IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT COOPERATION TREATY

Authorized Officer Shane Thomas	:	
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In Re Application of	:	METHOD AND APPARATUS FOR
	:	CLARIFICATION OF PYROLYSIS OILS
RJ LEE GROUP, INC.	:	
	:	Attorney Docket No. 287122-0159P
International Application No.	:	
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INFORMAL COMMENTS BY APPLICANT ON WRITTEN OPINION AND ARTICLE 19 AMENDMENTS

April 16, 2019

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Sir:

In response to the International Search Report and Written Opinion dated 26 February 2019, applicant respectfully requests entry of the following claim amendments and consideration of the remarks provided herein.

The Amendments to the Claims along with a clean copy of the claims are each attached separately.

The Remarks begin on page 3 of this Response to Written Opinion.

STATUS OF THE CLAIMS

Claims 1-54 were deemed to satisfy the novelty standard.

Claims 1-35, 37,40-41 and 43 were deemed to satisfy the Inventive step standard.

Claims 36, 38-39, 42 and 44-54 were deemed to not satisfy the Inventive step standard.

Claims 1 through 54 were deemed to satisfy the Industrial applicability standard.

On the basis of the claim amendments and associated remarks, reconsideration of the negative decisions as to the claims which were deemed to satisfy the novelty and Industrial applicability standard, but not the Inventive step standard is respectfully requested.

BASIS FOR CLAIM AMENDMENTS

The amendment to claim 2 involves merely an obvious grammatical change.

Claim 36 has been canceled.

Claim 37 has been rewritten so as to include all of the recitals of prior claim 36 and the prior recital of claim 37.

A number of claims previously dependent from canceled claim 36 have had the dependency changed to claim 37. These are claim 38, 40, 42, 44 and 45.

Claim 46 has been amended by including the expression "but said oil will not vaproize" on line 6. The basis for this change appears at (a) page 4, lines 11 and 12, (b) page 5, lines 25 through 29, (c) page 5, lines 30-33, (d) page 6, lines 1 through 7, (e) page 7, lines 3 through 10, and (f) page 7, lines 11 through 19.

Claim 46 has incorporated the recital of canceled claim 50.

Claim 49 merely repositions the word "simultaneously".

The amendment to claim 54 is based upon page 9, line 25 of the specification.

REMARKS

The present invention solves a long standing problem by improving the properties of pyrolysis oil to enhance the commercial value of the same. This is accomplished by methods and related apparatus which result in the creation of an oil with a much lighter color in lieu of the prior black color. It also reduces or eliminates the undesired sulfur/amine aroma. It further reduces the number of polycyclic aromatic hydrocarbons (PAH).

Method Claims 1-35

In one embodiment of the method as recited in independent claim 1, the pyrolysis oil is processed by adjusting the polarity of the oil with a non-polar solvent, binding unwanted components to clay, eluding the clean oil in the non-polar solvent and then separating the non-polar solvent from oil. Among the preferred non-polar solvents are alkanes, such as hexane. Certain preferred alkane carbon lengths are disclosed along with ratios of oil to alkane employed in the process. The clay is preferably cleaned after a cycle of operation before performing the next cycle. A polar solvent is preferably employed to clean the clay. Among the preferred solvents are acetone.

The foregoing are among the features recited in claims 1 through 34 which were found to possess novelty, satisfy the Inventive step standard and the industrial applicability standard. An obvious housekeeping amendment has been made in claim 2 and no other claims within this group having been amended.

Apparatus Claims 36-45

Claim 36 has been canceled and the major recitals thereof have been incorporated in amended claim 37.

In a first embodiment of the apparatus as set forth in amended independent claim 37, recites a first vessel for receiving a mixture of the pyrolysis oil and a non-polar solvent, a heater for evaporating the non-polar solvent, a first condenser for receiving the evaporated non-polar solvent and condensing the same and a clay column for receiving the condensed solvent vapors from said condenser and eluting the non-polar solvent therefrom into a second vessel.

Original claims 37, 40-41 and 43 of this group were deemed to satisfy the novelty, Inventive step and industrial applicability standards. The claims have been revised so as to create dependencies of claims 38 through 45 directly or indirectly from allowable claim 37. These revisions result in all of the claims in this grouping being allowable as having satisfied all three standards.

Claims 46 – 54

For reasons which will be stated hereinafter, original claims 1-54 were said to satisfy the novelty and industrial applicability standards. Original claims 36, 38-39, 42 and 44-55 were said not to satisfy the Inventive step standard. For reason which will be stated hereinafter, it is respectfully submitted that amended independent claim 46 and dependent claims 47-49 and 50-54 now satisfy the Inventive step requirement.

In another embodiment of the apparatus of the present invention, as amended in claim 46, the apparatus has as a first vessel for holding a mixture of the oil and non-polar solvent, a clay column for receipt of the mixture, a second vessel for receiving the mixture passing through the clay column, the second vessel is structured to heat the mixture to a temperature at which the non-polar solvent will vaporize, but the oil will not vaporize**.** **A** condenser for condensing the solvent vapors and a third vessel for receipt of the condensed vapors until only oil remains in the second vessel. In addition, the claim now recites delivery means for delivering a clay cleaning material to said clay column after a cycle of operation.

Independent apparatus claim 46 previously recited a first vessel for hold a mixture of oil and non-polar solvent, a clay column for receipt of the mixture, a second vessel for receiving the mixture passing through the clay column, a second vessel structured to heat the mixture to a temperature at which the non-polar solvent will vaporize, a condenser for condensing the vapors and a third vessel for receipt of the condensed vapors until only oil remains in the second vessel. Claim 46 has been amended after the expression "non-polar solvent will vaporize" to add the recital "but not the oil". In addition, the claim has been amended to recite "delivery means for delivering a clay cleaning material to the clay column after a cycle of operation".

Claim 46 was said to lack an Inventive step as being obvious over Tolero considered in combination with Murphy.

Tolero claims a system which includes a pyrolyzer coupled to a condenser unit. The pyrolysis oil vapors are quenched by contact with a solvent in the condensing unit and then the mixture of pyrolysis oil plus solvent is condensed and exits from the condensing unit. The mixture is then said to be either directed to a suitable solvent recovery system to separate the solvent from the oil or to be recirculated back to the quench. The liquid feed to the quench system is said to be temperature controlled to optimize the composition of the liquid product.

By contrast with applicant's invention as recited in amended independent claim 46, does not require the Tolero pyrolysis unit or an oil solvent condenser. Applicant's apparatus processes pyrolysis oil which is already in liquid form. The solvent and oil are mixed and passed through a clay column. The effluent from the column which is cleaned pyrolysis oil plus solvent is directed toward a solvent recovery system where the oil and solvent are effectively completely separated. While the solvent is vaporized as set forth in amended claim 46, the oil is not vaporized. The solvent is condensed and returned to the system inlet in the form of liquid to be mixed with fresh oil. There is no quenching control. Also, the solvent temperature is not being used to control the composition of the liquid product. Further, the claim recites delivery means for providing clay cleaning material to the column after a cycle of operation. Not only does Tolero not teach, suggest or motivate one in the direction of applicant's invention, but is totally inconsistent therewith. For the foregoing reasons, one could not find applicant's apparatus as set forth in amended claim 46 obvious as there would be major reconstruction of Tolero which would be destructive of the Tolero teaching in order to even suggest applicant's currently claimed invention.

Murphy discloses the use of organo clay compositions for purifying liquids. The prime thrust of his disclosure is the use of an alkylamine base to remove contaminates from an aqueous system.

Considering the combination of Tolero and Murphy, it is respectfully submitted that there is nothing in either reference to suggest to one skilled in the art combining the Tolero system with Murphy and such combination could not be achieved without substantial destruction of the individual teachings. Applicant is not claiming to have invented a clay column, but has apparatus which beneficially employs a clay column in the context of the other apparatus co-acting components, as discussed hereinbefore.

It is respectfully submitted that applicant's amended claim 46 recites an Inventive step over the applied references.

Claim 47

The comments made hereinbefore with respect to Tolero and Murphy are equally applicable with respect to the following claims.

This claim specifically recites the non-polar solvents being alkanes having 4 to 10 carbons. The Authorized officer agrees that neither Tolero nor Murphy teach or suggests this specific recital. The reference on line 2 of the paragraph dealing with claim 47 makes reference to paragraph [0024]. The Murphy, et al. published patent application (U.S. 2003/0015473) at this location makes reference to a specific patent very broadly and generically with a wide range of water treatment material. The Murphy publication at paragraph [0024] makes general reference to alkanes, but does not, in any way, recite applicant's preferred carbon length. The general principles do not, in any way, teach or suggest applicant's specific preferred recital.

Claim 48

With regard to claim 48, the selection of applicant's preferred hexane as the non-polar solvent is not, in any way, taught or suggested by Tolero and Murphy even though there might be a general reference to alkanes. The parameters presented in the two applied references do not, in any way, teach or suggest the recital of hexane in claim 48 and the limitations incorporated by dependency on claim 46.

Claim 49

With respect to claim 49, the applied prior art does not teach the simultaneous use of a plurality of non-polar solvents falling within applicant's preferred 4 to 10 carbons.

Claims 50-54

Claim 50 has been canceled.

The Osaheni et al. Patent Application Publication (U.S. 2009/0312176) teaching deals with the regeneration of adsorbent material that removes metals such as vanadium, nickel and sulfur compounds from hydrocompounds including crude oil. Applicant's

adsorbent removes polar organics including aromatics such as PAHs which as stated in applicant's specification, is one of applicant's major objectives.

This combination of recitals not only satisfies the novelty and industrial applicability standard as did original claim 46, but, now, also satisfies the Inventive step requirement.

With respect to claims 51 and 52, applicants are claiming respectively the use of the clay cleaning material being acetone and the clay being attapulgite. These are being claimed solely in the context of amended independent claim 46 from which they depend.

Applicant's claim 53 recites the activation before the next cycle which is claimed solely in the context of the claims from which it depends directly or indirectly.

Claim 54

With respect to 54, the temperature limit of 150°C is not expressly disclosed in the cited art and is not obvious. Applicant has determined that there is to be drying until there is no more weight loss. It further has stated that above 150°C, the "clay" tends to decompose at that temperature and loses much of its capacity (page 9, line 25 of applicant's specification).

Dependent Claims 37 -45 and 47-54 refine the recitals of the respective apparatus claims from which they depend directly or indirectly.

SUMMARY AND CONCLUSIONS

The conclusion that original claims 1 through 35 satisfy the tests of novelty, Inventive step and industrial applicability has been noted with appreciation.

Claim 37 has been rewritten as an independent claim which incorporates the recitals of prior claim 36. Claim 37 was indicated as having satisfied all three standards. The remaining claims in this group claims 38 through 45 now depend directly or indirectly from allowable claim 37. As a result, it would appear that claims 37 through 45 directly or through dependency satisfy the standards of novelty, Inventive step and industrial applicability.

As to claims 46 through 54, it is respectfully submitted that the amendment to claim 46 combined with the original recitals present a claim which is distinguishable from

the prior art and satisfies the novelty, Inventive step and industrial applicability standards and, therefore, are patentable.

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