operation upon very hard alloy steel. The drilling is accomplished with the production of a very smooth surface on the drilled hole and danger to workmen's eyes from flying chips during the operation is greatly reduced, as compared to operation in the absence of the cutting compound.

In another case, the composition is used in cutting hard alloy steel upon a lathe. During the operation, the compound is applied from time to time to the metal work piece surface. The composition wets the metal surface very well and carries continuously ahead of the working tool keeping the point of the tool wet with the result that the tendency of the cutting tool to burn or overheat is greatly reduced, as compared with similar operations using prior known cutting compounds.

Substantially any light lubricating oil of petroleum origin may be used as the base ingredient of the compositions. Thus, lubricating oils derived either from paraffin or asphaltic base petroleum crudes may be employed. The useful lubricating oils may possess various viscosities, but it has been found that oils of approximately 100° Saybolt at 100° F. are particularly useful.

As indicated above, the turpentine oil in the composition appears to greatly aid in the ability of the dies, drills, or other working tools to manipulate the surfaces being machined, i. e., the turpentine appears to "sharpen" the product. Substantially any commercial turpentine oil may be used, but it has been found that gum spirits of turpentine are particularly desirable.

As regard the usable chlorinated hydrocarbons, it has been found that substantially any normally liquid, volatile, chlorinated aliphatic hydrocarbon, particularly those having one to four carbon atoms, may be used in compounding these compositions. For example, useful materials include: ethylene dichloride, tetrachloroethane, chloroform, propyl chloride, trichloroethylene, isopropylchloride, propylidene dichloride, propylene chloride, dichlorobutane, tert. butyl chloride, allylene dichloride, epidichlorohydrin, and mixtures of such compounds, e. g., volatile, liquid products of chlorinated natural gases. However, the preferred material is carbon tetrachloride.

Actual tests have shown that air-floated Ceylon graphite is probably the best type of graphite for use in the products of this invention. However, it has been found that other graphites from natural or artificial sources may also be employed. The graphite should be sufficiently subdivided so as to be readily dispersible in the lubricating composition and should preferably be sufficiently comminuted so that 100% passes a 170 mesh per inch screen.

It has been found that magnetic, precipitated iron oxide is probably the best type of iron oxide for use in the products of this invention, i. e., iron oxide of the general formula $(FeO)_x(Fe_2O_3)_y$, particularly oxides of this type containing about 22% FeO. The iron oxide should be sufficiently subdivided so as to be readily dispersible in the lubricating composition, preferably an oxide having an average particle size of .2 micron and all but 10% will pass through a 325 mesh screen. As indicated above, the inclusion of this ingredient in the compound holds the graphite in suspension over a very much longer period of time and is more easily brought back to a state of suspension after precipitation. Other iron oxides, either synthetic or natural, e. g., yellow, Spanish red, black, rouge or the like may also be used. It is possible to omit the use of the iron oxide in the compositions and still obtain the unique benefits of the combination of other ingredients.

It should be pointed out that the portions of

the essential ingredients of these new cutting compounds may be varied, depending upon the exact machining operation in which the composition is to be used. In other words, if the composition is to be employed in a reaming operation, a slightly different formulation has been found to be preferable than where the composition is to be used for a drilling operation. As a matter of fact, it has been found that for the machining and working of plastics, the graphite may be entirely eliminated from the cutting compound. However, for substantially all general metal machining operations, the following proportions of ingredients have been found preferable:

	Parts by volume
Gum spirits turpentine	1 to 16
Graphite	1 to 5
Iron oxide	1 to 2
Chlorinated hydrocarbon	1 to 5
Petroleum lubricating oil	100 to 125

It is advantageous to add small amounts of such materials as citronella, terpineol and similar sweet smelling oils in order to give the final product a pleasant odor. Such odorants are added in the amount of a few drops to a gallon of the final lubricating composition.

The present invention provides new lubricating compositions for use in machining operations. While the product is particularly useful and has been described in connection with metal machining operations, it has also been found to be advantageous in the machining, such as molding and die cutting, of plastics, e. g., acrylic resins, cast or molded phenolics, vinyl resins, and the like.

In all cases, the new cutting compounds of this invention increase the life of tools or dies by greatly reducing the tendency of the tool to grasp the work piece and by increasing the ability of the tool to cut. As a result, the cutting compound makes possible a substantial saving in time in machining operations, since frequent re-sharpening or re-surfacing of tools or dies due to scoring is reduced. These cutting compounds may be used in surfacing or machining all types of finished or cast steel, cast iron, plastics or the like and are particularly useful in the machining of high tensile, high hardness, alloy steels.

I claim:

1. A lubricating composition for use in metal machining operations consisting of 100 to 125 parts of a petroleum lubricating oil, 1 to 16 parts of turpentine oil, 1 to 5 parts of comminuted graphite, 1 to 2 parts of iron oxide and 1 to 5 parts of carbon tetrachloride.

2. A composition according to claim 1 in which said lubricating oil is an oil having a viscosity approximately 100° Saybolt at 100° F.

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