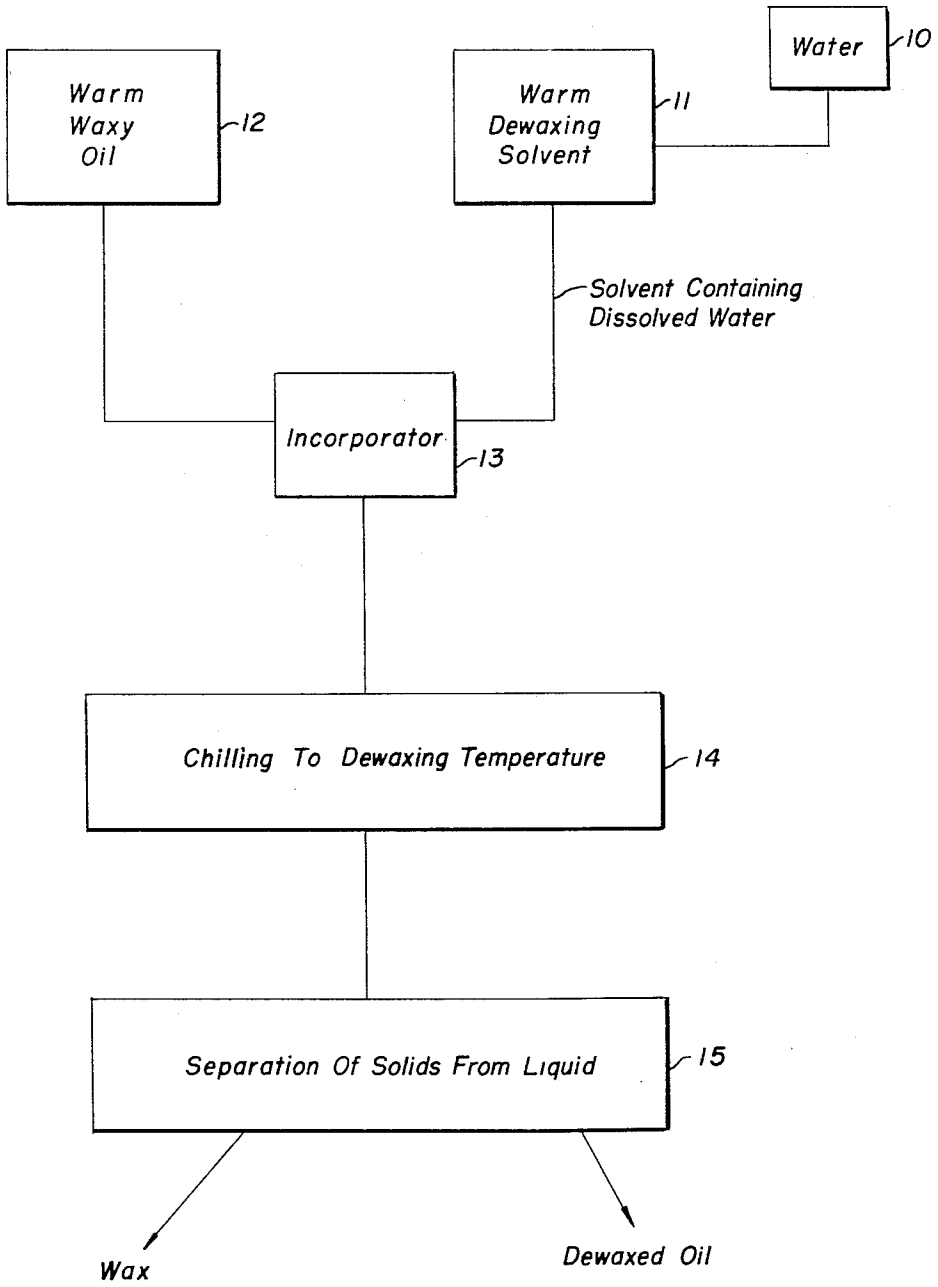
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SOLVENT DEWAXING OF LUBRICATING OIL

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SOLVENT DEWAXING OF LUBRICATING OIL

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The present invention is directed to a method for solvent dewaxing lubricating oil.

It is well known to the art to remove wax from a waxy oil by dissolving the waxy oil in solvent, chilling the resultant solution to cause wax to precipitate and then separating the precipitated wax by some suitable means such as filtration or gravity settling. The present application is directed to an improved method for solvent dewaxing oil.

The practice of the present invention will now be described in detail in conjunction with the accompanying drawing in which:

The sole figure is in the form of a flow sheet.

In the practice of the present invention a dewaxing solvent or solvent mixture is employed in which an appreciably greater amount of water is soluble than in the waxy oil-solvent solution. The warm dewaxing solvent or solvent mixture containing dissolved water has dissolved therein warm waxy oil to form a solution at a temperature above the wax nucleation temperature but at which water in finely divided particles appears as a second liquid phase. The said solvent and the water dissolved therein are selected such that upon dissolving the waxy oil in the solvent at a temperature above the wax nucleation temperature free water in an amount within the range of .25 to 5% by volume passes into the waxy oil in the form of fine particles of which approximately 90% are in the size range of 5 to 20 microns. Subsequent cooling to reduce the temperature to the desired dewaxing temperature causes the separation of wax particles in the form of large agglomerates thereby allowing the ready separation of a wax phase from a wax free oil phase. It is to be emphasized that the important feature of the solvent or solvent mixture selected is not the total amount of water which the solvent or solvent admixture dissolves. Rather it is the amount of water which separates out as free water in the form of finely divided particles when the waxy oil is dissolved in the solvent and as the solvent waxy oil solution is cooled from the selected first temperature to the lower wax nucleation temperature. As stated heretofore, in the practice of the present invention the free water separated out upon adding the waxy oil to the solvent at a temperature above the wax nucleation temperature may be within the range of .25 to 5% by volume and satisfactory results will be obtained. With a lubricating oil feed stock containing wax within the range of 5% to 25% by volume it will often be found that when the free water at the wax nucleation temperature is present in the range of .25 to 1.10% by volume the most satisfactory results are secured. It may be found when separating oil from wax mixtures where the wax is present in considerably greater amounts, for example over 50%, that larger amounts of free water, up to 5% by volume at the wax nucleation temperature, may give the most desirable results.

Specific examples of solvents and solvent mixtures which may be used in the practice of the present invention are as follows: Ketone-aromatic mixtures wherein

the ketone may be acetone, methylethyl ketone, methyl normal propyl ketone and diethyl ketone or mixtures thereof and the aromatic material may be benzol or toluol or mixtures thereof. Other solvent mixtures are ethylene dichloride in admixture with benzol or chloroform or carbon tetrachloride or mixtures thereof. Another example is furfural in admixture with benzol. Many other well known dewaxing solvents and solvent mixtures having the requisite characteristics will be apparent to a workman skilled in the art. A workman skilled in the art may readily select a suitable dewaxing solvent or solvent mixture, a suitable solvent temperature and the amount of water to be dissolved therein and a suitable temperature for dissolving warm waxy oil in the solvent containing said dissolved water so that upon dissolving said warm waxy oil the amount of free water and the particle size range thereof which passes into the waxy oil-solution are in the ranges previously disclosed.

Turning now specifically to the drawing which is in the form of a flow sheet, water from **10** is admixed with warm dewaxing solvent in **11**. Warm waxy oil from **12** is dissolved in the warm solvent containing the dissolved water in unit **13** to form a solution. The resultant solution contains dispersed water particles and is chilled in unit **14** (in a commercial unit the cooling in **14** may actually be carried out in multiple refrigeration stages) to the desired dewaxing temperature to cause the separation of wax particles in the form of agglomerates which are readily separated, the wax and oil then being separated in step **15**, as by filtering by a rotary filter to obtain as products a dewaxed oil fraction and a wax fraction. The drawing is in the form of a flow sheet and it will be understood that various well known steps, such as the recovery of solvent from the dewaxed oil and from separated wax have been omitted for the purpose of simplifying the description.

The present invention will be further described by way of the following examples:

Example I

A waxy neutral oil having a viscosity of 43.3 Saybolt seconds at 210° F. was divided into two fractions. The first fraction was dissolved in a solvent mixture containing 0.6% by volume dissolved water and the second fraction was dissolved in solvent mixture containing 1.65% by volume dissolved water. The composition of the solvent mixture used for dissolving both the first and the second fraction consisted of 58% by volume methylethyl ketone, 39% by volume toluol and 3% by volume benzol. The wax nucleation temperature was approximately 115° F. The amount of water soluble in the waxy oil-solvent solution at 100° F. (approximately the wax nucleation temperature) was 0.6% by volume so that there was no excess water in the first sample while there was 1.05% by volume excess water in the second sample in the form of finely divided particles. Both samples were chilled to 0° F. and the wax filtered. The first sample gave a dewaxed oil filter rate of 46 gallons per square foot per hour while the second sample, which illustrates the practice of the present invention, gave a dewaxed oil filter rate of 73 gallons per square foot per hour or an increase of 58%. These results are tabulated in columns 1 and 2 of the table set out hereafter.

Example II

A waxy distillate motor oil having a viscosity of 53.2 Saybolt seconds at 210° F. was separated into first and second samples. These samples were dissolved in a solvent having the same composition as used in Example I with the first sample having 0.6% by volume water dissolved in the solvent and the second sample having 1.15% by volume of water dissolved in the solvent. The wax

nucleation temperature was approximately 115° F. The excess water in the waxy oil solvent solution determined at 100° F. (approximately the wax nucleation temperature) was 0 for the first sample and .55% by volume for the second sample. Upon chilling the two samples to 0° F. and dewaxing the first sample it was found to have a dewaxed oil filter rate of 11 gallons per square foot per hour while the second sample (which illustrates the present invention), was found to have a dewaxed oil filter rate of 13.5 gallons per square foot per hour or an improvement of filter rate of 22%. These results are tabulated in columns 3 and 4 in the table set out hereafter.

TABLE

	Neutral Oil		Motor Oil	
	1	2	3	4
Percent Water in Solvent	0.6	1.65	0.6	1.15
Approximate Percent Excess Water:				
@ 100° F	0	1.05	0	0.55
@ 0° F	0.11	1.16	0.17	0.72
Dewaxed Oil Filter Rate:				
Gal./sq. ft./hr	46	73	11	13.5
Percent Oil in Wax	10	15	39	39

It is not understood why the procedure of the present invention causes the substantial improvement in results which are obtained. One postulate which has been advanced in explanation of the advantageous results is that the free water droplets act as nuclei upon which the wax crystals form and in this way the actual number of nuclei formed are controlled and thereby control the size of the resultant wax crystals. Another postulate which has been proposed is that each finely divided particle of water serves as a body, upon the interface of which wax nuclei form thereby causing a large wax agglomerate to form. In the art of filtration it is known that larger crystals or larger crystal agglomerates filter more rapidly than small crystals and thus either of the postulates advanced would result in a more rapid filtration rate. In any event the procedure of the present invention does result in substantially improved filtration rates.

I claim:

1. A method of dewaxing a waxy mineral oil including the steps of dissolving a waxy mineral oil at a temperature above the wax nucleation temperature in a solvent having admixed therewith water in such an amount that upon solution of the waxy oil in the solvent to form solvent-waxy oil solution, free water within the range of .25 to 5% by volume based on the solvent-waxy oil solution, with approximately 90% within the particle size range of 5 to 20 microns is separated from the solvent-waxy oil solution at approximately wax nucleation temperature, chilling the resultant solution containing particles of free water to a temperature substantially below the wax nucleation temperature to cause wax crystals to form and subsequently separating a wax crystal fraction from a wax free oil fraction.

2. A method of dewaxing a waxy mineral oil containing wax within the range of 5 to 25% by volume including the steps of dissolving said waxy mineral oil at a temperature above the wax nucleation temperature in a solvent having admixed therewith water in such an amount that upon admixture with the waxy oil to form solvent-waxy oil solution free water within the range of .25 to 1.10% by volume based on the solvent-waxy oil solution with approximately 90% within the particle size range of 5 to 20 microns is separated from the solvent-waxy oil solution at approximately wax nucleation temperature, chilling the resultant solution containing particles of free water to a temperature substantially below the wax nucleation temperature to cause wax crystals to form and subsequently separating a wax crystal fraction from a wax free oil fraction.

3. A method for dewaxing a waxy mineral oil containing wax within the range of 5 to 25% by volume which includes the steps of dissolving said waxy mineral oil at a temperature above the wax nucleation temperature in a ketone aromatic solvent mixture having added thereto water in such an amount that upon admixture with the waxy oil to form solvent-waxy oil solution, free water within the range of .25 to 1.10% by volume based on the solvent-waxy oil solution, with approximately 90% within the particle size range of 5 to 20 microns is separated from the solvent waxy oil solution at approximately wax nucleation temperature, chilling the resultant solution containing particles of free water to a temperature substantially below the wax nucleation temperature to cause wax crystals to form and subsequently separating a wax crystal fraction from a wax free oil fraction.

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