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CUTTING OIL COMPOSITION

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This invention relates to an improved cutting oil composition containing sulfurized talloil and free from deposition of sludge.

U. S. Patent 2,198,562, "Method of making sulfurized cutting oils," to Arthur Pollak and Randall Hastings, assignors to West Virginia Pulp & Paper Company, discloses that the use of sulfurized talloil, cut back with other oils such as mineral oils, presents some difficulty in that "ordinarily the sulfurized oil deposits a sludge upon standing which detracts from the usefulness of the oil for cutting purposes." A method is given wherein the resultant sludge deposition is kept at a minimum. This method consists in using a refined talloil and sulfurizing it at controlled conditions of time and temperature, namely from 2 to 4 hours, within a temperature range of 300° F.–400° F. However a certain amount of sludge still separates from mineral oil blends, both paraffinic and asphaltic, upon standing, as admitted in the patent specification. This deposit being quite gummy and sticky adheres to the metal surfaces of the lathe, tools and pump parts, thus preventing their normal operation.

The above drawbacks have been confirmed in experiments. When a blend of 6% of sulfurized refined talloil (Indusoil) and 94% of pale paraffin oil was installed in a test lathe for purposes of evaluation of the sulfurized base, after standing in the machine tool over the week end, the coolant pump was so badly gummed up that it was necessary to disassemble it for cleaning. The ways of the lathe were coated with a sticky film which prevented the passage of the carriage. A similar blend, installed in pipe threading machine for

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evaluation in the threading of a 2 inch seamless steel tubing showed that a large amount of sludge separated out overnight, the sticky mass adhering to the machine tool parts and being difficult to remove.

The sulfurized talloil used in the above experiments was made from refined talloil and in accordance with the teachings of the Pollak-Hastings patent.

This invention is based upon the discovery that the addition of aromatic solvents to cutting oils containing sulfurized talloil prevents separation of sludge, and in extreme cases of slight separation, the sludge is of such a nature that it does not adhere to the metal surfaces. The aromatic solvents used in the experimental work were those derived from high temperature catalytic conversion of petroleum oils, specifically those derived from recycle stocks from catalytic cracking. Characteristics of solvents used are given below.

	Medium Aromatic Solvent	Heavy Aromatic Solvent
Grav. ° API	12	3
Spec. Grav. @ 60/60	.985	1.05
Flash Pt. COC, ° F	265	335
Aniline Pt., ° F	—20	—25
Approx. Boiling Range, ° F	500–600	600–760

Experimental data are tabulated below. In all blends listed, the sulfurized talloil was made by sulfurizing "Indusoil" (refined talloil) to a 15% sulfur content at a temperature of about 350° F.

Table I

Blend	Stability of Blend	
	After Standing 1 week	After Standing 5 weeks
3% Sulfurized Talloil 97% 100" paraffin oil	Cloudy, appreciable separation	Almost all of sulf. talloil separated out (adhesive deposit).
6% Sulfurized Talloil 94% 100" paraffin oil	---do	Clear, large amount of separated material (adhesive material).
9% Sulfurized Talloil 91% 100" paraffin oil	---do	Large amount of separated material (adhesive material).
3% Sulfurized Talloil 5% Med. Aro. Solvent 92% 100" paraffin oil	---do	Appreciable separation.
3% Sulfurized Talloil 10% Med. Aro. Solvent 87% 100" paraffin oil	Cloudy, slight separation	Slight separation (deposit not adhesive).
3% Sulfurized Talloil 15% Med. Aro. Solvent 82% 100" paraffin oil	Clear, trace of separation	Clear, trace of separation (material which separated out not adhesive. Readily dispersed).
6% Sulfurized Talloil 15% Med. Aro. Solvent 79% 100" paraffin oil	Clear, no separation	Clear, trace of separation (material which separated out not adhesive. Readily dispersed).
6% Sulfurized Talloil 94% 100" paraffin oil	Cloudy, much separation	Clear, large amount of separated material.
3% Sulfurized Talloil 97% 100" Coastal (Asphaltic) Oil	Cloudy, considerable separation	Cloudy, considerable separation.
6% Sulfurized Talloil 94% 100" Coastal (Asphaltic) Oil	Slight separation	Slight separation, Sticky deposit.
6% Sulfurized Talloil 15% Med. Aro. Solvent 79% 100" Coastal Oil	Clear, no separation	Trace of separation—material separated out not adhesive, readily dispersed.

It will be seen from the above data that the incorporation of 10% or more of the aromatic solvent produced cutting oils satisfactory from the standpoint of stability and freedom of sludge deposition, whereas blends of sulfurized talloil with either paraffinic or asphaltic oils invariably failed in that respect. Even in cases when some separation was observed with smaller additions of the aromatic solvent, the sludge was not adhesive to metal and was readily dispersed by slight movement of the oil. It is believed that this constitutes an improvement which makes the sulfurized talloil blends suitable for operation in cutting machines.

Supplementary experimental work was conducted to check the performance of the improved talloil cutting oils containing the aromatic solvents in actual service. The following cutting oil was prepared.

	Percent
Sulfurized refined talloil (15% sulfur)	6
Hy. Aro. solvent	15
100'' paraffin oil	79

The above product was evaluated in the threading of 2 inch seamless steel tubing and left in the machine over night. No sticky resinous deposit was observed on parts of the machine tool or on the work. The oil was drained from the machine into an iron pail and allowed to stand for several days. No instability of the oil was indicated.

The metal cutting efficiency of the above blend was compared with that of a conventional sulfurized fat base cutting oil. The latter contained the same percent of sulfur, in the base and in the finished cutting oil. The threading efficiency of the two products under comparison, as expressed in kilowatts or specific power consumption was the same. This indicates that the performance of the stabilized sulfurized talloil blend compared favorably with blends of conventional sulfurized fat bases.

The aromatic oils used for this stabilization are in general derived from the high boiling portions of a material which has been subjected to severe cracking and find no counterpart in uncracked oils of similar boiling point. The nature of the oils to be used may be noted from the following table of properties defining oils useful for the purpose.

Table II

Sp. gravity @ 60/60° F.	.90–1.06
Flash (C. O. C.) °F.	250 minimum
Viscosity Saybolt Universal @ 100° F.	30–200 sec.
Aniline point, °F.	+40 max.
Refractive index @ 20° C.	1.50 min.
Initial boiling point, °F.	450 min.

Most striking of these properties is the combination of viscosity and gravity, wherein the

combination of low viscosities, (30–200' S. U. V. @ 100° F.), with high gravities (.97–1.06), (as heavy as water, practically), indicates an oil of a nature quite different from those found in ordinary lubricants, either distillate or residual.

These oils should be incorporated into the final composition to the extent of from 5% to 30% of the final composition, the preferable range being from 10% to 20%, and the apparent optimum being about 15%.

We claim:

1. A sulfurized talloil cutting oil composition stable against the formation of sludge comprising a mineral oil lubricating fraction, a sulfurized talloil, and from about 5% to about 30% of a hydrocarbon oil having an aniline point of +40° F. or lower, a specific gravity of from 0.9 to 1.06, a flash point of 250° F. minimum, an initial boiling point of not less than 450° F., and a viscosity of not over about 200 seconds Saybolt Universal at 100° F.

2. A sulfurized talloil cutting oil composition stable against the formation of sludge comprising a mineral oil lubricating fraction, a sulfurized talloil, and from about 10% to about 20% of a hydrocarbon oil having an aniline point of +40° F. or lower, a specific gravity of from 0.9 to 1.06, a flash point of 250° F. minimum, an initial boiling point of not less than 450° F., and a viscosity of not over about 200 seconds Saybolt Universal at 100° F.

3. A sulfurized talloil cutting oil composition stable against the formation of sludge comprising a mineral oil lubricating fraction, a sulfurized talloil and about 15% of a hydrocarbon oil having an aniline point of +40° F. or lower, a specific gravity of from 0.9 to 1.06, a flash point of 250° F. minimum, an initial boiling point of not less than 450° F., and a viscosity of not over about 200 seconds Saybolt Universal at 100° F.

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