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METHOD OF MAKING SULPHURIZED CUTTING OILS

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1 Claim. (Cl. 87-9)

Our present invention relates to an improved method of making a sulphurized cutting oil. Cutting oils as at present used are of two kinds: (1) the oil is emulsified with water and the emulsion used for cooling and lubricating the metal during the cutting operation; (2) the oil is used without the addition of water. In either case, but especially in the case of a non-emulsified oil, it is desirable to sulphurize the oil for the reason that hot sulphurized oils retain their lubricating qualities better than unsulphurized oils. Oils vary greatly in their ability to absorb sulphur. One oil or class of oils available as cutting oils and having a high sulphur absorption capacity is tall oil, which is a mixture of fatty and rosin acids occurring in pine and other non-deciduous woods, and is obtained as a by-product in paper manufacture. In some instances the crude tall oil is purified by distillation and separation of the rosin acids by crystallization. Tall oil, especially the refined variety, is capable of absorbing in excess of 25% by weight of sulphur. The sulphurized tall oil is then as a rule diluted with other oils having lubricating qualities, either vegetable or mineral or both (previously saturated with sulphur), the sulphur-retaining capacity of which is substantially less than that of the tall oil.

Difficulty has been experienced in maintaining the quality of such cutting oils, as ordinarily the sulphurized oil deposits a sludge upon standing which detracts from the usefulness of the oil for cutting purposes. We have now discovered that this deposition of sludge may be reduced to a point where such sludge is no longer objectionable. In general our method consists in heating the tall oil and sulphur in admixture therewith under controlled conditions as to time and temperature. For the best understanding of our invention reference is made to the following specific example illustrative thereof:

400 grams of refined tall oil is placed in a flask provided with a thermometer, the flask attached to a stirrer and placed in a vat of tricresyl phosphate heated by a Bunsen burner. 80 grams (20%) of powdered sulphur is added and the heating continued with agitation until a temperature of 350° F. is reached. After maintaining the temperature at this value for two hours a clear solution is obtained upon cooling. When sulphurized tall oil so prepared was diluted with a mineral cutting oil nine times its weight the solution remained clear. A sample of the oil so obtained was kept at 200° F. for ten days and found to yield only 0.64% sludge.

In general the following conditions are to be observed: The sulphur should be heated with tall oil until such time as a test sample when cooled shows no deposition of sulphur, but in general for a time less than four hours, after which appreciable decomposition of the oil results especially at the higher temperatures as evidenced by the evolution of hydrogen sulphide. The temperature, on the other hand, should not be substantially less than 300° F. nor substantially over 400° F. By observing these conditions, from 10% to 30% of sulphur may be incorporated in the tall oil and a stable product obtained which may be diluted with a hydrocarbon or other cutting oil and such mixture used directly for cutting purposes or emulsified with water in known manner. In general an optimum time and temperature within the limits above stated will be found for various amounts of sulphur. Thus, in a series of test runs the minimum sludge deposition was found to result when using 15% sulphur at 350° F. temperature in three hours' heating time; for 20% sulphur, minimum deposition occurred with two hours' heating time at the same temperature; with 25% sulphur, minimum deposition was found to result at 400° F. and two hours' heating time, temperatures higher or lower, or different periods of heating giving a greater amount of sludge. The sulphur present should go into solution before any substantial evolution of hydrogen sulphide occurs; should appreciable quantities of hydrogen sulphide be formed, the heating should be stopped and the mixture allowed to cool and either decanted from the undissolved sulphur or filtered, since continued heating under these circumstances will result in destruction of the oil substance.

While preferably the tall oil is first sulphurized and then diluted with lubricating (cutting) oil, if desired the tall oil may be at least partly diluted prior to the sulphurizing operation. Other variations in the disclosed method will occur to those skilled in the art within the scope of our invention.

We claim:

In the method of making sulphurized cutting oils by heating tall oil with agitation with up to 30% by weight of sulphur in the temperature range of approximately 300-400° F., the step of controlling the solution of the sulphur to give a minimum of sludging by terminating the heating within a period of from two to four hours, beyond which period a greater amount of sludge will be produced.

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