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PROCESS OF RECLAIMING USED LUBRICATING OIL

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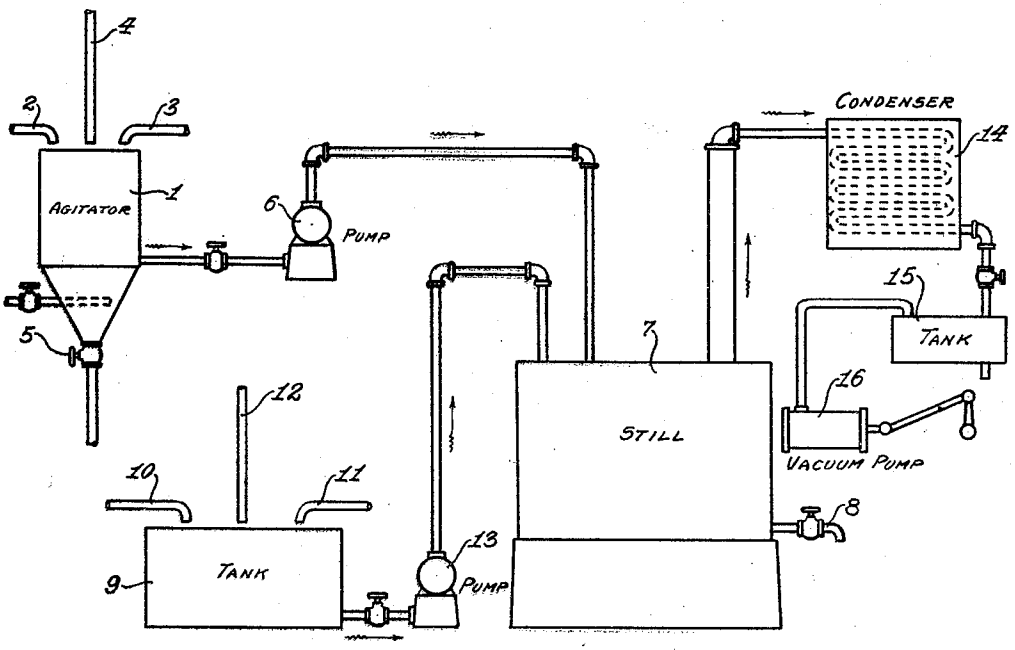

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UNITED STATES PATENT OFFICE

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PROCESS OF RECLAIMING USED LUBRICATING OIL

Application filed April 18, 1927. Serial No. 184,337.

This invention relates to the reclaiming of lubricating oils and more particularly to those oils having a mineral base and which have been used in crank cases of gas or gasoline engines. This application is a continuation in part of application Serial No. 129,658, filed August 16, 1926, as to subject matter common to the applications.

Used lubricating oil, particularly as taken from crank cases is a very complex mixture; not only may it consist of a mixture of oils due to the original compounding of the same but also due to the addition of different kinds of oils and even adulterants at various times to the crank case. It also contains moisture and lighter hydrocarbons which are usually mid way between gasolene and kerosene. Solid matter such as carbon, metal grindings, earthy matter and sand are also present. This entire mixture is churned and subjected to exposure; accordingly complex emulsions and colloids are formed, more especially where animal fats and alkalis are present, particularly as fats and soaps.

Now the lubricating property of the mineral base or constituent of used lubricating oil has not been damaged by use. On the other hand what remains of the mineral constituent is of high quality and if reclaimed will have a high lubricating value. On account of the complex nature of the mixture, however, used lubricating oil requires careful treatment and requires knowledge of the composition and nature of the mixture and treatment necessary to meet the conditions. One of the particular things to be avoided is the formation of unsaturated hydrocarbons, tar, resin and even free carbon; if formed, provisions should be made to remove the same.

One of the objects of this invention, therefore, is to provide a novel process of treating used lubricating oil in such a manner that the mineral constituent or base will be reclaimed.

Another object is to carry out the treatment in such a manner that the quality and property of the resultant lubricating oil will not be impaired.

Another object is to carry on the process in such a manner as to prevent the formation of unsaturated hydrocarbons, tar, resins and free carbon, or if formed secure their elimination.

Further objects will appear from the detail description in which will be set forth an illustrative embodiment of this invention; it will be understood, however, that the description and even the specific reagents employed are simply illustrative of an embodiment of this invention and that this invention is susceptible of various other embodiments.

The accompanying drawing is a view of an apparatus adapted for carrying out the process embodying this invention.

Generally stated, in accordance with this invention, the used lubricating oil is defecated to clear the same of the solid matter and entrained water. The defecated oil is then treated with suitable agents adapted to secure the objects of this invention. Suitable chemical agents which have been found satisfactory are zinc chloride used in connection with either caustic soda or one of the hypochlorites of an alkali metal, such as potassium or sodium hypochlorite; an alkali hypochlorite especially suitable for this purpose is one obtained by mixing a sufficient quantity of hypochlorite of lime with sodium carbonate and water and filtering the resulting liquid which then contains from 2–5% active chlorine. Such an agent may upon analysis contain, for example, about 6.5% sodium chloride, about 1% magnesium chloride, about 4.5% active chlorine and the remainder water. After treatment of the oil with the agents it is preferably subjected to heat under atmospheric pressure until freed of moisture and until the mineral constituent begins to vaporize. The heating of the oil is then continued under a pressure below atmospheric and under as high a vacuum as possible until the mineral constituent is vaporized. This mineral constituent is condensed under pressure below atmospheric and preferably under as high a vacuum as possible. The lighter hydrocarbons may be fractioned and separately collected; the lubricating constituents may also be fractioned and separately condensed; the latter may, however be condensed to form a blended lubricating stock.

A more complete example of an embodiment of this invention will now be described. Ordinary crank case oil is heated to a temperature of 100 to 130° F. and is placed in a suitable vat provided with an agitator. Sufficient sulphuric acid of about 66° Bé. is added in the proportion of about 5 to 7 pounds to a barrel of the oil. This is then agitated for several hours, the function of the treatment being to partially dissolve metal particles, break up the emulsions and colloids and cause precipitation of the solid matter as well as breaking up polymerized products. The acid is now neutralized with concentrated caustic soda solution of 30 to 33° Bé. or with milk of lime. Wash water is now added to thoroughly incorporate the materials and wash the whole and the sediment is allowed to settle as a sludge and drawn off, leaving the defecated oil in the vat.

The defecated oil is pumped to a still of any suitable construction, and preliminarily heated therein to a temperature of about 120 to 130° F. The chemicals are now added. Where caustic soda is used with zinc chloride they are mixed in equal proportions and dissolved in a generous amount of water to make a solution. This solution is then added to the oil in the still. As an example, for treating 150 gallons of defecated oil, one fourth pound of caustic soda and one fourth pound of zinc chloride are used. Where a hypochlorite of an alkali metal is used, one fourth pound of zinc chloride and a pint of the hypochlorite solution are mixed, additional water added, and added to the defecated oil in the still.

The treated oil in the still is now gradually heated over a period of three or four hours to a temperature of about 350° F. The temperature is held at this point until all of the moisture is distilled off (which can be noticed by the bumping ceasing) and until the oil vapors appear and start to come off. This preliminary heating is done under atmospheric pressure and is carried out gradually as stated.

After the preliminary heating the still as well as the condensers and the vapor lines thereto are subjected to as low a vacuum as possible. As a practical embodiment of this invention the vacuum is maintained at even a few millimeters of mercury. The temperature is then gradually run up to 650 and even 670° F. since the object is to vaporize the entire lubricating oil or mineral constituent of the oil. The lighter ends may be condensed separately as fuel oil or even lighter fractions. This is accomplished in the usual manner of fractional condensation well understood by those skilled in the art. The lubricating constituent can also be fractioned to obtain a light lubricating oil and a heavy lubricating oil which can be blended to make an oil of any desired viscosity. The lubricating constituent can, however, be condensed as one unit and its viscosity adjusted later in any suitable manner by suitable compounding. What is, therefore, left in the bottom of the still is a grease which is allowed to accumulate for several runs and then withdrawn. Any zinc chloride, alkali or other accumulated matter can, of course, be practically withdrawn with the grease and separated therefrom in any suitable manner.

Referring to the accompanying drawing, 1 designates an agitator provided with a suitable heating coil and agitating mechanism. This agitating tank is supplied with acid, alkali and water from the sources 2, 3 and 4, respectively. The sludge can be drained through the valve 5 while the oil is taken by a pump 6 to the still 7. A tank 9 is adapted to receive caustic or zinc chloride and water from the sources 10, 11 and 12, respectively. The vapors are condensed by a condenser 14 discharging into a tank 15, and a vacuum pump is shown at 16. The treating mixture is then transferred to the still by means of pump 13. Sludge and grease are withdrawn through the connection 8.

It will therefore be seen that this invention accomplishes its objects. A high grade lubricating oil is obtained, which lubricating oil has a high quality and grade and is of the desired viscosity, and has also high flash point and fire test. Not only is the lubricating oil clear as it condenses but it also remains clear when in storage. This is due to the fact that by the chemical treatment of the reagents, as described, the formation of unsaturated hydrocarbons, tar, resins, and deposit of carbon is prevented; in fact these impurities are even removed if they should be present in the still. The formation of the objectionable impurities is particularly avoided where, as is in this process, the vaporization is under pressure less than atmospheric and when the body of oil has been treated with the reagents as described. Not only, however, is there obtained a high grade lubricating oil, but the still bottom residue has a grease of high economic value as a cup grease. The process requires no filtration, nor the employment of any solids in the still, which must be removed or which render the still bottom residue unfit for economic use. The process is simple, requires only well known equipment and is economical in its operation.

While there has been specifically described the employment of agents such as zinc chloride, caustic soda and hypochlorite of an alkali metal, it will be understood that these are simply given as illustrations of operative reagents, and that equivalents may be employed without departing from the scope

of this invention. It will further be seen that while theories have been advanced, this has only been done to facilitate the disclosure and that there is no intention to limit this invention to any particular theory. It is, therefore, obvious that various changes may be made in details without departing from the spirit of this invention; it will, therefore, be understood that this invention is not to be limited to the specific details described.

Having thus described the invention what is claimed is:

1. In the art of reclaiming used lubricating oil, the process comprising steps, adding to the oil zinc chloride and an alkali and vaporizing the treated oil under a pressure below atmospheric.

2. In the art of reclaiming used lubricating oil, the process comprising steps, adding to the oil zinc chloride and a hypochlorite of an alkali metal and vaporizing the treated oil under a pressure below atmospheric.

3. In the art of reclaiming used lubricating oil, the process comprising steps, adding to the oil zinc chloride and an alkali, heating the treated oil under atmospheric pressure and then distilling the treated oil under a pressure below atmospheric.

4. In the art of reclaiming used lubricating oil, the process comprising steps, adding to the oil zinc chloride and an alkali, heating the treated oil until the lighter hydrocarbons and lubricating constituent begins to vaporize and vaporizing the lubricating constituent under a pressure below atmospheric.

5. In the art of reclaiming used lubricating oil, the process comprising steps, adding to the oil zinc chloride and an alkali, vaporizing the moisture in the oil under atmospheric pressure and vaporizing the lubricating constituent of the oil under a pressure below atmospheric.

6. In the art of reclaiming used lubricating oil, the process comprising steps, adding to the oil zinc chloride and an alkali, gradually heating the treated oil to the vaporizing point of the lubricating constituent and vaporizing the lubricating constituent under a pressure below atmospheric.

7. In the art of reclaiming used lubricating oil, the process comprising steps, adding to the oil zinc chloride and an alkali, heating the treated oil to a temperature of 350° F. under atmospheric pressure and continuing the heating thereafter to the vaporizing temperature of the lubricating constituent under a pressure below atmospheric.

8. In the art of reclaiming used lubricating oil, the process comprising steps, defecating the oil to clear the same of the solid matter and entrained water, treating the defecated oil with zinc chloride and an alkali and vaporizing the treated oil.

9. In the art of reclaiming used lubricating oil, the process comprising steps, adding to the oil sulphuric acid and caustic soda, treating the oil so treated with zinc chloride and an alkali and vaporizing the treated oil.

10. In the art of reclaiming used lubricating oil, the process comprising steps, defecating the oil to clear the same of the solid matter and entrained water, treating the defecated oil with zinc chloride and an alkali and vaporizing and condensing the treated oil under a pressure below atmospheric.

11. In the art of reclaiming used lubricating oil, the process comprising steps, defecating the oil to clear the same of the solid matter and entrained water, treating the defecated oil with zinc chloride and an alkali, heating the treated oil to the vaporizing point of the lubricating constituent and thereafter vaporizing the lubricating constituent.

12. In the art of reclaiming used lubricating oil, the process comprising steps, defecating the oil to clear the same of the solid matter and entrained water, treating the defecated oil with zinc chloride and an alkali, heating the treated oil under atmospheric pressure to the vaporizing point of the lubricating constituent and thereafter vaporizing the lubricating constituent under a pressure below atmospheric.

In testimony whereof I affix my signature this 14th day of April, 1927.

JULIUS F. HANKE.