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(12) **Patent:**

(11) **CA 579775**

(54) ISOMERIZATION OF PARAFFIN WAX

(54) ISOMERISATION DE CIRE DE PARAFFINE

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ABSTRACT:

CLAIMS: Show all claims

*** Note: Data on abstracts and claims is shown in the official language in which it was submitted.

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This invention relates to a new and useful process for the
isomerization of paraffin wax. The invention also relates to a proc-
ess for the production of lubricating oil and isoparaffin wax from
paraffin wax.

Paraffin wax is a normally solid wax-like substance com-
posed of high molecular weight hydrocarbons. It is usually obtained
from the heavier fractions of petroleum such as are used for the
production of lubricating oils as well as certain burning oils. In
nearly every case, it is an undesired constituent in such oils and

10   is removed by known so-called dewaxing methods during refining. While
paraffin wax is useful for many purposes such as sealing containers,
production of waxed paper, production of water-proofed cartons and
the like, and finds a large and wide use, there is still a considerable
amount of paraffin wax for which there is no ready market.

Various processes have been proposed for the treatment or con-
version of paraffin wax. Those processes resulting in a hydrocarbon
product generally involve a refining operation which produces a normally
solid wax of improved characteristics, or a more drastic conversion
treatment which results in the production of a liquid product. The

20   former usually comprises such steps as solvent extraction, fractional
crystallization, clay treatment and the like, in which the structure
of the hydrocarbons is unaltered. The latter involves a step in which
the hydrocarbons are decomposed or split to give a wide range of
products comprising normally gaseous and normally liquid products,
most of which are of relatively low value. It would be most advan-
tageous to have a practical process whereby paraffin wax could be con-
verted into more valuable hydrocarbon products. One possibility lies
in isomerization.

By isomerization of paraffin wax is meant the treatment of the wax under conditions to isomerize the hydrocarbon constituents into isomers having the same molecular weight but a more branched structure. Some isomerization may take place in other drastic conversions of the wax but the term "isomerization process" is considered to designate only a process in which such isomerization to a more branched structure takes place to a substantial extent without more than a minor occurrence of other reactions.

It is known that the melting points of the wax hydrocarbons are
10   lowered upon isomerization to isomers having a more branched structure. Merely by way of example, normal hexacosane, a typical wax constituent, is a waxy solid having a melting point of 56°C whereas, its isomer 6,6 - dipentyl hexadecane is a normally liquid compound having a melting point of -40°C. Thus, by suitable isomerization a substantial conversion of even high molecular weight paraffin wax to a normally liquid product may be obtained. This liquid product is an oil having particularly desirable properties. The isomerization can be accomplished and has been accomplished as described in U. S. Patent No. 2,475,358.

The main difficulty encountered in attempts to isomerize paraffin
20   wax is in preventing excessive degradation (cracking) to lower molecular weight products of little value. It is well known and generally recognized that the tendency for hydrocarbons to crack increases rapidly with increasing molecular weight. This holds both for thermal cracking as well as cracking induced by a cracking catalyst. Thus, whereas normal butane may be converted to isobutane quite selectively, the selective isomeriza- tion of paraffins of higher molecular weight becomes increasingly difficult as the molecular weight is increased. In the method described in U. S. Patent No. 2,475,358, a fairly selective isomerization of paraffin wax is obtained by the use of Friedel Crafts-type catalyst which has been modified
30   to decrease its cracking tendency and by simultaneous use of a large

amount of a cracking-suppressor (decahydronaphthalene). While this method affords a moderate yield of lubricating oil of high viscosity index, and also Diesel fuel of good cetane number, the recovery of the product requires special steps, and some catalyst is lost in each cycle. The process also involves the handling of corrosive liquids, and the isomerization reaction is intrinsically slow so that large reactors are required.

It has now been found that paraffin wax may be isomerized quite selectively and at a much faster rate with the production of good yields of excellent oil and isoparaffin wax by a new process which is quite simple and in which no corrosive reagents are involved. In this process the paraffin wax is isomerized by treatment with a platinum-containing catalyst. The various details of the process are described in the following:

The process of the invention is applicable for the isomerization of any normally solid paraffin wax. The wax will usually be derived from mineral sources such as petroleum, oil shale, oil from tar sands, gilsonite, ozokerite, or the like, as well as from coal via extraction and/or hydrogenation processes, but paraffin wax produced by the Fischer-Tropsch synthesis or as a by-product of other processes may also be isomerized. The process may be applied for the isomerization of crude so-called slack wax, or to refined waxes of various melting points or to so-called residue wax. While the various waxes differ somewhat in properties, e.g., melting point and hardness, they are all composed of hydrocarbons containing long paraffinic chains. In some paraffin waxes the chains may be slightly branched and in some may have naphthenic or aromatic groups attached. Olefinic groups are rarely present; when present they do not affect the operation of the process. In any case, the paraffin chain of the wax molecules can be isomerized to give a product having a more highly branched structure.

In the process of the invention, the paraffin wax is isomerized
through the aid of a supported platinum catalyst. Palladium or nickel
may be substituted for platinum if desired. The platinum may be applied
on a number of conventional carrier materials hitherto employed as a
support for platinum catalyst. Suitable supports are described in
U. S. Patents Numbers 2,478,916 and 2,550,531. Alumina is a preferred
support material. So-called activated alumina (gamma alumina) and
activated bauxite are quite suitable. The alumina should be substanti-
ally free of alkaline materials such in particular as the alkali and
10 alkaline earth metals. In order to insure the absence of any appreciable
amounts of such alkaline materials in the catalyst and to promote the
catalyst, it may be desirable to treat the carrier material with a halogen
compound, e.g., HCl or HF, prior to incorporating the platinum. The
amount of platinum in the catalyst may vary from a few hundredths of a
per cent, e.g., 0.05% to about 1%. The preferred concentration of
platinum is between about 0.1% and about 0.6%.

The platinum may be applied to the support in any one of
several known ways. One suitable method is to impregnate the support
material with a solution of a platinum salt, followed by drying and
20 reducing in the conventional manner. Thus, for example, pellets of
activated alumina may be treated with HF and then soaked in a solution
of chloroplatinic acid, dried, and reduced in hydrogen at 475°C. Commercial
"0.5% platinum on alumina pellets" made by Baker and Company, Inc.,
Newark, New Jersey, can be used.

An essential feature of one embodiment of the method of the
invention is that the isomerization is carried out in the presence of a
large amount of hydrogen. The mole ratio of hydrogen to hydrocarbon
should be at least 1 and preferably above 5 and may be much higher.
However, in practical operation, the ratio will rarely exceed about 300.

In carrying out the process by the vapor phase method, the wax is vaporized in a suitable vaporizer, mixed with the hydrogen, and the mixture is passed into contact with the catalyst. The hydrogen may advantageously be passed through the vaporizer to aid in the vaporization. The contact is most conveniently effected by supporting a bed of the catalyst in a reaction tube and passing the vapor mixture through the bed. Other methods of contact may, however, be applied if desired. The vapors issuing from the reaction tube are cooled to condense the product and the gas is then separated from the condensate. This gas is recycled. During repeated recycling of the gas the hydrogen gradually becomes diluted with inert gases produced by the minor amount of side reactions in the process. This is not particularly harmful as long as the specified minimum amount of hydrogen is applied. In order to prevent the dilution from becoming excessive, a small amount of the gas may be continuously withdrawn and replaced with fresh hydrogen. The temperature in the bed is between 300°C and 550°C and is preferably between about 375°C and about 490°C. The operation may be carried out under reduced pressure, at atmospheric pressure, or at considerably elevated pressures. Pressures between about 50 and 3000 psig. are suitable, pressures of the order of 300 - 100 psig. being generally preferred.

Under the conditions of temperature and pressure employed and in the presence of the large amount of gas the wax is retained in the vapor phase. It is essential in this embodiment that no condensation to a liquid take place in the reaction zone.

Under the described conditions, the isomerization takes place at a very rapid rate. Thus a contact time of the vapor mixture with the catalyst of only a tenth of a second is sufficient in many cases to afford a practical conversion. It is evident that with such rates a small reactor is capable of handling a large throughput. Longer contact times may, however, be used, particularly when operating at the lower

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temperatures. However, the contact time should not be so long at any given temperature to cause excessive cracking. The contact time may usually be adjusted between 0.5 and 25 seconds in any case to afford the desired conversion while limiting the formation of cracked products to below 25% and preferably below about 20%.

As pointed out above, the wax is retained completely in the vapor phase. If the hydrogen supplied is not quite sufficient to insure the absence of liquid wax a small amount of the higher molecular weight wax collects on the catalyst as a liquid. This liquid soaks into the
10   catalyst particles and is converted to tarry deposits which poison the catalyst.

It is found, however, that the wax may be isomerized in the liquid phase if sufficient liquid is retained to wash the catalyst of such tarry material as may tend to form under these conditions. In this second embodiment of the invention vaporization of the wax feed is, therefore, minimized by the application of somewhat lower temperatures and relatively small amounts of hydrogen.

In the liquid phase operation the catalyst may be powdered and the powder slurried in the molten wax. The slurry may then be
20   treated with hydrogen by the techniques used in the commercial hydrogenation of vegetable oils. Alternatively the catalyst may be in the form of a fixed bed of pieces and the molten wax may be gradually passed through the bed from the bottom to the top concurrently with recycled hydrogen. In this method the catalyst bed is flooded with liquid. The preferred method is, however, to allow the molten wax to trickle down through a fixed bed of catalyst pieces while hydrogen is passed concurrently or countercurrently.

When carrying out the process in the liquid phase the isomerization rate is considerably slower; thus contact times upward of five
30   minutes are required. At these longer times there is a considerably

greater opportunity for thermal cracking reactions to take place. Consequently, it is desirable to retain the temperature near the lower end of the mentioned ranges and preferably below 490°C.

In the liquid phase method a large amount of hydrogen is not essential; thus mole ratios of hydrogen to wax between 1 and 10 may be applied even with waxes of very high molecular weights. Such low ratios can only be approached in the vapor phase process in the case of lower molecular weight waxes that are easily vaporized.

The liquid phase method of operation is particularly advantage-
10 ous for the isomerization of high molecular weight waxes that are difficult or impossible to vaporize. For example, the liquid phase method is particularly suited for the isomerization of so-called residue wax or bright stock wax. This wax yields novel and highly desirable lubricating oil; it is most difficult to treat in the vapor phase. Also when treating this high molecular weight material, a small to appreciable conversion to lower molecular weight products by hydrocracking is not detrimental as the products remain largely in the lubricating oil range; in fact, a highly desirable and novel light lubricating oil is produced.

When treating a paraffin wax under the conditions above
20 described, the product consists of normally liquid oil, unconverted wax, partially converted wax, and a small amount of cracked products. The small amount of cracked material may be distilled from the oil and wax. Depending upon the starting material and the degree of conversion, the total or distilled (as above) product may vary in consistency from a slurry or mush to a grease-like or plastic material. In some cases the product may be used as is without any further processing. In other cases, particularly where a crude wax feed was used, it may be desirable to refine the product by extraction, clay treating, chemical treatment or the like.

The lubricating oils produced by the described process are novel oils having highly desirable properties. When starting with a paraffin wax obtained from a first dewaxing step and consisting almost completely of straight-chain paraffin hydrocarbons the lubricating oils produced consist almost completely of isoparaffin hydrocarbons. While these isoparaffins have a branched structure, they do not have the complicated structure obtained by the polymerization of olefins, e.g., isobutylene and, consequently, they are more thermally stable. Also, the product differs from the lubricating oil produced by the isomeriza-

10   tion of such normal paraffin wax using aluminum chloride with decahydronaphthalene (or cyclohexane) as a cracking suppressor as described in the above-mentioned patent since the product of this patented process contains appreciable amounts of alkylation-condensation products of the decahydronaphthalene.

When starting with a residue wax such as bright stock wax the lubricating oils produced also differ from those produced by other methods; they consist predominantly of hydrocarbons having a cycloparaffin nucleus with attached long isoparaffin side chains. They contain a small amount of hydrocarbons having an aromatic nucleus. This

20   latter type of hydrocarbon is not formed in the aluminum chloride process and if formed would be extracted into the aluminum chloride catalyst phase.

While the product may find application without further refinement, it will generally be desirable to separate it into two or more fractions. Thus, by employing conventional dewaxing techniques, a very high quality lubricating oil fraction may be separated. The pour point of the oil will depend in part upon the dewaxing conditions used and in turn the yield will depend in part upon the pour point chosen. Excellent yields of very low pour point oil of adequate viscosity for commercial

30   usage and having a high viscosity index have been obtained from the

product of a single pass isomerization treatment. In view of its very
low pour point and very high viscosity index, the oil is particularly
suited for many special purposes such, for example, as refrigerator
lubricating oil and low temperature hydraulic fluids.

The wax remaining after separating the oil consists of
unconverted and partially converted wax and the mixture has a lower
melting point and softer consistency than the starting material. It
may be used as such or retreated to produce additional amounts of oil.

While the wax may be used as such or recycled, it may also
10 be separated by known techniques into a fraction of partially converted
wax and a fraction of unconverted wax. Either of these fractions may
be recycled. Isoparaffin wax produced by the partial conversion of a
wax consisting essentially of normal paraffins partakes somewhat of
the characteristics of microcrystalline wax and may be used in place of
microcrystalline wax. The isoparaffin wax differs from ordinary
paraffin wax in having a much less brittle and more rubbery or plastic
consistency. It resembles carnauba wax in its ability to absorb con-
siderable quantities of oil without becoming sticky or tacky.

The amounts of the above products depend somewhat upon the
20 character of the wax feed and largely upon the severity of the treating
conditions, (degree of conversion). When treating waxes under relatively
mild conditions, only a small amount of oil is formed; when treating
under more severe conditions the amount of oil is greatly increased,
usually with more cracking.

The following examples are illustrative of the invention and
the effect of the severity of the processing conditions.

Example I. A paraffin wax having the following properties was isomerized:

Melting Point, AMP = 138/140°F
Average Molecular Weight = ca. 385

d 60/4°C	0.7786
n 60°C/D	1.4356
n 70°C/D	1.4325
n 80°C/D	1.4293

The isomerization was effected by vaporizing the wax with from 52 to 63 moles of hydrogen per mole of wax and passing the vapor mixture through a bed of platinum-alumina catalyst containing about 0.3% platinum under the following reaction conditions:

Temperature	430°C
Pressure	500 p.s.i.g.
Space Velocity*	25.4

* Space velocity is defined as the volumes
of wax processed per volume of catalyst
per hour.

The losses, including the small amount of cracked products, amounted to about 2.4% of the wax feed. The product was refined by a series of dewaxing steps to separate narrow fractions of the oil produced. The amounts and properties of the oil fractions are shown in the following table:

Fraction	Yield %/Wt. of Feedstock	Viscosity cs. 100°F	210°F	Viscosity Index	Pour Point, °F (ASTM)	n_D at 70°C
A	5.6	12.02	3.16	144	-15	1.4332
B	1.6	12.50	3.00	105	+ 5	1.4474
C	2.2	11.34	3.15	160	+25	1.4325
D	5.6	11.79	3.29	169	+60	1.4322

Since the conditions were in this case very mild due to the very high space velocity, (calculated contact time, 0.77 seconds) the conversion was quite limited. It will be noted, however, that 15% by weight of the wax was converted to oil of which about 37% was an oil of viscosity suitable for low temperature applications, very high viscosity index, and below zero Fahrenheit pour point. This desirable

oil could be separated and the remaining oil recycled with or without the unconverted and partially converted wax. This operation is attractive because the throughput is very high and the losses to cracking are very low.

Example II. A wax having the properties shown above was isomerized under the same conditions, except that the space velocity was 6.8. The losses, including losses to cracked products, amounted to about 5.6% by weight. The product was refined as before to give the following yields of oil fractions:

Fraction	Yield %/Wt. of Feedstock	Viscosity cs. 100°F	210°F	Viscosity Index	Pour Point,°F (ASTM)	n_D at 70°C
A	25.4	11.62	3.03	134	-55	1.4330
B	5.3	8.03	2.28	105	-20	1.4460
C	10.7	11.30	3.12	154	+ 5	1.4317
D	13.7	11.75	3.27	163	+65	1.4315

It will be seen that at the somewhat more severe conditions the yield of oil was increased to 55% by weight and that more than half of the oil was lubricating oil of especially desirable properties. The unconverted and partially converted wax, amounting to 39% of the feed, could be recycled.

Example III. The same wax was isomerized under the same conditions at a space velocity of 2.3. Under these more severe conditions the losses, including the loss through cracked products, amounted to about 18% by weight. The product was refined as before to give the following yields of oil:

Fraction	Yield,%/Wt. of Feedstock	Viscosity cs. 100°F	210°F	Viscosity Index	Pour Point,°F (ASTM)	n_D at 70°C
A	6.6	6.55	1.95	89	-70	1.4551
B	37.8	11.01	2.89	127	-60	1.4326
C	10.7	11.01	3.04	152	-10	1.4312
D	9.8	11.10	3.14	164	+45	1.4310

It will be seen that in this case the yield of valuable lubricating oil was again greatly increased with a relatively small increase in cracked products.

The above examples illustrate on a readily comparable basis the effect of the severity of the conditions upon the yields obtained. It is to be understood that the severity of the conditions may also be altered by changing other factors than the space velocity, e.g., the temperature and/or pressure.

Example IV. A white, hard, heavy distillate wax having the following inspection data was isomerized:

Melting Point, °F, A.S.T.M.-87	161
Gravity A.P.I., 210°F	51.8
Refraction Index, 80°C/D	1.4376
Oil Content, A.S.T.M. D-721,%	0.87
Molecular Weight	522
Viscosity, SSU at 210°F	50.6

The wax was vaporized and isomerized under the following conditions:

Temperature, °C	404-440
Pressure, psig.	250
Space Velocity	5.12
Hydrogen/Feed Mole Ratio	33

There were obtained 74.5% by weight (based on charge) of a wax of soft consistency containing lubricating oil; 12.4% of a distillate fraction boiling between 150°C and 265°C at 6.9 mm. pressure and containing light lubricating oil; 9.4% of cracked products boiling up to 150°C at 6.9 mm. ; and 3.7% of gas plus experimental loss. The soft wax fraction was dewaxed whereupon the oils listed in the following table were obtained:

	Acetone	MEK -60°C	MEK -40°C	MEK -10°C
% b.w. of Charge	3.0	5.2	6.7	7.4
RI N 20/d	1.5360	1.4693	1.4609	1.4590
Viscosity, at 100°F Cs	52	27	28	26
Viscosity Index	68	131	144	147
Pour Point, °F	-35	-75	-25	+25

Example V. Bright stock wax is the very high molecular

weight wax obtained from the residue remaining after distilling off the

distillable lubricating oil fractions from a lubricating oil petroleum

stock. The non-distillable oil (bright stock) in this residue is par-

ticularly desired for certain purposes and is in demand. A bright stock

wax having the following inspection data was isomerized.

Density, g/ml. at 20°C	0.8899
Viscosity at 210°F A.S.T.M. D-445	20.50
Molecular Weight	717
Oil Content	25%

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The wax was vaporized with hydrogen and isomerized under the following

conditions:

Temperature, °C	418-421
Pressure, psig.	300
Space Velocity	1.66
Hydrogen/Feed, Mole Ratio	336

There were obtained 71.9% of a very soft wax containing 43% bright stock;

20.8% of a distillate fraction boiling up to 238°C at 3 mm. pressure,

and containing lubricating oil; and 7.3% of gas plus experimental loss.

20 The soft wax was found to give a lower coefficient of friction than the

starting wax and in view of its softer consistency is better suited as a

rolling lubricant.

Example VI. A hard, white, heavy distillate wax similar to

that shown in Example IV but having a molecular weight of about 500 was

treated under the following conditions:

Temperature	405 - 410°C
Pressure	502 - 505 psig.
H_2/Feed, Mole Ratio	14.7 - 14.9
Space Velocity	2.5

30 Under these conditions this high molecular weight wax was largely in the

liquid phase. The hydrogen and liquid wax were passed upwards through a

fixed bed of the catalyst.

There were obtained about 7.3% of cracked products boiling

below 300°C; and a residue fraction which upon dewaxing yielded about

35.6% by weight (based on feed) of lubricating oil having a viscosity index of about 163, viscosity at 100°F of about 18.9 centistokes, and a pour point of about 22°F.

Example VII. A bright stock wax similar to that described in Example V but containing only about 8% oil was isomerized in the liquid phase in the manner described in Example VI. The conditions and results are shown in the following table:

Temperature, °C, Max.	423	410	405	385
Pressure, psig.	504	504	502	500
H₂/Feed Mole Ratio	6.9	4.7	4.7	4.7
Space Velocity	1.6	2.3	2.3	2.3
Light Lubricating Oil				
% By Weight of Charge	20.7	11.5	8.7	3.0
Viscosity, Centistokes at 100°F	14	13	29	23
Viscosity Index	115	122	116	113
Pour Point, °F	+20	+20	+25	+20
Heavy Lubricating Oil				
% By Weight of Charge	20.3	20.6	20.6	21.3
Viscosity, Centistokes at 100°F	244	338	366	404
Viscosity Index	102	93	93	90
Pour Point	+15	+25	+20	+25

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SUPPLEMENTARY DISCLOSURE

The oils produced by the process described in the main disclosure are unique and have unusually excellent properties in at least three respects, namely (1) a more favorable viscosity-temperature relationship, (2) a high viscosity index and (3) improved volatility-viscosity relationship.

Regarding the first, it may be pointed out that extensive research on the viscosity-temperature relationship of mineral oils has established that although different oils may and do have different viscosity indices they all behave in the same manner. Based on this the ASTM has printed charts which are available to all in which the kinematic viscosity is indicated by an imperical scale on the ordinate and the temperature is indicated by an imperical scale on the abscissa. These charts are designated ASTM chart D341E. The viscosity of any mineral oil may be determined at two different temperatures and the values plotted on the chart. A straight line drawn through the point then defines the viscosity of that oil at any other temperature and this holds for all liquid petroleum oils. If there is any deviation from this relationship it is towards a higher than predicted viscosity at low temperatures.

The oils produced by the process of the invention on the other hand do not behave in the manner predicted but have considerably lower viscosities at low temperatures. By way of example, the viscosity of an oil produced by the isomerization of wax as described was found to be about 5.08 cs at 210°F and about 24.57 cs at 100°F. This oil had a viscosity index of 148. The predicted viscosity at -40°F as determined by ASTM chart D341E is about 6500 cs. The actual measured viscosity at this temperature was, however, only about 4500 cs.

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Regarding the second point, it may be noted that the viscosity index is an arbitrary scale in which the best mineral oil available was rated at 100 and the poorest at 0. Most good lubricating oil stocks (without additives) usually have a viscosity index around 90. The oils produced according to the invention have a high viscosity index. As shown by the examples, for instance, most of the fractions have a viscosity index above 100 and oils with a viscosity index as high as 169 have been produced.

Regarding the third point, it is usual to set a volatility limit for any lubricating oil which limit is dependent upon the intended use of the oil. The volatility is measured by a standard test procedure in which the oil is heated at a specified temperature, e.g. 400°F for a time, e.g. six and one-half hours, while bubbling an inert gas through the oil at a specified rate and the amount of material lost by volatilization is measured and expressed in terms of percent by weight of the oil tested. In preparing a lubricating oil from its parent stock light materials are removed by distillation until the remaining oil satisfies the volatility requirement. In preparing lubricating oils of low volatility from mineral oils it is necessary to distill to a relatively high boiling point and this results in the production of a viscous oil. The oils produced by the process of the invention, on the other hand, are less viscous for a given volatility or vice versa, much less volatile for a given viscosity. For example, a lubricating oil topped at 450°C was prepared from one of the best lubricating crude petroleums, namely West Texas Ellenberger crude, and the oil was extracted to remove aromatic hydrocarbons. The resulting oil had the following properties:

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Volatility	ca 7%
Viscosity, 100°F	61 cs
Viscosity, 210°F	8.0 cs
Viscosity Index	106
Pour Point	-40°F

In comparison, an oil produced according to the process of the
invention from which the aromatic hydrocarbons were likewise removed
had the following properties:

Volatility	7.4%
Viscosity, 100°F	24.57 cs
Viscosity, 210°F	5.08 cs
Viscosity Index	148
Pour point	-45°F

Thus it will be seen that at substantially equal volatilities
(both oils were topped to 450°C) the oil according to the invention
was much less viscous.

The oils produced according to the invention normally
contain a small amount of aromatic type hydrocarbons. Aromatic
hydrocarbons are normally harmful in lubrication oils in lowering
the viscosity index and reducing the oxidation stability. However,
they are very desirable in improving the cleanliness of the oil,
i.e. its ability to resist the deposition of sludge and lacquer.
The aromatics may be removed from the oil if desired, e.g. by
passing it through a bed of silica gel. However, it should also
be noted that the aromatics removed from the oil by this means
and recovered from the silica gel are different from the aromatics
removed from mineral oils. Those removed from mineral oil normally
have a very low viscosity index. Those removed from equivalent
boiling range fractions of the oils of the invention generally

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have considerably higher viscosity index. For example, an oil was

produced by the isomerization of paraffin wax with a platinum-

alumina catalyst as described in the main disclosure and the aromatic

hydrocarbons contained in the oil were removed by passing the oil

through a bed of silica gel. The aromatic fraction separated from

the oil and recovered from the silica gel had the following properties:

	Before Hydrogenation	After Hydrogenation
Viscosity, 100°F	28.95 cs	32.57 cs
Viscosity, 210°F	5.40 cs	5.96 cs
Viscosity Index	133	136
Pour Point, °F	-	ca -45
Volatility, %	-	6.7

This is clearly a most unusual viscosity index for an

aromatic fraction. This material can be used as an aromatic additive

for extracted and refined mineral lubricating oils to improve their

anti-fouling properties.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR
PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. The process for the isomerization of paraffin wax
which comprises contacting the wax with at least one mole of
hydrogen per mole of said wax with a supported platinum catalyst
containing between about .05% to about 1% platinum at a temperature
between about 300°C and about 550°C for a time such that no more
than 25% of the wax is cracked to hydrocarbons lighter than
lubricating oil.

2. A process according to claim 1 in which the platinum
is supported on an alkali-free alumina.

3. A process according to claim 1 wherein the paraffin
wax is vaporized and the vapors contacted with the catalyst.

4. A process according to claim 3 in which the said vapors
are contacted with the said catalyst under a pressure between about
50 and 3000 pounds per square inch in the presence of sufficient recycle
gas that condensation to the liquid phase is avoided.

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5. A process for the production of a lubricating oil from paraffin wax which comprises vaporizing a normally solid paraffin wax with recycle gas containing at least one mole of hydrogen per mole of said wax, contacting the mixture in the vapor phase and in the absence of the liquid phase with a supported platinum catalyst containing between about .05% to about 1% platinum at a temperature between about 375°C and about 490°C and under a pressure between about 50 and 3000 psig. for a time between 0.5 seconds and 25 seconds insufficient to produce more than 25% conversion to cracked products of lower molecular weight, cooling the gaseous product, separating and recycling the hydrogen-containing gas, distilling the product to remove a lubricating oil distillate and subjecting the said distillate to a dewaxing treatment to separate unconverted wax from the normally liquid oil.

6. The process according to claim 1 further characterized in that the wax is first melted and the molten wax is passed in the liquid phase through a bed of the catalyst under conditions of time and temperature such that not more than 25% of the wax is cracked to hydrocarbons lighter than lubricating oil.

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CLAIMS SUPPORTED BY SUPPLEMENTARY DISCLOSURE

7. A normally liquid paraffin wax isomerizate boiling
in the lubricating oil range and characterized by having a lower
viscosity at low temperature than predicted from ASTM viscosity-
temperature correlation chart D341E, a high viscosity index, and
an appreciably lower viscosity at any given volatility compared
to mineral lubricating oils.

8. A normally liquid paraffin wax isomerizate containing
a small amount of aromatic hydrocarbons and boiling in the lubri-
cating oil range and characterized in having a lower viscosity at
low temperature than predicted from ASTM viscosity-temperature
correlation chart D341E, a high viscosity index, and an appreciably
lower viscosity at any given volatility compared to mineral
lubricating oils.

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