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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	2103-00902
	Application Number	
Title of Invention	Natural Gas Liquid Recovery Process	

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Applicant Information:

Applicant 1 [Remove]

Applicant Authority ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Eric		Prim	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Midland	State/Province	TX	Country of Residence [i]	US

Citizenship under 37 CFR 1.41(b) [i] US

Mailing Address of Applicant:

Address 1	4901 Polo Parkway
Address 2	

City	Midland	State/Province	TX
Postal Code	79705	Country [i]	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. [Add]

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Customer Number	30652		
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Application Information:

Title of the Invention	Natural Gas Liquid Recovery Process		
Attorney Docket Number	2103-00902	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		Sub Class (if any)	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	4	Suggested Figure for Publication (if any)	1

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☐	Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☒	Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not been and will not be the subject of an application filed in another country, or under a multilateral agreement, that requires publication at eighteen months after filing.

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Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ US Representative (37 CFR 11.9)
Customer Number	30652		

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This section allows for the applicant to claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c). Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
		60938726	2007-05-18

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Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

Remove

Application Number	Country [i]	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			○ Yes ◉ No

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Assignee 1

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	2103-00902
	Application Number	
Title of Invention	Natural Gas Liquid Recovery Process	

Organization Name	Holloman Corporation		
Mailing Address Information:			
Address 1	5257 West Interstate 20		
Address 2			
City	Odessa	**State/Province**	TX
Country [i]	US	Postal Code	79769
Phone Number		Fax Number	
Email Address			
Additional Assignee Data may be generated within this form by selecting the **Add** button.		Add	

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.					
Signature	/Grant Rodolph/			Date (YYYY-MM-DD)	2008-05-16
First Name	Grant	Last Name	Rodolph	Registration Number	50487

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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Natural Gas Liquid Recovery Process

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority to U.S. Provisional Patent Application Serial No. 60/938,726, filed May 18, 2007 by Eric Prim, and entitled "NGL Recovery Process," which is incorporated herein by reference as if reproduced in their entirety.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

REFERENCE TO A MICROFICHE APPENDIX

[0003] Not applicable.

BACKGROUND

[0004] Carbon dioxide (CO_2) is a naturally occurring substance in most hydrocarbon subterranean formations. Carbon dioxide may also be used for recovering or extracting oil and hydrocarbons from subterranean formations. One carbon dioxide based recovery process involves injecting carbon dioxide into an injection well, and recovering heavy hydrocarbons and perhaps some of the carbon dioxide from at least one recovery well. Carbon dioxide reinjection process may also produce natural gas liquids (NGLs).

SUMMARY

[0005] In one aspect, the disclosure includes a method comprising receiving a hydrocarbon feed stream, separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream, separating the carbon dioxide recycle stream into a NGL rich stream and a purified carbon dioxide recycle stream, and injecting the purified carbon dioxide recycle stream into a subterranean formation.

[0006] In another aspect, the disclosure includes a plurality of process equipment configured to implement a method comprising receiving a recycle stream comprising at least one C_{3+} hydrocarbon and a gas selected from the group consisting of carbon dioxide, nitrogen, air, and water, and separating the recycle stream into a NGL rich stream and a purified recycle stream, wherein the NGL rich stream comprises less than about 70 percent of the C_{3+} hydrocarbons from the recycle stream.

[0007] In a third aspect, the disclosure includes a method comprising selecting a first recovery rate for a NGL recovery process, estimating the economics of the NGL recovery process based on the first recovery rate, selecting a second recovery rate that is different from the first recovery rate, estimating the economics of the NGL recovery process based on the second recovery rate, and selecting the first recovery rate for the NGL recovery process when the estimate based on the first recovery rate is more desirable than the estimate based on the second recovery rate.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a process flow diagram for an embodiment of a carbon dioxide reinjection process.

[0009] FIG. 2 is a schematic diagram of an embodiment of a NGL recovery process.

[0010] FIG. 3 is a chart depicting an embodiment of the relationship between the NGL recovery rate and the energy requirement.

[0011] FIG. 4 is a flowchart of an embodiment of a NGL recovery optimization method.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] It should be understood at the outset that although an illustrative implementation of one or more embodiments are provided below, the disclosed systems and/or methods may be implemented using any number of techniques, whether currently known or in existence. The

disclosure should in no way be limited to the illustrative implementations, drawings, and techniques illustrated below, including the exemplary designs and implementations illustrated and described herein, but may be modified within the scope of the appended claims along with their full scope of equivalents.

[0013] Disclosed herein is a NGL recovery process that may be implemented as part of a carbon dioxide reinjection process to recover NGLs from a carbon dioxide recycle stream. When implementing a carbon dioxide reinjection process, the carbon dioxide is typically injected downhole into an injection well and a stream comprising hydrocarbons and carbon dioxide is generally recovered from a recovery well. The carbon dioxide may be separated from the heavy hydrocarbons and then recycled downhole, e.g. in the reinjection well. In some cases, the carbon dioxide recycle stream may comprise some NGLs, which may be recovered prior to injecting the carbon dioxide recycle stream downhole. The NGL recovery process may be optimized by weighing the NGL recovery rate against the amount of energy expended on NGL recovery.

[0014] FIG. 1 illustrates an embodiment of a carbon dioxide reinjection process 100. The carbon dioxide reinjection process 100 may receive hydrocarbons and carbon dioxide from a subterranean formation 114, separate heavy hydrocarbons and some of the NGLs from the carbon dioxide, and inject the carbon dioxide downhole. As shown in FIG. 1, additional process steps may be included in the carbon dioxide reinjection process, such as compressing the carbon dioxide, dehydrating the carbon dioxide, and/or adding additional carbon dioxide to the carbon dioxide recycle stream. The specific steps in the carbon dioxide reinjection process 100 are explained in further detail below.

[0015] The carbon dioxide reinjection process 100 may receive a hydrocarbon feed stream 152 from a subterranean formation 114. The hydrocarbon feed stream 152 may be obtained from at

least one recovery well as shown in FIG. 1, but may also be obtained from other types of wells. In addition, the hydrocarbon feed stream 152 may be obtained from the subterranean formation 114 using any suitable method. For example, if a suitable pressure differential exists between the subterranean formation 114 and the surface, the hydrocarbon feed stream 152 may flow to the surface via the pressure differential. Alternatively, surface and/or downhole pumps may be used to draw the hydrocarbon feed stream 152 from the subterranean formation 114 to the surface.

[0016] Although the composition of the hydrocarbon feed stream 152 will vary from one location to another, the hydrocarbon feed stream 152 may comprise carbon dioxide, methane, ethane, NGLs, heavy hydrocarbons, hydrogen sulfide (H_2S), helium, nitrogen, water, or combinations thereof. The term "hydrocarbon" may refer to any compound comprising, consisting essentially of, or consisting of carbon and hydrogen atoms. The term "natural gas" may refer to any hydrocarbon that may exist in a gas phase under atmospheric or downhole conditions, and includes methane and ethane, but may also include diminishing amounts of $C_3 - C_8$ hydrocarbons. The term "natural gas liquids" or NGLs may refer to natural gases that may be liquefied without refrigeration, and may include $C_3 - C_8$ hydrocarbons. Both natural gas and NGL are terms known in the art and are used herein as such. In contrast, the term "heavy hydrocarbons" may refer to any hydrocarbon that may exist in a liquid phase under atmospheric or downhole conditions, and generally includes liquid crude oil, which may comprise C_{9+} hydrocarbons, branched hydrocarbons, aromatic hydrocarbons, and combinations thereof.

[0017] The hydrocarbon feed stream 152 may enter a separator 102. The separator 102 may be any process equipment suitable for separating at least one inlet stream into a plurality of effluent streams having different compositions, states, temperatures, and/or pressures. For example, the separator 102 may be a column having trays, packing, or some other type of complex internal

structure. Examples of such columns include scrubbers, strippers, absorbers, adsorbers, packed columns, and distillation columns having valve, sieve, or other types of trays. Such columns may employ weirs, downspouts, internal baffles, temperature control elements, and/or pressure control elements. Such columns may also employ some combination of reflux condensers and/or reboilers, including intermediate stage condensers and reboilers. Alternatively, the separator 102 may be a phase separator, which is a vessel that separates an inlet stream into a substantially vapor stream and a substantially liquid stream, such as a knock-out drum, flash drum, reboiler, condenser, or other heat exchanger. Such vessels may also have some internal baffles, temperature control elements, and/or pressure control elements, but generally lack any trays or other type of complex internal structure commonly found in columns. The separator 102 may also be any other type of separator, such as a membrane separator. In a specific embodiment, the separator 102 is a knockout drum. Finally, the separator 102 may be any combination of the aforementioned separators 102 arranged in series, in parallel, or combinations thereof.

[0018] The separator 102 may produce a heavy hydrocarbon stream 154 and a carbon dioxide recycle stream 156. The heavy hydrocarbon stream 154 may comprise most of the heavy hydrocarbons from the hydrocarbon feed stream 152. In embodiments, the heavy hydrocarbon stream 154 may comprise at least about 90 percent, at least about 95 percent, at least about 99 percent, or substantially all of the heavy hydrocarbons from the hydrocarbon feed stream 152. The heavy hydrocarbon stream 154 may be sent to a pipeline for transportation or a storage tank 104, where it is stored until transported to another location or further processed. In contrast, the carbon dioxide recycle stream 156 may comprise most of the carbon dioxide from the hydrocarbon feed stream 152. In embodiments, the carbon dioxide recycle stream 156 may comprise at least about 90 percent, at least about 95 percent, at least about 99 percent, or substantially all of the carbon

dioxide from the hydrocarbon feed stream 152. Similarly, the carbon dioxide recycle stream 156 may comprise at least about 80 percent, at least about 90 percent, at least about 95 percent, or substantially all of the natural gas from the hydrocarbon feed stream 152. All of the percentages referred to herein are molar percentages until otherwise specified.

[0019] The carbon dioxide recycle stream 156 may enter a compressor 106. The compressor 106 may be any process equipment suitable for increasing the pressure, temperature, and/or density of an inlet stream. The compressor 106 may be configured to compress a substantially vapor phase inlet stream, a substantially liquid phase inlet stream, or combinations thereof. As such, the term "compressor" may include both compressors and pumps, which may be driven by electrical, mechanical, hydraulic, or pneumatic means. Specific examples of suitable compressors 106 include centrifugal, axial, positive displacement, turbine, rotary, and reciprocating compressors and pumps. In a specific embodiment, the compressor 106 is a turbine compressor. Finally, the compressor 106 may be any combination of the aforementioned compressors 106 arranged in series, in parallel, or combinations thereof.

[0020] The compressor 106 may produce a compressed carbon dioxide recycle stream 158. The compressed carbon dioxide recycle stream 158 may contain the same composition as the carbon dioxide recycle stream 156, but at a higher energy level. The additional energy in the carbon dioxide recycle stream 158 may be obtained from energy added to the compressor 106, e.g. the electrical, mechanical, hydraulic, or pneumatic energy. In embodiments, difference in energy levels between the compressed carbon dioxide recycle stream 158 and the carbon dioxide recycle stream 156 is at least about 50 percent, at least about 65 percent, or at least about 80 percent of the energy added to the compressor 106.

[0021] The compressed carbon dioxide recycle stream 158 may enter a dehydrator 108. The dehydrator 108 may remove some or substantially all of the water from the compressed carbon dioxide recycle stream 158. The dehydrator 108 may be any suitable dehydrator, such as a condenser, an absorber, or an adsorber. Specific examples of suitable dehydrators 108 include refrigerators, molecular sieves, liquid desiccants such as glycol, solid desiccants such as silica gel or calcium chloride, and combinations thereof. The dehydrator 108 may also be any combination of the aforementioned dehydrators 108 arranged in series, in parallel, or combinations thereof. In a specific embodiment, the dehydrator 108 is a glycol unit. Any water accumulated within or exiting from the dehydrator 108 may be stored, used for other processes, or discarded.

[0022] The dehydrator 108 may produce a dehydrated carbon dioxide recycle stream 160. The dehydrated carbon dioxide recycle stream 160 may contain little water, e.g. liquid water or water vapor. In embodiments, the dehydrated carbon dioxide recycle stream 160 may comprise no more than about 5 percent, no more than about 3 percent, no more than about 1 percent, or be substantially free of water.

[0023] The dehydrated carbon dioxide recycle stream 160 may enter a NGL recovery process 110. The NGL recovery process 110 may separate the dehydrated carbon dioxide recycle stream 160 into a NGL rich stream 162 and a purified carbon dioxide recycle stream 164. The NGL rich stream 162 may only comprise a portion of the total NGLs from the dehydrated carbon dioxide recycle stream 160. For example, the NGL rich stream 162 may comprise less than about 70 percent, from about 10 percent to about 50 percent, or from about 20 percent to about 35 percent of the NGLs from the dehydrated carbon dioxide recycle stream 160. By taking a less aggressive cut of the NGLs and/or disregarding the recovery of methane, ethane, and optionally propane from the dehydrated carbon dioxide recycle stream 160, the NGL recovery process 100 may produce a

relatively high quality NGL rich stream 162 with relatively little process equipment or energy. A specific example of a suitable NGL recovery process 110 is shown in FIG. 2 and described in further detail below.

[0024] As mentioned above, the NGL recovery process 110 may produce a relatively high-quality NGL rich stream 162. Specifically, while the NGL recovery process 110 recovers only a portion, e.g., about 20 to about 35 percent, of the NGLs in the dehydrated carbon dioxide recycle stream 160, the resulting NGL rich stream 162. For example, the NGL rich stream 162 may comprise most of the butane and heavier components from the dehydrated carbon dioxide recycle stream 160. For example, the NGL rich stream 162 may comprise at least about 90 percent, at least about 95 percent, at least about 99 percent, or substantially all of the C_{4+} from the dehydrated carbon dioxide recycle stream 160. In embodiments, the NGL rich stream 162 may comprise no more than about 10 percent, no more than about 5 percent, no more than about 1 percent, or be substantially free of ethane. Similarly, the NGL rich stream 162 may comprise no more than about 5 percent, no more than about 3 percent, no more than about 1 percent, or be substantially free of methane. Moreover, the NGL rich stream 162 may comprise no more than about 5 percent, no more than about 3 percent, no more than about 1 percent, or be substantially free of acid gases, such as carbon dioxide or hydrogen sulfide. It will be realized that the composition of the NGL rich stream 162 may be dependent on the dehydrated carbon dioxide recycle stream 160 composition. The examples provided below show the composition of the NGL rich stream 162 for three different dehydrated carbon dioxide recycle stream 160 compositions. The NGL rich stream 162 may be sent to a pipeline for transportation or a storage tank, where it is stored until transported to another location or further processed.

[0025] As mentioned above, the NGL recovery process 110 may produce a purified carbon dioxide recycle stream 164. The purified carbon dioxide recycle stream 164 may comprise most of the carbon dioxide from the dehydrated carbon dioxide recycle stream 160, as well as some other components such as methane, ethane, propane, butane, nitrogen, and hydrogen sulfide. In embodiments, the purified carbon dioxide recycle stream 164 may comprise at least about 90 percent, at least about 95 percent, at least about 99 percent, or substantially all of the carbon dioxide from the dehydrated carbon dioxide recycle stream 160. In addition, the purified carbon dioxide recycle stream 164 may comprise at least about 90 percent, at least about 95 percent, at least about 99 percent, or substantially all of the methane from the dehydrated carbon dioxide recycle stream 160. As such, the purified carbon dioxide recycle stream 164 may comprise at least about 65 percent, at least about 80 percent, at least about 90 percent, or at least about 95 percent carbon dioxide. In embodiments, the purified carbon dioxide recycle stream 164 may comprise no more than about 10 percent, no more than about 5 percent, no more than about 1 percent, or be substantially free of C_{3+}. Similarly, the purified carbon dioxide recycle stream 164 may comprise no more than about 20 percent, no more than about 10 percent, no more than about 5 percent, or be substantially free of C_{2+}.

[0026] The purified carbon dioxide recycle stream 164 may enter a compressor 112. The compressor 112 may comprise one or more compressors, such as the compressor 106 described above. In a specific embodiment, the compressor 112 is a turbine compressor. The compressor 112 may compress the purified carbon dioxide recycle stream 164, thereby producing a carbon dioxide injection stream 168. The carbon dioxide injection stream 168 may contain the same composition as the purified carbon dioxide recycle stream 164, but at a higher energy level. The additional energy in the carbon dioxide injection stream 168 may be obtained from energy added to

the compressor 112, e.g. the electrical, mechanical, hydraulic, or pneumatic energy. In embodiments, difference in energy levels between the carbon dioxide injection stream 168 and the purified carbon dioxide recycle stream 164 is at least about 50 percent, at least about 65 percent, or at least about 80 percent of the energy added to the compressor 112.

[0027] In some embodiments, a makeup stream 166 may be combined with either the purified carbon dioxide recycle stream 164 or the carbon dioxide injection stream 168. Specifically, as the carbon dioxide reinjection process 100 is operated, carbon dioxide and other compounds will be lost, e.g. by replacing the hydrocarbons in the subterranean formation 114, by leakage into inaccessible parts of the subterranean formation 114, and/or to other causes. Alternatively, it may be desirable to increase the amount of carbon dioxide and other compounds injected downhole. As such, the makeup stream 166 may be combined with either the purified carbon dioxide recycle stream 164 and/or the carbon dioxide injection stream 168, for example in the compressor 112. Alternatively or additionally, the makeup stream 166 may be combined with the carbon dioxide recycle stream 156, the compressed carbon dioxide recycle stream 158, the dehydrated carbon dioxide recycle stream 160, or combinations thereof. The makeup stream 166 may comprise carbon dioxide, nitrogen, methane, ethane, air, water, or any other suitable compound. In an embodiment, the makeup stream 166 comprises at least 75 percent, at least 85 percent, or at least 95 percent carbon dioxide, nitrogen, methane, air, water, or combinations thereof.

[0028] FIG. 2 illustrates an embodiment of a NGL recovery process 200. The NGL recovery process 200 may recover some of the NGLs from a carbon dioxide recycle stream described above. For example, the NGL recovery process 200 may be implemented as part of the carbon dioxide reinjection process 100, e.g. by separating the dehydrated carbon dioxide recycle stream 160 into a NGL rich stream 162 and a purified carbon dioxide recycle stream 164.

[0029] The NGL recovery process 200 may begin by cooling the dehydrated carbon dioxide recycle stream 160 in a heat exchanger 202. The heat exchanger 202 may be any equipment suitable for heating or cooling one stream using another stream. Generally, the heat exchanger 202 is a relatively simple device that allows heat to be exchanged between two fluids without the fluids directly contacting each other. Examples of suitable heat exchangers 202 include shell and tube heat exchangers, double pipe heat exchangers, plate fin heat exchangers, bayonet heat exchangers, reboilers, condensers, evaporators, and air coolers. In the case of air coolers, one of the fluids is atmospheric air, which may be forced over tubes or coils using one or more fans. In a specific embodiment, the heat exchanger 202 is a shell and tube heat exchanger.

[0030] As shown in FIG. 2, the dehydrated carbon dioxide recycle stream 160 may be cooled using the cooled, purified carbon dioxide recycle stream 258. Specifically, the dehydrated carbon dioxide recycle stream 160 is cooled to produce the cooled carbon dioxide recycle stream 252, and the cooled, purified carbon dioxide recycle stream 258 is heated to produce the purified carbon dioxide recycle stream 164. The efficiency of the heat exchange process depends on several factors, including the heat exchanger design, the temperature, composition, and flowrate of the hot and cold streams, and/or the amount of thermal energy lost in the heat exchange process. In embodiments, the difference in energy levels between the dehydrated carbon dioxide recycle stream 160 and the cooled carbon dioxide recycle stream 252 is at least about 60 percent, at least about 70 percent, at least about 80, or at least about 90 percent of the difference in energy levels between the cooled, purified carbon dioxide recycle stream 258 and the purified carbon dioxide recycle stream 164.

[0031] The cooled carbon dioxide recycle stream 252 then enters a NGL stabilizer 204. The NGL stabilizer 204 may comprise a separator 206, a condenser 208, and a reboiler 210. The

separator 206 may be similar to any of the separators described herein, such as separator 102. In a specific embodiment, the separator 206 is a distillation column. The condenser 208 may receive an overhead 254 from the separator 206 and produce the cooled, purified carbon dioxide recycle stream 258 and a reflux stream 256, which is returned to the separator 206. The condenser 208 may be similar to any of the heat exchangers described herein, such as heat exchanger 202. In a specific embodiment, the condenser 208 is a shell and tube, kettle type condenser coupled to a refrigeration process, and contains a reflux accumulator. As such, the condenser 208 may remove some energy 282 from the reflux 256 and cooled, purified carbon dioxide recycle stream 258, typically by refrigeration. The cooled, purified carbon dioxide recycle stream 258 is substantially similar in composition to the purified carbon dioxide recycle stream 164 described above. Similarly, the reboiler 210 may receive a bottoms stream 260 from the separator 206 and produce a sour NGL rich stream 264 and a boil-up stream 262, which is returned to the separator 206. The reboiler 210 may be like any of the heat exchangers described herein, such as heat exchanger 202. In a specific embodiment, the reboiler 210 is a shell and tube heat exchanger coupled to a hot oil heater. As such, the reboiler 210 adds some energy 284 to the boil-up 262 and the sour NGL rich stream 264, typically by heating. The sour NGL rich stream 264 may be substantially similar in composition to the NGL rich stream 162, with the exception that the sour NGL rich stream has some additional acid gases, e.g. acid gases 270 described below.

[0032] The sour NGL rich stream 264 may then be cooled in another heat exchanger 212. The heat exchanger 212 may be like any of the heat exchangers described herein, such as heat exchanger 202. For example, the heat exchanger 212 may be an air cooler as described above. A cooled, sour NGL rich stream 266 exits the heat exchanger 212 and enters a throttling valve 214. The throttling valve 214 may be an actual valve such as a gate valve, globe valve, angle valve, ball

valve, butterfly valve, needle valve, or any other suitable valve, or may be a restriction in the piping such as an orifice or a pipe coil, bend, or size reduction. The throttling valve 214 may reduce the pressure, temperature, or both of the cooled, sour NGL rich stream 266 and produce a low-pressure sour NGL rich stream 268. The cooled, sour NGL rich stream 266 and the low-pressure sour NGL rich stream 268 have substantially the same composition as the sour NGL rich stream 264, albeit with lower energy levels.

[0033] The low-pressure sour NGL rich stream 268 may then be sweetened in a separator 216. The separator 216 may be similar to any of the separators described herein, such as separator 102. In an embodiment, the separator 216 may be one or more packed columns that use a sweetening process to remove acid gases from the low-pressure sour NGL rich stream 268. Suitable sweetening processes include amine solutions, physical solvents such as SELEXOL or RECTISOL, mixed amine solution and physical solvents, potassium carbonate solutions, direct oxidation, absorption, adsorption using, e.g., molecular sieves, or membrane filtration. The separator 216 may produce the NGL rich stream 162 described above. In addition, any acid gases 270 accumulated within or exiting from the separator 270 may be stored, used for other processes, or suitably disposed of. Finally, while FIGS.1 and 2 are described in the context of carbon dioxide reinjection, it will be appreciated that the concepts described herein can be applied to other reinjection processes, for example those using nitrogen, air, or water.

[0034] FIG. 3 illustrates an embodiment of a chart 300 depicting the relationship between the NGL recovery rate and the energy expended to recover NGLs in the NGL recovery process. The NGL recovery rate may be a percentage recovery, and may represent the amount of C_{3+} in the carbon dioxide recycle stream that is recovered in the NGL rich stream. The energy requirement may be measured in joules (J) or in horsepower (hp), and may represent the energy required to

generate the condenser energy and reboiler energy described above. If additional compressors are needed at any point in the carbon dioxide reinjection process than would be required in an otherwise similar carbon dioxide reinjection process that lacks the NGL recovery process, then the energy required to operate such compressors may be included in the energy requirement shown in FIG. 3.

[0035] As shown by curve 302, the energy requirements may increase about exponentially as the NGLs are recovered at higher rates. In other words, substantially higher energy may be required to recover the NGLs at incrementally higher rates. For example, recovering a first amount 304 of from about 20 percent to about 35 percent of C_{3+} may require substantially less energy than recovering a second amount 306 of from about 40 percent to about 65 percent of C_{3+}. Moreover, recovering the second amount 306 of from about 40 percent to about 65 percent of C_{3+} may require substantially less energy than recovering a third amount 308 of from about 70 percent to about 90 percent of C_{3+}. Such significant reduction in energy requirements may be advantageous in terms of process feasibility and cost, where relatively small decreases in NGL recovery rates may require significantly less energy and process equipment, yielding significantly better process economics. Although the exact relationship of the curve 302 may depend on numerous factors especially the price of C_{3+}, in an embodiment the economics of the NGL recovery process when the NGL recovery rate is in the second amount 306 may be better than the economics of the NGL recovery process when the NGL recovery rate is in the third amount 308. Similarly, the economics of the NGL recovery process when the NGL recovery rate is in the first amount 304 may be significantly better than the economics of the NGL recovery process when the NGL recovery rate is in the second amount 306. Such a relationship is counterintuitive considering that in many other processes, the process economics generally improve with increased recovery rates.

[0036] FIG. 4 illustrates an embodiment of a NGL recovery optimization method 400. The NGL recovery optimization method 400 may be used to determine an improved or optimal project estimate for implementing the NGL recovery process and recovering NGLs at a suitable rate. As such, the NGL recovery process may be configured using appropriate equipment design based on the NGL recovery rate. Specifically, the NGL recovery optimization method 400 may design or configure the equipment size, quantity, or both based on an initial NGL recovery rate and required energy, and hence estimate the project feasibility and cost. The method 400 may upgrade or improve the project estimate by iteratively incrementing the initial NGL recovery rate, re-estimating the project, and comparing the two estimates.

[0037] At block 402, the method 400 may select an initial NGL recovery rate. The initial NGL recovery rate may be relatively small, such as no more than about 20 percent recovery, no more than about 10 percent recovery, no more than about 5 percent recovery, or no more than about 1 percent recovery. Choosing the initial NGL recovery rate at a small percentage of the total NGL amount may result in a relatively low project estimate that may be increased gradually to reach improved estimates.

[0038] The method 400 may then proceed to block 404, where the project equipment size may be determined based on the initial NGL recovery rate. Specifically, the size of the equipment described in the NGL recovery process and any additional compressors as described above may be determined. In addition, the pressure and temperature ratings and material compositions of such equipment may be determined at block 404, if desired.

[0039] The method 400 may then proceed to block 406, where the project may be estimated. Project estimation may comprise an economic evaluation of the NGL recovery process, and may include the cost of obtaining, fabricating, and/or field constructing the equipment sized in block

404. In addition, project estimation may include the cost of operating and maintaining the NGL process, as well as the revenue generated by the sale or use of the products obtained by implementing the NGL process. As such, the project estimate may comprise the total project benefits (including production, sales, etc.) minus the total project capital and operating costs (including cost, equipment, etc.). In some embodiments, the project estimate may be based on an existing carbon dioxide reinjection plant that lacks the NGL recovery process.

[0040] The method 400 may then proceed to block 408, where the recovery rate is incremented. The NGL recovery rate may be incremented by a relatively small percentage, for example no more than about 10 percent, not more than about 5 percent, or no more than about 1 percent. The method 400 may then proceed to block 410, which is substantially similar to block 404. The method 400 may then proceed to block 412, which is substantially similar to block 406.

[0041] The method 400 may then proceed to block 414, where the method 400 may determine whether the project estimate has improved. For instance, the method 400 may compare the project estimate from block 412 with the previous project estimate (either block 406 or the previous iteration of block 412) and determine whether the revised estimate is more economically desirable. The method 400 may return to block 408 when the condition at block 414 is met. Otherwise, the method 400 may proceed to block 416.

[0042] At block 416, the method 400 may choose the previous project estimate as the final estimate. For example, the method 400 may select the previous NGL recovery rate (either block 406 or the previous iteration of block 412) instead of the estimate obtained at block 412. In some embodiments, the desired or optimum recovery rate selected at block 416 may represent a range of desirable or optimum points, as opposed to a single point. Accordingly, the method 400 may select the equipment sizing corresponding to the selected NGL recovery rate. The selected project

estimate and sizing may then be used for the NGL recovery process. Of course, it will be appreciated that the method 400 may be revised to include a decremented, top-down estimation approach as opposed to an incremented, bottom-up estimation approach.

[0043] The method 400 may have several advantages over other project estimation methods. For example, process equipment of a specific size may be selected, and the corresponding recovery rate determined. Alternatively, a required recovery rate may be selected, and the equipment sized to achieve the recovery rate. However, it has been discovered that such approaches are inflexible and often yields suboptimal process economics. For example, relatively high NGL recovery rates will not lead to an improvement in process economics, e.g. because of the exponential increase in energy consumption. In contrast, the method 400 provides a flexible approach to determining a desirable or optimal project estimate.

[0044] In an embodiment, the equipment size may be configured to allow for variations in recovery rates to accommodate changes in economic conditions, such as C_{3+} or energy pricing. Specifically, the equipment described herein can be sized above or below the desired or optimum amount to allow the processes described herein to operate at recovery rates slightly greater than or slightly less than the desirable or optimum point obtained in method 400. As the process parameters and the energy requirements may be closely related, the ability of the process to continue to successfully operate under differing conditions may be reflected by constrained changes in the energy requirements of the process. When operating in the first amount 304 or the second amount 306 on the curve 302 in FIG. 3, significant increases or decreases in NGL recovery rate may be obtained with little change in the energy requirements. Such is not the case when operating in the third amount 308 on the curve 302 in FIG. 3, where significant increases or decreases in energy requirements yield only incremental changes in NGL recovery rate.

EXAMPLES

[0045] In one example, a process simulation was performed using the NGL recovery process 200 shown in FIG. 2. The simulation was performed using the Hyprotech Ltd. HYSYS Process v2.1.1 (Build 3198) software package. The NGL recovery process 200 separated the dehydrated carbon dioxide recycle stream 160 into the purified carbon dioxide recycle stream 164, the NGL rich stream 162, and the acid gas stream 270. The specified values are indicated by an asterisk (*). The physical properties are provided in degrees Fahrenheit (F), pounds per square inch gauge (psig), million standard cubic feet per day (MMSCFD), pounds per hour (lb/hr), U.S. gallons per minute (USGPM), and British thermal units per hour (Btu/hr). The material streams, their compositions, and the associated energy streams produced by the simulation are provided in tables 1, 2, and 3 below, respectively.

Name		Dehydrated CO_2 Recycle Stream 160	Cooled CO_2 Recycle Stream 252	Cooled, Purified CO_2 Recycle Stream 258
Vapor Fraction		0.9838	0.9392	1.0000
Temperature	(F)	104.0*	45.00*	4.011
Pressure	(psig)	340.0*	335.0	330.0
Molar Flow	(MMSCFD)	17.00*	17.00	15.88
Mass Flow	(lb/hr)	8.049e+04	8.049e+04	7.254e+04
Liquid Volume Flow	(USGPM)	218.1	218.1	192.3
Heat Flow	(Btu/hr)	-2.639e+08	-2.658e+08	-2.577e+08

Table 1A: Material Streams

Name		Purified CO_2 Recycle Stream 164	Sour NGL Rich Stream 264	Cooled Sour NGL Rich Stream 266
Vapor Fraction		1.0000	0.00000	0.0000
Temperature	(F)	97.39	202.6	120.0*
Pressure	(psig)	325.0	340.0	635.3*
Molar Flow	(MMSCFD)	15.88	1.119	1.119
Mass Flow	(lb/hr)	7.254e+04	7947	7947
Liquid Volume Flow	(USGPM)	192.3	25.84	25.84
Heat Flow	(Btu/hr)	-2.558e+08	-8.443e+06	-8.862e+06

Table 1B: Material Streams

Name	Low-Pressure Sour NGL Rich Stream 268	Acid Gas Stream 270	NGL Rich Stream 162
Vapor Fraction	0.0000	1.0000	0.0000
Temperature (F)	120.9	100.0*	111.8
Pressure (psig)	200.3*	5.304*	185.3*
Molar Flow (MMSCFD)	1.119	0.1030	1.016
Mass Flow (lb/hr)	7947	446.4	7501
Liquid Volume Flow (USGPM)	25.84	1.100	24.74
Heat Flow (Btu/hr)	-8.862e+06	-1.083e+06	-7.779e+06

Table 1C: Material Streams

Name	Dehydrated CO_2 Recycle Stream 160	Cooled CO_2 Recycle Stream 252	Cooled, Purified CO_2 Recycle Stream 258
Comp Mole Frac (H_2S)	0.0333*	0.0333	0.0327
Comp Mole Frac (Nitrogen)	0.0054*	0.0054	0.0058
Comp Mole Frac (CO_2)	0.7842*	0.7842	0.8359
Comp Mole Frac (Methane)	0.0521*	0.0521	0.0558
Comp Mole Frac (Ethane)	0.0343*	0.0343	0.0348
Comp Mole Frac (Propane)	0.0406*	0.0406	0.0313
Comp Mole Frac (i-Butane)	0.0072*	0.0072	0.0022
Comp Mole Frac (n-Butane)	0.0171*	0.0171	0.0015
Comp Mole Frac (i-Pentane)	0.0058*	0.0058	0.0000
Comp Mole Frac (n-Pentane)	0.0057*	0.0057	0.0000
Comp Mole Frac (n-Hexane)	0.0070*	0.0070	0.0000
Comp Mole Frac (n-Octane)	0.0071*	0.0071	0.0000
Comp Mole Frac (H_2O)	0.0000*	0.0000	0.0000

Table 2A: Stream Compositions

Name	Purified CO_2 Recycle Stream 164	Sour NGL Rich Stream 264	Cooled Sour NGL Rich Stream 266
Comp Mole Frac (H_2S)	0.0327	0.0421	0.0421
Comp Mole Frac (Nitrogen)	0.0058	0.0000	0.0000
Comp Mole Frac (CO_2)	0.8359	0.0500	0.0500
Comp Mole Frac (Methane)	0.0558	0.0000	0.0000
Comp Mole Frac (Ethane)	0.0348	0.0281	0.0281
Comp Mole Frac (Propane)	0.0313	0.1728	0.1728
Comp Mole Frac (i-Butane)	0.0022	0.0789	0.0789

Name	Purified CO_2 Recycle Stream 164	Sour NGL Rich Stream 264	Cooled Sour NGL Rich Stream 266
Comp Mole Frac (n-Butane)	0.0015	0.2388	0.2388
Comp Mole Frac (i-Pentane)	0.0000	0.0887	0.0887
Comp Mole Frac (n-Pentane)	0.0000	0.0866	0.0866
Comp Mole Frac (n-Hexane)	0.0000	0.1063	0.1063
Comp Mole Frac (n-Octane)	0.0000	0.1077	0.1077
Comp Mole Frac (H_2O)	0.0000	0.0000	0.0000

Table 2B: Stream Compositions

Name	Low-Pressure Sour NGL Rich Stream 268	Acid Gas Stream 270	NGL Rich Stream 162
Comp Mole Frac (H_2S)	0.0421	0.4568	0.0000
Comp Mole Frac (Nitrogen)	0.0000	0.0000	0.0000
Comp Mole Frac (CO_2)	0.0500	0.5432	0.0000
Comp Mole Frac (Methane)	0.0000	0.0000	0.0000
Comp Mole Frac (Ethane)	0.0281	0.0000	0.0309
Comp Mole Frac (Propane)	0.1728	0.0000	0.1903
Comp Mole Frac (i-Butane)	0.0789	0.0000	0.0869
Comp Mole Frac (n-Butane)	0.2388	0.0000	0.2630
Comp Mole Frac (i-Pentane)	0.0887	0.0000	0.0977
Comp Mole Frac (n-Pentane)	0.0866	0.0000	0.0954
Comp Mole Frac (n-Hexane)	0.1063	0.0000	0.1171
Comp Mole Frac (n-Octane)	0.1077	0.0000	0.1186
Comp Mole Frac (H_2O)	0.0000	0.0000	0.0000

Table 2C: Stream Compositions

Name	Heat Flow (Btu/hr)
Condenser Q Energy Stream 282	1.469e+06
Reboiler Q Energy Stream 284	1.152e+06

Table 3: Energy Streams

[0046] In another example, the process simulation was repeated using a different dehydrated carbon dioxide recycle stream 160. The material streams, their compositions, and the associated energy streams produced by the simulation are provided in tables 4, 5, and 6 below, respectively.

Name	Dehydrated CO_2 Recycle Stream 160	Cooled CO_2 Recycle Stream 252	Cooled, Purified CO_2 Recycle Stream 258

Name	Dehydrated CO_2 Recycle Stream 160	Cooled CO_2 Recycle Stream 252	Cooled, Purified CO_2 Recycle Stream 258
Vapor Fraction	0.9874	0.9286	1.0000
Temperature (F)	104.0*	60.00*	22.77
Pressure (psig)	685.3*	680.3	590.0
Molar Flow (MMSCFD)	20.00*	20.00	18.86
Mass Flow (lb/hr)	8.535e+04	8.535e+04	7.780e+04
Liquid Volume Flow (USGPM)	258.0	258.0	232.2
Heat Flow (Btu/hr)	-2.741e+08	-2.760e+08	-2.683e+08

Table 4A: Material Streams

Name	Purified CO_2 Recycle Stream 164	Sour NGL Rich Stream 264	Cooled Sour NGL Rich Stream 266
Vapor Fraction	1.0000	0.00000	0.0000
Temperature (F)	87.48	290.7	120.0*
Pressure (psig)	585.0	600.0	635.3*
Molar Flow (MMSCFD)	18.86	1.139	1.139
Mass Flow (lb/hr)	7.780e+04	7552	7552
Liquid Volume Flow (USGPM)	232.2	25.83	25.83
Heat Flow (Btu/hr)	-2.663e+08	-7.411e+06	-8.371e+06

Table 4B: Material Streams

Name	Low-Pressure Sour NGL Rich Stream 268	Acid Gas Stream 270	NGL Rich Stream 162
Vapor Fraction	0.0000	1.0000	0.0000
Temperature (F)	120.5	100.0*	118.6
Pressure (psig)	200.3*	5.304*	185.3*
Molar Flow (MMSCFD)	1.139	0.02943	1.110
Mass Flow (lb/hr)	7552	141.2	7411
Liquid Volume Flow (USGPM)	25.83	0.3421	25.49
Heat Flow (Btu/hr)	-8.371e+06	-5.301e+05	-7.841e+06

Table 4C: Material Streams

Name	Dehydrated CO_2 Recycle Stream 160	Cooled CO_2 Recycle Stream 252	Cooled, Purified CO_2 Recycle Stream 258
Comp Mole Frac (H_2S)	0.0004*	0.0004	0.0004
Comp Mole Frac (Nitrogen)	0.0153*	0.0153	0.0162
Comp Mole Frac (CO_2)	0.6592*	0.6592	0.6975

Name	Dehydrated CO_2 Recycle Stream 160	Cooled CO_2 Recycle Stream 252	Cooled, Purified CO_2 Recycle Stream 258
Comp Mole Frac (Methane)	0.1813*	0.1813	0.1922
Comp Mole Frac (Ethane)	0.0620*	0.0620	0.0620
Comp Mole Frac (Propane)	0.0411*	0.0411	0.0275
Comp Mole Frac (i-Butane)	0.0064*	0.0064	0.0017
Comp Mole Frac (n-Butane)	0.0179*	0.0179	0.0024
Comp Mole Frac (i-Pentane)	0.0040*	0.0040	0.0000
Comp Mole Frac (n-Pentane)	0.0049*	0.0049	0.0000
Comp Mole Frac (n-Hexane)	0.0030*	0.0030	0.0000
Comp Mole Frac (n-Octane)	0.0045*	0.0045	0.0000
Comp Mole Frac (H_2O)	0.0000*	0.0000	0.0000

Table 5A: Stream Compositions

Name	Purified CO_2 Recycle Stream 164	Sour NGL Rich Stream 264	Cooled Sour NGL Rich Stream 266
Comp Mole Frac (H_2S)	0.0004	0.0008	0.0008
Comp Mole Frac (Nitrogen)	0.0162	0.0000	0.0000
Comp Mole Frac (CO_2)	0.6975	0.0250	0.0250
Comp Mole Frac (Methane)	0.1922	0.0000	0.0000
Comp Mole Frac (Ethane)	0.0620	0.0613	0.0613
Comp Mole Frac (Propane)	0.0275	0.2670	0.2670
Comp Mole Frac (i-Butane)	0.0017	0.0836	0.0836
Comp Mole Frac (n-Butane)	0.0024	0.2751	0.2751
Comp Mole Frac (i-Pentane)	0.0000	0.0697	0.0697
Comp Mole Frac (n-Pentane)	0.0000	0.0858	0.0858
Comp Mole Frac (n-Hexane)	0.0000	0.0527	0.0527
Comp Mole Frac (n-Octane)	0.0000	0.0790	0.0790
Comp Mole Frac (H_2O)	0.0000	0.0000	0.0000

Table 5B: Stream Compositions

Name	Low-Pressure Sour NGL Rich Stream 268	Acid Gas Stream 270	NGL Rich Stream 162
Comp Mole Frac (H_2S)	0.0008	0.0315	0.0000
Comp Mole Frac (Nitrogen)	0.0000	0.0000	0.0000
Comp Mole Frac (CO_2)	0.0250	0.9685	0.0000
Comp Mole Frac (Methane)	0.0000	0.0000	0.0000
Comp Mole Frac (Ethane)	0.0613	0.0000	0.0629
Comp Mole Frac (Propane)	0.2670	0.0000	0.2740

Name	Low-Pressure Sour NGL Rich Stream 268	Acid Gas Stream 270	NGL Rich Stream 162
Comp Mole Frac (i-Butane)	0.0836	0.0000	0.0858
Comp Mole Frac (n-Butane)	0.2751	0.0000	0.2824
Comp Mole Frac (i-Pentane)	0.0697	0.0000	0.0716
Comp Mole Frac (n-Pentane)	0.0858	0.0000	0.0881
Comp Mole Frac (n-Hexane)	0.0527	0.0000	0.0541
Comp Mole Frac (n-Octane)	0.0790	0.0000	0.0811
Comp Mole Frac (H_2O)	0.0000	0.0000	0.0000

Table 5C: Stream Compositions

Name	Heat Flow (Btu/hr)
Condenser Q Energy Stream 282	1.884e+06
Reboiler Q Energy Stream 284	2.211e+06

Table 6: Energy Streams

[0047] In a third example, the process simulation was repeated using a different dehydrated carbon dioxide recycle stream 160. The material streams, their compositions, and the associated energy streams produced by the simulation are provided in tables 7, 8, and 9 below, respectively.

Name	Dehydrated CO_2 Recycle Stream 160	Cooled CO_2 Recycle Stream 252	Cooled, Purified CO_2 Recycle Stream 258
Vapor Fraction	1.0000	0.9988	1.0000
Temperature (F)	104.0*	30.00*	4.617
Pressure (psig)	340.0*	335.0	330.0
Molar Flow (MMSCFD)	17.00*	17.00	16.82
Mass Flow (lb/hr)	8.083e+04	8.083e+04	7.968e+04
Liquid Volume Flow (USGPM)	203.4	203.4	199.5
Heat Flow (Btu/hr)	-3.016e+08	-3.032e+08	-3.025e+08

Table 7A: Material Streams

Name	Purified CO_2 Recycle Stream 164	Sour NGL Rich Stream 264	Cooled Sour NGL Rich Stream 266
Vapor Fraction	1.0000	0.00000	0.0000
Temperature (F)	76.45	199.4	120.0*
Pressure (psig)	325.0	340.0	635.3*
Molar Flow (MMSCFD)	16.82	0.1763	0.1763
Mass Flow (lb/hr)	7.968e+04	1153	1153

Name	Purified CO_2 Recycle Stream 164	Sour NGL Rich Stream 264	Cooled Sour NGL Rich Stream 266
Liquid Volume Flow (USGPM)	199.5	3.894	3.894
Heat Flow (Btu/hr)	-3.009e+08	-1.278e+06	-1.340e+06

Table 7B: Material Streams

Name	Low-Pressure Sour NGL Rich Stream 268	Acid Gas Stream 270	NGL Rich Stream 162
Vapor Fraction	0.0000	1.0000	0.0000
Temperature (F)	120.4	100.0*	115.4
Pressure (psig)	200.3*	5.304*	185.3*
Molar Flow (MMSCFD)	0.1763	0.01048	0.1659
Mass Flow (lb/hr)	1153	48.82	1105
Liquid Volume Flow (USGPM)	3.894	0.1188	3.776
Heat Flow (Btu/hr)	-1.340e+06	-1.653e+05	-1.175e+06

Table 7C: Material Streams

Name	Dehydrated CO_2 Recycle Stream 160	Cooled CO_2 Recycle Stream 252	Cooled, Purified CO_2 Recycle Stream 258
Comp Mole Frac (H_2S)	0.0031*	0.0031	0.0030
Comp Mole Frac (Nitrogen)	0.0008*	0.0008	0.0008
Comp Mole Frac (CO_2)	0.9400*	0.9400	0.9493
Comp Mole Frac (Methane)	0.0219*	0.0219	0.0222
Comp Mole Frac (Ethane)	0.0156*	0.0156	0.0157
Comp Mole Frac (Propane)	0.0116*	0.0116	0.0088
Comp Mole Frac (i-Butane)	0.0015*	0.0015	0.0002
Comp Mole Frac (n-Butane)	0.0031*	0.0031	0.0001
Comp Mole Frac (i-Pentane)	0.0007*	0.0007	0.0000
Comp Mole Frac (n-Pentane)	0.0006*	0.0006	0.0000
Comp Mole Frac (n-Hexane)	0.0005*	0.0005	0.0000
Comp Mole Frac (n-Octane)	0.0006*	0.0006	0.0000
Comp Mole Frac (H_2O)	0.0000*	0.0000	0.0000

Table 8A: Stream Compositions

Name	Purified CO_2 Recycle Stream 164	Sour NGL Rich Stream 264	Cooled Sour NGL Rich Stream 266
Comp Mole Frac (H_2S)	0.0030	0.0094	0.0094
Comp Mole Frac (Nitrogen)	0.0008	0.0000	0.0000

Name	Purified CO_2 Recycle Stream 164	Sour NGL Rich Stream 264	Cooled Sour NGL Rich Stream 266
Comp Mole Frac (CO_2)	0.9493	0.0500	0.0500
Comp Mole Frac (Methane)	0.0222	0.0000	0.0000
Comp Mole Frac (Ethane)	0.0157	0.0000	0.0000
Comp Mole Frac (Propane)	0.0088	0.2794	0.2794
Comp Mole Frac (i-Butane)	0.0002	0.1265	0.1265
Comp Mole Frac (n-Butane)	0.0001	0.2985	0.2985
Comp Mole Frac (i-Pentane)	0.0000	0.0713	0.0713
Comp Mole Frac (n-Pentane)	0.0000	0.0617	0.0617
Comp Mole Frac (n-Hexane)	0.0000	0.0482	0.0482
Comp Mole Frac (n-Octane)	0.0000	0.0550	0.0550
Comp Mole Frac (H_2O)	0.0000	0.0000	0.0000

Table 8B: Stream Compositions

Name	Low-Pressure Sour NGL Rich Stream 268	Acid Gas Stream 270	NGL Rich Stream 162
Comp Mole Frac (H_2S)	0.0094	0.1584	0.0000
Comp Mole Frac (Nitrogen)	0.0000	0.0000	0.0000
Comp Mole Frac (CO_2)	0.0500	0.8416	0.0000
Comp Mole Frac (Methane)	0.0000	0.0000	0.0000
Comp Mole Frac (Ethane)	0.0000	0.0000	0.0000
Comp Mole Frac (Propane)	0.2794	0.0000	0.2970
Comp Mole Frac (i-Butane)	0.1265	0.0000	0.1345
Comp Mole Frac (n-Butane)	0.2985	0.0000	0.3174
Comp Mole Frac (i-Pentane)	0.0713	0.0000	0.0758
Comp Mole Frac (n-Pentane)	0.0617	0.0000	0.0656
Comp Mole Frac (n-Hexane)	0.0482	0.0000	0.0512
Comp Mole Frac (n-Octane)	0.0550	0.0000	0.0584
Comp Mole Frac (H_2O)	0.0000	0.0000	0.0000

Table 8C: Stream Compositions

Name	Heat Flow (Btu/hr)
Condenser Q Energy Stream 282	6.236e+06
Reboiler Q Energy Stream 284	5.666e+06

Table 9: Energy Streams

[0048] While preferred embodiments of the invention have been shown and described, modifications thereof can be made by one skilled in the art without departing from the spirit and teachings of the invention. The embodiments described herein are exemplary only, and are not

intended to be limiting. Many variations and modifications of the invention disclosed herein are possible and are within the scope of the invention. Specifically, while the process is described in terms of a continuous process, it is contemplated that the process can be implemented as a batch process. In addition, where numerical ranges or limitations are expressly stated, such express ranges or limitations should be understood to include iterative ranges or limitations of like magnitude falling within the expressly stated ranges or limitations (e.g., from about 1 to about 10 includes, 2, 3, 4, etc.; greater than 0.10 includes 0.11, 0.12, 0.13, etc.). Use of the term "optionally" with respect to any element of a claim is intended to mean that the subject element is required, or alternatively, is not required. Both alternatives are intended to be within the scope of the claim. Use of broader terms such as comprises, includes, having, etc. should be understood to provide support for narrower terms such as consisting of, consisting essentially of, comprised substantially of, etc. Moreover, the percentages described herein may be mole fraction, weight fraction, or volumetric fraction.

[0049] Accordingly, the scope of protection is not limited by the description set out above but is only limited by the claims that follow, that scope including all equivalents of the subject matter of the claims. Each and every claim is incorporated into the specification as an embodiment of the present invention. Thus, the claims are a further description and are an addition to the preferred embodiments of the present invention. The discussion of a reference in the herein is not an admission that it is prior art to the present invention, especially any reference that may have a publication date after the priority date of this application. The disclosures of all patents, patent applications, and publications cited herein are hereby incorporated by reference, to the extent that they provide exemplary, procedural, or other details supplementary to those set forth herein.

CLAIMS

What is claimed is:

1. A method comprising:

receiving a hydrocarbon feed stream;

separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream;

separating the carbon dioxide recycle stream into a natural gas liquids (NGL) rich stream and a purified carbon dioxide recycle stream; and

injecting the purified carbon dioxide recycle stream into a subterranean formation.

2. The method of claim 1, further comprising:

compressing the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrating the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream; and

combining a makeup stream with the purified carbon dioxide recycle stream prior to injection.

3. The method of claim 2, wherein separating the carbon dioxide recycle stream comprises:

separating the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream; and

sweetening the sour NGL rich stream, thereby producing the NGL rich stream.

4. The method of claim 3, further comprising cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream.

5. The method of claim 3, further comprising:

cooling the sour NGL rich stream prior to sweetening the sour NGL rich stream; and

throttling the sour NGL rich stream prior to sweetening the sour NGL rich stream.

6. The method of claim 1, wherein separating the carbon dioxide recycle stream consists essentially of:

separating the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream; and

optionally sweetening, cooling, and/or throttling the sour NGL rich stream, thereby producing the NGL rich stream.

7. The method of claim 1, wherein the NGL rich stream is substantially free of methane.

8. The method of claim 7, wherein the NGL rich stream comprises no more than about 10 percent ethane.

9. The method of claim 4, wherein the NGL rich stream comprises no more than about 5 percent acid gases.

10. A plurality of process equipment configured to implement a method comprising:

receiving a recycle stream comprising at least one C_{3+} hydrocarbon and a gas selected from the group consisting of carbon dioxide, nitrogen, air, and water; and

separating the recycle stream into a natural gas liquid (NGL) rich stream and a purified recycle stream,

wherein the NGL rich stream comprises less than about 70 percent of the C_{3+} hydrocarbons from the recycle stream.

11. The process equipment of claim 10, wherein the NGL rich stream comprises at least about 90 percent C_{3+} hydrocarbons.

12. The process equipment of claim 11, wherein the NGL rich stream comprises no more than about 50 percent of the C_{3+} hydrocarbons from the recycle stream.

13. The process equipment of claim 11, wherein the NGL rich stream comprises from about 20 percent to about 35 percent of the C_{3+} from the recycle stream.

14. The process equipment of claim 13, wherein the recycle stream is injected into a subterranean formation.

15. A method comprising:

selecting a first recovery rate for a natural gas liquid (NGL) recovery process;

estimating the economics of the NGL recovery process based on the first recovery rate;

selecting a second recovery rate that is different from the first recovery rate;

estimating the economics of the NGL recovery process based on the second recovery rate; and

selecting the first recovery rate for the NGL recovery process when the estimate based on the first recovery rate is more desirable than the estimate based on the second recovery rate.

16. The method of claim 15, wherein estimating the economics comprises sizing the NGL recovery process equipment required to accommodate the selected recovery rate.

17. The method of claim 15, wherein the first recovery rate is no more than about 50 percent.

18. The method of claim 15, wherein the first recovery rate is no more than about 10 percent.

19. The method of claim 18, wherein the difference between the first recovery rate and the second recovery rate is no more than about 10 percent.

20. The method of claim 15, wherein the NGL recovery process comprises:

receiving a carbon dioxide recycle stream;

separating the carbon dioxide recycle stream into a purified carbon dioxide recycle stream and a sour NGL rich stream;

cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream; and

sweetening the sour NGL rich stream.

ABSTRACT

A method comprising receiving a hydrocarbon feed stream, separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream, separating the carbon dioxide recycle stream into a natural gas liquids (NGL) rich stream and a purified carbon dioxide recycle stream, and injecting the purified carbon dioxide recycle stream into a subterranean formation. Included is a method comprising selecting a first recovery rate for a NGL recovery process, estimating the economics of the NGL recovery process based on the first recovery rate, selecting a second recovery rate that is different from the first recovery rate, estimating the economics of the NGL recovery process based on the second recovery rate, and selecting the first recovery rate for the NGL recovery process when the estimate based on the first recovery rate is more desirable than the estimate based on the second recovery rate.

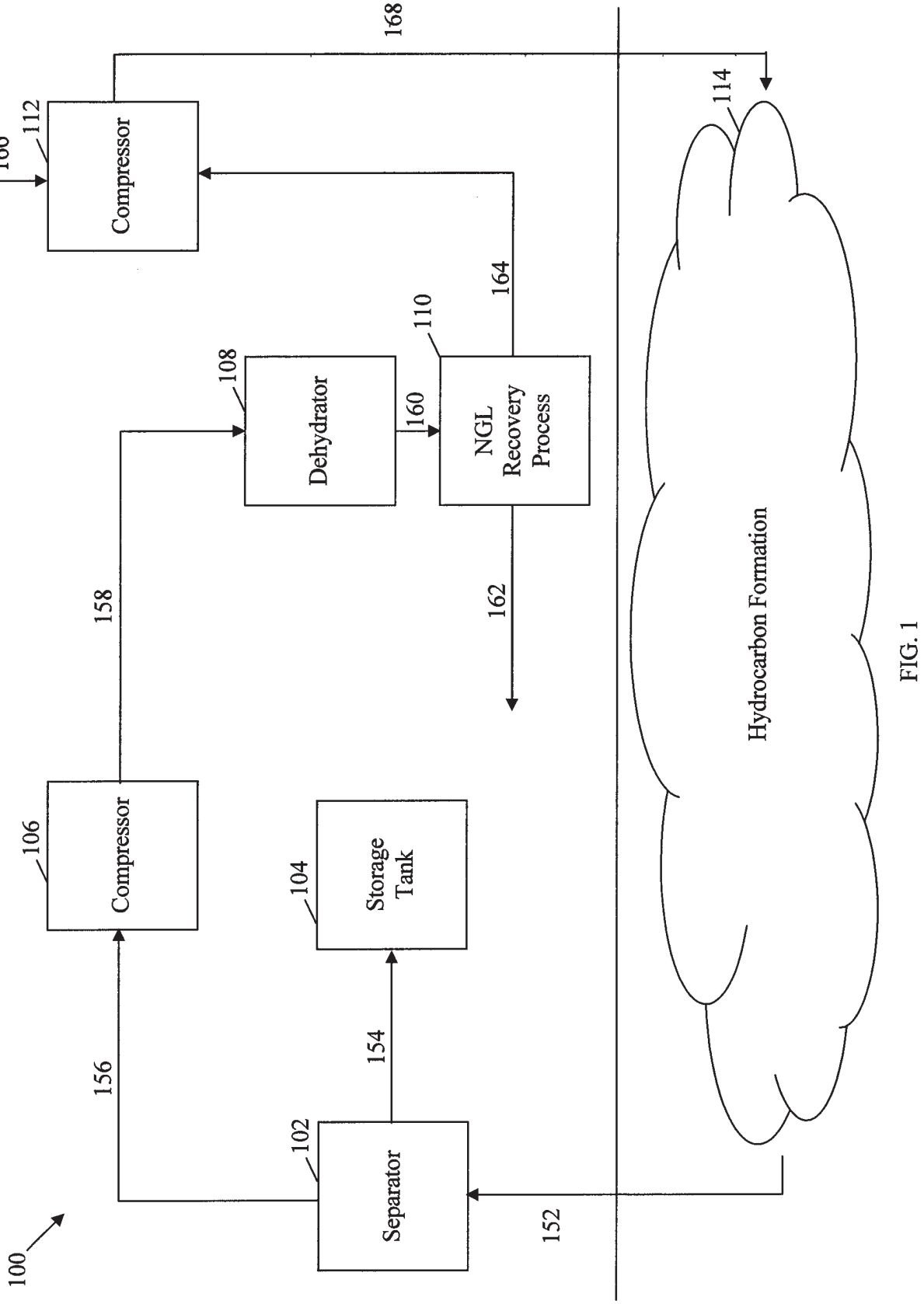

100
Separator
102
Storage Tank
104
Compressor
106
Dehydrator
108
NGL Recovery Process
110
Compressor
112
Hydrocarbon Formation
114
152
154
156
158
160
162
164
166
168

FIG. 1

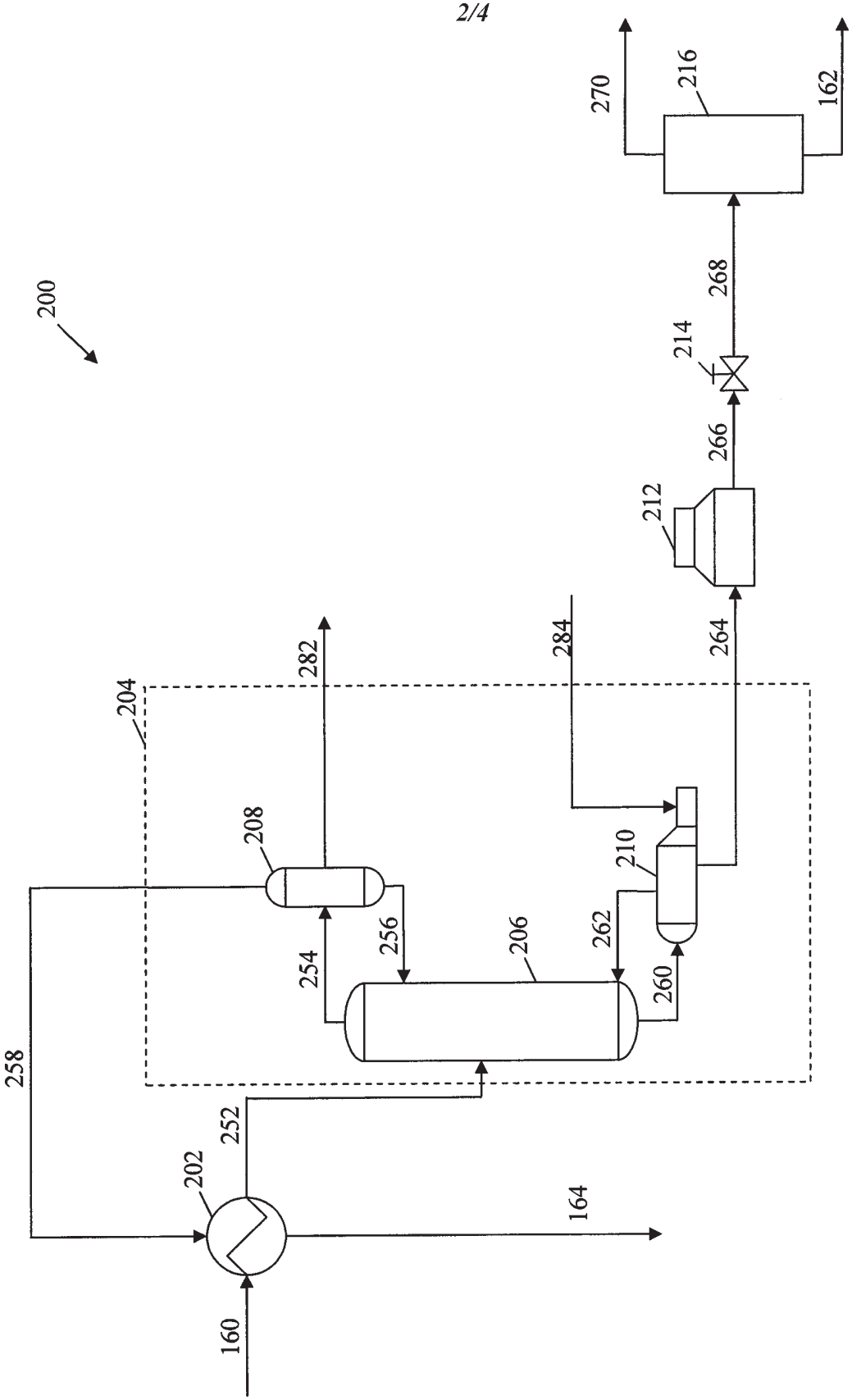

200
270
216
162
268
214
266
212
264
284
282
204
208
210
256
206
262
254
260
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252
202
164
160

FIG. 2

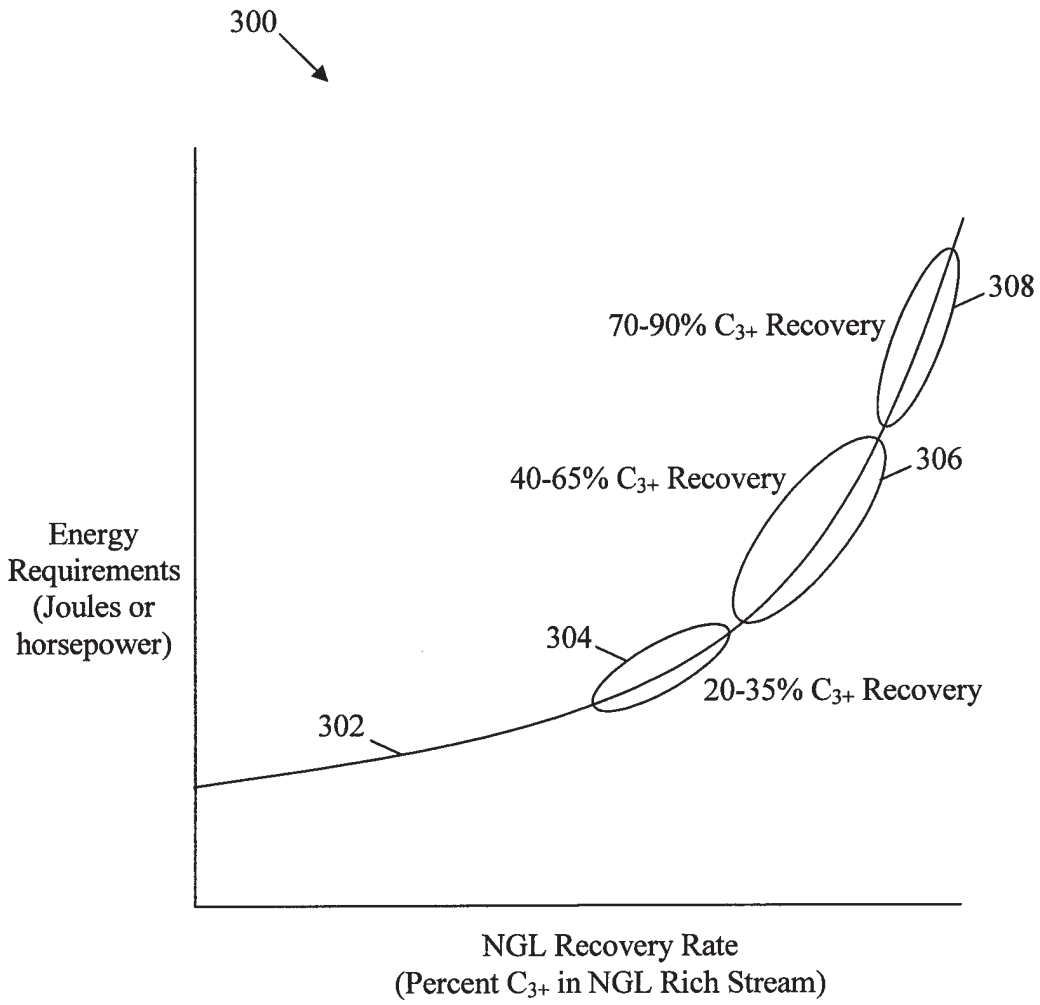

300
308
70-90% C_{3+} Recovery
306
40-65% C_{3+} Recovery
304
20-35% C_{3+} Recovery
302
Energy Requirements (Joules or horsepower)
NGL Recovery Rate
(Percent C_{3+} in NGL Rich Stream)

FIG. 3

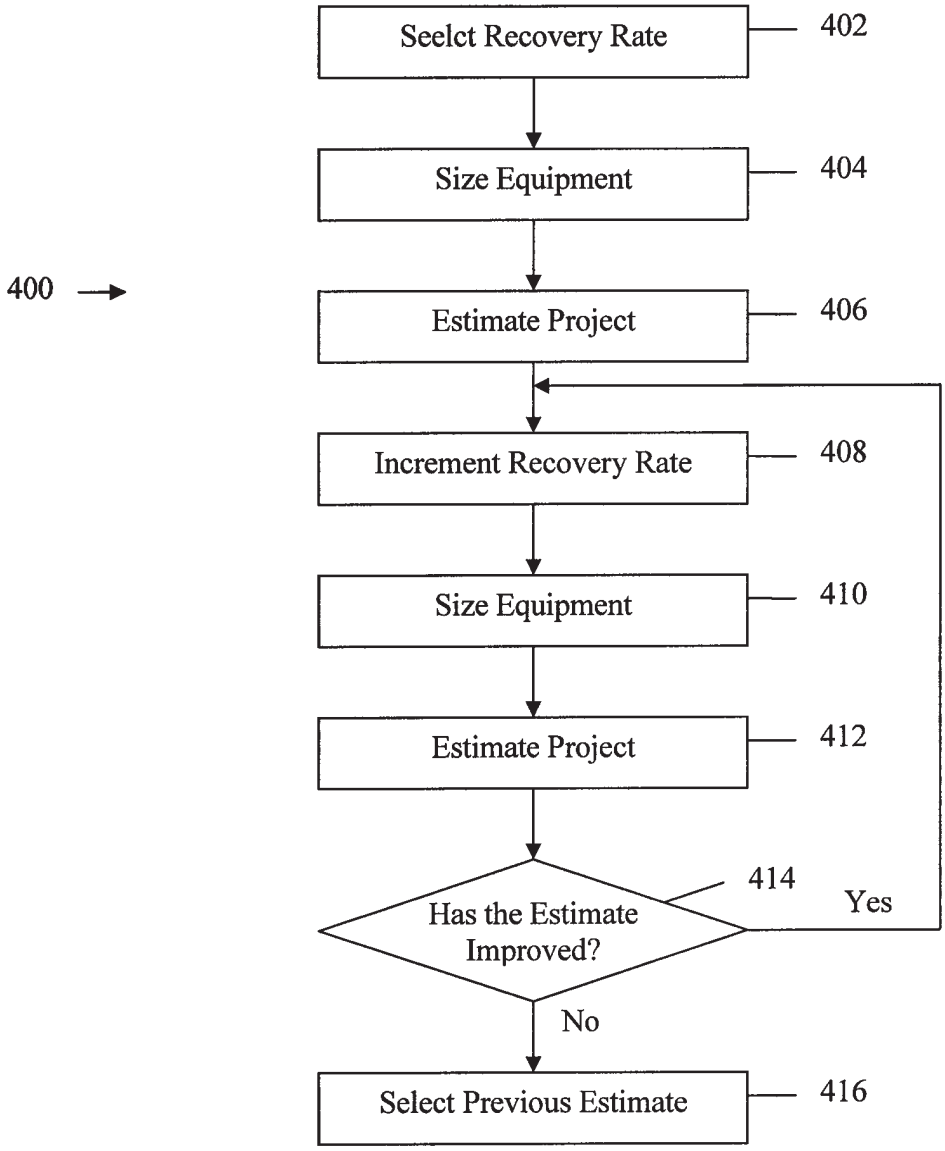

400
Seelct Recovery Rate
402
Size Equipment
404
Estimate Project
406
Increment Recovery Rate
408
Size Equipment
410
Estimate Project
412
Has the Estimate Improved?
414
Yes
No
Select Previous Estimate
416

FIG. 4

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Filer:	Grant Rodolph/Shannon Trotter
Attorney Docket Number:	2103-00902

Filed as Large Entity

Utility Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	310	310
Utility Search Fee	1111	1	510	510
Utility Examination Fee	1311	1	210	210
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1030**

Electronic Acknowledgement Receipt

EFS ID:	3317306
Application Number:	12122336
International Application Number:	
Confirmation Number:	8617
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Customer Number:	30652
Filer:	Grant Rodolph/Shannon Trotter
Filer Authorized By:	Grant Rodolph
Attorney Docket Number:	2103-00902
Receipt Date:	16-MAY-2008
Filing Date:	
Time Stamp:	16:49:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1030
RAM confirmation Number	1887
Deposit Account	501515
Authorized User	

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	2103-00902_ApplicationDataSheet.pdf	1007818 8980b497d0df5f85193285397f4cd1a3a7af3af7	no	4
Warnings:					
Information:					
2		2103-00902_Application.pdf	1402659 d2249281b71ede080308f01a2a9a395b45a30847	yes	32

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	26
Claims	27	31
Abstract	32	32

Warnings:					
Information:					
3	Drawings-only black and white line drawings	2103-00902_Drawings.pdf	618342 071c0d3549d5561f0e8cce07f44d14d009e5d9e7	no	4
Warnings:					
Information:					
4	Fee Worksheet (PTO-06)	fee-info.pdf	8349 6a54aa5059de147b73f5eba74def435c65c842f9	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3037168		

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Electronic Acknowledgement Receipt

EFS ID:	3317306
Application Number:	12122336
International Application Number:	
Confirmation Number:	8617
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Customer Number:	30652
Filer:	Grant Rodolph/Shannon Trotter
Filer Authorized By:	Grant Rodolph
Attorney Docket Number:	2103-00902
Receipt Date:	16-MAY-2008
Filing Date:	
Time Stamp:	16:49:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1030
RAM confirmation Number	1887
Deposit Account	501515
Authorized User	

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	2103-00902_ApplicationDataSheet.pdf	1007818 8980b497d0df5f85193285397f4cd1a3a7af3af7	no	4
Warnings:					
Information:					
2		2103-00902_Application.pdf	1402659 d2249281b71ede080308f01a2a9a395b45a30847	yes	32

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	26
Claims	27	31
Abstract	32	32

Warnings:					
Information:					
3	Drawings-only black and white line drawings	2103-00902_Drawings.pdf	618342 071c0d3549d5561f0e8cce07f44d14d009e5d9e7	no	4
Warnings:					
Information:					
4	Fee Worksheet (PTO-06)	fee-info.pdf	8349 6a54aa5059de147b73f5eba74def435c65c842f9	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3037168		

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PTO/SB/06 (12-04)

Approved for use through 7/31/2006. OMB 0651-0032

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Filing Date: 05/16/08

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 12/122,336

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	310
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	510
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	210
TOTAL CLAIMS (37 CFR 1.16(i))	20	0	X$ 25		OR	X$50	0
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	* 0	X$105			X$210	0
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $260 ($130 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			185			370	
			TOTAL	0		TOTAL	1030

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
						TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
						TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/122,336	05/16/2008	3744	1030	2103-00902	20	3

CONFIRMATION NO. 8617

30652
CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 750
PLANO, TX 75024

FILING RECEIPT

OC000000030148562

Date Mailed: 05/29/2008

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Eric Prim, Midland, TX;

Assignment For Published Patent Application

HOLLOMAN CORPORATION, Odessa, TX

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 60/938,726 05/18/2007

Foreign Applications

If Required, Foreign Filing License Granted: 05/27/2008

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/122,336**

Projected Publication Date: Request for Non-Publication Acknowledged

Non-Publication Request: Yes

Early Publication Request: No

Title

Natural Gas Liquid Recovery Process

Preliminary Class

062

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/122,336	05/16/2008	Eric Prim	2103-00902

CONFIRMATION NO. 8617

30652
CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 750
PLANO, TX 75024

FORMALITIES LETTER

OC000000030148563

Date Mailed: 05/29/2008

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is missing.
  A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
  Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of $**130** for a non-small entity, must be submitted with the missing items identified in this notice.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is $**130** for a non-small entity
- $**130** Surcharge.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/pwallace sr/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Eric Prim	§	
		§	Group Art Unit: 3744
Serial No.:	12/122,336	§	
		§	Examiner: N/A
Filed:	May 16, 2008	§	
		§	Confirmation No.: 8617
For:	NATURAL GAS LIQUID RECOVERY PROCESS	§	

Mail Stop: Missing Parts
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF EFS-WEB TRANSMISSION

Pursuant to 37 C.F.R. §1.8, I hereby certify that this correspondence is being electronically submitted to the U.S. Patent and Trademark Office website www.uspto.gov on:

July 24, 2008
Date of Transmission

Karen Harris
Karen Harris

RESPONSE TO NOTICE TO FILE MISSING PARTS

Dear Sir:

In response to the Notice to File Missing Parts of Nonprovisional Application mailed May 29, 2008 for the above-referenced matter, Applicant submits the enclosed executed Declaration.

The Commissioner is hereby authorized to charge payment of the required fees and any further fees associated with any of the foregoing papers submitted herewith, or to credit any overpayment thereof, to Deposit Account No. 05-1515, Conley Rose, P.C.

Respectfully submitted,
CONLEY ROSE, P.C.

Date: July 24, 2008

By: Grant Rodolph
Grant Rodolph
Reg. No. 50,487

ATTORNEY FOR APPLICANT

5601 Granite Parkway, Suite 750
Plano, Texas 75024
Telephone: (972) 731-2288
Facsimile: (972) 731-2289

2103-00902

PTO/SB/01A (07-07)
Approved for use through 06/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	NATURAL GAS LIQUID RECOVERY PROCESS

As the below named inventor(s), I/we declare that:

This declaration is directed to:

☐ The attached application, or

☑ Application No. 12/122,336 filed on May 16, 2008

☐ As amended on _____ (if applicable);

I/we believe that I/we am/are the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought;

I/we have reviewed and understand the contents of the above-identified application, including the claims, as amended by any amendment specifically referred to above;

I/we acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me/us to be material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT International filing date of the continuation-in-part application.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

All statements made herein of my/our own knowledge are true, all statements made herein on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and may jeopardize the validity of the application or any patent issuing thereon.

FULL NAME OF INVENTOR(S)

Inventor one: Eric Prim Date: 7/24/08

Signature: [signature] Citizen of: US

Inventor two: _____ Date: _____

Signature: _____ Citizen of: _____

☐ Additional inventors or a legal representative are being named on _____ additional form(s) attached hereto.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Attorney Docket No. 2103-00000

GENERAL POWER OF ATTORNEY
For Intellectual Property Proceedings

WHEREAS, Holloman Corporation, a corporation organized and existing under the laws of the State of Texas, United States of America, having its principal office and place of business at 5257 West Interstate 20, Odessa, Texas 79769 owns certain patent, trademark and other intellectual property, and has proceedings relating to its intellectual property ("IP proceedings") pending before the United States Patent and Trademark Office as well as in other foreign jurisdictions;

WHEREAS, Conley Rose, P.C., a professional corporation organized and existing under the laws of the State of Texas, having a principal office and place of business located at 5601 Granite Parkway, Suite 750, Plano, Texas 75024, United States of America, is responsible for handling some of these IP proceedings on behalf of Holloman Corporation.;

NOW, THEREFORE, as an authorized representative of Holloman Corporation, I hereby appoint the attorneys of Conley Rose, P.C. associated with Customer No.: **30652,** as our attorney(s) and/or agent(s) with full power of substitution and revocation, to prosecute the applications assigned to Conley Rose, P.C., to make alterations and amendments therein, to transact all business related to Holloman Corporation, in the United States Patent and Trademark Office and in any foreign jurisdiction, including but not limited to IP proceedings under The Patent Cooperation Treaty ("PCT") and resultant national filings.

Please direct all correspondence to the address associated with Customer No.: 30652.

The undersigned is an authorized representative having the title hereunder, of Holloman Corporation. As an authorized representative, the undersigned is authorized to sign and execute documents, including the Power of Attorney, on behalf of Holloman Corporation.

In Testimony Whereof, I hereunto set my hand this 24 day of July, 2008.

HOLLOMAN CORPORATION

By: E. Prim

Name: Eric Prim

Title: Vice President

51946.01/2103.00000

Electronic Patent Application Fee Transmittal

Application Number:	12122336
Filing Date:	16-May-2008
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Filer:	Grant Rodolph/Karen Harris
Attorney Docket Number:	2103-00902

Filed as Large Entity

Utility Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Late filing fee for oath or declaration	1051	1	130	130
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**130**

Electronic Acknowledgement Receipt

EFS ID:	3674073
Application Number:	12122336
International Application Number:	
Confirmation Number:	8617
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Customer Number:	30652
Filer:	Grant Rodolph/Karen Harris
Filer Authorized By:	Grant Rodolph
Attorney Docket Number:	2103-00902
Receipt Date:	24-JUL-2008
Filing Date:	16-MAY-2008
Time Stamp:	18:50:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$130
RAM confirmation Number	3383
Deposit Account	501515
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Response to Pre-Exam Formalities Notice	2103-00902_ResponseMissingParts.PDF	34521 cc5afbb7f978862a65d86f1c0ddc8597abe01fd5	no	1
Warnings:					
Information:					
2	Oath or Declaration filed	2103-00902_Declaration.pdf	94317 2666bd8e3fbdf3a1c28c2055ca6adc0062a15657	no	1
Warnings:					
Information:					
3	Power of Attorney	2103_GeneralPowerofAttorney.PDF	55583 87f2eec7939b52554a419a0b82f6ab8df0394611	no	1
Warnings:					
Information:					
4	Fee Worksheet (PTO-06)	fee-info.pdf	8141 a28d292337e06b676fb73b5f0e2836518b07b48b	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	192562		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/122,336	05/16/2008	Eric Prim	2103-00902

CONFIRMATION NO. 8617

30652
CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 750
PLANO, TX 75024

IMPROPER CPOA LETTER

OC000000031295301

Date Mailed: 07/31/2008

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/24/2008. The Power of Attorney in this application is not accepted for the reason(s) listed below:

- The Power of Attorney is from an assignee and the Certificate required by 37 CFR 3.73(b) has not been received.

/zretta/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/122,336	05/16/2008	3744	1160	2103-00902	20	3

CONFIRMATION NO. 8617

UPDATED FILING RECEIPT

30652
CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 750
PLANO, TX 75024

OC000000031295330

Date Mailed: 07/31/2008

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Eric Prim, Midland, TX;

Assignment For Published Patent Application

HOLLOMAN CORPORATION, Odessa, TX

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 60/938,726 05/18/2007

Foreign Applications

If Required, Foreign Filing License Granted: 05/27/2008

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/122,336**

Projected Publication Date: Request for Non-Publication Acknowledged

Non-Publication Request: Yes

Early Publication Request: No

Title

Natural Gas Liquid Recovery Process

Preliminary Class

062

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

PTO/SB/96 (08-08)
Approved for use through 08/31/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Eric Prim

Application No./Patent No.: 12/122,336 Filed/Issue Date: May 16, 2008

Entitled: Natural Gas Liquid Recovery Process

Holloman Operating, LLC, a Corporation
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☑ the assignee of the entire right, title, and interest; or

2. ☐ an assignee of less than the entire right, title and interest
(The extent (by percentage) of its ownership interest is_____ %)

in the patent application/patent identified above by virtue of either:

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 021288, Frame 0719, or for which a copy thereof is attached.

OR

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

3. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet.

☐ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Grant Rodolph/	August 8, 2008
Signature	Date
Grant Rodolph	972-731-2288
Printed or Typed Name	Telephone Number
Attorney of Record	
Title	

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	3755077
Application Number:	12122336
International Application Number:	
Confirmation Number:	8617
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Customer Number:	30652
Filer:	Grant Rodolph/Shannon Trotter
Filer Authorized By:	Grant Rodolph
Attorney Docket Number:	2103-00902
Receipt Date:	09-AUG-2008
Filing Date:	16-MAY-2008
Time Stamp:	13:01:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73(b).	2103-00902_Statementunder37CFR3_73b.pdf	132580 e02b8defab7c5d1b01b9a06eba16dfaf48df9f85	no	2

Warnings:	
Information:	

Total Files Size (in bytes):	132580

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/08a (03-08)
Approved for use through 07/31/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	12122336
Filing Date	2008-05-16
First Named Inventor	Eric Prim
Art Unit	3744
Examiner Name	
Attorney Docket Number	2103-00902

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	4136738		1979-01-30	Haynes, Jr., et al.	
	2	4374657		1983-02-22	Schendel, et al.	
	3	4441900		1984-04-10	Swallow	
	4	4451275		1984-05-29	Vines, et al.	
	5	4529411		1985-07-16	Goddin, Jr., et al.	
	6	4563202		1986-01-07	Yao, et al.	
	7	4595404		1986-06-17	Ozero, et al.	
	8	4664190		1987-05-12	Carpentier	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12122336
	Filing Date	2008-05-16
	First Named Inventor	Eric Prim
	Art Unit	3744
	Examiner Name	
	Attorney Docket Number	2103-00902

	9	4683948		1987-08-04	Fleming	
	10	4762543		1988-08-09	Pantermuehl, et al.	
	11	4765407		1988-08-23	Yuvancic	
	12	5019279		1991-05-28	Haines, et al.	
	13	5411721		1995-05-02	Doshi, et al.	
	14	6128919		2000-10-10	Daus, et al.	
	15	6505683	B2	2003-01-14	Minkkinen, et al.	
	16	6648944	B1	2003-11-18	Baker, et al.	
	17	6915662	B2	2005-07-12	Wilkinson, et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12122336
	Filing Date	2008-05-16
	First Named Inventor	Eric Prim
	Art Unit	3744
	Examiner Name	
	Attorney Docket Number	2103-00902

	1					

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12122336
	Filing Date	2008-05-16
	First Named Inventor	Eric Prim
	Art Unit	3744
	Examiner Name	
	Attorney Docket Number	2103-00902

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Grant Rodolph/	Date (YYYY-MM-DD)	2008-08-09
Name/Print	Grant Rodolph	Registration Number	50487

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	3756135
Application Number:	12122336
International Application Number:	
Confirmation Number:	8617
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Customer Number:	30652
Filer:	Grant Rodolph/Shannon Trotter
Filer Authorized By:	Grant Rodolph
Attorney Docket Number:	2103-00902
Receipt Date:	11-AUG-2008
Filing Date:	16-MAY-2008
Time Stamp:	10:06:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Filed (SB/08)	2103-00902_IDS.pdf	574594 ee6633f7ae3d002613a1f585f81a020ca1865e47	no	5

Warnings:	
Information:	

Total Files Size (in bytes):	574594

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New Applications Under 35 U.S.C. 111
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National Stage of an International Application under 35 U.S.C. 371
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New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Attorney Docket No. 2103-00000

GENERAL POWER OF ATTORNEY
For Intellectual Property Proceedings

WHEREAS, Pilot Energy Solutions, LLC, a corporation organized and existing under the laws of the State of Texas, United States of America, having its principal office and place of business at 5257 West Interstate 20, Odessa, Texas 79769 owns certain patent, trademark and other intellectual property, and has proceedings relating to its intellectual property ("IP proceedings") pending before the United States Patent and Trademark Office as well as in other foreign jurisdictions;

WHEREAS, Conley Rose, P.C., a professional corporation organized and existing under the laws of the State of Texas, having a principal office and place of business located at 5601 Granite Parkway, Suite 750, Plano, Texas 75024, United States of America, is responsible for handling some of these IP proceedings on behalf of Pilot Energy Solutions, LLC.;

NOW, THEREFORE, as an authorized representative of Pilot Energy Solutions, LLC, I hereby appoint the attorneys of Conley Rose, P.C. associated with Customer No.: **30652**, as our attorney(s) and/or agent(s) with full power of substitution and revocation, to prosecute the applications assigned to Conley Rose, P.C., to make alterations and amendments therein, to transact all business related to Pilot Energy Solutions, LLC, in the United States Patent and Trademark Office and in any foreign jurisdiction, including but not limited to IP proceedings under The Patent Cooperation Treaty ("PCT") and resultant national filings.

Please direct all correspondence to the address associated with Customer No.: 30652.

The undersigned is an authorized representative having the title hereunder of Pilot Energy Solutions, LLC. As an authorized representative, the undersigned is authorized to sign and execute documents, including the Power of Attorney, on behalf of Pilot Energy Solutions, LLC.

In Testimony Whereof, I hereunto set my hand this 16 day of February.

PILOT ENERGY SOLUTIONS, LLC

By: _____

Name: Eric Prim

Title: President

Electronic Acknowledgement Receipt

EFS ID:	4798116
Application Number:	12122336
International Application Number:	
Confirmation Number:	8617
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Customer Number:	30652
Filer:	Grant Rodolph/Karen Harris
Filer Authorized By:	Grant Rodolph
Attorney Docket Number:	2103-00902
Receipt Date:	16-FEB-2009
Filing Date:	16-MAY-2008
Time Stamp:	15:21:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73(b).	2103-00902_AssigneeStatement373.pdf	422177 8497a9a710be0e22c682bb11a2022975ad239b26	no	2

Warnings:	
Information:	

2	Power of Attorney	2103-00000_PilotEnergySolutionsGeneralPOA.pdf	912831 df9e759ff35bdabc9cd4912cfc1dda1969d1ce60	no	1
Warnings:					
Information:					
			Total Files Size (in bytes):	1335008	

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PTO/SB/96 (01-09)
Approved for use through 02/28/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Eric Prim

Application No./Patent No.: 12/122,336 Filed/Issue Date: May 16, 2008

Titled: NATURAL GAS LIQUID RECOVERY PROCESS

Pilot Energy Solutions, LLC , a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;

2. ☐ an assignee of less than the entire right, title, and interest in (The extent (by percentage) of its ownership interest is _____ %); or

3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy therefore is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Eric Prim To: Holloman Operating, LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 021288 , Frame 0719, or for which a copy thereof is attached.

2. From: Holloman Operating, LLC To: Pilot Energy Solutions, LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 021818 , Frame 0244, or for which a copy thereof is attached.

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Grant Rodolph/	February 16, 2009
Signature	Date
Grant Rodolph	Attorney of Record
Printed or Typed Name	Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Attorney Docket No. 2103-00000

GENERAL POWER OF ATTORNEY
For Intellectual Property Proceedings

WHEREAS, Pilot Energy Solutions, LLC, a corporation organized and existing under the laws of the State of Texas, United States of America, having its principal office and place of business at 333 North Sam Houston Parkway East, suite 600 Houston Texas 77060, owns certain patent, trademark and other intellectual property, and has proceedings relating to its intellectual property ("IP proceedings") pending before the United States Patent and Trademark Office as well as in other foreign jurisdictions;

WHEREAS, Conley Rose, P.C., a professional corporation organized and existing under the laws of the State of Texas, having a principal office and place of business located at 5601 Granite Parkway, Suite 750, Plano, Texas 75024, United States of America, is responsible for handling some of these IP proceedings on behalf of Pilot Energy Solutions, LLC.;

NOW, THEREFORE, as an authorized representative of Pilot Energy Solutions, LLC, I hereby appoint the attorneys of Conley Rose, P.C. associated with Customer No.: **30652**, as our attorney(s) and/or agent(s) with full power of substitution and revocation, to prosecute the applications assigned to Conley Rose, P.C., to make alterations and amendments therein, to transact all business related to Pilot Energy Solutions, LLC, in the United States Patent and Trademark Office and in any foreign jurisdiction, including but not limited to IP proceedings under The Patent Cooperation Treaty ("PCT") and resultant national filings.

Please direct all correspondence to the address associated with Customer No.: 30652.

The undersigned is an authorized representative having the title hereunder of Pilot Energy Solutions, LLC. As an authorized representative, the undersigned is authorized to sign and execute documents, including the Power of Attorney, on behalf of Pilot Energy Solutions, LLC.

In Testimony Whereof, I hereunto set my hand this 16 day of February, 2009.

PILOT ENERGY SOLUTIONS, LLC

By: E Prim

Name: Eric Prim

Title: President

58807.01/2103.00000

Electronic Acknowledgement Receipt

EFS ID:	4846026
Application Number:	12122336
International Application Number:	
Confirmation Number:	8617
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Customer Number:	30652
Filer:	Grant Rodolph/Karen Harris
Filer Authorized By:	Grant Rodolph
Attorney Docket Number:	2103-00000
Receipt Date:	24-FEB-2009
Filing Date:	16-MAY-2008
Time Stamp:	16:14:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73(b).	2103-00902_AssigneeStatement373.pdf	426905 997bcd51169f0cd8206bfec14b8c8494f8e6573f	no	2

Warnings:

Information:

2	Power of Attorney	2103-00000_PilotEnergySolutionsGeneralPOA.pdf	51922 746d9a840d81f08ebd02cb409eb13eadd3482ccb	no	1

Warnings:	
Information:	
Total Files Size (in bytes):	478827

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New Applications Under 35 U.S.C. 111
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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/96 (01-09)
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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Eric Prim

Application No./Patent No.: 12/122,336 Filed/Issue Date: May 16, 2008

Titled: NATURAL GAS LIQUID RECOVERY PROCESS

Pilot Energy Solutions, LLC , a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;

2. ☐ an assignee of less than the entire right, title, and interest in (The extent (by percentage) of its ownership interest is _____ %); or

3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy therefore is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Eric Prim To: Holloman Operating, LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 021288 , Frame 0719, or for which a copy thereof is attached.

2. From: Holloman Operating, LLC To: Pilot Energy Solutions, LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 021818 , Frame 0244, or for which a copy thereof is attached.

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Grant Rodolph/	February 24, 2009
Signature	Date
Grant Rodolph	Attorney of Record
Printed or Typed Name	Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/122,336	05/16/2008	Eric Prim	2103-00000

CONFIRMATION NO. 8617

30652
CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 750
PLANO, TX 75024

POA ACCEPTANCE LETTER

OC000000034622345

Date Mailed: 02/25/2009

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/16/2009.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/sleutchit/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PLUS Search Results for S/N 12122336, Searched Thu Jun 02 08:52:10 EDT 2011

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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PLUS Search Results for S/N 12122336, Searched Thu Jun 02 08:52:07 EDT 2011

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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PLUS Search Results for S/N 12122336, Searched Fri Oct 21 08:25:54 EDT 2011

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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PLUS Search Results for S/N 12122336, Searched Fri Oct 21 08:25:01 EDT 2011

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/122,336	05/16/2008	Eric Prim	2103-00902	8617

30652 7590 10/27/2011

CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 750
PLANO, TX 75024

EXAMINER	
RAYMOND, KEITH MICHAEL	
ART UNIT	**PAPER NUMBER**
3784	

MAIL DATE	DELIVERY MODE
10/27/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	12/122,336	PRIM, ERIC	
	Examiner	Art Unit	
	KEITH RAYMOND	3784	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 February 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☒ An election was made by the applicant in response to a restriction requirement set forth during the interview on *10/20/2011*; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) *15-20* is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-14* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☒ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *08/11/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-14, drawn to a method and process equipment utilized to separate NGL's and carbon dioxide from a hydrocarbon stream, classified in class 62, subclass 618.

II. Claims 15-20, drawn to a method of estimating the economics based on different recovery rates of NGL, classified in class 62, subclass 618.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct if they do not overlap in scope and are not obvious variants, and if it is shown that at least one subcombination is separately usable. In the instant case, subcombination II has separate utility such as it can be utilized to estimate the economics of any separation plant, not necessarily the plant described in claims 1-14. See MPEP § 806.05(d).

The examiner has required restriction between subcombinations usable together. Where applicant elects a subcombination and claims thereto are subsequently found allowable, any claim(s) depending from or otherwise requiring all the limitations of the allowable subcombination will be examined for patentability in accordance with 37 CFR 1.104. See MPEP § 821.04(a). Applicant is advised that if any claim presented in a continuation or divisional application is anticipated by, or includes all the limitations of, a claim that is allowable in the present application, such claim may be subject to

provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application.

During a telephone conversation with Grant Rodolph on October 10th, 2011 a provisional election was made without traverse to prosecute invention I, claims 1-14. Affirmation of this election must be made by applicant in replying to this Office action. Claim 15-20 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Specification

3. The disclosure is objected to because of the following informalities: applicant refers to "the NGL recovery process 100" (page 7, paragraph 23, line 9) when it has been previously referred to as the NGL recovery process 110. Further 100 has already been utilized to represent a carbon reinjection process. It will be assumed that this is a typographical error and it is meant to read "the NGL recovery process 110". Appropriate correction is required.

4. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 7-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. The term "substantially" in claim 7 is a relative term which renders the claim indefinite. The term "substantially" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It will be assumed by the examiner for the purpose of this office action that "substantially free of methane" means having no more than 5% of methane.

8. The term "about" in claims 8-13 is a relative term which renders the claim indefinite. The term "about" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It will be assumed for the purpose of this office action by the examiner that claims 8-13 directly read on the limitation of the percentage given, for example, claim 8 will be examined as “wherein the NGL rich stream comprises no more than 10 percent ethane”.

9. Claims 8-13 are unclear as a percentage is given, however, no units of measurement are given causing the limitations to be indefinite. Further, the examiner has taken note of the specification's mention that “the percentages described herein **may be** mole fraction, weight fraction, or volumetric fraction", however, “may be” causes indefiniteness in the specification as there is no actual limitation of what the percentage

can represent and therefore in the claims when percentages are disclosed without units of measurement. For the purpose of this office action, it will be assumed that the percentages represent exclusively mole fraction, weight fraction, or volumetric fraction.

Double Patenting

10. A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. **The filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.**

11. Claims 1 and 10 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claim 2 and 20 respectively of copending Application No. 13/096,788. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

> the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

14. Claims 1-3, 5-8, and 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent number 6,128,919 Daus et al. in view of U.S. Patent number 4,683,948 Fleming.

15. Regarding claim 1, Daus discloses receiving a hydrocarbon feed stream **10 (fig 1)**, separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream **38, 40 (column 3, lines 11-19)** and a carbon dioxide recycle stream **54**, separating the carbon dioxide recycle stream **54, 56, 61** (column 3, lines 44-46) into a natural gas liquids (NGL) rich stream **64, 90, 106** and a purified carbon dioxide recycle stream **62, 78.** Daus does not explicitly disclose injecting the purified carbon dioxide recycle stream into a subterranean formation, however, he does state “the compressed and cooled first permeate stream **62** is then recovered via a line **78** and transferred to a pipeline (not shown) for **EOR**" (column 3, lines 53-55). EOR stands for enhanced oil recovery and involves injecting a gas like CO2 into a subterranean formation. Fleming does disclose the details of the EOR process by stating “the repeated or cyclic injections of carbon dioxide into the formation preferably acts to facilitate effective contact of carbon dioxide

with the hydrocarbons" (column 2, lines 24-28) and "because the system requires the injection of fluids into a **subterranean geological petroleum-bearing formation"** (column 4, lines 60-64). It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the injection method of Fleming with the produce carbon dioxide of Duas in order to continue the EOR recycling efficiently and keep a cyclic process ongoing.

16. Regarding claim 2, Duas discloses compressing **80** the carbon dioxide recycle stream **64** prior to separating the carbon dioxide recycle stream **20**(fig 1). Duas utilizes a double separation system after the initial heavy hydrocarbon separation. The compression step is utilized before the second separation into hydrocarbons and carbon-dioxide and it would have been obvious to one skill in the art to utilize said compression step before the first separation to reach the necessary temperatures and pressures for the design. Duas discloses dehydrating **30** the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream **56, 64** and also discloses combining a make up stream **88, 100** with the purified carbon dioxide recycle stream **61** prior to injection **78.**

17. Regarding claim 3, Duas discloses separating the carbon dioxide recycle stream **54, 56, 61** (column 3, lines 44-46) into a natural gas liquids (NGL) rich stream **64, 90, 106** and a purified carbon dioxide recycle stream **62, 78.** Although he does not state that this stream is necessarily sour he does mention processes of removing the sour gases including hydrogen sulfide and carbon dioxide from the stream and therefore further discloses sweetening the sour NGL rich stream, thereby producing the NGL rich

stream by stating "for example, where the raw feed gas contains hydrogen sulfide in amounts less than about 5%, the hydrogen sulfide can either be removed before dehydration, **or it will permeate along with the carbon dioxide and can be removed from the product gas streams by downstream treating processes"** (column 9, lines 6-15).

18. Regarding claim 5, Duas discloses further comprising cooling the sour NGL rich stream **82** prior to sweetening the sour NGL rich stream **20**; and throttling **68** the sour NGL rich stream prior to sweetening the sour NGL rich stream **20 (fig 1)**. It is obvious to one skill in the art at the time of invention that the second membrane removes sour gases like hydrogen sulfide as disclosed by Duas (column 9, lines 5-14). Further throttling and cooling are common hydrocarbon processes before purification as Duas discloses "altering the temperature and pressure of the first nonpermeate stream to preselected values of a second stage membrane and forming a second altered feed stream" (column 9, lines 37-39). The temperatures and pressures are merely design choices dependent on the contents of the feed stream and what is being removed by the membrane or separator. It would have been obvious to one skilled in the art at the time of invention that altering the temperatures and pressures of the first stream may require cooling and throttling as these are common process tools.

19. Regarding claim 6, Duas discloses claim 3 and 5 above and therefore discloses the broader limitations of claim 6.

20. Regarding claim 7, Daus discloses wherein the NGL rich streams that were separated is substantially free of methane as seen in table 1 which shows that the NGL

rich stream contains 0.000% methane (column 7, table 1). Although, this stream is not the final process stream like in the applicant's invention and is representative of the heavy hydrocarbons. It is obvious to one skilled in the art to separate out propane, methane, ethane, or any hydrocarbons to receive percentages of purity. It is simply a technical feature that depends on original composition of the feed stream and the temperature and pressure of the fractionation or distillation column. Propanizers, Ethanizers, Methanizers, and other types of fractionation columns are all considered common in the art, and specific percentages do not represent an inventive step especially since a stream with 0% methane is disclose in the table of Duas.

21. Regarding claim 8, Duas discloses wherein the NGL rich stream comprises no more than about 10% ethane (**table 1)**. Duas discloses an NGL stream from the first separator that has 0% methane and 0.008% ethane. It would have been obvious for one of ordinary skill in the art to utilize the same separator processes of the first NGL processing plant to separate out an NGL stream that has no more than about 10% ethane if that is the favored composition of the NGL for dependant on customer and pipeline specifications and does not constitute an inventive step. The compositions of NGL streams are merely a feature of design and the separator in addition to the feed stream's temperature and pressure can be modified to reach these percentages.

22. Regarding claim 10, Daus discloses a plurality of process equipment configured to implement a method comprising receiving a recycle stream comprising at least one C3+ hydrocarbon and a gas selected from the group consisting of carbon dioxide, nitrogen, air, and water (column 2, lines 54-58), Separating the recycle stream into a

natural gas liquid (NGL) rich stream and a purified recycle stream (column 3, lines 11-19) wherein the NGL rich stream comprises less than about 70% of the C3+ hydrocarbons from the recycle stream. The equipment of Duas is fully capable of reaching the design choice percentage and further, the final hydrocarbon stream of Duas far less then 70% of the C3+ hydrocarbons (**table 1).**

23. Regarding claims 11-13, the process equipment as discussed above can be configured so the NGL rich stream comprises at least about 90% C3+ hydrocarbons, the NGL rich stream comprises no more than about 50% of the C3+ hydrocarbons from the recycle stream and the NGL stream comprises from about 20% to about 35% of the C3+ from the recycle stream. Membrane separators and NGL processing plants are known in the art to have the common abilities to separate out specific percentages dependant on the composition, temperature, and pressure of the feed stream. These claims include functional language for an apparatus that is provided by Duas. One of ordinary skill in the art at the time of invention can modify the temperatures and pressures of the separators to compose NGL rich streams of favored compositions.

24. Regarding claim 14, Duas does not explicitly disclose injecting the purified carbon dioxide recycle stream into a subterranean formation, however, he does state “the compressed and cooled first permeate stream **62** is then recovered via a line **78** and transferred to a pipeline (not shown) for **EOR**" (column 3, lines 53-55). EOR stands for enhanced oil recovery and involves injecting a gas like CO2 into a subterranean formation. However, Fleming does disclose the details of the EOR process by stating “the repeated or cyclic injections of carbon dioxide into the formation preferably acts to

facilitate effective contact of carbon dioxide with the hydrocarbons" (column 2, lines 24-28) and "because the system requires the injection of fluids into a **subterranean geological petroleum-bearing formation"** (column 4, lines 60-64). It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the injection process equipment of Fleming with the produced carbon dioxide from the process equipment of Duas in order to continue the EOR recycling efficiently and keep a cyclic process ongoing.

25. Claims 4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Duas and Fleming as applied to claim 3 above, and further in view of U.S. Patent application publication 2008/0156035 Aspelund et al. (hereinafter Aspelund).

26. Regarding claim 4, Duas and Fleming disclose claim 3 above. They do not, however, explicitly disclose further comprising cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream. This is disclosed by Aspelund who states "the cooling units arrange to cool the fluid flow may **use recycled carbon dioxide as the cooling fluid**" (paragraph 23). It would have been obvious to one of ordinary skill in the art at the time of invention utilize the purified carbon dioxide to cool upstream streams though heat exchange as provided by Aspelund with the hydrocarbon and carbon dioxide separation facility provided by Duas and injection methods provided by Fleming in order to save on utilizing outside refrigerants for cooling. Utilizing recycled streams is a common practice and is more efficient for upstream cooling or heating.

27. Regarding claim 9, Duas discloses wherein the NGL rich stream comprises no more than about 5 percent acid gases (table 1).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEITH RAYMOND whose telephone number is (571)270-1790. The examiner can normally be reached on Monday through Thursday 8:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frantz Jules can be reached on 571-273-6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/KEITH RAYMOND/
Examiner, Art Unit 3784

/Frantz F. Jules/
Supervisory Patent Examiner, Art Unit 3784

Notice of References Cited	Application/Control No. 12/122,336	Applicant(s)/Patent Under Reexamination PRIM, ERIC	
	Examiner KEITH RAYMOND	Art Unit 3784	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2011/0197629	08-2011	Prim et al.	62/618
*	B	US-2008/0156035	07-2008	Aspelund et al.	62/606
*	C	US-6,128,919	10-2000	Daus et al.	62/624
*	D	US-4,683,948	08-1987	Fleming, Graham C.	166/402
	E	US-			
	F	US-			
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	I	US-			
	J	US-			
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FOREIGN PATENT DOCUMENTS

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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	350	62/622,928,929.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 14:00
L2	1167	62/617-638.ccls. and ((carbon adj dioxide) or CO2)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 14:01
L3	18	62/617-638.ccls. and ((carbon adj dioxide) or CO2) and NGL and sour	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 14:01
S1	119	62/618.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:18
S2	411	62/620.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:19
S3	303	62/617.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:19
S4	17	("4136738", "4374657", "4441900", "4451275", "4529411", "4563202", "4595404", "4664190", "4683948", "4762543", "4765407", "5019279", "5411721", "6128919", "6505683", "6648944", "6915662").pn.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:20
S5	2061	injection with (subterranean adj formation)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S6	790	injection with (subterranean adj formation) and (carbon adj dioxide)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S7	78	injection with (subterranean adj formation) with (carbon adj dioxide)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23

S8	1	"12122336"	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S10	13	prim-eric.in.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:26
S12	50	("20110197629" "4964980" "4459142" "4889545" "5335504" "5881569" "6190540" "7219513" "20060283207" "20090301133" "20100011810" "20100043488" "5345772" "4318723" "4451275" "4466946" "4529411" "4857078" "4869740" "5555748" "5669958" "5771712" "5799507" "5879431" "5890378" "5964923" "5983664" "6035641" "6109061" "6182469" "6516631" "6526777" "6610124" "6648944" "6823692" "6889523" "6915662" "7806965" "7883569" "7914606" "7955420" "8007571" "20020065446" "20030029190" "20040177646" "20080302012" "20080302239" "20080302240" "20080305019" "20080307706").pn.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 10:25
S13	46	("20110197629" "20100179232" "20100219061" "6180684" "6040460" "6274096" "7192468" "7662215" "20050000360" "20080107581" "20100083697" "20110064648" "20110088896" "20110088897" "20110064648" "20110088896"	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 10:25

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S14	51	("4130403" | "4374657" | "4466946" | "4511382" | "4529411" | "4595405" | "4599096" | "4602477" | "4639257" | "4654063" | "4681612" | "4687498" | "4689062" | "4718921" | "4755193" | "4793841" | "4857078" | "4936887" | "5002590" | "5013338" | "5067971" | "5071451" | "5089033" | "5199962" | "5205843" | "5240472" | "5281255" | "5352272" | "5374300" | "5401300" | "5407467" | "5414190" | "5647227" | "5669958" | "5688307").PN. OR ("5964923").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 12:01

EAST Search History (Interference)

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CONFIRMATION NO. 8617

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/122,336	05/16/2008	062	3784	2103-00902

APPLICANTS
Eric Prim, Midland, TX;

**** CONTINUING DATA ***************************
This appln claims benefit of 60/938,726 05/18/2007

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****
05/27/2008

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /KEITH MICHAEL RAYMOND/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		TX	4	20	3

ADDRESS

CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 750
PLANO, TX 75024
UNITED STATES

TITLE

Natural Gas Liquid Recovery Process

FILING FEE RECEIVED		
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BIB (Rev. 05/07).

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12122336	PRIM, ERIC
	Examiner	Art Unit
	KEITH RAYMOND	3784

SEARCHED			
Class	Subclass	Date	Examiner
62	617, 618, 620, 622	10/20/2011	kraymond

SEARCH NOTES		
Search Notes	Date	Examiner
inventor search	10/20/2011	kraymond
PLUS SEARCH	10/21/2011	kraymond
Consulted Lukas Baldridge	10/21/2011	kraymond

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

/KEITH RAYMOND/ Examiner, Art Unit 3784	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	12122336
Filing Date	2008-05-16
First Named Inventor	Eric Prim
Art Unit	3744
Examiner Name	
Attorney Docket Number	2103-00902

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.R./

Receipt date: 08/11/2008	Application Number	12122336	12122336 - GAU: 3784
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Filing Date	2008-05-16	
	First Named Inventor	Eric Prim	
	Art Unit	3744	
	Examiner Name		
	Attorney Docket Number	2103-00902	

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Receipt date: 08/11/2008	Application Number	12122336	12122336 - GAU: 3784
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Filing Date	2008-05-16	
	First Named Inventor	Eric Prim	
	Art Unit	3744	
	Examiner Name		
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Examiner Signature	/Keith Raymond/	Date Considered	10/21/2011

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.R./

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12122336	PRIM, ERIC
	Examiner	Art Unit
	KEITH RAYMOND	3784

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	10/20/2011								
	1	✓								
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	18	N								
	19	N								
	20	N								

Atty. Docket: 2103-00902

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Eric Prim	§	
	§	Group Art Unit: 3784
Application No.: 12/122,336	§	
	§	Examiner: Keith Michael Raymond
Filed: May 16, 2008	§	
	§	Confirmation No.: 8617
For: NATURAL GAS LIQUID RECOVERY PROCESS	§	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF EFS-WEB FILING

Pursuant to 37 C.F.R. §1.8, I hereby certify that this correspondence is being electronically submitted to the U.S. Patent and Trademark Office website, www.uspto.gov, on Jan 19, 2012.

Jerri Pearson

AMENDMENTS AND RESPONSE TO
OFFICE ACTION DATED OCTOBER 27, 2011

Sir:

In response to the Office Action dated October 27, 2011, the Applicant respectfully requests the following amendments to the above-identified application. The changes made are shown by underlining the added text and striking through the deleted text.

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims, which begins on page 6 of this paper.

Remarks/Arguments begin on page 13 of this paper.

A **Replacement Drawing Sheet** is attached hereto.

AMENDMENTS TO THE SPECIFICATION

Please replace paragraph 15 with the following amended paragraph:

[0015] The carbon dioxide reinjection process 100 may receive a hydrocarbon feed stream 152 from a subterranean formation 114. The hydrocarbon feed stream 152 may be obtained from at least one recovery well as ~~shown~~ indicated by the upward arrow in FIG. 1, but may also be obtained from other types of wells. In addition, the hydrocarbon feed stream 152 may be obtained from the subterranean formation 114 using any suitable method. For example, if a suitable pressure differential exists between the subterranean formation 114 and the surface, the hydrocarbon feed stream 152 may flow to the surface via the pressure differential. Alternatively, surface and/or downhole pumps may be used to draw the hydrocarbon feed stream 152 from the subterranean formation 114 to the surface.

Please replace paragraph 20 with the following amended paragraph:

[0020] The compressor 106 may produce a compressed carbon dioxide recycle stream 158. The compressed carbon dioxide recycle stream 158 may contain the same composition as the carbon dioxide recycle stream 156, but at a higher energy level. The additional energy in the compressed carbon dioxide recycle stream 158 may be obtained from energy added to the compressor 106, e.g. the electrical, mechanical, hydraulic, or pneumatic energy. In embodiments, difference in energy levels between the compressed carbon dioxide recycle stream 158 and the carbon dioxide recycle stream 156 is at least about 50 percent, at least about 65 percent, or at least about 80 percent of the energy added to the compressor 106.

Please replace paragraphs 23 and 24 with the following amended paragraphs:

[0023] The dehydrated carbon dioxide recycle stream 160 may enter a NGL recovery process 110. The NGL recovery process 110 may separate the dehydrated carbon dioxide recycle stream 160 into a NGL rich stream 162 and a purified carbon dioxide recycle stream 164. The NGL rich stream 162 may only comprise a portion of the total NGLs from the dehydrated carbon dioxide recycle stream 160. For example, the NGL rich stream 162 may comprise less than about 70 percent, from about 10 percent to about 50 percent, or from about 20 percent to about 35 percent of the NGLs from the dehydrated carbon dioxide recycle stream 160. By taking a less aggressive cut of the NGLs and/or disregarding the recovery of methane, ethane, and optionally propane from the dehydrated carbon dioxide recycle stream 160, the NGL recovery process ~~100~~ 110 may produce a relatively high quality NGL rich stream 162 with relatively little process equipment or energy. A specific example of a suitable NGL recovery process 110 is shown in FIG. 2 and described in further detail below.

[0024] As mentioned above, the NGL recovery process 110 may produce a relatively high-quality NGL rich stream 162. Specifically, while the NGL recovery process 110 recovers only a portion, e.g., about 20 to about 35 percent, of the NGLs in the dehydrated carbon dioxide recycle stream 160, the resulting NGL rich stream 162 is relatively lean with respect to methane, ethane, and acid gases. For example, the NGL rich stream 162 may comprise most of the butane and heavier components from the dehydrated carbon dioxide recycle stream 160. For example, the NGL rich stream 162 may comprise at least about 90 percent, at least about 95 percent, at least about 99 percent, or substantially all of the C_{4+} from the dehydrated carbon dioxide recycle stream 160. In embodiments, the NGL rich stream 162 may comprise no more than about 10 percent, no more than about 5 percent, no more than about 1 percent, or be substantially free of ethane.

Similarly, the NGL rich stream 162 may comprise no more than about 5 percent, no more than about 3 percent, no more than about 1 percent, or be substantially free of methane. Moreover, the NGL rich stream 162 may comprise no more than about 5 percent, no more than about 3 percent, no more than about 1 percent, or be substantially free of acid gases, such as carbon dioxide or hydrogen sulfide. It will be realized that the composition of the NGL rich stream 162 may be dependent on the dehydrated carbon dioxide recycle stream 160 composition. The examples provided below show the composition of the NGL rich stream 162 for three different dehydrated carbon dioxide recycle stream 160 compositions. The NGL rich stream 162 may be sent to a pipeline for transportation or a storage tank, where it is stored until transported to another location or further processed.

Please replace paragraph 31 with the following amended paragraph:

[0031] The cooled carbon dioxide recycle stream 252 then enters a NGL stabilizer 204. The NGL stabilizer 204 may comprise a separator 206, a condenser 208, and a reboiler 210. The separator 206 may be similar to any of the separators described herein, such as separator 102. In a specific embodiment, the separator 206 is a distillation column. The condenser 208 may receive an overhead 254 from the separator 206 and produce the cooled, purified carbon dioxide recycle stream 258 and a reflux stream 256, which is returned to the separator 206. The condenser 208 may be similar to any of the heat exchangers described herein, such as heat exchanger 202. In a specific embodiment, the condenser 208 is a shell and tube, kettle type condenser coupled to a refrigeration process, and contains a reflux accumulator. As such, the condenser 208 may remove some energy 282 from the reflux stream 256 and cooled, purified carbon dioxide recycle stream 258, typically by refrigeration. The cooled, purified carbon dioxide recycle stream 258 is

substantially similar in composition to the purified carbon dioxide recycle stream 164 described above. Similarly, the reboiler 210 may receive a bottoms stream 260 from the separator 206 and produce a sour NGL rich stream 264 and a boil-up stream 262, which is returned to the separator 206. The reboiler 210 may be like any of the heat exchangers described herein, such as heat exchanger 202. In a specific embodiment, the reboiler 210 is a shell and tube heat exchanger coupled to a hot oil heater. As such, the reboiler 210 adds some energy 284 to the boil-up stream 262 and the sour NGL rich stream 264, typically by heating. The sour NGL rich stream 264 may be substantially similar in composition to the NGL rich stream 162, with the exception that the sour NGL rich stream 264 has some additional acid gases, e.g. acid gases 270 described below.

Please replace paragraph 33 with the following amended paragraph:

[0033] The low-pressure sour NGL rich stream 268 may then be sweetened in a separator 216. The separator 216 may be similar to any of the separators described herein, such as separator 102. In an embodiment, the separator 216 may be one or more packed columns that use a sweetening process to remove acid gases from the low-pressure sour NGL rich stream 268. Suitable sweetening processes include amine solutions, physical solvents such as SELEXOL or RECTISOL, mixed amine solution and physical solvents, potassium carbonate solutions, direct oxidation, absorption, adsorption using, e.g., molecular sieves, or membrane filtration. The separator 216 may produce the NGL rich stream 162 described above. In addition, any acid gases 270 accumulated within or exiting from the separator ~~270~~ 216 may be stored, used for other processes, or suitably disposed of. Finally, while FIGS. 1 and 2 are described in the context of carbon dioxide reinjection, it will be appreciated that the concepts described herein can be applied to other reinjection processes, for example those using nitrogen, air, or water.

AMENDMENTS TO THE CLAIMS

Listing of claims:

1. (Original) A method comprising:

receiving a hydrocarbon feed stream;

separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream;

separating the carbon dioxide recycle stream into a natural gas liquids (NGL) rich stream and a purified carbon dioxide recycle stream; and

injecting the purified carbon dioxide recycle stream into a subterranean formation.

2. (Currently Amended) The method of claim 1, further comprising:

compressing the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrating the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream; and

combining an external carbon dioxide makeup stream with the purified carbon dioxide recycle stream prior to injection.

3. (Original) The method of claim 2, wherein separating the carbon dioxide recycle stream comprises:

separating the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream; and

sweetening the sour NGL rich stream, thereby producing the NGL rich stream.

4. (Currently Amended) The method of ~~claim 3~~ claim 1, further comprising cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream.

5. (Original) The method of claim 3, further comprising:

cooling the sour NGL rich stream prior to sweetening the sour NGL rich stream; and

throttling the sour NGL rich stream prior to sweetening the sour NGL rich stream.

6. (Original) The method of claim 1, wherein separating the carbon dioxide recycle stream consists essentially of:

separating the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream; and

optionally sweetening, cooling, and/or throttling the sour NGL rich stream, thereby producing the NGL rich stream.

7. (Currently Amended) The method of claim 1, wherein the NGL rich stream ~~is substantially free of~~ comprises no more than 1 molar percent methane.

8. (Currently Amended) The method of claim 7, wherein the NGL rich stream comprises no more than ~~about~~ 10 molar percent ethane.

9. (Currently Amended) The method of ~~claim 4~~ claim 8, wherein the NGL rich stream comprises no more than ~~about~~ 5 molar percent acid gases.

10. (Currently Amended) A plurality of process equipment configured to ~~implement a method comprising~~:

~~receiving~~ receive a recycle stream comprising at least one C_{3+} hydrocarbon and a gas selected from the group consisting of carbon dioxide, nitrogen, air, and water; and

~~separating~~ separate the recycle stream into a natural gas liquid (NGL) rich stream and a purified recycle stream,

wherein the NGL rich stream comprises ~~less than about 70 percent~~ from 20 molar percent to 35 molar percent of the C_{3+} hydrocarbons from the recycle stream.

11. (Currently Amended) The process equipment of claim 10, wherein the NGL rich stream comprises at least ~~about~~ 90 molar percent C_{3+} hydrocarbons.

12. – 13. (Canceled)

14. (Currently Amended) The process equipment of ~~claim 13~~ claim 11, wherein the recycle stream is injected into a subterranean formation.

15. – 20. (Canceled)

21. (New) The process equipment of claim 10, wherein the process equipment that is configured to separate the recycle stream is configured to:

separate the recycle stream into the purified recycle stream and a sour NGL rich stream;

cool the sour NGL rich stream;

expand the sour NGL rich stream;

sweeten the sour NGL rich stream after cooling and expanding the sour NGL rich stream, thereby producing the NGL rich stream; and

cool the recycle stream using the purified recycle stream.

22. (New) The process equipment of claim 21, wherein the process equipment is further configured to:

receive a hydrocarbon feed stream;

separate the hydrocarbon feed stream into a heavy hydrocarbon rich stream and the recycle stream;

compress the recycle stream prior to separating the recycle stream;

dehydrate the recycle stream after separating the hydrocarbon feed stream and prior to separating the recycle stream;

combine an external makeup stream with the purified recycle stream; and

subsequently inject the purified recycle stream into a subterranean formation.

23. (New) The process equipment of claim 22, wherein the heavy hydrocarbon rich stream comprises at least 90 molar percent of the C_{9+} hydrocarbons in the hydrocarbon feed stream, wherein the recycle stream comprises at least 90 molar percent of the carbon dioxide in the hydrocarbon feed stream, wherein the NGL rich stream comprises at least 90 molar percent of the C_{4+} hydrocarbons in the recycle stream, and wherein the purified carbon dioxide recycle stream comprises at least 90 molar percent of the carbon dioxide and at least 90 molar percent of the methane in the recycle stream.

24. (New) The process equipment of claim 11, wherein the NGL rich stream comprises no more than 5 molar percent ethane and no more than 1 molar percent methane, and wherein the purified recycle stream comprises no more than 20 molar percent C_{2+}.

25. (New) A plurality of process equipment configured to:

receive a hydrocarbon feed stream;

separate the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream;

separate the carbon dioxide recycle stream into a natural gas liquids (NGL) rich stream and a purified carbon dioxide recycle stream; and

inject the purified carbon dioxide recycle stream into a subterranean formation.

26. (New) The process equipment of claim 25, wherein the process equipment is further configured to:

compress the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrate the carbon dioxide recycle stream after separating the hydrocarbon feed stream and prior to separating the carbon dioxide recycle stream;

cool the carbon dioxide recycle stream with the purified carbon dioxide recycle stream; and

combine an external carbon dioxide makeup stream with the purified carbon dioxide recycle stream prior to injection.

27. (New) The process equipment of claim 26, wherein the process equipment that is configured to separate the carbon dioxide recycle stream is configured to:

separate the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream;

cool the sour NGL rich stream;

expand the sour NGL rich stream;

sweeten the sour NGL rich stream after cooling and expanding the sour NGL rich stream, thereby producing the NGL rich stream; and

cool the carbon dioxide recycle stream using the purified carbon dioxide recycle stream.

28. (New) The process equipment of claim 25, wherein the heavy hydrocarbon rich stream comprises at least 90 molar percent of the C_{9+} hydrocarbons in the hydrocarbon feed stream, wherein the carbon dioxide recycle stream comprises at least 90 molar percent of the carbon dioxide in the hydrocarbon feed stream, wherein the NGL rich stream comprises at least 90 molar percent of the C_{4+} hydrocarbons in the carbon dioxide recycle stream, wherein the NGL rich stream comprises no more than 5 molar percent ethane and no more than 1 molar percent methane, wherein the purified carbon dioxide recycle stream comprises at least 90 molar percent of the carbon dioxide and at least 90 molar percent of the methane in the carbon dioxide recycle stream, and wherein the purified carbon dioxide recycle stream comprises no more than 20 molar percent C_{2+}.

REMARKS/ARGUMENTS

Status of Claims

Claims 1-14 stand rejected.

Claims 2, 4, 7-11, and 14 are currently amended.

Claims 12, 13, and 15-20 are hereby canceled.

Claims 21-28 are new.

Thus, claims 1-14 and 21-28 are pending in this patent application.

The Applicant hereby requests further examination and reconsideration of the presently claimed application.

Drawing Amendments

A replacement sheet of drawings is attached hereto. FIG. 1 has been amended to replace "Hydrocarbon Formation" with "Subterranean Formation" because the term "Subterranean Formation" is used in the specification when describing FIG. 1.

Specification Objections/Amendments

The Examiner objected to the specification due to informalities. The specification has been amended to overcome the objection and to correct typographical errors.

Claim Rejections – 35 U.S.C. § 112, Second Paragraph

Claims 7-13 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that the Applicant regards as the invention. Claims 7-13 have been amended to overcome the rejection.

Double Patenting

Claims 1 and 10 stand as provisionally rejected on the grounds of statutory double patenting for claiming the same invention as claims 2 and 20 of copending Application No. 13/096,788 (*Prim*). The Applicant notes that this is a provisional rejection, and therefore chooses to defer amending the claims in *Prim* and the present application until prosecution of the present claims is concluded.

Claim Rejections – 35 U.S.C. § 103

Claims 1-3, 5-8, and 10-14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,128,919 (*Daus*) in view of U.S. Patent 4,683,948 (*Fleming*). Claims 4 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Daus* in view of *Fleming* and U.S. Patent Application Publication 2008/0156035 (*Aspelund*). Claims 12 and 13 have been canceled, claims 2-8 depend from independent claim 1, and claims 11 and 14 depend from independent claim 10. Thus, claims 1-11 and 14 stand or fall on the application of the combination of *Daus* and *Fleming* to independent claims 1 and 10. The United States Supreme Court in *Graham v. John Deere Co. of Kansas City* noted that an obviousness determination begins with a finding that **"the prior art as a whole in one form or another contains all" of the elements of the claimed invention**. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 22 (U.S. 1966). The Applicant respectfully asserts that the combination of *Daus* and *Fleming* fails to disclose all of the limitations set forth in independent claims 1 and 10, and consequently does not render obvious claims 1-11 and 14.

The combination of *Daus* and *Fleming* fails to render obvious claims 1-9 because the combination of *Daus* and *Fleming* fails to disclose separating the carbon dioxide recycle stream

into a natural gas liquids (NGL) rich stream and a purified carbon dioxide recycle stream. Claim 1 reads:

> 1. A method comprising:
> receiving a hydrocarbon feed stream;
> separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream;
> **separating the carbon dioxide recycle stream into a natural gas liquids (NGL) rich stream and a purified carbon dioxide recycle stream**; and
> injecting the purified carbon dioxide recycle stream into a subterranean formation.

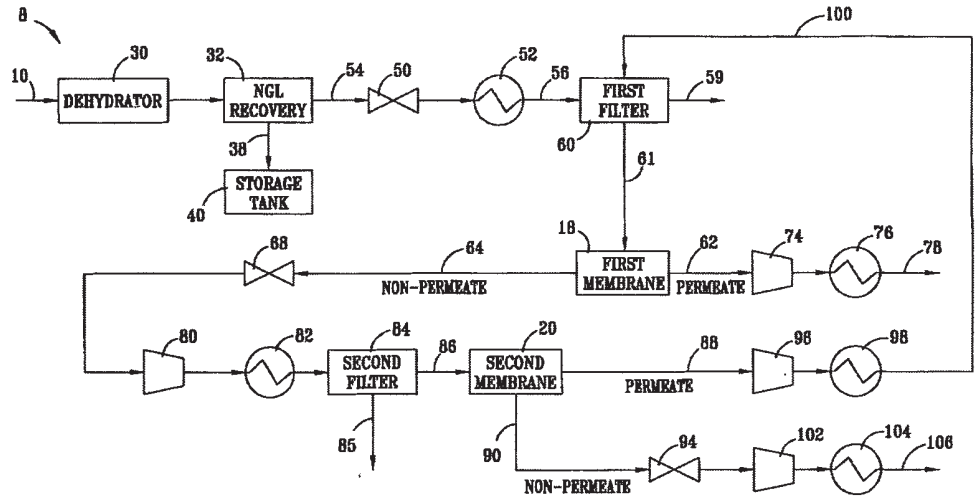
(Emphasis added). As shown above, claim 1 requires separating the carbon dioxide recycle stream into a NGL rich stream and a purified carbon dioxide recycle stream. NGL is a term of art meaning C_{3+} as shown in the Schlumberger Oilfield Glossary:

> Components of natural gas that are liquid at surface in field facilities or in gas-processing plants. Natural gas liquids can be classified according to their vapor pressures as low (condensate), intermediate (natural gasoline) and high (liquefied petroleum gas) vapor pressure.
>
> **Natural gas liquids include propane, butane, pentane, hexane and heptane, but not methane and ethane**, since these hydrocarbons need refrigeration to be liquefied. The term is commonly abbreviated as NGL.

Schlumberger Oilfield Glossary, definition of "natural gas liquids"[1]; *see also Specification*, ¶16. The Examiner maps the claimed NGL rich stream to *Daus's* streams 64, 90, 106. *See* Office Action mailed October 27, 2011 (*Office Action*), p. 6. However, *Daus's* streams 64, 90, 106 cannot be a NGL rich stream because *Daus* removes most of the NGLs at the NGL recovery 32, and thus his stream 64, 90, 106 is not rich in NGLs:

[1] Available at http://www.glossary.oilfield.slb.com/Display.cfm?Term=natural%20gas%20liquids.

FIG. 1



The raw feed gas stream at the optimum pressure enters a dehydration column 30 via a line 10. In the dehydration column 30, water in the raw feed gas stream is adsorbed on a desiccant (not shown) and **the dry gas is delivered to a natural gas liquids (NGL) recovery unit 32. In the NGL recovery unit 32, the dehydrated feed gas stream is cooled to a temperature sufficient to condense a portion of the feed stream, primarily valuable heavier hydrocarbons which are then removed via a line 38 to a storage tank 40**.

Daus, FIG. 1 & col. 3, ll. 11-19 (emphasis added). As shown above, *Daus's* streams 64, 90, 106 cannot be a NGL rich stream because *Daus* removes most of the NGLs at the NGL recovery 32, and thus his stream 64, 90, 106 is not rich in NGLs. *Fleming* fails to make up for the shortcomings of *Daus*. Thus, the combination of *Daus* and *Fleming* fails to disclose separating the carbon dioxide recycle stream into a NGL rich stream and a purified carbon dioxide recycle stream. As such, the combination of *Daus* and *Fleming* fails to disclose all the elements of independent claim 1, and consequently fails to render obvious claims 1-9.

The combination of *Daus* and *Fleming* fails to render obvious claims 10, 11, and 14 because the combination of *Daus* and *Fleming* fails to disclose that the NGL rich stream comprises from 20 molar percent to 35 molar percent of the C_{3+} hydrocarbons from the recycle stream. Claim 10 reads:

10. A plurality of process equipment configured to:

receive a recycle stream comprising at least one C_{3+} hydrocarbon and a gas selected from the group consisting of carbon dioxide, nitrogen, air, and water; and

separate the recycle stream into a natural gas liquid (NGL) rich stream and a purified recycle stream,

wherein the NGL rich stream comprises from 20 molar percent to 35 molar percent of the C_{3+} hydrocarbons from the recycle stream.

(Emphasis added). As shown above, claim 10 requires that the NGL rich stream comprises from 20 molar percent to 35 molar percent of the C_{3+} hydrocarbons from the recycle stream. The Examiner asserts that *Daus's* NGL stream 38 contains from 20 molar percent to 35 molar percent of the C_{3+} hydrocarbons from the recycle stream. See *Office Action*, p. 10. While *Daus* states that he removes most of the NGLs at the NGL recovery 32 (see *Daus*, col. 3, ll. 11-19, *supra*), it is impossible to determine exactly how much NGLs are removed because *Daus's* material streams do not balance:

TABLE 1

(Example 1)

Stream	Raw Gas	NGL	CO2	HC
Rate (MMSCFD)	31.054		20.703	8.566
Rate (GPM @ T/P)		41.439		
Temperature (DEG. F.)	85.000	150.13	85.011	96.339
Pressure (PSIG.)	155.000	154.000	0	80.000
Composition (by volume)				
Methane	19.228%	0.000%	3.669%	60.839%
Ethane	6.119%	0.008%	1.168%	19.361%
Propane	5.529%	38.262%	0.652%	10.804%
I-Butane	0.640%	8.560%	0.032%	0.528%
N-Butane	1.930%	28.108%	0.072%	1.190%
I-Penane	0.430%	7.295%	0.005%	0.085%
N-Pentane	0.490%	8.424%	0.005%	0.077%
N-Hexane	0.420%	7.532%	0.001%	0.012%
N-Octane	0.100%	1.809%	0.000%	0.000%
Nitrogen	1.390%	0.000%	0.265%	4.398%
Carbon Dioxide	63.434%	0.000%	94.029%	2.704%
Hydrogen Sulfide	0.070%	0.003%	0.103%	0.003%
Water	0.220%	0.000%	0.000%	0.000%

Daus, col. 7, ll. 26-49 (emphasis added). As shown above, it is impossible to determine exactly how much NGLs are removed because *Daus's* material streams do not balance (e.g. the mass flowrate of octane in the raw gas stream is not equal to the mass flowrate of octane in the NGL stream). *Fleming* fails to make up for the shortcomings of *Daus*. Thus, the combination of *Daus*

and *Fleming* fails to disclose that the NGL rich stream comprises from 20 molar percent to 35 molar percent of the C_{3+} hydrocarbons from the recycle stream. As such, the combination of *Daus* and *Fleming* fails to disclose all the elements of independent claim 10, and consequently fails to render obvious claims 10, 11, and 14.

New Claims

New claims 21-28 recite novel and non-obvious aspects of the invention. Support for new claims 21-28 is found in the specification, thus no new matter is contained in these claims. Claims 21-24 depend from claim 10, which is allowable over the cited art for the reasons stated above. Thus, claim 21-24 are also allowable. Claims 25-28 are allowable over the cited art for reasons similar to those provided for claim 1.

Finality of Next Office Action

The Applicant would like to point out that claims 1 and 6 have not been amended. The Applicant would also like to remind the Examiner of the rules regarding finality of office actions. Specifically, MPEP § 706.07(a) states that the next office action should not be final if the Examiner changes the grounds of rejection for any of claims 1 and 6. Should the Examiner insist on making the next office action final based on a new ground of rejection for any of claims 1 and 6, the Applicant requests a telephone conference with the Examiner and the Supervisory Patent Examiner to clarify the finality issue, and thereby potentially avoid a petition under 37 C.F.R. § 1.181.

CONCLUSION

Consideration of the foregoing amendments and remarks, reconsideration of the application, and withdrawal of the rejections and objections is respectfully requested by the Applicant. No new matter is introduced by way of the amendment. It is believed that each ground of rejection raised in the Office Action dated October 27, 2011 has been fully addressed. If any fee is due as a result of the filing of this paper, please appropriately charge such fee to Deposit Account Number 50-1515 of Conley Rose, P.C., Texas. If a petition for extension of time is necessary in order for this paper to be deemed timely filed, please consider this a petition therefore.

If a telephone conference would facilitate the resolution of any issue or expedite the prosecution of the application, the Examiner is invited to telephone the undersigned at the telephone number given below.

Respectfully submitted,
CONLEY ROSE, P.C.

Date: 1/19/12

Grant Rodolph
Reg. No. 50,487

ATTORNEY FOR APPLICANT

5601 Granite Parkway, Suite 750
Plano, TX 75024
(972) 731-2288
(972) 731-2289 (Facsimile)

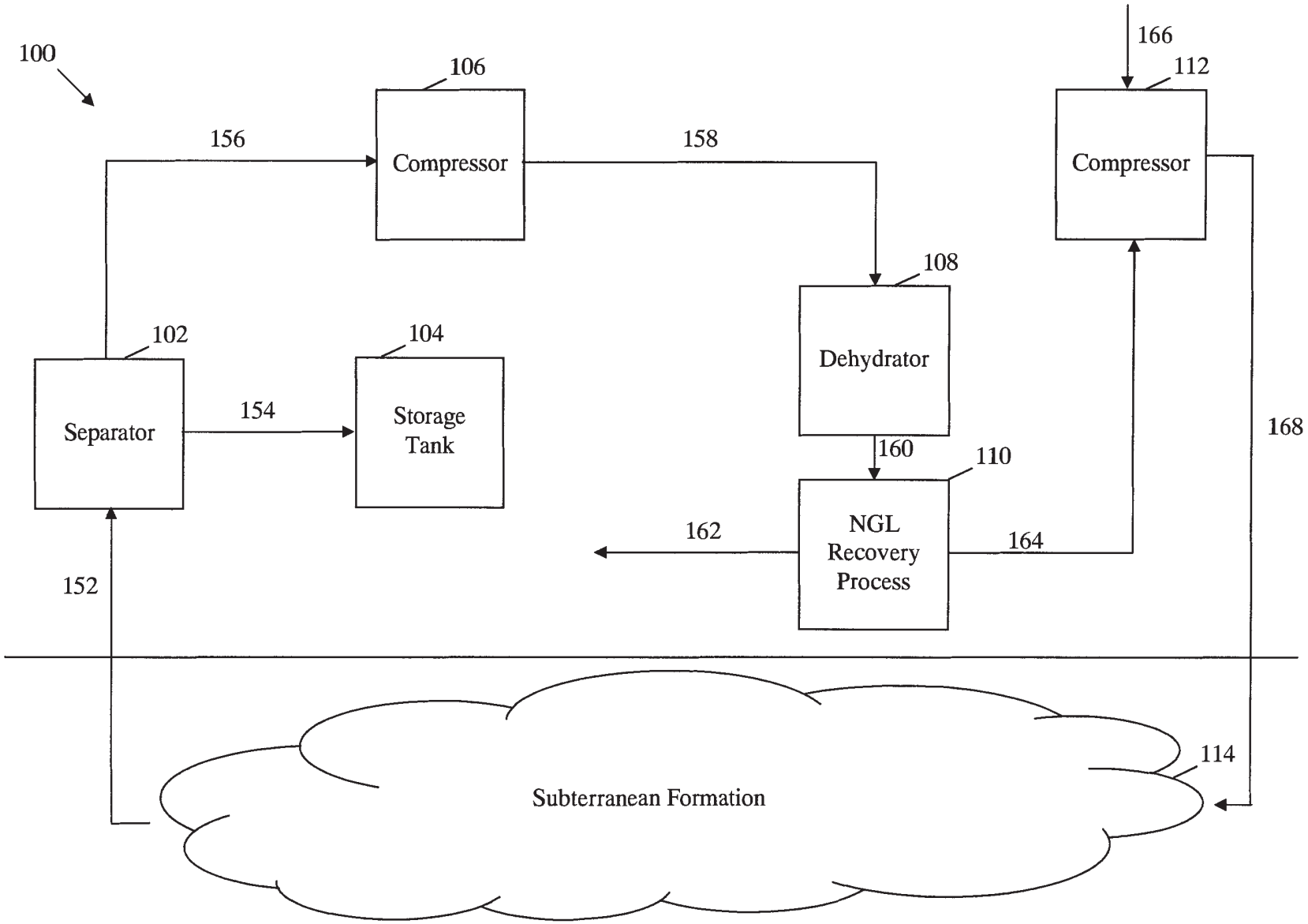


FIG. 1

SCOUT and CHEVRON EXHIBIT 1003
Page 134

Electronic Acknowledgement Receipt

EFS ID:	11875214
Application Number:	12122336
International Application Number:	
Confirmation Number:	8617
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Customer Number:	30652
Filer:	Grant Rodolph/Jerri Pearson
Filer Authorized By:	Grant Rodolph
Attorney Docket Number:	2103-00902
Receipt Date:	19-JAN-2012
Filing Date:	16-MAY-2008
Time Stamp:	16:26:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2103-00902_response_10272011_oa.pdf	1931325 72700f1e24beaee2743c1bf60cdd79969082067c	yes	20

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Specification	2	5
	Claims	6	12
	Applicant Arguments/Remarks Made in an Amendment	13	19
	Drawings-only black and white line drawings	20	20
Warnings:			
Information:			
	Total Files Size (in bytes):	1931325	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/122,336	Filing Date 05/16/2008	☒ To be Mailed

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT	01/19/2012	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X $ =		OR	X $60=	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $ =		OR	X $250=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/NICHELE PETERSON/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/122,336	05/16/2008	Eric Prim	2103-00902	8617

30652 7590 06/29/2012

CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 750
PLANO, TX 75024

EXAMINER	
RAYMOND, KEITH MICHAEL	
ART UNIT	**PAPER NUMBER**
3784	

MAIL DATE	DELIVERY MODE
06/29/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	12/122,336	PRIM, ERIC	
	Examiner	Art Unit	
	KEITH RAYMOND	3784	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 January 2012*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-11,14 and 21-28* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-11,14 and 21-28* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *19 January 2012* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Double Patenting

1. A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. **The filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.**

2. Claims 1 and 10 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claim 2 and 20 respectively of copending Application No. 13/096,788. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 10, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent number 4,529,411 Goddin Jr. et al. (hereinafter Goddin).

3. Regarding claims 1 and 25, Goddin anticipates a method comprising receiving a hydrocarbon feed stream **151 (figure 12)**, separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream **167** and a carbon dioxide recycle stream **170;** separating the carbon dioxide recycle stream **170, though 162 and 174 to DEA unit 177 (where it is then separated)** into a natural gas liquids (NGL) rich stream **154 (also, an NGL rich stream 154 is separated in separator 153)** and a purified carbon dioxide recycle stream **179/189** and injecting the purified carbon dioxide recycle stream into a subterranean formation by stating "to produce sweet CO2 stream 189, having, for example, less than 100 ppm H2S, suitable for pipelining **and/or reinjection for CO2 miscible flooding" (**column 20, lines 26-34). Goddin further discloses claim 25 relating to an apparatus that performs the method of claim 1.

4. Regarding claim 10, Goddin anticipates a plurality of process equipment configured to receive a recycle stream comprising at least one C3+ hydrocarbon and a gas selected from the group consisting of carbon dioxide, nitrogen, air, and water (top stream from separator **175**, further composition can be seen in the table at the bottom of column 19), and separate the recycle stream **(top stream from 175)** into a natural gas liquid (NGL) rich stream **154** and a purified recycle stream **179/189**. Goddin further anticipates wherein the NGL rich stream comprises from 20 molar percent to 35 molar percent of the C3+ hydrocarbons from the recycle stream as can clearly be seen in the table at the bottom of column 19 wherein the C3, C4, and C5+ hydrocarbons in stream 154 are equal to roughly 27mol% of the C3, C4, and C5+ hydrocarbons in stream 175.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 2-3, 5-9, 11, 14, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goddin as applied to claims 1, 10, and 25 and further in view of U.S. Patent number 6,128,919 Daus et al. (hereinafter Daus).

6. Regarding claim 2, Goddin discloses the limitations of independent claim 1. Goddin does not explicitly disclose compressing the carbon dioxide recycle stream prior to separation, dehydrating the carbon dioxide stream prior to separation and combining an external carbon dioxide makeup stream with a purified carbon dioxide recycle stream prior to injection.

7. Regarding claim 2, Duas does however disclose compressing **80** a carbon dioxide recycle stream **64** prior to separating a carbon dioxide recycle stream **20**(fig 1) through second filter **84**. Duas utilizes a double separation system after the initial heavy hydrocarbon separation. The compression step is utilized before a second separation into hydrocarbons and carbon-dioxides and it would have been obvious to one of ordinary skill in the art at the time of invention to utilize compression before other steps of separation such as before the NGL recovery of 32. It is common in the art to have to pressurize or expand a stream to a proper pressure and temperature before separation and this is merely a matter of selecting design equipment to provide for the proper separation of different compositions. Duas discloses dehydrating **30** the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream **32** and also discloses combining a make up stream **88, 100** with the purified carbon dioxide recycle stream **61** prior to injection **78. Overall, it would have obvious to one of ordinary skill in the art at the time of invention to utilize the processes of Duas as applied to a carbon dioxide stream before separation of NGL and after NGL recovery with the carbon dioxide stream provided by Goddin** as these are common processes utilized to reach proper design pressures dependent on stream composition. Further, it is well known to dehydrate streams before separation to avoid condensation or freezing of water during cooling that negatively affects NGL recovery.

8. Regarding claim 3, Goddin does not explicitly disclose separating the carbon dioxide recycle stream into a purified carbon dioxide recycle stream and a sour NGL rich stream and sweetening the sour NGL rich stream, thereby producing the NGL rich

stream, however, Goddin does provide for the common method of sweetening process streams providing a Selexol unit 188 to provide sweet CO2 by removing H2S. Further, hydrocarbons for NGL recovery are sweetened in DEA Unit 177 stating "DEA unit 177 is functional for removal of most of the remaining CO2 to produce a **lean sweet hydrocarbon stream 178 which can be further processed for NGL recovery" (column 20, lines 11-16).** The sweeting process is well known in the art to one of ordinary skill at the time of invention and can easily be applied to other process streams including an NGL rich stream. The sweetening process simple involves acid gases which is a well-known process. Further Daus discloses separating a carbon dioxide recycle stream **10** (column 3, lines 44-46) into a natural gas liquids (NGL) rich stream **38** and a purified carbon dioxide recycle stream **54.** Although he does explicitly disclose sweetening of the NGL stream, he does mention processes of removing the sour gases from process streams including hydrogen sulfide and carbon dioxide from stream **64** by stating "for example, where the raw feed gas contains hydrogen sulfide in amounts less than about 5%, the hydrogen sulfide can either be removed before dehydration, **or it will permeate along with the carbon dioxide and can be removed from the product gas streams by downstream treating processes"** (column 9, lines 6-15) The NGL is naturally sweetened by the separation process that removes the CO2, however, if sour gases are not fully removed, it is well known in the art at the time of invention to utilize a sweetening process to remove acid gases. It would have been obvious to one of ordinary skill in the art at the time of invention to utilize a sweetening process as

provided by both Daus and Goddin to sweeten any process stream including a sour NGL rich stream.

9. Regarding claim 5, Duas discloses further comprising cooling the sour stream **82** prior to sweetening the sour stream **20**; and throttling **68** the sour stream prior to sweetening the sour stream **20 (fig 1)**. It is obvious to one skill in the art at the time of invention that the second membrane removes sour gases like hydrogen sulfide as disclosed by Duas (column 9, lines 5-14). Further throttling and cooling are common hydrocarbon processes before purification as Duas discloses "altering the temperature and pressure of the first nonpermeate stream to preselected values of a second stage membrane and forming a second altered feed stream" (column 9, lines 37-39). The temperatures and pressures are merely design choices dependent on the contents of the feed stream and what is being removed by the membrane or separator. It would have been obvious to one skilled in the art at the time of invention that altering the temperatures and pressures of the first stream may require cooling and throttling as these are common process tools. Further motivation for utilizing sweetening processes of Daus and Goddin in combination can be seen with respect to the rejection of claim 4 above.

10. Regarding claim 6, Goddin and Duas discloses claims 3 and 5 above and therefore discloses the broader limitations of claim 6.

11. Regarding claim 7, Daus discloses wherein the NGL rich streams that were separated is substantially free of methane as seen in table 1 which shows that an NGL rich stream contains 0.000% methane (column 7, table 1). Although, this stream is not

the final process stream like in the applicant's invention, It is obvious for one of ordinary skill in the art to separate out propane, methane, ethane, or any hydrocarbons to receive percentages of purity. It is simply a technical feature that depends on original composition of the feed stream and the temperature and pressure of the fractionation or distillation column. Propanizers, Ethanizers, Methanizers, and other types of fractionation columns are all considered common in the art, and specific percentages do not represent an inventive step especially since a stream with 0% methane is disclose in the table of Duas showing that removal of virtually all methane is quite easily achievable. It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the separation techniques of Duas with the NGL recovery process of Goddin in order to provide for higher purity NGL recovery.

12. Regarding claim 8, Duas again discloses wherein an NGL rich stream comprises no more than about 10% ethane (**table 1)**. Duas discloses an NGL stream from the first separator that has 0% methane and 0.008% ethane. It would have been obvious for one of ordinary skill in the art to utilize the same designed NGL recovery of Duas as the NGL recovery of Goddin in order to put out an NGL stream that has no more than about 10% ethane if that is the favored composition of the NGL which is merely a design choice that is dependent on customer and pipeline specifications and does not constitute an inventive step. The compositions of NGL streams are merely a feature of design and the separator in addition to the feed stream's temperature and pressure can be modified to reach these percentages. Overall, Duas shows that it is commonly

achievable to separate out an NGL stream with less than 10% ethane. (see further motivation to combine with respect to the rejection of claim 7 above).

13. Regarding claim 9, Duas discloses wherein the NGL rich stream comprises no more than about 5 percent acid gases (table 1). Further, Goddin also states that "DEA unit 177 is functional for removal **of most all of the remaining CO2 to produce a lean sweet hydrocarbon stream 178 which can be further processed for NGL recovery" (column 20, lines 11-16).** Again, separating out a rich NGL stream with less than 5% acid gases is easily achievable to one of ordinary skill in the art at the time of invention. One of ordinary skill in the art at the time of invention would be able to utilize the processes of Duas to provide a pure NGL steam as provided in table 1 as the NGL stream of Goddin which is also a sweetened stream in order to provide for proper pipeline compositions and NGL recovery. (see further motivation to combine with respect to the rejection of claim 7 above).

14. Regarding claim 11, the process equipment as discussed above with regards to claim 10 can be configured so the NGL rich stream comprises at least about 90% C3+ hydrocarbons. Membrane separators and NGL processing plants are known in the art to have the common abilities to separate out specific percentages dependent on the composition, temperature, and pressure of the feed stream. These claims include functional language for an apparatus that is provided by Goddin. Further, Duas discloses wherein the NGL rich stream comprises at least 90 molar percent C3+ hydrocarbons (see table 1). One of ordinary skill in the art at the time of invention can modify the temperatures and pressures of the separators to compose NGL rich streams

of favored compositions and one of ordinary skill in the art at the time of invention would be able to utilize the separator and membrane designs of Duas to provide an NGL stream of equal purity with the separation process of Goddin. a stream comprising at least 90 molar percent c3+ hydrocarbons is easily achievable in the art as shown by Goddin.

15. Regarding claim 14, Goddin discloses injecting the recycle stream into a subterranean formation by stating "to produce sweet CO2 stream 189, having, for example, less than 100 ppm H2S, suitable for pipelining **and/or reinjection for CO2 miscible flooding" (**column 20, lines 26-34).

16. Regarding claim 24, Duas discloses wherein the NGL stream comprises no more than 5 molar percent ethane, and no more than 1 molar percent methane (**table 1, NGL stream**) and wherein the purified recycle stream comprises no more than 20 molar percent C2+ (**table 1, CO2 stream).** It would have been obvious for one of ordinary skill in the art to utilize the same designed NGL recovery of Duas as the NGL recovery of Goddin in order to put out an NGL stream that has no more than about 10% ethane if that is the favored composition of the NGL which is merely a design choice that is dependent on customer and pipeline specifications and does not constitute an inventive step. The compositions of NGL streams are merely a feature of design and the separator in addition to the feed stream's temperature and pressure can be modified to reach these percentages. Overall, Duas shows that it is commonly achievable to separate out an NGL stream with less than 5 percent ethane and 1 percent methane. (see further motivation to combine with respect to the rejection of claim 7 above). Also,

as both Duas and Goddin supply reinjection purified CO2 streams, a simple substitution of the purified CO2 stream of Duas provides for a purified recycle stream comprising no more than 20 molar percent C2+. This substitution would have been obvious to one of ordinary skill in the art at the time of invention in order to provide for purest CO2 for more efficient reinjection and EOR in addition to greater amounts of NGL being recovered instead of recycled underground.

17. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Goddin as applied to claim 3 above, and further in view of U.S. Patent application publication 2008/0156035 Aspelund et al. (hereinafter Aspelund).

18. Regarding claim 4, Goddin discloses claim 1 above. He does not, however, explicitly disclose further comprising cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream. This is disclosed by Aspelund who states “the cooling units arrange to cool the fluid flow may **use recycled carbon dioxide as the cooling fluid**" (paragraph 23). It would have been obvious to one of ordinary skill in the art at the time of invention utilize the purified carbon dioxide to cool upstream streams though heat exchange as provided by Aspelund with the hydrocarbon and carbon dioxide separation facility provided by Goddin. Utilizing recycled streams is a common practice and is more efficient for upstream cooling or heating to avoid the utilization of external refrigeration.

19. Claims 21-23, and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goddin as applied to claims 10 and 25 above, and further in view of U.S. Patent number 6,128,919 Daus et al. (hereinafter Daus) and U.S. Patent application publication 2008/0156035 Aspelund et al. (hereinafter Aspelund).

20. Regarding claim 21, Goddin does not explicitly disclose separating the carbon dioxide recycle stream into a purified carbon dioxide recycle stream and a sour NGL rich stream and sweetening the sour NGL rich stream, thereby producing the NGL rich stream, however, Goddin does provide for the common method of sweetening process streams providing a Selexol unit 188 to provide sweet CO2 by removing H2S. Further, hydrocarbons for NGL recovery are sweetened in DEA Unit 177 stating "DEA unit 177 is functional for removal of most of the remaining CO2 to produce a **lean sweet hydrocarbon stream 178 which can be further processed for NGL recovery" (column 20, lines 11-16).** The sweeting process is well known in the art to one of ordinary skill at the time of invention and can easily be applied to other process streams including an NGL rich stream. The sweetening process simple involves acid gases which is a well-known process. Further Daus discloses separating a carbon dioxide recycle stream **10** (column 3, lines 44-46) into a natural gas liquids (NGL) rich stream **38** and a purified carbon dioxide recycle stream **54.** Although he does not explicitly disclose sweetening of the NGL stream, he does mention processes of removing the sour gases from process streams including hydrogen sulfide and carbon dioxide from stream **64** by stating "for example, where the raw feed gas contains hydrogen sulfide in amounts less than about 5%, the hydrogen sulfide can either be removed before

dehydration, **or it will permeate along with the carbon dioxide and can be removed from the product gas streams by downstream treating processes"** (column 9, lines 6-15) The NGL is naturally sweetened by the separation process that removes the CO2, however, if sour gases are not fully removed, it is well known in the art at the time of invention to utilize a sweetening process to remove acid gases. It would have been obvious to one of ordinary skill in the art at the time of invention to utilize a sweetening process as provided by both Daus and Goddin to sweeten any process stream including a sour NGL rich stream. Duas further discloses further comprising cooling the sour stream **82** prior to sweetening the sour stream **20**; and throttling **68** the sour stream prior to sweetening the sour stream **20 (fig 1)**. It is obvious to one skill in the art at the time of invention that the second membrane removes sour gases like hydrogen sulfide as disclosed by Duas (column 9, lines 5-14). Further throttling and cooling are common hydrocarbon processes before purification as Duas discloses "altering the temperature and pressure of the first nonpermeate stream to preselected values of a second stage membrane and forming a second altered feed stream" (column 9, lines 37-39). The temperatures and pressures are merely design choices dependent on the contents of the feed stream and what is being removed by the membrane or separator. It would have been obvious to one skilled in the art at the time of invention that altering the temperatures and pressures of the first stream may require cooling and throttling as these are common process tools. Further it would have been obvious to utilize the sweetening, cooling, and expanding process of Duas on a sour NGL stream if required. Again, the sweetening process is well known in the art as shown by Duas and can

easily be applied to other process streams requiring sweetening, for example the NGL stream of Goddin is sweetened in the DEA. Goddin and Duas do not disclose cooling the recycle stream using the purified recycle stream. This is disclosed by Aspelund (see the rejection of claim 4 above).

21. Regarding claim 22, see the rejections of claim 2 and claim 4 above as the additional process equipment of claim 21 merely perform additional method limitations of claims 1, 2 and 4 that have already been rejected, i.e. compression, dehydration, combining of a makeup stream and injecting purified CO2 into a subterranean formation.

22. Regarding claims 23 and 28, although some of the limitations of stream composition are not explicitly provided by Goddin, Duas, and Aspelund, the stream composition is merely a matter of functional language in an apparatus claim. Since Goddin, Duas, and Aspelund disclose the entire method of the parent claims in addition to all of the process equipment previously disclosed, one of ordinary skill in the art could utilize the process equipment to separate stream composition exactly as described by applicant. There is no inventive step provided to separate the stream to specific purities and all of the purities claimed are within the means of one of ordinary skill in the art at the time of invention as the same apparatus of process equipment has been previously disclosed. Stream composition and purity is a matter of feed stream composition, the quality of the raw gas being removed by EOR, and design temperatures and pressures of the separators.

23. Regarding claim 26, see the rejection of claim 22 above in addition Aspelund providing cooling the recycle stream using the purified recycle stream (also see rejection of claim 4 above).

24. Regarding claim 27, see the rejection of claim 21 above as the limitations are the same.

Response to Arguments

5. Applicant's arguments with respect to claims 1 and 10 have been considered but are moot because the arguments do not apply to any of the new references being used in the current rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEITH RAYMOND whose telephone number is (571)270-1790. The examiner can normally be reached on Monday through Thursday 8:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frantz Jules can be reached on 571-273-6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/KEITH RAYMOND/
Examiner, Art Unit 3784

Notice of References Cited	Application/Control No. 12/122,336	Applicant(s)/Patent Under Reexamination PRIM, ERIC	
	Examiner KEITH RAYMOND	Art Unit 3784	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,128,919	10-2000	Daus et al.	62/624
*	B	US-4,529,411	07-1985	Goddin et al.	95/51
*	C	US-2008/0156035	07-2008	Aspelund et al.	62/606
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12122336	PRIM, ERIC
	Examiner	Art Unit
	KEITH RAYMOND	3784

SEARCHED			
Class	Subclass	Date	Examiner
62	617, 618, 620, 622	10/20/2011	kraymond
585	818, 802, 833, 837	06/19/2012	kraymond

SEARCH NOTES		
Search Notes	Date	Examiner
inventor search	10/20/2011	kraymond
PLUS SEARCH	10/21/2011	kraymond
Consulted Lukas Baldridge	10/21/2011	kraymond

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

/KEITH RAYMOND/ Examiner, Art Unit 3784	

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CONFIRMATION NO. 8617

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/122,336	05/16/2008	062	3784	2103-00902

APPLICANTS
Eric Prim, Midland, TX;

**** CONTINUING DATA ***************************
This appln claims benefit of 60/938,726 05/18/2007

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****
05/27/2008

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /KEITH MICHAEL RAYMOND/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		TX	4	20	3

ADDRESS

CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 750
PLANO, TX 75024
UNITED STATES

TITLE

Natural Gas Liquid Recovery Process

FILING FEE RECEIVED		
1160	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	"20060156035"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/19 11:50
L2	1	"20080156035"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/19 11:50
S1	119	62/618.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:18
S2	411	62/620.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:19
S3	303	62/617.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:19
S4	17	("4136738", "4374657", "4441900", "4451275", "4529411", "4563202", "4595404", "4664190", "4683948", "4762543", "4765407", "5019279", "5411721", "6128919", "6505683", "6648944", "6915662").pn.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:20
S5	2061	injection with (subterranean adj formation)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S6	790	injection with (subterranean adj formation) and (carbon adj dioxide)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S7	78	injection with (subterranean adj formation) with (carbon adj dioxide)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S8	1	"12122336"	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S10	13	prim-eric.in.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:26
S12	50	("20110197629" "4964980" "4459142" "4889545" "5335504" "5881569" "6190540" "7219513" "20060283207"	US-PGPUB; USPAT;	OR	ON	2011/10/21 10:25

		"20090301133" "20100011810" "20100043488" "5345772" "4318723" "4451275" "4466946" "4529411" "4857078" "4869740" "5555748" "5669958" "5771712" "5799507" "5879431" "5890378" "5964923" "5983664" "6035641" "6109061" "6182469" "6516631" "6526777" "6610124" "6648944" "6823692" "6889523" "6915662" "7806965" "7883569" "7914606" "7955420" "8007571" "20020065446" "20030029190" "20040177646" "20080302012" "20080302239" "20080302240" "20080305019" "20080307706").pn.	USOCR			
S13	46	("20110197629" "20100179232" "20100219061" "6180684" "6040460" "6274096" "7192468" "7662215" "20050000360" "20080107581" "20100083697" "20110064648" "20110088896" "20110088897" "20110064648" "20110088896" "20110088897" "20090255294" "20110056237" "20110056237" "4094767" "20090324458" "20090324459" "20090324460" "20090324461" "20090324462" "20090248174" "20100069515" "4043897" "5952523" "5021232" "7294172" "4261420" "4747858" "6401486" "6604380" "7165423" "20060042312" "20090165498" "3664091" "3677534" "4348486" "4483834" "4542114" "4963339" "4999030" "5000925" "5173513" "6736955" "7235677").pn.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 10:25
S14	51	("4130403" | "4374657" | "4466946" | "4511382" | "4529411" | "4595405" | "4599096" | "4602477" | "4639257" | "4654063" | "4681612" | "4687498" | "4689062" | "4718921" | "4755193" | "4793841" | "4857078" | "4936887" | "5002590" | "5013338" | "5067971" | "5071451" | "5089033" | "5199962" | "5205843" | "5240472" | "5281255" | "5352272" | "5374300" | "5401300" | "5407467" | "5414190" | "5647227" | "5669958" | "5688307").PN. OR ("5964923").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 12:01
S15	350	62/622,928,929.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 14:00
S16	1167	62/617-638.ccls. and ((carbon adj dioxide) or CO2)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 14:01
S17	18	62/617-638.ccls. and ((carbon adj dioxide) or CO2) and NGL and sour	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 14:01
S18	1	"13096788"	US-PGPUB;	OR	ON	2012/03/07 15:42

			USPAT; USOCR			
S19	751	62/618-620.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:49
S20	430	62/630-631.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:50
S23	226	62/928-929.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:51
S24	143	62/929.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:51
S25	25	"carbon dioxide reinjection"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:54
S26	408	"C9 hydrocarbon"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:43
S27	5	"C9 hydrocarbon" with separation	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:44
S28	784	"heavy hydrocarbon" with separation	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:46
S29	0	"heavy hydrocarbon" with separation with C9	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:46
S30	1	"heavy hydrocarbon" with separation with C8	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:46
S31	17	C9 with hydrocarbons with (removal or separation)	DERWENT	OR	ON	2012/03/08 10:06
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S35	1	"12605249"	US-PGPUB;	OR	ON	2012/03/09 11:05

			USPAT; USOCR			
S37	1	"12605249"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/09 11:06
S38	1	"12605240"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/09 11:07
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S40	432	62/620.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
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S42	344	(S39 S40 S41) and oil	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
S43	220	(S39 S40 S41) and oil and "carbon dioxide"	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
S44	62	ngl and eor	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:36
S45	2	("2009/0100754").URPN.	USPAT	OR	OFF	2012/06/02 10:54
S46	49	("20020007733" | "20050172807" | "20050217479" | "20060283207" | "20070180855" | "20070208432" | "2475957" | "2886405" | "3130026" | "3791157" | "4061481" | "4140504" | "4157904" | "4171964" | "4252548" | "4278457" | "4305733" | "4441900" | "4449994" | "4453956" | "4475347" | "4509967" | "4511382" | "4533372" | "4701200" | "4923493" | "5062270" | "5120338" | "5141544" | "5157925" | "5257505" | "5265428" | "5375422" | "5615561" | "5775128" | "5852061" | "5890378" | "5950453" | "5956971" | "7152430" | "7155931" | "7191617" | "7204100" | "7210311" | "H000825").PN. OR ("7883569").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/02 10:55
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S51	0	"20030051504"	USPAT	OR	OFF	2012/06/05 11:57
S52	1	"20030051504"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/05 11:58
S53	1	"6397631"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/05 11:58
S54	1	"12195450"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/05 11:59
S56	20	"LNG" and "carbon dioxide" and "reinjection" and "62".clas.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/05 12:00
S57	43	"LNG" and "carbon dioxide" and "reinjection"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/14 11:16
S58	1	sweetening with "ngl rich stream"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/14 11:24
S59	93	("2065112" | "2143283" | "2159434" | "2377966" | "2399142" | "2583601" | "2786652" | "2970106" | "3137654" | "3250080" | "3286778" | "3612192" | "4119417" | "4130403" | "4136747" | "4161222" | "4181675" | "4238211" | "4264338" | "4374657" | "4386944" | "4417449" | "4435191" | "4466946" | "4477419" | "4529411" | "4542010" | "4548619" | "4589896" | "4597777" | "4599096" | "4602477" | "4639257" | "4659343" | "4690695" | "4701187" | "4717395" | "4759780" | "4781907" | "4797141" | "4871378" | "4894068" | "4936887" | "4960579" | "4990168" | "5032148" | "5090971" | "5102432" | "5207806" | "5233837" | "5234471" | "5275640" | "5282968" | "5282969" | "5314528" | "5388650" | "5411721" |	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 11:18

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S61	0	(green with joe).in. and (morgan).in.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:19
S62	0	(green with joe).in. and (morgan).in.	US-PGPUB; USPAT; USOCR; FPRS	OR	OFF	2012/06/15 14:19
S63	12	(green with joe).in.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:19
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S65	1	"6128919".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:20
S66	0	53/22.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:26
S67	0	53/022.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:26
S68	437	95/51.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:28
S69	17	95/51.ccls. and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:28
S70	24	h825	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:02
S71	15	h825 and green	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:03
S72	1	h825 and green and freeman	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:03
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S79	1	"sour ngl rich"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:08
S80	2	"sour ngl"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:08
S81	1	"7777088".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:36
S82	1476	585/818,802,833,837.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:39
S83	23	585/818,802,833,837.ccls. and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:40

EAST Search History (Interference)

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6/19/2012 11:55:10 AM
C:\Users\kraymond\Documents\EAST\Workspaces\12122336.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12122336	PRIM, ERIC
	Examiner	Art Unit
	KEITH RAYMOND	3784

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	10/20/2011	06/19/2012							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
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	19	N	-							
	20	N	-							
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	22		✓							
	23		✓							
	24		✓							
	25		✓							
	26		✓							
	27		✓							
	28		✓							

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/122,336	05/16/2008	Eric Prim	2103-00902	8617

30652 7590 08/29/2012

CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 750
PLANO, TX 75024

EXAMINER	
RAYMOND, KEITH MICHAEL	
ART UNIT	**PAPER NUMBER**
3784	

MAIL DATE	DELIVERY MODE
08/29/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Applicant-Initiated Interview Summary	Application No.	Applicant(s)	
	12/122,336	PRIM, ERIC	
	Examiner	Art Unit	
	KEITH RAYMOND	3784	

All participants (applicant, applicant's representative, PTO personnel):

(1) *KEITH RAYMOND*.

(2) *GRANT RODOLPH*.

(3) *FRANTZ JULES*.

(4) _____.

Date of Interview: *08/21/2012*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☒103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *2, 6, AND 23*.

Identification of prior art discussed: *U.S. Patent 6,128,919 Daus et al, U.S. Patent 4,529411 Goddin et al.*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

See Continuation Sheet.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/KEITH RAYMOND/ Examiner, Art Unit 3784	/Frantz F. Jules/ Supervisory Patent Examiner, Art Unit 3784

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: Discussed examiners interpretation of claim 2 regarding the limitation "combining an external carbon dioxide makeup stream with the purified carbon dioxide recycle stream prior to injection" No agreement was made, examiner has stated that the carbon dioxide reflux makeup stream is external to the purifeid carbon dioxide stream prior to injection as shown in Daus. Examiner recommended amending the claim to be more clear such as -combining a carbon dioxide makeup stream external to the system with the purified carbon dioxide recycle stream-, No agreement was made.

Regarding claim 6, Examiner has expressed that "consists essentially of" language does not exclude the additional processes of Goddin and Daus as these additional processes do not materially affect the basic and novel characteristics of the claimed invention (MPEP 2111.03) and further it was discussed of possible ways of excluding additional process steps including negative claim limitations and "consisting of" language, No agreement was made.

Regarding claim 23, Examiner has clarified that the current percentages as claimed would be obvious to one of ordinary skill as they are well within the means of past separation methods and are dependent on temperature and pressure of a separation column, No agreement was made.

Further claim limitations were discussed however no agreement has been made..

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Eric Prim	§	
	§	Group Art Unit: 3784
Application No.: 12/122,336	§	
	§	Examiner: Keith Michael Raymond
Filed: May 16, 2008	§	
	§	Confirmation No.: 8617
For: NATURAL GAS LIQUID RECOVERY PROCESS	§	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF EFS-WEB FILING

Pursuant to 37 C.F.R. §1.8, I hereby certify that this correspondence is being electronically submitted to the U.S. Patent and Trademark Office website, www.uspto.gov, on September 10, 2012.

Jerri Pearson

Jerri Pearson

AMENDMENTS AND RESPONSE TO
OFFICE ACTION DATED JUNE 29, 2012

Sir:

In response to the Office Action dated June 29, 2012, the Applicant respectfully requests the following amendments to the above-identified application. The changes made are shown by underlining the added text and striking through the deleted text.

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 12 of this paper.

AMENDMENTS TO THE CLAIMS

Listing of claims:

1. (Currently Amended) A method comprising:

receiving a hydrocarbon feed stream;

separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream;

separating the carbon dioxide recycle stream into a natural gas liquids (NGL) rich stream and a purified carbon dioxide recycle stream,

wherein carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream~~; and injecting the purified carbon dioxide recycle stream into a subterranean formation~~.

2. (Currently Amended) The method of claim 1, further comprising:

compressing the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrating the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream; ~~and~~

combining ~~an external~~ a carbon dioxide makeup stream external to the method with the purified carbon dioxide recycle stream prior to injection; and

injecting the purified carbon dioxide recycle stream into a subterranean formation.

3. (Canceled)

4. (Currently Amended) The method of claim 1, further comprising cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream, wherein the hydrocarbon feed stream and the carbon dioxide recycle stream are not subjected to cryogenic conditions, membranes, and solvents between being received and being separated into the NGL rich stream and the purified carbon dioxide recycle stream.

5. – 8. (Canceled)

9. (Currently Amended) The method of ~~claim 8~~ claim 4, wherein the NGL rich stream comprises no more than 1 molar percent methane, no more than 10 molar percent ethane, and no more than 5 molar percent acid gases.

10. (Currently Amended) A plurality of process equipment configured to:

receive a ~~recycle~~ hydrocarbon feed stream comprising at least one C_{3+} hydrocarbon and a gas selected from the group consisting of carbon dioxide, nitrogen, air, and water;

separate the hydrocarbon feed stream into a heavy hydrocarbon rich stream and the recycle stream; and

separate the recycle stream into a natural gas liquid (NGL) rich stream and a purified recycle stream,

wherein the hydrocarbon feed stream and the recycle stream are not subjected to cryogenic conditions, membranes, and solvents between being received and being separated into the NGL rich stream and the purified recycle stream~~wherein the NGL rich stream comprises from 20 molar percent to 35 molar percent of the C_{3+} hydrocarbons from the recycle stream~~.

11. (Currently Amended) The process equipment of claim 10, wherein the NGL rich stream comprises at least 90 molar percent C_{3+} hydrocarbons, wherein the NGL rich stream comprises from 20 molar percent to 35 molar percent of the C_{3+} hydrocarbons from the recycle stream, and wherein the purified carbon dioxide recycle stream comprises at least 94 molar percent of the carbon dioxide, at least 94 molar percent of the methane, and at least 93 molar percent of the ethane from the carbon dioxide recycle stream.

12. – 20. (Canceled)

21. (Currently Amended) The process equipment of ~~claim 10~~ claim 32, wherein the process equipment that is configured to separate the recycle stream is configured to:

separate the recycle stream into the purified recycle stream and a sour NGL rich stream;

cool the sour NGL rich stream;

expand the sour NGL rich stream;

sweeten the sour NGL rich stream after cooling and expanding the sour NGL rich stream, thereby producing the NGL rich stream; and

cool the recycle stream using the purified recycle stream.

22. (Currently Amended) The process equipment of claim 21, wherein the process equipment is further configured to:

~~receive a hydrocarbon feed stream;~~

~~separate the hydrocarbon feed stream into a heavy hydrocarbon rich stream and the recycle stream;~~

compress the recycle stream prior to separating the recycle stream; and

dehydrate the recycle stream after separating the hydrocarbon feed stream and prior to separating the recycle stream,

wherein the hydrocarbon feed stream and the carbon dioxide recycle stream are not subjected to cryogenic conditions, membranes, and solvents between being received and being separated into the NGL rich stream and the purified carbon dioxide recycle stream;

~~combine an external makeup stream with the purified recycle stream; and~~

~~subsequently inject the purified recycle stream into a subterranean formation~~.

23. (Previously Presented) The process equipment of claim 22, wherein the heavy hydrocarbon rich stream comprises at least 90 molar percent of the C_{9+} hydrocarbons in the hydrocarbon feed stream, wherein the recycle stream comprises at least 90 molar percent of the carbon dioxide in the hydrocarbon feed stream, wherein the NGL rich stream comprises at least 90 molar percent of the C_{4+} hydrocarbons in the recycle stream, and wherein the purified carbon dioxide recycle stream comprises at least 90 molar percent of the carbon dioxide and at least 90 molar percent of the methane in the recycle stream.

24. (Previously Presented) The process equipment of claim 11, wherein the NGL rich stream comprises no more than 5 molar percent ethane and no more than 1 molar percent methane, and wherein the purified recycle stream comprises no more than 20 molar percent C_{2+}.

25. (Currently Amended) A plurality of process equipment configured to:

receive a hydrocarbon feed stream;

separate the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream;

separate the carbon dioxide recycle stream into a natural gas liquids (NGL) rich stream and a purified carbon dioxide recycle stream;

combine a carbon dioxide makeup stream from a source external to the process equipment with the purified carbon dioxide recycle stream; and

subsequently inject the purified carbon dioxide recycle stream into a subterranean formation.

26. (Currently Amended) The process equipment of claim 25, wherein the process equipment is further configured to:

compress the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrate the carbon dioxide recycle stream after separating the hydrocarbon feed stream and prior to separating the carbon dioxide recycle stream; and

cool the carbon dioxide recycle stream with the purified carbon dioxide recycle stream~~; and~~

~~combine an external carbon dioxide makeup stream with the purified carbon dioxide recycle stream prior to injection.~~

27. (Previously Presented) The process equipment of claim 26, wherein the process equipment that is configured to separate the carbon dioxide recycle stream is configured to:

separate the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream;

cool the sour NGL rich stream;

expand the sour NGL rich stream;

sweeten the sour NGL rich stream after cooling and expanding the sour NGL rich stream, thereby producing the NGL rich stream; and

cool the carbon dioxide recycle stream using the purified carbon dioxide recycle stream.

28. (Previously Presented) The process equipment of claim 25, wherein the heavy hydrocarbon rich stream comprises at least 90 molar percent of the C_{9+} hydrocarbons in the hydrocarbon feed stream, wherein the carbon dioxide recycle stream comprises at least 90 molar percent of the carbon dioxide in the hydrocarbon feed stream, wherein the NGL rich stream comprises at least 90 molar percent of the C_{4+} hydrocarbons in the carbon dioxide recycle stream, wherein the NGL rich stream comprises no more than 5 molar percent ethane and no more than 1 molar percent methane, wherein the purified carbon dioxide recycle stream comprises at least 90 molar percent of the carbon dioxide and at least 90 molar percent of the methane from the carbon dioxide recycle stream, and wherein the purified carbon dioxide recycle stream comprises no more than 20 molar percent C_{2+}.

29. (New) The method of claim 1, wherein the NGL rich stream comprises from 20 molar percent to 35 molar percent of the C_{3+} hydrocarbons from the carbon dioxide recycle stream, and wherein the purified carbon dioxide recycle stream comprises at least 94 molar percent of the carbon dioxide, at least 94 molar percent of the methane, and at least 93 molar percent of the ethane from the carbon dioxide recycle stream.

30. (New) The method of claim 1, wherein separating the carbon dioxide recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream consists of:

separating the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream;

optionally refluxing part of the purified carbon dioxide recycle stream;

optionally reboiling part of the sour NGL rich stream; and

optionally cooling, throttling, and/or sweetening the sour NGL rich stream, thereby producing the NGL rich stream.

31. (New) The method of claim 30, wherein the sour NGL rich steam comprises no more than 5 molar percent carbon dioxide, no more than 1 molar percent methane, and no more than 1 molar percent ethane, and wherein the NGL rich stream is substantially free of carbon dioxide.

32. (New) The process equipment of claim 10, wherein separating the recycle stream into the NGL rich stream and the purified recycle stream consists of:

separating the recycle stream into the purified recycle stream and a sour NGL rich stream;

optionally refluxing part of the purified recycle stream;

optionally reboiling part of the sour NGL rich stream; and

optionally cooling, throttling, and/or sweetening the sour NGL rich stream, thereby producing the NGL rich stream.

33. (New) The process equipment of claim 21, wherein the sour NGL rich steam comprises no more than 5 molar percent carbon dioxide, no more than 1 molar percent methane, and no more than 1 molar percent ethane, and wherein the NGL rich stream is substantially free of carbon dioxide.

34. (New) The process equipment of claim 22, wherein carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the recycle stream prior to separating the recycle stream into the NGL rich stream and the purified recycle stream.

35. (New) The process equipment of claim 22, wherein the process equipment is further configured to combine a carbon dioxide makeup stream from a source external to the process equipment with the purified recycle stream and subsequently inject the purified recycle stream into a subterranean formation.

36. (New) The process equipment of claim 25, wherein the hydrocarbon feed stream and the carbon dioxide recycle stream are not subjected to cryogenic conditions, membranes, and solvents between being received and being separated into the NGL rich stream and the purified carbon dioxide recycle stream.

37. (New) The process equipment of claim 25, wherein separating the carbon dioxide recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream consists of:

separating the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream;

optionally refluxing part of the purified carbon dioxide recycle stream;

optionally reboiling part of the sour NGL rich stream; and

optionally cooling, throttling, and/or sweetening the sour NGL rich stream, thereby producing the NGL rich stream.

38. (New) The process equipment of claim 37, wherein the sour NGL rich steam comprises no more than 5 molar percent carbon dioxide, no more than 1 molar percent methane, and no more than 1 molar percent ethane, and wherein the NGL rich stream is substantially free of carbon dioxide.

39. (New) The process equipment of claim 25, wherein carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon dioxide recycle stream prior to separating the recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream.

40. (New) The process equipment of claim 25, wherein the NGL rich stream comprises at least 90 molar percent C_{3+} hydrocarbons, wherein the NGL rich stream comprises from 20 molar percent to 35 molar percent of the C_{3+} hydrocarbons from the recycle stream, and wherein the purified carbon dioxide recycle stream comprises at least 94 molar percent of the carbon dioxide, at least 94 molar percent of the methane, and at least 93 molar percent of the ethane from the carbon dioxide recycle stream.

REMARKS/ARGUMENTS

Status of Claims

Claims 1-11, 14, and 21-28 stand rejected.

Claims 3, 5-8, and 14 are hereby canceled.

Claims 1, 2, 4, 9-11, 21, 22, 25, and 26 are currently amended.

Claims 29-40 are new.

Thus, claims 1, 2, 4, 9-11, and 21-40 are pending in this patent application.

The Applicant hereby requests further examination and reconsideration of the presently claimed application.

Double Patenting

Claims 1 and 10 stand as provisionally rejected on the grounds of statutory double patenting for claiming the same invention as claims 2 and 20 of copending Application No. 13/096,788 (*Prim*). Claims 1 and 10 have been amended to overcome the rejection.

Claim Rejections – 35 U.S.C. § 102

Claims 1, 10, and 25 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent 4,529,411 (*Goddin*). According to MPEP § 2131, " [a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." The Applicant respectfully asserts that *Goddin* fails to teach each and every element of independent claims 1, 10 and 25, and consequently fails to anticipate claims 1, 10 and 25.

Goddin fails to anticipate claims 1, 2, 4, and 9 because *Goddin* fails to teach that carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon

dioxide recycle stream prior to separating the carbon dioxide recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream. Claim 1 reads:

> 1. A method comprising:
> receiving a hydrocarbon feed stream;
> separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream;
> separating the carbon dioxide recycle stream into a natural gas liquids (NGL) rich stream and a purified carbon dioxide recycle stream,
> **wherein carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream**.

(Emphasis added). As shown above, claim 1 requires that carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream. The Examiner asserts that *Goddin's* stream 151 reads on the claimed hydrocarbon feed stream, *Goddin's* stream 170 reads on the claimed carbon dioxide recycle stream, and *Goddin's* separator 153 reads on the claimed separating the carbon dioxide recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream. *See* Office Action dated June 29, 2012 (*Office Action*), p. 3. However, *Goddin's* process removes carbon dioxide at two locations (his permeator 162 and his TEA absorber 174) prior to separating the carbon dioxide recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream:

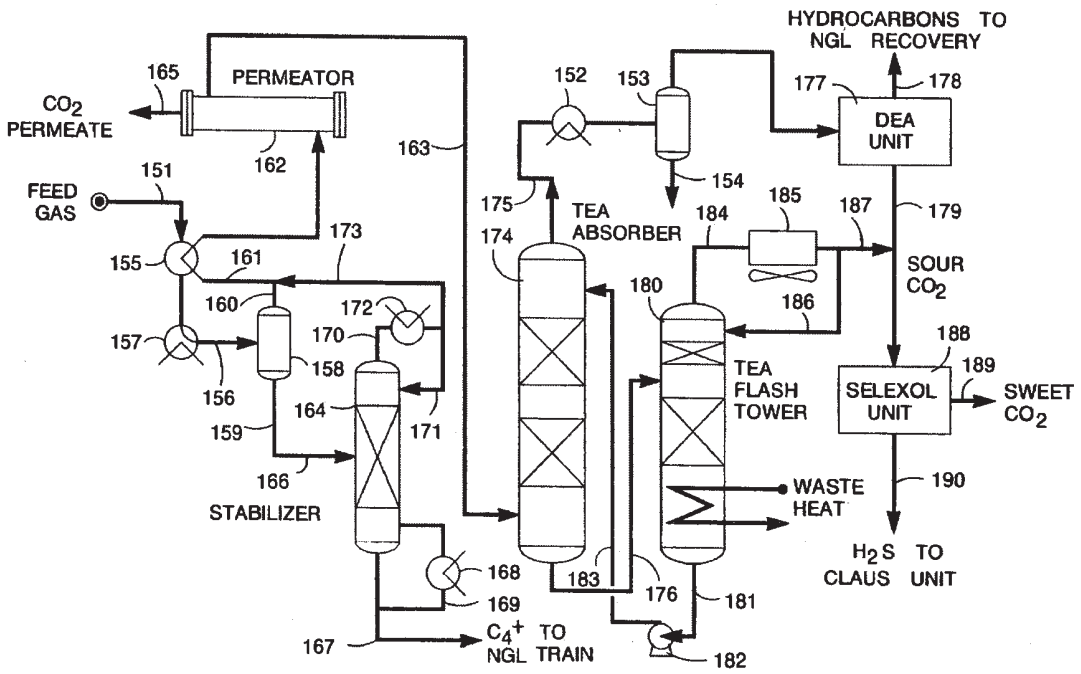


FIG.12

Permeator unit 162 separates combined stream 161 into a high purity CO_2 stream 165. The material balance across permeator 162 is, for example, as follows:

	Stream 161 Feed		Stream 163 Process		Stream 165 Permeate	
	Mols/hr	Mol%	Mols/hr	Mol%	Mols/hr	Mol%
N_2	15		14		1	
CO_2	6442	81.2	1803	55.8	4639	98.7
H_2S	12		6		6	
C_1	47		451		36	
C_2	304		292		12	
C_3	336		332		4	
C_4	209		207		2	
C_5+	130		129		1	
Total	7935		3234		4701	

In the illustrated embodiment of FIG. 12, the permeator 162 is designed to yield a hydrocarbon enriched process stream 163 with about 56 mol % CO_2 to be sent to TEA absorber 174. **The TEA absorber 174 is designed to remove CO_2 from its feed to yield an overhead vapor stream 175 containing about 20 mol % CO_2 at 160° F. and 330 psia**.

Goddin, FIG. 12; col. 19, ll. 24-39 & ll. 46-52 (emphasis added). As shown above, *Goddin's* process removes carbon dioxide at two locations (his permeator 162 and his TEA absorber 174) prior to separating the carbon dioxide recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream. Thus, *Goddin* fails to teach that carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream. As such, *Goddin* fails to teach each and every limitation of claim 1, and consequently fails to anticipate claims 1, 2, 4, and 9.

Goddin fails to anticipate claims 10, 11, and 21-24 because *Goddin* fails to teach that the hydrocarbon feed stream and the recycle stream are not subjected to cryogenic conditions, membranes, and solvents between being received and being separated into the NGL rich stream and the purified recycle stream. Claim 10 reads:

> 10. A plurality of process equipment configured to:
> receive a hydrocarbon feed stream comprising at least one C_{3+} hydrocarbon and a gas selected from the group consisting of carbon dioxide, nitrogen, air, and water;
> separate the hydrocarbon feed stream into a heavy hydrocarbon rich stream and the recycle stream; and
> separate the recycle stream into a natural gas liquid (NGL) rich stream and a purified recycle stream,
> **wherein the hydrocarbon feed stream and the recycle stream are not subjected to cryogenic conditions, membranes, and solvents between being received and being separated into the NGL rich stream and the purified recycle stream**.

(Emphasis added). As shown above, claim 10 requires that the hydrocarbon feed stream and the recycle stream are not subjected to cryogenic conditions, membranes, and solvents between being received and being separated into the NGL rich stream and the purified recycle stream. The Examiner asserts that *Goddin's* stream 151 reads on the claimed hydrocarbon feed stream,

Goddin's stream 170 reads on the claimed recycle stream, and *Goddin's* separator 153 reads on the claimed separating the recycle stream into the NGL rich stream and the purified recycle stream. *See Office Action*, p. 3. As discussed *supra*, *Goddin's* process subjects his recycle stream to a solvent (TEA) between separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and the recycle stream and separating the recycle stream into the NGL rich stream and the purified recycle stream. *Goddin*, FIG. 12 & col. 19, ll. 46-52. Thus, *Goddin* fails to teach that the hydrocarbon feed stream and the recycle stream are not subjected to cryogenic conditions, membranes, and solvents between being received and being separated into the NGL rich stream and the purified recycle stream. As such, *Goddin* fails to teach each and every limitation of claim 10, and consequently fails to anticipate claims 10, 11, and 21-24.

Goddin fails to anticipate claims 25-28 because *Goddin* fails to combine a carbon dioxide makeup stream from a source external to the process equipment with the purified carbon dioxide recycle stream. Claim 25 reads:

> 25. A plurality of process equipment configured to:
> receive a hydrocarbon feed stream;
> separate the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream;
> separate the carbon dioxide recycle stream into a natural gas liquids (NGL) rich stream and a purified carbon dioxide recycle stream;
> **combine a carbon dioxide makeup stream from a source external to the process equipment with the purified carbon dioxide recycle stream**; and
> subsequently inject the purified carbon dioxide recycle stream into a subterranean formation.

(Emphasis added). As shown above, claim 25 requires a carbon dioxide makeup stream from a source external to the process equipment to be combined with the purified carbon dioxide recycle stream. In contrast, *Goddin* never adds any carbon dioxide from an external source (e.g. a tank or pipeline) to his process:

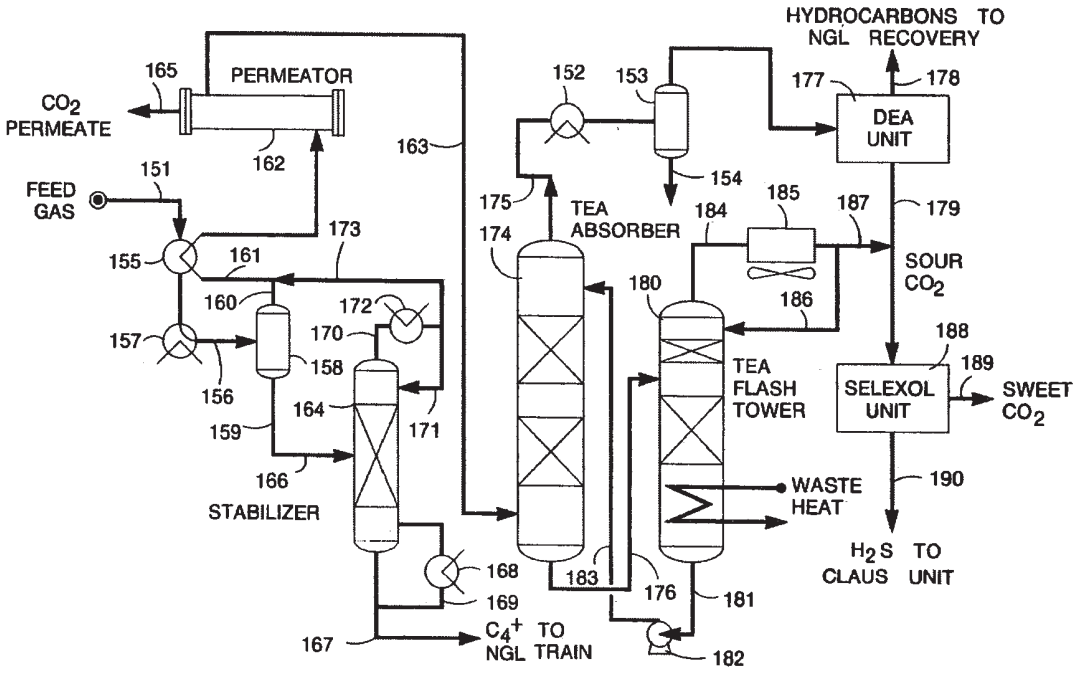


FIG.12

Goddin, FIG. 12. As shown above, *Goddin* never adds any carbon dioxide from an external source (e.g. a tank or pipeline) to his process. Thus, *Goddin* fails to combine a carbon dioxide makeup stream from a source external to the process equipment with the purified carbon dioxide recycle stream. As such, *Goddin* fails to teach each and every limitation of claim 25, and consequently fails to anticipate claims 25-28.

Claim Rejections – 35 U.S.C. § 103

Claims 2, 3, 5-9, 11, 14, and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Goddin* in view of U.S. Patent 6,128,919 (*Daus*). Claim 4 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over *Goddin* in view of U.S. Patent Application Publication 2008/0156035 (*Aspelund*). Claims 21-23 and 26-28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Goddin* in view of *Daus* and *Aspelund*. Claims 3, 5-8, and 14 have been canceled, claims 2, 4, and 9 depend from independent claim 1, claims 11, and 21-24

depend from independent claim 10, and claims 26-28 depend from independent claim 25. Claims 1, 10, and 25 are allowable over *Goddin* for the reasons described above, and neither *Daus* nor *Aspelund* make up for the shortcomings in *Goddin*. Thus, claims 2, 4, 9, 11, 21-24, and 26-28 are allowable over the cited prior art.

New Claims

New claims 29-40 recite novel and non-obvious aspects of the invention. Support for new claims 29-40 is found in the specification, thus no new matter is contained in these claims. Claims 29-31 depend from claim 1, claims 32-35 depend from claim 10, and claims 36-40 depend from claim 25. Claims 1, 10, and 25 are allowable over the cited art for the reasons stated above, thus claims 29-40 are also allowable over the cited prior art.

CONCLUSION

Consideration of the foregoing amendments and remarks, reconsideration of the application, and withdrawal of the rejections and objections is respectfully requested by the Applicant. No new matter is introduced by way of the amendment. It is believed that each ground of rejection raised in the Office Action dated June 29, 2012 has been fully addressed. If any fee is due as a result of the filing of this paper, please appropriately charge such fee to Deposit Account Number 50-1515 of Conley Rose, P.C., Texas. If a petition for extension of time is necessary in order for this paper to be deemed timely filed, please consider this a petition therefore.

If a telephone conference would facilitate the resolution of any issue or expedite the prosecution of the application, the Examiner is invited to telephone the undersigned at the telephone number given below.

Respectfully submitted,
CONLEY ROSE, P.C.

Date: 9/10/12

Grant Rodolph
Reg. No. 50,487

ATTORNEY FOR APPLICANT

5601 Granite Parkway, Suite 750
Plano, TX 75024
(972) 731-2288
(972) 731-2289 (Facsimile)

Electronic Patent Application Fee Transmittal

Application Number:	12122336
Filing Date:	16-May-2008
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Filer:	Grant Rodolph/Jerri Pearson
Attorney Docket Number:	2103-00902

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Claims in excess of 20	1202	6	60	360
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**360**

Electronic Acknowledgement Receipt

EFS ID:	13701214
Application Number:	12122336
International Application Number:	
Confirmation Number:	8617
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Customer Number:	30652
Filer:	Grant Rodolph/Jerri Pearson
Filer Authorized By:	Grant Rodolph
Attorney Docket Number:	2103-00902
Receipt Date:	10-SEP-2012
Filing Date:	16-MAY-2008
Time Stamp:	16:25:31
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$360
RAM confirmation Number	3888
Deposit Account	501515
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		2103-00902_response_06292012_OA.pdf	1775287 bd4fbafd16b88d520b2263c16740eff8db85424f	yes	19

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Claims	2	11
Applicant Arguments/Remarks Made in an Amendment	12	19

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	29798 9098fdd7ef3726aced9df2ae0cdaa4400a112533	no	2

Warnings:

Information:

Total Files Size (in bytes):	1805085

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/122,336	05/16/2008	Eric Prim	2103-00902	8617

30652 7590 02/21/2013

CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 750
PLANO, TX 75024

EXAMINER	
RAYMOND, KEITH MICHAEL	
ART UNIT	**PAPER NUMBER**
3744	

MAIL DATE	DELIVERY MODE
02/21/2013	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	12/122,336	PRIM, ERIC	
	Examiner	Art Unit	
	KEITH RAYMOND	3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 September 2012*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-4,9-11 and 21-40* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-4,9-11 and 21-40* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1 and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent number 4,529,411 Goddin, Jr. et al. (hereinafter Goddin) in view of U.S. patent number 6,128,919 Daus et al. (hereinafter Daus).

1. Regarding claims 1 , Goddin discloses a method comprising receiving a hydrocarbon feed stream **151 (figure 12)**, separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream **167** and a carbon dioxide recycle stream **170;** separating the carbon dioxide recycle stream **170, though 162 and 174 to DEA unit 177 (where it is then separated)** into a natural gas liquids (NGL) rich stream **154 (also, an NGL rich stream 154 is separated in separator 153)** and a purified carbon

dioxide recycle stream **179/189** and injecting the purified carbon dioxide recycle stream into a subterranean formation by stating "to produce sweet CO2 stream 189, having, for example, less than 100 ppm H2S, suitable for pipelining **and/or reinjection for CO2 miscible flooding" (**column 20, lines 26-34). Goddin does not explicitly disclose wherein carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream as Goddin provides additional steps that involve the removal of carbon dioxide from the stream before NGL separation. These separation steps, however, are merely additional steps to provide pure CO2 and are not required in the art as shown by Daus. Daus provides taking a stream with CO2 and NGL and separating out the NGL **(NGL recovery 32, figures 1-3)** without any prior CO2 separation. Daus shows that the additional processes provided by Goddin are not required for NGL recovery and the removal of CO2 from an NGL containing stream. It would have been obvious to one of ordinary skill in the art to utilize a simpler apparatus as provided by Daus with the CO2/NGL containing stream of Goddin (after heavy hydrocarbon removal) as less separation steps provide for a cheaper and smaller process.

2. Regarding claim 29, Goddin and Daus disclose the limitations of claim 1 above, Goddin further anticipates wherein the NGL rich stream comprises from 20 molar percent to 35 molar percent of the C3+ hydrocarbons from the recycle stream as can clearly be seen in the table at the bottom of column 19 wherein the C3, C4, and C5+ hydrocarbons in stream 154 are equal to roughly 27mol% of the C3, C4, and C5+

hydrocarbons in stream 175. Further Daus discloses that after the stream is sent though NGL recovery, the purified carbon dioxide stream **54 (after NGL recovery)** comprises at least 94 molar percent of the carbon dioxide, at least 94 molar percent of the methane, and at least 93 molar percent of the ethane from the carbon dioxide recycle stream **10 as shown in Table 1 (the NGL stream contains 0% of the CO2 and methane and only 0.008% ethane).** Duas discloses an NGL stream from the separator that has 0% methane and 0.008% ethane. It would have been obvious for one of ordinary skill in the art to utilize the same designed NGL recovery of Duas as the NGL recovery of Goddin in order to put out a purified carbon dioxide stream containing at least 94 molar percent of the carbon dioxide and methane and at least 93 molar percent of the ethane to create a favored composition of the NGL which is merely a design choice that is dependent on customer and pipeline specifications and does not constitute an inventive step. The compositions of NGL streams and carbon dioxide recycle streams are merely a feature of design and the separator in addition to the feed stream's temperature and pressure can be modified to reach these percentages. Overall, Duas shows that it is commonly achievable to separate out an NGL stream that has virtually no methane, ethane, and carbon dioxide which means these 3 elements have to be fully contained in the purified carbon dioxide stream.

3. Regarding claim 30, Daus discloses wherein separating the carbon dioxide recycle stream into the NGL rich stream and the purified carbon dioxide stream consists of separating the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream **(see table 1, column 7, NGL stream contains**

hydrogen sulfide). Again, the fact that hydrogen sulfide is contained in the NGL stream making it sour is not an inventive step in the art and is merely a result of the separation efficiency, temperature, and pressures of the feed streams and original composition of the feed stream.

4. Regarding claim 31, Daus discloses the sour NGL rich stream comprises no more than 5 molar percent carbon dioxide, no more than 1 molar percent methane, and no more than 1 molar percent ethane **(table 1, column 7) and wherein the NGL rich stream is substantially free of carbon dioxide (0.000%).**

5. Claims 4 and 9-11, 21-24, and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goddin and Daus as applied to claim 1 above, and further in view of U.S. Patent application publication 2008/0156035 Aspelund et al. (hereinafter Aspelund).

6. Regarding claim 4, Goddin discloses claim 1 above. He does not, however, explicitly disclose further comprising cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream. This is disclosed by Aspelund who states “the cooling units arrange to cool the fluid flow may **use recycled carbon dioxide as the cooling fluid**" (paragraph 23). It would have been obvious to one of ordinary skill in the art at the time of invention utilize the purified carbon dioxide to cool upstream streams though heat exchange as provided by Aspelund with the hydrocarbon and carbon dioxide separation facility provided by Goddin. Utilizing recycled streams is a common practice and is more efficient for upstream cooling or heating to avoid the utilization of

external refrigeration. Daus further discloses wherein the hydrocarbon feed stream and the carbon dioxide recycle stream are not subjected to cryogenic conditions membranes, and solvents between being received and being separated into the NGL rich stream and the purified carbon dioxide recycle stream stating providing an NGL separation step stating "**in the NGL recovery column 32, portions of the raw feed stream are liquefied to remove from the system hydrocarbon portions having a carbon content predominantly heavier than C3....the raw feed stream can be cooled to remove the heavier hydrocarbons by evaporating liquid refrigerant and bringing the resultant gaseous refrigerant into indirect heat exchange relationship with the raw feed stream in the column 32" (column 5).** The temperatures of this process are shown in table 1 wherein they are not cryogenic (85 degrees F) as cryogenic temperatures aren't required to remove NGL's from a stream. The substitution of a well-known separation process for another well-known separation process is not deemed an inventive step over the prior art. It would have been obvious to one of ordinary skill in the art to not utilize cryogenic conditions, membranes, and solvents to remove the NGL from the CO2 in order to save energy and avoid costly membranes and solvents for the separation of large amounts of CO2 in the feed stream (further see **H825 Green et al.** who describes the common process of cryogenic fractionation and solvents are not efficient with large amounts of CO2 and therefore proposes utilizing other methods (columns 1-3, Green)).

7. Regarding claim 9, **Daus discloses wherein the NGL rich stream comprises no more than about 5 percent acid gases, 1 percent methane, and 1 percent**

ethane (table 1, NGL column). Further, Goddin also states that "DEA unit 177 is functional for removal **of most all of the remaining CO2 to produce a lean sweet hydrocarbon stream 178 which can be further processed for NGL recovery" (column 20, lines 11-16).** Again, separating out a rich NGL stream with less than 5% acid gases, no more than 1 molar percent methane, and no more than 10 molar percent ethane is easily achievable to one of ordinary skill in the art at the time of invention. One of ordinary skill in the art at the time of invention would be able to utilize the processes of Duas to provide a pure NGL steam as provided in table 1 as the NGL stream of Goddin which is also a sweetened stream in order to provide for proper pipeline compositions and NGL recovery. (see further motivation to combine with respect to the rejection of claim 7 above).

8. Regarding claim 10, see the rejection of claims 1 and 4 above.

9. Regarding claim 11, Goddin, Daus, and Aspelund disclose the limitations of claim 10 above, the process equipment as discussed above with regards to claim 10 can be configured so the NGL rich stream comprises at least about 90% C3+ hydrocarbons. Membrane separators and NGL processing plants are known in the art to have the common abilities to separate out specific percentages dependent on the composition, temperature, and pressure of the feed stream. These claims include functional language for an apparatus that is provided by Goddin. Further, Duas discloses wherein the NGL rich stream comprises at least 90 molar percent C3+ hydrocarbons (see table 1). One of ordinary skill in the art at the time of invention can modify the temperatures and pressures of the separators to compose NGL rich streams of favored compositions and

one of ordinary skill in the art at the time of invention would be able to utilize the separator and membrane designs of Duas to provide an NGL stream of equal purity with the separation process of Goddin. a stream comprising at least 90 molar percent c3+ hydrocarbons is easily achievable in the art as shown by Goddin. Goddin further anticipates wherein the NGL rich stream comprises from 20 molar percent to 35 molar percent of the C3+ hydrocarbons from the recycle stream as can clearly be seen in the table at the bottom of column 19 wherein the C3, C4, and C5+ hydrocarbons in stream 154 are equal to roughly 27mol% of the C3, C4, and C5+ hydrocarbons in stream 175. Further Daus discloses that after the stream is sent though NGL recovery, the purified carbon dioxide stream **54 (after NGL recovery)** comprises at least 94 molar percent of the carbon dioxide, at least 94 molar percent of the methane, and at least 93 molar percent of the ethane from the carbon dioxide recycle stream **10 as shown in Table 1 (the NGL stream contains 0% of the CO2 and methane and only 0.008% ethane).** Duas discloses an NGL stream from the separator that has 0% methane and 0.008% ethane. It would have been obvious for one of ordinary skill in the art to utilize the same designed NGL recovery of Duas as the NGL recovery of Goddin in order to put out a purified carbon dioxide stream containing at least 94 molar percent of the carbon dioxide and methane and at least 93 molar percent of the ethane to create a favored composition of the NGL which is merely a design choice that is dependent on customer and pipeline specifications and does not constitute an inventive step. The compositions of NGL streams and carbon dioxide recycle streams are merely a feature of design and the separator in addition to the feed stream's temperature and pressure can be modified

to reach these percentages. Overall, Duas shows that it is commonly achievable to separate out an NGL stream that has virtually no methane, ethane, and carbon dioxide which means these 3 elements have to be fully contained in the purified carbon dioxide stream.

10. Regarding claim 24, **Daus discloses wherein the NGL rich stream comprises no more than about 5 percent acid gases, 1 percent methane, and 1 percent ethane (table 1, NGL column).** Further, Goddin also states that "DEA unit 177 is functional for removal **of most all of the remaining CO2 to produce a lean sweet hydrocarbon stream 178 which can be further processed for NGL recovery" (column 20, lines 11-16).** Again, separating out a rich NGL stream with less than 5% acid gases, no more than 1 molar percent methane, and no more than 10 molar percent ethane is easily achievable to one of ordinary skill in the art at the time of invention. One of ordinary skill in the art at the time of invention would be able to utilize the processes of Duas to provide a pure NGL steam as provided in table 1 as the NGL stream of Goddin which is also a sweetened stream in order to provide for proper pipeline compositions and NGL recovery. (see further motivation to combine with respect to the rejection of claim 7 above).

11. Regarding the limitations of claim 32, see the rejection of claim 30 above.

12. Regarding claim 21, Goddin does not explicitly disclose separating the carbon dioxide recycle stream into a purified carbon dioxide recycle stream and a sour NGL rich stream and sweetening the sour NGL rich stream, thereby producing the NGL rich stream, however, Goddin does provide for the common method of sweetening process

streams providing a Selexol unit 188 to provide sweet CO2 by removing H2S. Further, hydrocarbons for NGL recovery are sweetened in DEA Unit 177 stating "DEA unit 177 is functional for removal of most of the remaining CO2 to produce a **lean sweet hydrocarbon stream 178 which can be further processed for NGL recovery" (column 20, lines 11-16).** The sweeting process is well known in the art to one of ordinary skill at the time of invention and can easily be applied to other process streams including an NGL rich stream. The sweetening process simple involves acid gases which is a well-known process. Further Daus discloses separating a carbon dioxide recycle stream **10** (column 3, lines 44-46) into a natural gas liquids (NGL) rich stream **38** and a purified carbon dioxide recycle stream **54.** Although he does not explicitly disclose sweetening of the NGL stream, he does mention processes of removing the sour gases from process streams including hydrogen sulfide and carbon dioxide from stream **64** by stating "for example, where the raw feed gas contains hydrogen sulfide in amounts less than about 5%, the hydrogen sulfide can either be removed before dehydration, **or it will permeate along with the carbon dioxide and can be removed from the product gas streams by downstream treating processes"** (column 9, lines 6-15) The NGL is naturally sweetened by the separation process that removes the CO2, however, if sour gases are not fully removed, it is well known in the art at the time of invention to utilize a sweetening process to remove acid gases. It would have been obvious to one of ordinary skill in the art at the time of invention to utilize a sweetening process as provided by both Daus and Goddin to sweeten any process stream including a sour NGL rich stream. Duas further discloses further comprising cooling the sour

stream **82** prior to sweetening the sour stream **20**; and throttling **68** the sour stream prior to sweetening the sour stream **20 (fig 1)**. It is obvious to one skill in the art at the time of invention that the second membrane removes sour gases like hydrogen sulfide as disclosed by Duas (column 9, lines 5-14). Further throttling and cooling are common hydrocarbon processes before purification as Duas discloses "altering the temperature and pressure of the first nonpermeate stream to preselected values of a second stage membrane and forming a second altered feed stream" (column 9, lines 37-39). The temperatures and pressures are merely design choices dependent on the contents of the feed stream and what is being removed by the membrane or separator. It would have been obvious to one skilled in the art at the time of invention that altering the temperatures and pressures of the first stream may require cooling and throttling as these are common process tools. Further it would have been obvious to utilize the sweetening, cooling, and expanding process of Duas on a sour NGL stream if required. Again, the sweetening process is well known in the art as shown by Duas and can easily be applied to other process streams requiring sweetening, for example the NGL stream of Goddin is sweetened in the DEA. Goddin and Duas do not disclose cooling the recycle stream using the purified recycle stream. This is disclosed by Aspelund (see the rejection of claim 4 above).

13. Regarding claim 22, Goddin does not explicitly disclose compressing the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream and dehydrating the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream, however this is disclosed by Daus who provides **(figure 2) that a**

carbon dioxide stream can be compressed (26) and dehydrated (30) before being separated into NGL and a purified CO2 stream (in NGL recovery 32). It would have been obvious to utilize compression and dehydration as provided by Daus with the separation apparatus of Goddin to provide proper pressures and temperatures for the separation of NGL's and further to remove water as water may freeze during the NGL recovery and further effect either the separation or the purity of the product streams. Regarding not being subjected to cryogenic conditions, membranes, and solvents, this has already been addressed with respect to independent claim 10 above (referencing claim 4).

14. Regarding claim 23, although some of the limitations of stream composition are not explicitly provided by Goddin, Daus, and Aspelund, the stream composition is merely a matter of functional language in an apparatus claim. Since Goddin, Daus, and Aspelund disclose the entire method of the parent claims in addition to all of the process equipment previously disclosed, one of ordinary skill in the art could utilize the process equipment to separate stream composition exactly as described by applicant. There is no inventive step provided to separate the stream to specific purities and all of the purities claimed are within the means of one of ordinary skill in the art at the time of invention as the same apparatus of process equipment has been previously disclosed. Stream composition and purity is a matter of feed stream composition, the quality of the raw gas being removed by EOR, and design temperatures and pressures of the separators.

15. Regarding claim 33, **Daus discloses wherein the NGL rich stream comprises no more than about 5 percent acid gases, 1 percent methane, and 1 percent ethane (table 1, NGL column).** Further, Goddin also states that "DEA unit 177 is functional for removal **of most all of the remaining CO2 to produce a lean sweet hydrocarbon stream 178 which can be further processed for NGL recovery" (column 20, lines 11-16).** Again, separating out a rich NGL stream with less than 5% acid gases, no more than 1 molar percent methane, and no more than 10 molar percent ethane is easily achievable to one of ordinary skill in the art at the time of invention. One of ordinary skill in the art at the time of invention would be able to utilize the processes of Duas to provide a pure NGL steam as provided in table 1 as the NGL stream of Goddin which is also a sweetened stream in order to provide for proper pipeline compositions and NGL recovery. (see further motivation to combine with respect to the rejection of claim 7 above).

16. Regarding claim 34, see the rejection of claim 1 above addressing wherein carbon dioxide is not removed from the hydrocarbon feed stream and the recycle stream prior to separating the recycle stream into the NGL rich stream and the purified recycle stream.

1. Claims 2, 25, 28, and 36-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goddin and Daus as applied to claims 1 and 10 above and further in view of U.S. Patent application publication number 2003/0161780 Howard et al. (hereinafter Howard).

2. Regarding claim 2, Goddin does disclose injecting the purified carbon dioxide recycle stream into a subterranean formation (column 20, lines 26-34). Goddin does not explicitly disclose compressing the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream and dehydrating the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream, however this is disclosed by Daus who provides **(figure 2) that a carbon dioxide stream can be compressed (26) and dehydrated (30) before being separated into NGL and a purified CO2 stream (in NGL recovery 32).** It would have been obvious to utilize compression and dehydration as provided by Daus with the separation apparatus of Goddin to provide proper pressures and temperatures for the separation of NGL's and further to remove water as water may freeze during the NGL recovery and further effect either the separation or the purity of the product streams. Goddin and Daus do not explicitly disclose combining a carbon dioxide makeup stream external to the method with the purified carbon dioxide recycle stream prior to injection. Utilizing additional carbon dioxide from a source outside process equipment is well-known in the art and further is disclosed by Howard. Howard provides for CO2 makeup **20 (figure 2) that is mixed with other process streams containing CO2.** It would have been obvious to one of ordinary skill in the art

at the time of invention to utilize a CO2 makeup stream external to the apparatus as provided by Howard with the separation apparatuses of Goddin and Daus in order to provide a higher purity carbon dioxide for reinjection (see abstract of Howard).

3. Regarding claim 25, Goddin and Daus disclose receiving a hydrocarbon feed stream, separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream; separating the carbon dioxide recycle stream into NGL rich stream and a purified carbon dioxide recycle stream (see rejection of independent claim 10 above). Goddin further discloses injecting the purified carbon dioxide recycle stream into a subterranean formation stating "to produce sweet CO2 stream 189, having, for example less than 100 ppm H2S, suitable for pipelining **and/or reinjection for CO2 miscible flooding"** (column 20, lines 26-34). They do not explicitly disclose combining a carbon dioxide makeup stream from a source external to the process equipment with the purified carbon dioxide recycle stream. Utilizing additional carbon dioxide from a source outside process equipment is well-known in the art and further is disclosed by Howard. Howard provides for CO2 makeup **20 (figure 2) that is mixed with other process streams containing CO2.** It would have been obvious to one of ordinary skill in the art at the time of invention to utilize a CO2 makeup stream external to the apparatus as provided by Howard with the separation apparatuses of Goddin and Daus in order to provide a higher purity carbon dioxide for reinjection (see abstract of Howard).

4. Regarding claim 28, although some of the limitations of stream composition are not explicitly provided by Goddin, Duas, and Howard, the stream composition is merely

a matter of functional language in an apparatus claim. Since Goddin, Duas, and Aspelund disclose the entire method of the parent claims in addition to all of the process equipment previously disclosed, one of ordinary skill in the art could utilize the process equipment to separate stream composition exactly as described by applicant. There is no inventive step provided to separate the stream to specific purities and all of the purities claimed are within the means of one of ordinary skill in the art at the time of invention as the same apparatus of process equipment has been previously disclosed. Stream composition and purity is a matter of feed stream composition, the quality of the raw gas being removed by EOR, and design temperatures and pressures of the separators.

5. Regarding claim 36, the limitations have previously been taught by the prior art (see the rejection of claims 4 and 10 above).

6. Regarding claim 37, the limitations have previously been taught in this rejection (see the rejection of claims 30 and 32 above).

7. Regarding claim 38, the limitations have previously been taught in this rejection (see the rejection of claims 9 and 24 above).

8. Regarding claim 39, see the rejection of claim 1 regarding not removing CO2 prior to separating the recycle stream into the NGL rich stream and the purified carbon dioxide recycle stream.

9. Regarding claim 40, see the rejection of claims 11 and 29 above.

10. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Goddin, Daus, and Aspelund as applied to claim 22 above and further in view of U.S. Patent application publication number 2003/0161780 Howard et al. (hereinafter Howard).

11. Regarding claim 35, see the rejection of claim 25 above wherein Howard further teaches utilizing a makeup CO2 stream from a source external to the process equipment. Further Goddin discloses injecting the purified recycle stream into a subterranean formation (rejection of claim 25 above).

12. Claims 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goddin, Daus, and Howard as applied to claim 25 above and further in view of Aspelund.

13. Regarding claim 26, Goddin, Daus, and Howard disclose the limitations of claim 25 above. Daus further discloses **(figure 2) that a carbon dioxide stream can be compressed (26) and dehydrated (30) before being separated into NGL and a purified CO2 stream (in NGL recovery 32).** It would have been obvious to utilize compression and dehydration as provided by Daus with the separation apparatus of Goddin to provide proper pressures and temperatures for the separation of NGL's and further to remove water as water may freeze during the NGL recovery and further effect either the separation or the purity of the product streams. Goddin, Daus, and Howard do not explicitly disclose cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream. This, however, is disclosed by Aspelund (see the rejection of claim 4 above).

17. Regarding claim 27, Regarding claim 21, Goddin does not explicitly disclose separating the carbon dioxide recycle stream into a purified carbon dioxide recycle stream and a sour NGL rich stream and sweetening the sour NGL rich stream, thereby producing the NGL rich stream, however, Goddin does provide for the common method of sweetening process streams providing a Selexol unit 188 to provide sweet CO2 by removing H2S. Further, hydrocarbons for NGL recovery are sweetened in DEA Unit 177 stating "DEA unit 177 is functional for removal of most of the remaining CO2 to produce a **lean sweet hydrocarbon stream 178 which can be further processed for NGL recovery" (column 20, lines 11-16).** The sweeting process is well known in the art to one of ordinary skill at the time of invention and can easily be applied to other process streams including an NGL rich stream. The sweetening process simple involves acid gases which is a well-known process. Further Daus discloses separating a carbon dioxide recycle stream **10** (column 3, lines 44-46) into a natural gas liquids (NGL) rich stream **38** and a purified carbon dioxide recycle stream **54.** Although he does not explicitly disclose sweetening of the NGL stream, he does mention processes of removing the sour gases from process streams including hydrogen sulfide and carbon dioxide from stream **64** by stating "for example, where the raw feed gas contains hydrogen sulfide in amounts less than about 5%, the hydrogen sulfide can either be removed before dehydration, **or it will permeate along with the carbon dioxide and can be removed from the product gas streams by downstream treating processes"** (column 9, lines 6-15) The NGL is naturally sweetened by the separation process that removes the CO2, however, if sour gases are not fully removed, it is well

known in the art at the time of invention to utilize a sweetening process to remove acid gases. It would have been obvious to one of ordinary skill in the art at the time of invention to utilize a sweetening process as provided by both Daus and Goddin to sweeten any process stream including a sour NGL rich stream. Duas further discloses further comprising cooling the sour stream **82** prior to sweetening the sour stream **20**; and throttling **68** the sour stream prior to sweetening the sour stream **20 (fig 1)**. It is obvious to one skill in the art at the time of invention that the second membrane removes sour gases like hydrogen sulfide as disclosed by Duas (column 9, lines 5-14). Further throttling and cooling are common hydrocarbon processes before purification as Duas discloses “altering the temperature and pressure of the first nonpermeate stream to preselected values of a second stage membrane and forming a second altered feed stream” (column 9, lines 37-39). The temperatures and pressures are merely design choices dependent on the contents of the feed stream and what is being removed by the membrane or separator. It would have been obvious to one skilled in the art at the time of invention that altering the temperatures and pressures of the first stream may require cooling and throttling as these are common process tools. Further it would have been obvious to utilize the sweetening, cooling, and expanding process of Duas on a sour NGL stream if required. Again, the sweetening process is well known in the art as shown by Duas and can easily be applied to other process streams requiring sweetening, for example the NGL stream of Goddin is sweetened in the DEA. Goddin and Duas do not disclose cooling the recycle stream using the purified recycle stream. This is disclosed by Aspelund (see the rejection of claim 4 above).

Response to Arguments

18. Applicant's arguments with respect to claims 1, 10, and 25 have been considered but are moot because the arguments do not apply to the new rejection above, necessitated by amendment.

Conclusion

1. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEITH RAYMOND whose telephone number is (571)270-1790. The examiner can normally be reached on Monday through Thursday 8:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frantz Jules can be reached on 571-273-6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/KEITH RAYMOND/
Examiner, Art Unit 3744

/Frantz F. Jules/

Supervisory Patent Examiner, Art Unit 3744

Notice of References Cited	Application/Control No. 12/122,336	Applicant(s)/Patent Under Reexamination PRIM, ERIC	
	Examiner KEITH RAYMOND	Art Unit 3744	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2003/0161780	08-2003	Howard et al.	423/437.1
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12122336	PRIM, ERIC
	Examiner	Art Unit
	KEITH RAYMOND	3744

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
62	617, 618, 620, 622	10/20/2011	kraymond
585	818, 802, 833, 837	06/19/2012	kraymond

SEARCH NOTES		
Search Notes	Date	Examiner
inventor search	10/20/2011	kraymond
PLUS SEARCH	10/21/2011	kraymond
Consulted Lukas Baldridge	10/21/2011	kraymond
UPDATED SEARCH (SEE ATTACHED EAST SEARCH HISTORY)	02/08/2013	KR

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/KEITH RAYMOND/ Examiner.Art Unit 3744	

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	"4529411".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/09 13:22
L2	1	"20030161780"	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/09 13:56
L3	0	"compressor" with "dehyrator" and (CO2 or "carbon dioxide") and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/09 14:13
L4	0	"compressor" with "dehyrator" and (CO2 or "carbon dioxide")	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/09 14:13
L5	73	"compressor" with "dehydrator" and (CO2 or "carbon dioxide")	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/09 14:14
L6	3	"compressor" with "dehydrator" and (CO2 or "carbon dioxide") and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/09 14:14
S1	119	62/618.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:18
S2	411	62/620.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:19
S3	303	62/617.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:19
S4	17	("4136738", "4374657", "4441900", "4451275", "4529411", "4563202", "4595404", "4664190", "4683948", "4762543", "4765407", "5019279", "5411721", "6128919", "6505683", "6648944", "6915662").pn.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:20
S5	2061	injection with (subterranean adj formation)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S6	790	injection with (subterranean adj formation) and (carbon adj dioxide)	US-PGPUB; USPAT;	OR	ON	2011/10/20 17:23

			USOCR			
S7	78	injection with (subterranean adj formation) with (carbon adj dioxide)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S8	1	"12122336"	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S10	13	prim-eric.in.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:26
S12	50	("20110197629" "4964980" "4459142" "4889545" "5335504" "5881569" "6190540" "7219513" "20060283207" "20090301133" "20100011810" "20100043488" "5345772" "4318723" "4451275" "4466946" "4529411" "4857078" "4869740" "5555748" "5669958" "5771712" "5799507" "5879431" "5890378" "5964923" "5983664" "6035641" "6109061" "6182469" "6516631" "6526777" "6610124" "6648944" "6823692" "6889523" "6915662" "7806965" "7883569" "7914606" "7955420" "8007571" "20020065446" "20030029190" "20040177646" "20080302012" "20080302239" "20080302240" "20080305019" "20080307706").pn.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 10:25
S13	46	("20110197629" "20100179232" "20100219061" "6180684" "6040460" "6274096" "7192468" "7662215" "20050000360" "20080107581" "20100083697" "20110064648" "20110088896" "20110088897" "20110064648" "20110088896" "20110088897" "20090255294" "20110056237" "20110056237" "4094767" "20090324458" "20090324459" "20090324460" "20090324461" "20090324462" "20090248174" "20100069515" "4043897" "5952523" "5021232" "7294172" "4261420" "4747858" "6401486" "6604380" "7165423" "20060042312" "20090165498" "3664091" "3677534" "4348486" "4483834" "4542114" "4963339" "4999030" "5000925" "5173513" "6736955" "7235677").pn.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 10:25
S14	51	("4130403" | "4374657" | "4466946" | "4511382" | "4529411" | "4595405" | "4599096" | "4602477" | "4639257" | "4654063" | "4681612" | "4687498" | "4689062" | "4718921" | "4755193" | "4793841" | "4857078" | "4936887" | "5002590" | "5013338" | "5067971" | "5071451" | "5089033" | "5199962" | "5205843" | "5240472" | "5281255" |	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 12:01

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S15	350	62/622,928,929.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 14:00
S16	1167	62/617-638.ccls. and ((carbon adj dioxide) or CO2)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 14:01
S17	18	62/617-638.ccls. and ((carbon adj dioxide) or CO2) and NGL and sour	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 14:01
S18	1	"13096788"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:42
S19	751	62/618-620.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:49
S20	430	62/630-631.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:50
S23	226	62/928-929.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:51
S24	143	62/929.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:51
S25	25	"carbon dioxide reinjection"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:54
S26	408	"C9 hydrocarbon"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:43
S27	5	"C9 hydrocarbon" with separation	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:44
S28	784	"heavy hydrocarbon" with separation	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:46
S29	0	"heavy hydrocarbon" with separation with C9	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:46
S30	1	"heavy hydrocarbon" with separation with C8	US-PGPUB; USPAT;	OR	ON	2012/03/07 16:46

			USOCR			
S31	17	C9 with hydrocarbons with (removal or separation)	DERWENT	OR	ON	2012/03/08 10:06
S32	34	"5467722"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/08 15:49
S33	1	"5467722".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/08 15:49
S34	33	("5133190" | "5321946").PN. OR ("5467722").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/08 15:49
S35	1	"12605249"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/09 11:05
S37	1	"12605249"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/09 11:06
S38	1	"12605240"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/09 11:07
S39	128	62/618.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
S40	432	62/620.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
S41	343	62/617.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
S42	344	(S39 S40 S41) and oil	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
S43	220	(S39 S40 S41) and oil and "carbon dioxide"	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
S44	62	ngl and eor	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:36
S45	2	("2009/0100754").URPN.	USPAT	OR	OFF	2012/06/02 10:54
S46	49	("20020007733" | "20050172807" | "20050217479" | "20060283207" | "20070180855" | "20070208432" | "2475957" | "2886405" | "3130026" | "3791157" | "4061481" | "4140504" |	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/02 10:55

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S47	92	("2065112" | "2143283" | "2159434" | "2377966" | "2399142" | "2583601" | "2786652" | "2970106" | "3137654" | "3250080" | "3286778" | "3612192" | "4119417" | "4130403" | "4136747" | "4161222" | "4181675" | "4238211" | "4264338" | "4374657" | "4386944" | "4417449" | "4435191" | "4466946" | "4477419" | "4529411" | "4542010" | "4548619" | "4589896" | "4597777" | "4599096" | "4602477" | "4639257" | "4659343" | "4690695" | "4701187" | "4717395" | "4759780" | "4781907" | "4797141" | "4871378" | "4894068" | "4936887" | "4960579" | "4990168" | "5032148" | "5090971" | "5102432" | "5207806" | "5233837" | "5234471" | "5275640" | "5282968" | "5282969" | "5314528" | "5388650" | "5411721" | "5445669" | "5482539" | "B15388650").PN. OR ("6128919").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/02 10:58
S50	1	"5685173".pn.	USPAT	OR	OFF	2012/06/05 11:57
S51	0	"20030051504"	USPAT	OR	OFF	2012/06/05 11:57
S52	1	"20030051504"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/05 11:58
S53	1	"6397631"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/05 11:58
S54	1	"12195450"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/05 11:59
S56	20	"LNG" and "carbon dioxide" and "reinjection" and "62".clas.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/05 12:00
S57	43	"LNG" and "carbon dioxide" and "reinjection"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/14 11:16
S58	1	sweetening with "ngl rich stream"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/14 11:24

S59	93	("2065112" | "2143283" | "2159434" | "2377966" | "2399142" | "2583601" | "2786652" | "2970106" | "3137654" | "3250080" | "3286778" | "3612192" | "4119417" | "4130403" | "4136747" | "4161222" | "4181675" | "4238211" | "4264338" | "4374657" | "4386944" | "4417449" | "4435191" | "4466946" | "4477419" | "4529411" | "4542010" | "4548619" | "4589896" | "4597777" | "4599096" | "4602477" | "4639257" | "4659343" | "4690695" | "4701187" | "4717395" | "4759780" | "4781907" | "4797141" | "4871378" | "4894068" | "4936887" | "4960579" | "4990168" | "5032148" | "5090971" | "5102432" | "5207806" | "5233837" | "5234471" | "5275640" | "5282968" | "5282969" | "5314528" | "5388650" | "5411721" | "5445669" | "5482539" | "B15388650").PN. OR ("6128919").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 11:18
S60	24	h825	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:15
S61	0	(green with joe).in. and (morgan).in.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:19
S62	0	(green with joe).in. and (morgan).in.	US-PGPUB; USPAT; USOCR; FPRS	OR	OFF	2012/06/15 14:19
S63	12	(green with joe).in.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:19
S64	600	"carbon dioxide" and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:19
S65	1	"6128919".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:20
S66	0	53/22.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:26
S67	0	53/022.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:26
S68	437	95/51.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:28
S69	17	95/51.ccls. and ngl	US-PGPUB;	OR	OFF	2012/06/15 14:28

			USPAT; USOCR			
S70	24	h825	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:02
S71	15	h825 and green	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:03
S72	1	h825 and green and freeman	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:03
S73	7	h825 and ngl	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:03
S74	1	"7853569".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:04
S75	0	000H825.pn.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:05
S76	0	00H825.pn.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:05
S77	0	00H825	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:05
S78	1	"7883569".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:05
S79	1	"sour ngl rich"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:08
S80	2	"sour ngl"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:08
S81	1	"7777088".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:36
S82	1476	585/818,802,833,837.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:39
S83	23	585/818,802,833,837.ccls. and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:40

S84	2	"20060156035"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/19 11:50
S85	1	"20080156035"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/19 11:50
S86	18	("20080156035" | "4136738" | "4374657" | "4441900" | "4451275" | "4529411" | "4563202" | "4595404" | "4664190" | "4683948" | "4762543" | "4765407" | "5019279" | "5411721" | "6128919" | "6505683" | "6648944" | "6915662").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 10:32
S87	442	"three-phase separator"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 10:33
S88	30	"three-phase separator" and lng	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 10:33
S89	349	62/630.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 14:04
S90	26	"Ngl separation"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 15:57
S91	0	"Ngl separation" and "reid vapor pressure"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:00
S92	1400	"reid vapor pressure"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:00
S93	13	"reid vapor pressure" and ngl	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:00
S94	1	"light ngl" with psig	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:16
S95	24	"ngl" with psig	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:16
S96	3981	"250 psig"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:19
S97	40	"250 psig" and ngl	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:19
S98	40	"250 psig" and ngl	US-	OR	ON	2012/07/11

			PGPUB; USPAT; USOCR			16:19
S99	1	"13096788"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 10:35
S100	0	"make-up ngl"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 11:50
S101	628	"make-up stream"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 11:50
S102	7	"make-up stream" and ngl	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 11:50
S103	2	"20080016909"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 12:02
S104	7	"ngl reflux"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 13:27
S105	180	"debutanizer" and "depropanizer" and "deethanizer"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 14:38
S106	25	"debutanizer" and "depropanizer" and "deethanizer" and ngl	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 14:38
S107	1	"4529411".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/16 10:42
S108	15	("make up" or "makeup" or make-up) with (CO2 or "carbon dioxide") and lng	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/08 16:10
S109	389	"makeup stream"	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/08 16:14
S110	10	"makeup stream" with (CO2 or "carbon dioxide")	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/08 16:14
S111	6	("20040127759" | "20050113623" | "6781014" | "6846951" | "7199276").PN. OR ("7470811").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/08 16:17
S112	1327	"CO2 injection" or "carbon dioxide injection"	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/08 16:36

S113	26	("CO2 injection" or "carbon dioxide injection") and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/08 16:36

EAST Search History (Interference)

<This search history is empty>

2/9/2013 2:44:36 PM
C:\Users\kraymond\Documents\EAST\Workspaces\12122336.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12122336	PRIM, ERIC
	Examiner	Art Unit
	KEITH RAYMOND	3744

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	10/20/2011	06/19/2012	02/08/2013						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	-						
	6	✓	✓	-						
	7	✓	✓	-						
	8	✓	✓	-						
	9	✓	✓	✓						
	10	✓	✓	✓						
	11	✓	✓	✓						
	12	✓	-	-						
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	14	✓	✓	-						
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	19	N	-	-						
	20	N	-	-						
	21		✓	✓						
	22		✓	✓						
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	25		✓	✓						
	26		✓	✓						
	27		✓	✓						
	28		✓	✓						
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	30			✓						
	31			✓						
	32			✓						
	33			✓						
	34			✓						
	35			✓						
	36			✓						

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12122336	PRIM, ERIC
	Examiner	Art Unit
	KEITH RAYMOND	3744

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	10/20/2011	06/19/2012	02/08/2013						
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	38			✓						
	39			✓						
	40			✓						

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/122,336	05/16/2008	Eric Prim	2103-00902	8617

30652 7590 03/25/2013

CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 500
PLANO, TX 75024

EXAMINER	
RAYMOND, KEITH MICHAEL	
ART UNIT	**PAPER NUMBER**
3744	

MAIL DATE	DELIVERY MODE
03/25/2013	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Applicant-Initiated Interview Summary	Application No.	Applicant(s)	
	12/122,336	PRIM, ERIC	
	Examiner	Art Unit	
	KEITH RAYMOND	3744	

All participants (applicant, applicant's representative, PTO personnel):

(1) *KEITH RAYMOND*.

(2) *FRANTZ JULES*.

(3) *NICHOLAS BEAULIEU*.

(4) *GRANT RODOLPH*.

Date of Interview: *15 March 2013*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☒103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1, 10, AND 25,*.

Identification of prior art discussed: *4,529,411 AND 6,128,919*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

See Continuation Sheet.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/KEITH RAYMOND/ Examiner, Art Unit 3744	/Frantz F. Jules/ Supervisory Patent Examiner, Art Unit 3744

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: Discussed possible claim amendments to the independnet claims including adding the limitations of dependent claims. The addition of limitations from claims 21, 27, 30, 32, and 37 regarding a "sweetening" process was discussed in addition to the limitations from claims 23 AND 28 regarding separating out a "C9+ heavy hydrocarbon stream" from the feed stream before removal of NGL's. Examiner pointed out that although the prior art does not explicitly disclose the removal of C9+ hydrocarbons, these hydrocarbons would inherently be removed in the separation process with the C4+ hydrocarbon is Goddin (separator 164, figure 12). Examiner did recommend perhaps changing the wording of the limitations of dependENt claims 23 AND 28 before inclusion into the independent claimS including stating explicitly that a high percentge of C3-C8 hydrocarbons are maintained in the first CO2 recycle stream prior to NGL recovery while C9+ are separated out. Limitations of claim 4 was further discussed. Examiner pointed out that the line "between being received and being separated into the NGl rich stream and the purified carbon dioxide reycle stream" allows the prior art to be applicable to meeting the claim limitations and recommended removing said broadening line to show that cryogenic conditions, membranes, and solvents are not utilized anywhere in the process.

Examiner stated that a further search may be required depending on the changes made to the claims (one that can possible be done in after final before sending out of an advisory action) and no agreement on specific allowable material was made. .

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Eric Prim	§	
	§	Group Art Unit: 3784
Application No.: 12/122,336	§	
	§	Examiner: Keith Raymond
Filed: May 16, 2008	§	
	§	Confirmation No.: 8617
For: NATURAL GAS LIQUID RECOVERY PROCESS	§	
	§	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF EFS-WEB FILING

Pursuant to 37 C.F.R. §1.8, I hereby certify that this correspondence is being electronically submitted to the U.S. Patent and Trademark Office website, www.uspto.gov, on April 11, 2013.

Jerri Pearson

AMENDMENTS AND RESPONSE TO
FINAL OFFICE ACTION DATED FEBRUARY 21, 2013

Sir:

In response to the Final Office Action dated February 21, 2013, the Applicant respectfully requests the following amendments to the above-identified application. The changes made are shown by underlining the added text and striking through the deleted text.

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 15 of this paper.

AMENDMENTS TO THE CLAIMS

Listing of claims:

1. (Currently Amended) A method comprising:

receiving a hydrocarbon feed stream, wherein the hydrocarbon feed stream comprises carbon dioxide, natural gas liquid (NGL), heavy hydrocarbons, and acid gas, wherein the NGL comprises C_3-C_8 hydrocarbons, and wherein the heavy hydrocarbons comprise C_{9+} hydrocarbons; ~~stream;~~

separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream, wherein the heavy hydrocarbon rich stream comprises the C_{9+} hydrocarbons, and wherein the carbon dioxide recycle stream comprises the carbon dioxide, the C_3-C_8 hydrocarbons, and the acid gas; ~~stream;~~

separating the carbon dioxide recycle stream into a sour NGL ~~natural gas liquids (NGL)~~ rich stream and a purified carbon dioxide recycle stream, wherein the sour NGL rich stream comprises the C_3-C_8 hydrocarbons and the acid gas, and wherein the purified carbon dioxide recycle stream comprises the carbon dioxide; and ~~stream,~~

separating the sour NGL rich stream into a sweet NGL rich stream and an acid gas stream, wherein the sweet NGL rich stream comprises the C_3-C_8 hydrocarbons, and wherein the acid gas stream comprises the acid gas,

wherein the carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream, and ~~stream.~~

wherein the hydrocarbon feed stream, the carbon dioxide recycle stream, and the sour NGL rich stream are not subjected to cryogenic conditions, membranes, and carbon dioxide recovery

solvents between being received and being separated into the heavy hydrocarbon rich stream, the purified carbon dioxide recycle stream, the sweet NGL rich stream, and the acid gas stream.

2. (Currently Amended) The method of claim 1, further comprising:

compressing the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrating at least part of the carbon dioxide recycle stream using a dehydration solvent prior to separating the carbon dioxide recycle stream;

combining a carbon dioxide makeup stream external to the method with the purified carbon dioxide recycle stream ~~prior to injection~~; and

injecting the combined carbon dioxide makeup stream and the purified carbon dioxide recycle stream into a subterranean formation.

3. (Cancelled)

4. (Currently Amended) The method of claim 1, further comprising cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream. ~~stream, wherein the hydrocarbon feed stream and the carbon dioxide recycle stream are not subjected to cryogenic conditions, membranes, and solvents between being received and being separated into the NGL rich stream and the purified carbon dioxide recycle stream.~~

5. - 8. (Cancelled)

9. (Currently Amended) The method of claim 4, wherein the sweet NGL rich stream comprises no more than 1 molar percent methane, no more than ~~10~~ 1 molar percent ethane, and no more than ~~5~~ 1 molar percent acid gases.

10. (Currently Amended) A method comprising: ~~plurality of process equipment configured to:~~

receiving ~~receive~~ a hydrocarbon feed stream comprising at least one C_{3+} hydrocarbon, at least one C_{9+} hydrocarbon, acid gas, ~~hydrocarbon~~ and a gas selected from the group consisting of carbon dioxide, nitrogen, air, and water;

separating ~~separate~~ the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a ~~the~~ recycle stream, wherein the heavy hydrocarbon rich stream comprises most of the C_{9+} hydrocarbon in the hydrocarbon feed stream, wherein the recycle stream comprises most of the C_{3+} hydrocarbon and most of the acid gas in the hydrocarbon feed stream, and wherein the acid gas is selected from the group consisting of carbon dioxide, nitrogen, air, and water; ~~stream; and~~

separating ~~separate~~ the recycle stream into a sour natural gas liquid (NGL) rich stream and a purified recycle stream, wherein the sour NGL rich stream comprises some of the C_{3+} hydrocarbon and some of the acid gas in the recycle stream, and wherein the purified recycle stream comprises most of the C_{3+} hydrocarbon and most of the acid gas in the recycle stream; and

separating the sour NGL rich stream into a sweet NGL rich stream and an acid gas stream, wherein the sweet NGL rich stream comprises substantially all of the C_{3+} hydrocarbon in the sour NGL rich stream, and wherein the acid gas stream comprises substantially all of the acid gas in the sour NGL rich stream,

wherein the hydrocarbon feed stream, ~~stream and~~ the recycle stream, and the sour NGL rich stream are not subjected to cryogenic conditions, membranes, and carbon dioxide recovery

solvents between being received and being separated into the heavy hydrocarbon rich stream, the sweet NGL rich stream, ~~stream and~~ the purified recycle stream, and the acid gas stream, and ~~stream.~~

wherein carbon dioxide, nitrogen, and air are not removed from the hydrocarbon feed stream and are not removed from the recycle stream prior to separating the recycle stream into the sour NGL rich stream and the purified recycle stream.

11. (Currently Amended) The method ~~process equipment~~ of claim 10, wherein the sweet NGL rich stream comprises at least 90 molar percent C_{3+} hydrocarbons, wherein the sweet NGL rich stream comprises from 20 molar percent to ~~35~~ 40 molar percent of the C_{3+} hydrocarbons from the recycle stream, and wherein the purified ~~carbon dioxide~~ recycle stream comprises at least 94 molar percent of the carbon dioxide, at least 94 molar percent of the methane, and at least 93 molar percent of the ethane from the ~~carbon dioxide~~ recycle stream.

12. - 20. (Cancelled)

21. (Currently Amended) The method ~~process equipment~~ of claim 32, further comprising: ~~wherein the process equipment that is configured to separate the recycle stream is configured to:~~

~~separate the recycle stream into the purified recycle stream and a sour NGL rich stream;~~

cooling ~~cool~~ the sour NGL rich stream;

expanding ~~expand~~ the sour NGL rich stream; and

~~sweeten the sour NGL rich stream after cooling and expanding the sour NGL rich stream, thereby producing the NGL rich stream; and~~

cooling ~~cool~~ the recycle stream using the purified recycle stream.

22. (Currently Amended) The method ~~process equipment~~ of claim 21, further comprising: ~~wherein the process equipment is further configured to:~~

compressing ~~compress~~ the recycle stream prior to separating the recycle stream; and

dehydrating at least part of ~~dehydrate~~ the recycle stream using a dehydration solvent after separating the hydrocarbon feed stream and prior to separating the recycle stream. ~~stream,~~

~~wherein the hydrocarbon feed stream and the carbon dioxide recycle stream are not subjected to cryogenic conditions, membranes, and solvents between being received and being separated into the NGL rich stream and the purified carbon dioxide recycle stream.~~

23. (Currently Amended) The method ~~process equipment~~ of claim 22, wherein the heavy hydrocarbon rich stream comprises at least 90 molar percent of the C_{9+} hydrocarbons in the hydrocarbon feed stream, wherein the recycle stream comprises at least 90 molar percent of the carbon dioxide in the hydrocarbon feed stream, wherein the sweet NGL rich stream comprises at least ~~90~~ 60 molar percent of the C_{4+} hydrocarbons in the recycle stream, and wherein the purified ~~carbon dioxide~~ recycle stream comprises at least 90 molar percent of the carbon dioxide and at least 90 molar percent of the methane in the recycle stream.

24. (Currently Amended) The method ~~process equipment~~ of claim 11, wherein the sweet NGL rich stream comprises no more than 5 molar percent ethane and no more than 1 molar percent methane, and wherein the purified recycle stream comprises no more than ~~20~~ 10 molar percent C_{2+}.

25. (Currently Amended) A method comprising: ~~plurality of process equipment configured to:~~

receiving ~~receive~~ a hydrocarbon feed stream, wherein the hydrocarbon feed stream comprises carbon dioxide, natural gas liquid (NGL), and heavy hydrocarbons, wherein the NGL comprises C_3-C_8 hydrocarbons, and wherein the heavy hydrocarbons comprise C_{9+} hydrocarbons; ~~stream;~~

separating ~~separate~~ the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream, wherein the heavy hydrocarbon rich stream comprises most of the C_{9+} hydrocarbons in the hydrocarbon feed stream, and wherein the carbon dioxide recycle stream comprises most of the carbon dioxide and most of the C_3-C_8 hydrocarbons in the hydrocarbon feed stream; ~~stream;~~

separating ~~separate~~ the carbon dioxide recycle stream into a sour NGL ~~natural gas liquids (NGL)~~ rich stream and a purified carbon dioxide recycle stream, wherein the sour NGL rich stream comprises some of the C_3-C_8 hydrocarbons in the carbon dioxide recycle stream, and wherein the purified carbon dioxide recycle stream comprises most of the carbon dioxide in the carbon dioxide recycle stream; ~~stream;~~

separating the sour NGL rich stream into a sweet NGL rich stream and a carbon dioxide rich stream, wherein the sweet NGL rich stream comprises the substantially all of the C_3-C_8 hydrocarbons in the source NGL rich stream, and wherein the carbon dioxide rich stream comprises substantially all of the carbon dioxide in the sour NGL rich stream;

combining ~~combine~~ a carbon dioxide makeup stream from a source external to the method ~~process equipment~~ with the purified carbon dioxide recycle stream; and

subsequently injecting ~~inject~~ the combined carbon dioxide makeup stream and the purified carbon dioxide recycle stream into a subterranean formation, ~~formation.~~

wherein the carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream, and

wherein the hydrocarbon feed stream, the carbon dioxide recycle stream, and the sour NGL rich stream are not subjected to cryogenic conditions, membranes, and carbon dioxide recovery solvents between being received and being separated into the heavy hydrocarbon rich stream, the purified carbon dioxide recycle stream, the sweet NGL rich stream, and the carbon dioxide rich stream.

26. (Currently Amended) The method ~~process equipment~~ of claim 25, further comprising: ~~wherein the process equipment is further configured to:~~

compressing ~~compress~~ the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrating at least part of ~~dehydrate~~ the carbon dioxide recycle stream using a dehydration solvent after separating the hydrocarbon feed stream and prior to separating the carbon dioxide recycle stream; and

cooling ~~cool~~ the carbon dioxide recycle stream with the purified carbon dioxide recycle stream.

27. (Currently Amended) The method ~~process equipment~~ of claim 26, further comprising: ~~wherein the process equipment that is configured to separate the carbon dioxide recycle stream is configured to:~~

~~separate the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream;~~

cooling ~~cool~~ the sour NGL rich stream;

expanding ~~expand~~ the sour NGL rich stream; and

~~sweeten the sour NGL rich stream after cooling and expanding the sour NGL rich stream, thereby producing the NGL rich stream; and~~

cooling ~~cool~~ the carbon dioxide recycle stream using the purified carbon dioxide recycle stream.

28. (Currently Amended) The method ~~process equipment~~ of claim 25, wherein the heavy hydrocarbon rich stream comprises at least 90 molar percent of the C_{9+} hydrocarbons in the hydrocarbon feed stream, wherein the carbon dioxide recycle stream comprises at least 90 molar percent of the carbon dioxide in the hydrocarbon feed stream, wherein the sweet NGL rich stream comprises at least ~~90~~ 60 molar percent of the C_{4+} hydrocarbons in the carbon dioxide recycle stream, wherein the sweet NGL rich stream comprises no more than 5 molar percent ethane and no more than 1 molar percent methane, wherein the purified carbon dioxide recycle stream comprises at least 90 molar percent of the carbon dioxide and at least 90 molar percent of the methane from the carbon dioxide recycle stream, and wherein the purified carbon dioxide recycle stream comprises no more than ~~20~~ 10 molar percent C_{2+}.

29. (Currently Amended) The method of claim 1, wherein the sweet NGL rich stream comprises from 20 molar percent to ~~35~~ 40 molar percent of the C_{3+} hydrocarbons from the carbon dioxide recycle stream, and wherein the purified carbon dioxide recycle stream comprises at least 94 molar percent of the carbon dioxide, at least 94 molar percent of the methane, and at least 93 molar percent of the ethane from the carbon dioxide recycle stream.

30. (Currently Amended) The method of claim 1, wherein separating the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream comprises: ~~consists of:~~

~~separating the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream;~~

~~optionally~~ refluxing part of the purified carbon dioxide recycle stream;

~~optionally~~ reboiling part of the sour NGL rich stream; and

~~optionally cooling, throttling, and/or sweetening~~ cooling and throttling the sour NGL rich stream. ~~stream, thereby producing the NGL rich stream.~~

31. (Currently Amended) The method of claim 30, wherein the sour NGL rich steam comprises no more than 5 molar percent carbon dioxide, no more than 1 molar percent methane, and no more than ~~1~~ 5 molar percent ethane, and wherein the sweet NGL rich stream is substantially free of carbon dioxide.

32. (Currently Amended) The method ~~process equipment~~ of claim 10, wherein separating the recycle stream into the sour NGL rich stream and the purified recycle stream comprises: ~~consists of:~~

~~separating the recycle stream into the purified recycle stream and a sour NGL rich stream;~~

~~optionally~~ refluxing part of the purified recycle stream;

~~optionally~~ reboiling part of the sour NGL rich stream; and

~~optionally cooling, throttling, and/or sweetening~~ cooling and throttling the sour NGL rich stream. ~~stream, thereby producing the NGL rich stream.~~

33. (Currently Amended) The method ~~process equipment~~ of claim 21, wherein the sour NGL rich steam comprises no more than 5 molar percent carbon dioxide, no more than 1 molar percent methane, and no more than ~~1~~ 5 molar percent ethane, and wherein the sweet NGL rich stream is substantially free of carbon dioxide.

34. (Cancelled)

35. (Currently Amended) The method ~~process equipment~~ of claim 22, further comprising combining ~~wherein the process equipment is further configured to combine~~ a carbon dioxide makeup stream from a source external to the method ~~process equipment~~ with the purified recycle stream and subsequently injecting ~~inject~~ the combined carbon dioxide makeup stream and the purified recycle stream into a subterranean formation.

36. (Cancelled)

37. (Currently Amended) The method ~~process equipment~~ of claim 25, wherein separating the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream comprises: ~~consists of:~~

~~separating the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream;~~

~~optionally~~ refluxing part of the purified carbon dioxide recycle stream;

~~optionally~~ reboiling part of the sour NGL rich stream; and

~~optionally cooling, throttling, and/or sweetening~~ cooling and throttling the sour NGL rich stream. ~~stream, thereby producing the NGL rich stream.~~

38. (Currently Amended) The method ~~process equipment~~ of claim 37, wherein the sour NGL rich steam comprises no more than 5 molar percent carbon dioxide, no more than 1 molar percent methane, and no more than ~~1~~ 5 molar percent ethane, and wherein the sweet NGL rich stream is substantially free of carbon dioxide.

39. (Cancelled)

40. (Currently Amended) The method ~~process equipment~~ of claim 25, wherein the sweet NGL rich stream comprises at least 90 molar percent C_{3+} hydrocarbons, wherein the sweet NGL rich stream comprises from 20 molar percent to ~~35~~ 40 molar percent of the C_{3+} hydrocarbons from the recycle stream, and wherein the purified carbon dioxide recycle stream comprises at least 94 molar percent of the carbon dioxide, at least 94 molar percent of the methane, and at least 93 molar percent of the ethane from the carbon dioxide recycle stream.

41. (New) The method of claim 1, further comprising:

compressing the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrating at least part of the carbon dioxide recycle stream using molecular sieves prior to separating the carbon dioxide recycle stream;

combining a carbon dioxide makeup stream external to the method with the purified carbon dioxide recycle stream; and

injecting the combined carbon dioxide makeup stream and the purified carbon dioxide recycle stream into a subterranean formation.

42. (New) The method of claim 21, further comprising:

compressing the recycle stream prior to separating the recycle stream; and

dehydrating at least part of the recycle stream using molecular sieves after separating the hydrocarbon feed stream and prior to separating the recycle stream.

43. (New) The method of claim 25, further comprising:

compressing the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrating at least part of the carbon dioxide recycle stream using molecular sieves after separating the hydrocarbon feed stream and prior to separating the carbon dioxide recycle stream; and

cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream.

REMARKS/ARGUMENTS

Status of Claims

Claims 1-4, 9-11, and 21-40 stand rejected.

Claims 1-2, 4, 9-11, 21-33, 35, 37-38, and 40 are currently amended.

Claims 3, 34, 36, and 39 are hereby cancelled.

Claims 41-43 are new.

Thus, claims 1-2, 4, 9-11, 21-33, 35, 37-38, and 40-43 are pending in this patent application.

The Applicant hereby requests further examination and reconsideration of the presently claimed application.

Request to Enter and Consider Amendment after a Final Rejection

The Applicant respectfully requests that the Examiner enter and consider this amendment after a Final Rejection. MPEP § 714.12 states in regards to amendments after a Final Rejection that "[a]ny amendment that will place the application either in condition for allowance or in better form for appeal may be entered." As is discussed in the 35 U.S.C. § 103 section below, the Applicant respectfully contends that this amendment places the application in condition for allowance. Alternatively, if the Examiner finds that this amendment does not place the application in condition for allowance, the Applicant respectfully contends that the amendment places the application in better form for appeal by reducing the number of issues that must be considered during appeal.

First, the Examiner did not give any patentable weight to the claimed stream compositions recited in claims 23 and 28, because the Examiner alleges that "the stream composition is merely a matter of functional language in an apparatus claim." *See* Office Action dated February 21, 2013

(*Office Action*), pp. 12 and 15-16. Although the Applicant disagrees with the Examiner's analysis, the Applicant would rather focus on the substantive technical differences between the claims and the cited art. Accordingly, the Applicant has changed all of the apparatus claims to method claims. Therefore, by entering this amendment, the issue of whether or not the stream composition features in claims 23 and 28 should be given patentable weight is eliminated and will not need to be argued and considered during appeal.

Second, this amendment reduces the number of claims and also narrows the scope of all of the claims by cancelling several dependent claims and adding them into the independent claims. The Applicant respectfully contends that this will greatly simplify the appeal. In particular, the Applicant respectfully contends that it is easier to decide whether a smaller number of narrower claims are patentable than to decide whether a larger number of broader claims are patentable. For example, independent claim 10 has been amended to include features from its dependent claims 21, 22, and 23. Accordingly, instead of having to separately argue and consider each of the broader claims 10, 21, 22, and 23, only the narrower amended claim 10 will have to be argued and considered. The other two independent claims, claims 1 and 25, have similarly been narrowed in scope, thus simplifying the appeal.

Additionally, the Applicant would like to highlight that this amendment does not raise any new issues that would require further search. The independent claims 1, 10, and 25 have only been amended to include features that were previously recited in dependent claims. Accordingly, the Examiner has already searched for all of the features presented in this amendment and no further search is necessary. Therefore, for at least the reasons discussed above, the Applicant respectfully requests that the Examiner enter and consider this amendment.

Claim Rejections – 35 U.S.C. § 103

Claims 1 and 29-31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 4,529,411 (*Goddin*) in view of U.S. Patent 6,128,919 (*Daus*). Claims 4, 9-11, 21-24, and 32-34 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Goddin* in view of *Daus* and U.S. Patent Application Publication 2008/0156035 (*Aspelund*). Claims 2, 25, 28, and 36-40 stand rejected under 35 U.S.C § 103(a) as being unpatentable over *Goddin* in view of *Daus* and U.S. Patent Application Publication 2003/0161780 (*Howard*). Claim 35 stands rejected under 35 U.S.C. § 103(a) as being unpatenable over *Goddin* in view of *Daus*, *Aspelund*, and *Howard*. Claims 26-27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Goddin* in view of *Daus*, *Howard*, and *Aspelund*. Claims 3, 34, 36, and 39 have been cancelled. Claims 2, 4, 9, and 29-31 depend from independent claim 1, claims 11, 21-24, 32-33, and 35 depend from independent claim 10, and claims 26-28, 37-38, and 40 depend from independent claim 25. Thus, claims 1-2, 4, 9, and 29-31 stand or fall on the application of the combination of *Goddin* and *Daus* to independent claim 1, claims 10-11, 21-24, 32-33, and 35 stand or fall on the application of the combination of *Goddin*, *Daus*, and *Aspelund* to independent claim 10, and claims 25-28, 37-38, and 40 stand or fall on the application of the combination of *Goddin*, *Daus*, and *Howard* to independent claim 25. The United States Supreme Court in *Graham v. John Deere Co. of Kansas City* noted that an obviousness determination begins with a finding that **"the prior art as a whole in one form or another contains all" of the elements of the claimed invention**. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 22 (U.S. 1966). The Applicant respectfully asserts that the combinations of the cited art fail to disclose all of the limitations set forth in independent claims 1, 10, and 25, and consequently do not render obvious claims 1-4, 9-11, 21-33, 35, 37-38, and 40.

The combination of *Goddin* and *Daus* fails to render obvious claims 1-2, 4, 9, and 29-31 because the combination of *Goddin* and *Daus* fails to: (1) separate the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream, wherein the heavy hydrocarbon rich stream comprises the C_{9+} hydrocarbons, and wherein the carbon dioxide recycle stream comprises the carbon dioxide, the C_3-C_8 hydrocarbons, and the acid gas; (2) separate the carbon dioxide recycle stream into a sour natural gas liquids (NGL) rich stream and a purified carbon dioxide recycle stream, wherein the sour NGL rich stream comprises the C_3-C_8 hydrocarbons and the acid gas, and wherein the purified carbon dioxide recycle stream comprises the carbon dioxide; and (3) teach that the hydrocarbon feed stream, the carbon dioxide recycle stream, and the sour NGL rich stream are not subjected to cryogenic conditions, membranes, and carbon dioxide recovery solvents between being received and being separated into the heavy hydrocarbon rich stream, the purified carbon dioxide recycle stream, the sweet NGL rich stream, and the acid gas stream. Claim 1 reads:

1. A method comprising:

receiving a hydrocarbon feed stream, wherein the hydrocarbon feed stream comprises carbon dioxide, natural gas liquid (NGL), heavy hydrocarbons, and acid gas, wherein the NGL comprises C_3-C_8 hydrocarbons, and wherein the heavy hydrocarbons comprise C_{9+} hydrocarbons;

separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream, wherein the heavy hydrocarbon rich stream comprises the C_{9+} hydrocarbons, and wherein the carbon dioxide recycle stream comprises the carbon dioxide, the C_3-C_8 hydrocarbons, and the acid gas;

separating the carbon dioxide recycle stream into a sour NGL rich stream and a purified carbon dioxide recycle stream, wherein the sour NGL rich stream comprises the C_3-C_8 hydrocarbons and the acid gas, and wherein the purified carbon dioxide recycle stream comprises the carbon dioxide; and

separating the sour NGL rich stream into a sweet NGL rich stream and an acid gas stream, wherein the sweet NGL rich stream comprises the C_3-C_8 hydrocarbons, and wherein the acid gas stream comprises the acid gas,

wherein the carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream, and

wherein the hydrocarbon feed stream, the carbon dioxide recycle stream, and the sour NGL rich stream are not subjected to cryogenic conditions, membranes, and carbon dioxide recovery solvents between being received and being separated into the heavy hydrocarbon rich stream, the purified carbon dioxide recycle stream, the sweet NGL rich stream, and the acid gas stream.

(Emphasis added). First, claim 1 requires that a hydrocarbon feed stream is separated into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream, wherein the heavy hydrocarbon rich stream comprises the C_{9+} hydrocarbons, and wherein the carbon dioxide recycle stream comprises the carbon dioxide, the C_3-C_8 hydrocarbons, and the acid gas. The Examiner asserts that *Goddin's* FIG. 12 discloses these features. *See Office Action*, p. 2. While *Goddin* separates a feed stream 151 (i.e., a hydrocarbon feed stream), *Goddin* separates its feed stream 151 into a NGL stream 167 having butane and heavier hydrocarbons (i.e., C_{4+} hydrocarbons) and an overhead stream 170 having carbon dioxide, hydrogen sulfide (i.e., an acid gas), and propane and lighter hydrocarbons (i.e., C_1-C_3 hydrocarbons):

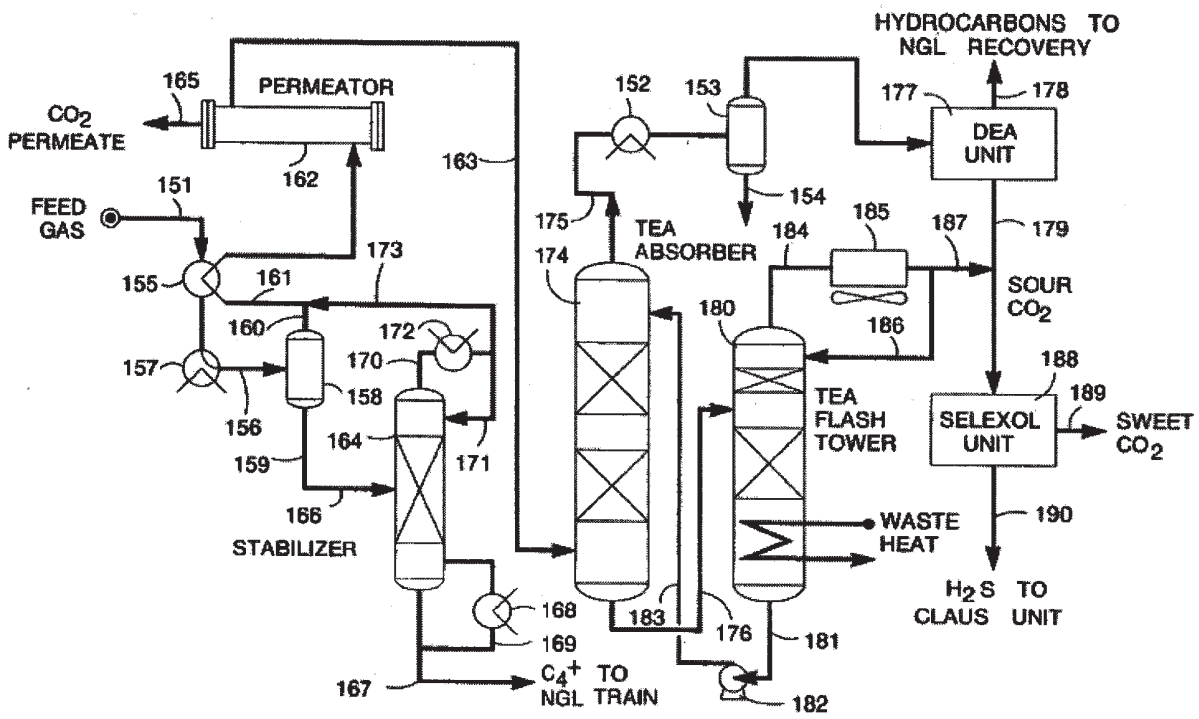


FIG.12

Hydrocarbon liquid stream 159 from chiller flash drum 158 is sent by line 166 to stabilizer column 164 where H_2S, CO_2 and propane and lighter hydrocarbons are taken overhead in stream 170, chilled in chiller 172, and liquids refluxed via line 171 to the top of stabilizer column 164. C_3 and lighter hydrocarbons together with H_2S and CO_2 are combined by line 173 with vapor stream 160 from chiller flash drum 158 and combined stream 161 is superheated in exchanger 155 to 110° F at 350 psia and sent to the permeator unit 162.

The butane and heavier bottom streams from stabilizer 164 is taken, for example, to a natural gas liquids train via line 167. A portion of the bottom is used for temperature control of the stabilizer column 164 via line 169 and exchanger 168.

Goddin, col. 19, ll. 9-23 and FIG. 12 (emphasis added). As shown above, *Goddin* separates its feed stream 151 into an NGL stream 167 and an overhead stream 170. **The NGL stream 167 includes butane and heavier hydrocarbons (i.e. C_{4+} hydrocarbons)**, and **the overhead stream 170 includes carbon dioxide, hydrogen sulfide (i.e., an acid gas), and propane and lighter hydrocarbons (i.e., C_1-C_3 hydrocarbons)**. However, claim 1 recites that that a hydrocarbon feed

stream is separated into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream, wherein **the heavy hydrocarbon rich stream comprises the C_{9+} hydrocarbons**, and wherein **the carbon dioxide recycle stream comprises the carbon dioxide, the C_3-C_8 hydrocarbons, and the acid gas**. Accordingly, *Goddin* is performing a different separation than the separation recited in claim 1. Specifically, *Goddin* is separating out all of the butane and heavier hydrocarbons (i.e., C_{4+} hydrocarbons), whereas claim 1 recites separating out nonane and heavier hydrocarbons (i.e., C_{9+} hydrocarbons). Therefore, *Goddin's* overhead stream 170 only includes methane, ethane, and propane (i.e., C_1-C_3 hydrocarbons), whereas claim 1's carbon dioxide recycle stream includes propane to octane (i.e., C_3-C_8 hydrocarbons). Thus, *Goddin* fails to separate a hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream, wherein the heavy hydrocarbon rich stream comprises C_{9+} hydrocarbons, and wherein the carbon dioxide recycle stream comprises carbon dioxide, C_3-C_8 hydrocarbons, and acid gas.

Second, claim 1 recites that the carbon dioxide recycle stream is separated into a sour NGL rich stream and a purified carbon dioxide recycle stream, wherein the sour NGL rich stream comprises the C_3-C_8 hydrocarbons and the acid gas, and wherein the purified carbon dioxide recycle stream comprises the carbon dioxide. *Goddin* and *Daus* do not separate their streams into a sour NGL stream and a purified carbon dioxide stream. Instead, *Goddin* and *Daus* separate their streams into a sour carbon dioxide stream and a sweet NGL stream:

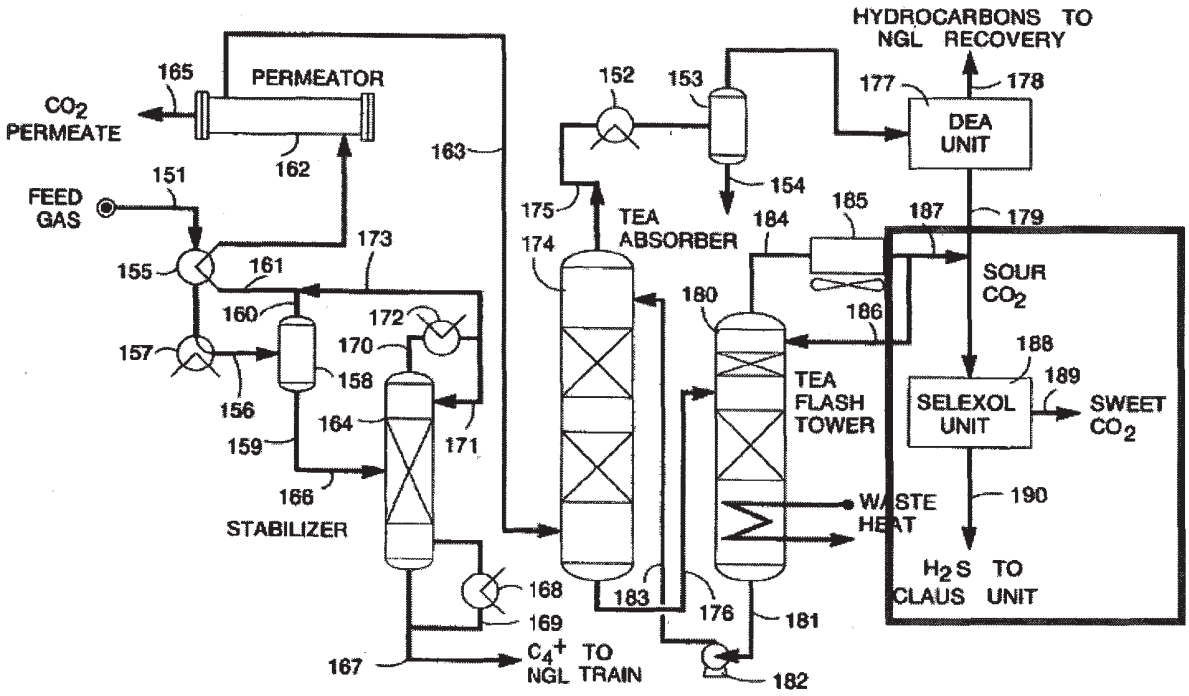


FIG.12

TABLE 1

(Example 1)

Stream	Raw Gas	NGL	CO2	HC
Rate (MMSCFD)	31.054		20.703	8.566
Rate (GPM @ T/P)		41.439		
Temperature (DEG. F.)	85.000	150.13	85.011	96.339
Pressure (PSIG.)	155.000	154.000	0	80.000
Composition (by volume)				
Methane	19.228%	0.000%	3.669%	60.839%
Ethane	6.119%	0.008%	1.168%	19.361%
Propane	5.529%	38.262%	0.652%	10.804%
I-Butane	0.640%	8.560%	0.032%	0.528%
N-Butane	1.930%	28.108%	0.072%	1.190%
I-Penane	0.430%	7.295%	0.005%	0.085%
N-Pentane	0.490%	8.424%	0.005%	0.077%
N-Hexane	0.420%	7.532%	0.001%	0.012%
N-Octane	0.100%	1.809%	0.000%	0.000%
Nitrogen	1.390%	0.000%	0.265%	4.398%
Carbon Dioxide	63.434%	0.000%	94.029%	2.704%
Hydrogen Sulfide	0.070%	0.003%	0.103%	0.003%
Water	0.220%	0.000%	0.000%	0.000%

Goddin, FIG. 12 and *Daus*, Table 1 (emphasis added). As shown in *Goddin's* FIG. 12 above, *Goddin* receives a sour carbon dioxide stream (i.e., a stream containing carbon dioxide and acid gas/hydrogen sulfide) at a selexol unit 188 and separates the sour carbon dioxide stream into a carbon dioxide stream 189 and an acid gas/hydrogen sulfide stream 190. Also, as shown in *Daus'* Table 1, *Daus* similarly separates the acid gas/hydrogen sulfide from its raw gas into a sour carbon dioxide stream and not into an NGL stream. Accordingly, both *Goddin* and *Daus* separate their streams into a sour carbon dioxide stream and a sweet NGL stream. Amended claim 1 on the other hand recites that the carbon dioxide recycle stream is separated into a **sour NGL stream** (i.e., a stream with C_3-C_8 hydrocarbons and acid gas) and a carbon dioxide stream. ***Goddin* and *Daus* do not have sour NGL streams**. Instead, *Goddin* and *Daus* have sour carbon dioxide streams. Thus, *Goddin* and *Daus* fail to separate a carbon dioxide recycle stream into a sour NGL rich stream and a purified carbon dioxide stream, wherein the sour NGL rich stream comprises the C_3-C_8 hydrocarbons and acid gas, and wherein the purified carbon dioxide recycle stream comprises the carbon dioxide.

Third, claim 1 requires that the hydrocarbon feed stream, the carbon dioxide recycle stream, and the sour NGL rich stream are not subjected to cryogenic conditions, membranes, and carbon dioxide recovery solvents between being received and being separated into the heavy hydrocarbon rich stream, the purified carbon dioxide recycle stream, the sweet NGL rich stream, and the acid gas stream. The Examiner asserts that *Daus'* column 5, lines 30-33 discloses these features. *See Office Action*, p. 6. While *Daus* may arguably not use carbon dioxide recovery solvents or cyrogenic conditions, *Daus* certainly relies heavily on membranes:

SUMMARY OF THE INVENTION

The invention includes a process for separating carbon dioxide from a raw feed stream containing hydrocarbon gases and carbon dioxide. Compared to conventional processes, this process requires less power because the **membrane** operates at relatively low feed stream pressures. Relatively high purity carbon dioxide and a separated hydrocarbon gas are recovered.

In one aspect of the invention, a **membrane** having relatively high selectivities may be utilized to increase the purity of recovered gases.

In another aspect of the invention, the feed gas stream may be dehydrated, to protect the **membrane**, to increase the efficiency and effectiveness of gas separation, and to reduce power requirements.

In yet another aspect of the invention, liquid hydrocarbons are removed from the feed gas stream to protect the **membrane**, to increase the efficiency and effectiveness of the gas separation, and to reduce power requirements.

In still another aspect of the invention, turbo expansion of the feed stream gas is incorporated to recover power upstream of the **first membrane**.

In still another aspect of the invention, **membranes** are employed in a multi-stage configuration.

In yet another aspect of the invention, gas from **one or more downstream membrane stages** is recycled to one or more upstream stages, to heighten the purity of recovered gas and the system efficiency.

In still another aspect of the invention, a feed stream is passed into the bore of the **membrane** to separate a portion of one or more factions of the feed stream.

Daus, col. 1, l. 63 to col. 2, l. 27 (emphasis added). As shown above, every single embodiment disclosed in *Daus* requires at least one membrane. The other cited reference, *Goddin*, clearly uses all three of a membrane, cryogenic conditions, and carbon dioxide recovery solvents. For instance, *Goddin* states that:

> According to the invention, there are provided combination staged processes for CO_2 removal from gaseous streams containing hydrocarbons. According to this aspect of the invention, a first portion of CO_2 is removed in a permeation zone containing **membranes** selectively permeable to CO_2 to produce a hydrocarbon enriched process stream of reduced CO_2 content. CO_2 is further removed from the hydrocarbon enriched process stream by **cryogenic fractionation** and/or by **CO_2 solution absorption**.

Goddin, col. 7, ll. 24-33 (emphasis added). As shown above, *Goddin* subjects its streams to membranes, cryogenic fractionation, and CO_2 solution absorption (i.e., carbon dioxide recovery solvents). Thus, *Goddin* and *Daus* subject the hydrocarbon feed stream, the carbon dioxide recycle

stream, and the sour NGL rich stream are to cryogenic conditions, membranes, and carbon dioxide recovery solvents between being received and being separated into the heavy hydrocarbon rich stream, the purified carbon dioxide recycle stream, the sweet NGL rich stream, and the acid gas stream. As such, the combination of *Goddin* and *Daus* fails to disclose at least one limitation of independent claim 1, and consequently fails to render obvious claims 1-2, 4, 9, and 29-31.

Claim 10 contains limitations that are the same or similar to those recited in claim 1. *Aspelund* does not make up for the deficiencies of *Goddin* and *Daus*. Therefore, the combination of *Goddin*, *Daus*, and *Aspelund* fails to disclose at least one limitation of independent claim 10, and consequently fails to render obvious claims 10-11, 21-24, 32-33, and 35.

Claim 25 contains limitations that are the same or similar to those recited in claims 1 and 10. *Howard* does not make up for the deficiencies of *Goddin* and *Daus*. Therefore, the combination of *Goddin*, *Daus*, and *Howard* fails to disclose at least one limitation of independent claim 25, and consequently fails to render obvious claims 25-28, 37-38, and 40.

New Claims

Claims 41-43 recite novel and non-obvious aspects of the invention not present in the prior art. Claims 41-43 are supported by the specification, thus they do not contain any new matter. Claims 41-43 are allowable because they depend on allowable claims 1, 21, and 25.

CONCLUSION

Consideration of the foregoing amendments and remarks, reconsideration of the application, and withdrawal of the rejections and objections is respectfully requested by the Applicant. No new matter is introduced by way of the amendment. It is believed that each ground of rejection raised in the Final Office Action dated February 21, 2013 has been fully addressed. If any fee is due as a result of the filing of this paper, please appropriately charge such fee to Deposit Account Number 50-1515 of Conley Rose, P.C., Texas. If a petition for extension of time is necessary in order for this paper to be deemed timely filed, please consider this a petition therefore.

If a telephone conference would facilitate the resolution of any issue or expedite the prosecution of the application, the Examiner is invited to telephone the undersigned at the telephone number given below.

Respectfully submitted,
CONLEY ROSE, P.C.

Date: 4/11/13

Grant Rodolph
Reg. No. 50,487

ATTORNEY FOR APPLICANT

5601 Granite Parkway, Suite 750
Plano, TX 75024
(972) 731-2288
(972) 731-2289 (Facsimile)

Electronic Acknowledgement Receipt

EFS ID:	15498003
Application Number:	12122336
International Application Number:	
Confirmation Number:	8617
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Customer Number:	30652
Filer:	Grant Rodolph/Jerri Pearson
Filer Authorized By:	Grant Rodolph
Attorney Docket Number:	2103-00902
Receipt Date:	11-APR-2013
Filing Date:	16-MAY-2008
Time Stamp:	18:21:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2103-00902_response_22113_oa.pdf	2769914 370ab1d100ba1044f977fe27e8f6de9239782919	yes	26

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment After Final	1	1
	Claims	2	14
	Applicant Arguments/Remarks Made in an Amendment	15	26
Warnings:			
Information:			
	Total Files Size (in bytes):	2769914	

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/122,336	Filing Date 05/16/2008	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	04/11/2013	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 26	Minus	** 26	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/KIMBERLY WHITE/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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NOTICE OF ALLOWANCE AND FEE(S) DUE

30652 7590 05/08/2013

CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 500
PLANO, TX 75024

EXAMINER
RAYMOND, KEITH MICHAEL

ART UNIT	PAPER NUMBER
3744	

DATE MAILED: 05/08/2013

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/122,336	05/16/2008	Eric Prim	2103-00902	8617

TITLE OF INVENTION: Natural Gas Liquid Recovery Process

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$0	$0	$1780	08/08/2013

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

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III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

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PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

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(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/122,336	05/16/2008	Eric Prim	2103-00902	8617

TITLE OF INVENTION: Natural Gas Liquid Recovery Process

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$0	$0	$1780	08/08/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
RAYMOND, KEITH MICHAEL	3744	062-618000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
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3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

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- ❑ Publication Fee (No small entity discount permitted)
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- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29	NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
❑ Applicant asserting small entity status. See 37 CFR 1.27	NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
❑ Applicant changing to regular undiscounted fee status.	NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/122,336	05/16/2008	Eric Prim	2103-00902	8617

30652 7590 05/08/2013

CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 500
PLANO, TX 75024

EXAMINER	
RAYMOND, KEITH MICHAEL	
ART UNIT	PAPER NUMBER
3744	

DATE MAILED: 05/08/2013

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 916 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 916 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 12/122,336	Applicant(s) PRIM, ERIC	
	Examiner KEITH RAYMOND	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *After-Final Amendment filed 04/11/2013*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1,2,4,9-11,21-33,35,37,38 and 40-43*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

   Interim copies:

   a) ☐ All b) ☐ Some c) ☐ None of the: Interim copies of the priority documents have been received.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☒ Other *After Final Amendment*.

/KEITH RAYMOND/
Examiner, Art Unit 3744

DETAILED ACTION

Allowable Subject Matter

1. Claim 1-2, 4, 9-11, 21-33, 35, 37-38, and 40-43 are allowed.

2. The following is an examiner's statement of reasons for allowance: The prior art does not anticipate or make obvious the entirety of the claimed invention. Most importantly, the prior art fails to teach or make obvious a method comprising separating a hydrocarbon feed stream into a heavy hydrocarbon rich stream comprising C9+ hydrocarbons and a carbon dioxide recycle stream comprising carbon dioxide, C3-C8 hydrocarbons and acid gas, separating the carbon dioxide recycle stream into a sour NGL stream comprising C3-C8 hydrocarbons and the acid gas and a purified carbon dioxide stream, separating the sour NGL stream into a sweet NGL stream and an acid gas stream, wherein the carbon dioxide is not removed from the hydrocarbon feed stream or the carbon dioxide recycle stream prior to separation into the sour NGL rich stream and the purified carbon dioxide stream and wherein the streams are not subjected to cryogenic conditions, membranes, and solvent (independent claims 1, 10, and 25). The closest prior at on record include U.S. patent number 6,128,919 Daus et al. (hereinafter Daus) and U.S. patent number 4,529,411 Goddin Jr. et al. (hereinafter Goddin). Daus provides for the separation of carbon dioxide and NGL hydrocarbons utilizing membrane separation steps. Goddin discloses taking a feed gas 151, separating out heavier hydrocarbons (C4+) then sending a CO2 permeate containing NGL hydrocarbons to a further separator that separates out sour CO2 and NGLs and then discloses the well-known

sweetening process for sweetening the sour CO2. The examiner would like to point out that sweetening processes are a well-known method in the art and can be applied to any sour process streams (including a sour NGL stream as claimed by the applicant). However, neither Goddin nor Daus provide for the separation steps in the order claimed by the applicant and none of the prior art of record provide for the multiple separation steps wherein the carbon dioxide is not removed from the feed stream and the recycle stream prior to separating the carbon dioxide recycle stream into a sour NGL rich stream and a purified carbon dioxide recycle stream. Further, none of the prior art of record provide for utilizing an overall process for heavy hydrocarbon separation, NGL separation, and CO2 separation without the utilization of cryogenic conditions, membranes, or solvents and still provide the same method and order of separation as claimed by the applicant. Therefore, in view of all the evidence, it is seen that the claimed invention is patentable as it is novel and non-obvious over the prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEITH RAYMOND whose telephone number

is (571)270-1790. The examiner can normally be reached on Monday through Thursday 8:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frantz Jules can be reached on 571-273-6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/KEITH RAYMOND/
Examiner, Art Unit 3744

/Frantz F. Jules/
Supervisory Patent Examiner, Art Unit 3744

OK TO ENTER: /K.R./

AMENDMENTS TO THE CLAIMS

Listing of claims:

1. (Currently Amended) A method comprising:

receiving a hydrocarbon feed stream, wherein the hydrocarbon feed stream comprises carbon dioxide, natural gas liquid (NGL), heavy hydrocarbons, and acid gas, wherein the NGL comprises C_3-C_8 hydrocarbons, and wherein the heavy hydrocarbons comprise C_{9+} hydrocarbons; ~~stream;~~

separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream, wherein the heavy hydrocarbon rich stream comprises the C_{9+} hydrocarbons, and wherein the carbon dioxide recycle stream comprises the carbon dioxide, the C_3-C_8 hydrocarbons, and the acid gas; ~~stream;~~

separating the carbon dioxide recycle stream into a sour NGL ~~natural gas liquids (NGL)~~ rich stream and a purified carbon dioxide recycle stream, wherein the sour NGL rich stream comprises the C_3-C_8 hydrocarbons and the acid gas, and wherein the purified carbon dioxide recycle stream comprises the carbon dioxide; and ~~stream,~~

separating the sour NGL rich stream into a sweet NGL rich stream and an acid gas stream, wherein the sweet NGL rich stream comprises the C_3-C_8 hydrocarbons, and wherein the acid gas stream comprises the acid gas,

wherein the carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream, and ~~stream.~~

wherein the hydrocarbon feed stream, the carbon dioxide recycle stream, and the sour NGL rich stream are not subjected to cryogenic conditions, membranes, and carbon dioxide recovery

solvents between being received and being separated into the heavy hydrocarbon rich stream, the purified carbon dioxide recycle stream, the sweet NGL rich stream, and the acid gas stream.

2. (Currently Amended) The method of claim 1, further comprising:

compressing the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrating at least part of the carbon dioxide recycle stream using a dehydration solvent prior to separating the carbon dioxide recycle stream;

combining a carbon dioxide makeup stream external to the method with the purified carbon dioxide recycle stream ~~prior to injection~~; and

injecting the combined carbon dioxide makeup stream and the purified carbon dioxide recycle stream into a subterranean formation.

3. (Cancelled)

4. (Currently Amended) The method of claim 1, further comprising cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream. ~~stream, wherein the hydrocarbon feed stream and the carbon dioxide recycle stream are not subjected to cryogenic conditions, membranes, and solvents between being received and being separated into the NGL rich stream and the purified carbon dioxide recycle stream.~~

5. - 8. (Cancelled)

9. (Currently Amended) The method of claim 4, wherein the sweet NGL rich stream comprises no more than 1 molar percent methane, no more than ~~10~~ 1 molar percent ethane, and no more than ~~5~~ 1 molar percent acid gases.

10. (Currently Amended) A method comprising: ~~plurality of process equipment configured to:~~

receiving ~~receive~~ a hydrocarbon feed stream comprising at least one C_{3+} hydrocarbon, at least one C_{9+} hydrocarbon, acid gas, ~~hydrocarbon~~ and a gas selected from the group consisting of carbon dioxide, nitrogen, air, and water;

separating ~~separate~~ the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a ~~the~~ recycle stream, wherein the heavy hydrocarbon rich stream comprises most of the C_{9+} hydrocarbon in the hydrocarbon feed stream, wherein the recycle stream comprises most of the C_{3+} hydrocarbon and most of the acid gas in the hydrocarbon feed stream, and wherein the acid gas is selected from the group consisting of carbon dioxide, nitrogen, air, and water; ~~stream; and~~

separating ~~separate~~ the recycle stream into a sour natural gas liquid (NGL) rich stream and a purified recycle stream, wherein the sour NGL rich stream comprises some of the C_{3+} hydrocarbon and some of the acid gas in the recycle stream, and wherein the purified recycle stream comprises most of the C_{3+} hydrocarbon and most of the acid gas in the recycle stream; and

separating the sour NGL rich stream into a sweet NGL rich stream and an acid gas stream, wherein the sweet NGL rich stream comprises substantially all of the C_{3+} hydrocarbon in the sour NGL rich stream, and wherein the acid gas stream comprises substantially all of the acid gas in the sour NGL rich stream,

wherein the hydrocarbon feed stream, ~~stream and~~ the recycle stream, and the sour NGL rich stream are not subjected to cryogenic conditions, membranes, and carbon dioxide recovery

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solvents between being received and being separated into the heavy hydrocarbon rich stream, the sweet NGL rich stream, ~~stream and~~ the purified recycle stream, and the acid gas stream, and ~~stream.~~

wherein carbon dioxide, nitrogen, and air are not removed from the hydrocarbon feed stream and are not removed from the recycle stream prior to separating the recycle stream into the sour NGL rich stream and the purified recycle stream.

11. (Currently Amended) The method ~~process equipment~~ of claim 10, wherein the sweet NGL rich stream comprises at least 90 molar percent C_{3+} hydrocarbons, wherein the sweet NGL rich stream comprises from 20 molar percent to ~~35~~ 40 molar percent of the C_{3+} hydrocarbons from the recycle stream, and wherein the purified ~~carbon dioxide~~ recycle stream comprises at least 94 molar percent of the carbon dioxide, at least 94 molar percent of the methane, and at least 93 molar percent of the ethane from the ~~carbon dioxide~~ recycle stream.

12. - 20. (Cancelled)

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21. (Currently Amended) The method ~~process equipment~~ of claim 32, further comprising: ~~wherein the process equipment that is configured to separate the recycle stream is configured to:~~

~~separate the recycle stream into the purified recycle stream and a sour NGL rich stream;~~

cooling ~~cool~~ the sour NGL rich stream;

expanding ~~expand~~ the sour NGL rich stream; and

~~sweeten the sour NGL rich stream after cooling and expanding the sour NGL rich stream, thereby producing the NGL rich stream; and~~

cooling ~~cool~~ the recycle stream using the purified recycle stream.

22. (Currently Amended) The method ~~process equipment~~ of claim 21, further comprising: ~~wherein the process equipment is further configured to:~~

compressing ~~compress~~ the recycle stream prior to separating the recycle stream; and

dehydrating at least part of ~~dehydrate~~ the recycle stream using a dehydration solvent after separating the hydrocarbon feed stream and prior to separating the recycle stream. ~~stream,~~

~~wherein the hydrocarbon feed stream and the carbon dioxide recycle stream are not subjected to cryogenic conditions, membranes, and solvents between being received and being separated into the NGL rich stream and the purified carbon dioxide recycle stream.~~

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23. (Currently Amended) The method ~~process equipment~~ of claim 22, wherein the heavy hydrocarbon rich stream comprises at least 90 molar percent of the C_{9+} hydrocarbons in the hydrocarbon feed stream, wherein the recycle stream comprises at least 90 molar percent of the carbon dioxide in the hydrocarbon feed stream, wherein the sweet NGL rich stream comprises at least ~~90~~ 60 molar percent of the C_{4+} hydrocarbons in the recycle stream, and wherein the purified ~~carbon dioxide~~ recycle stream comprises at least 90 molar percent of the carbon dioxide and at least 90 molar percent of the methane in the recycle stream.

24. (Currently Amended) The method ~~process equipment~~ of claim 11, wherein the sweet NGL rich stream comprises no more than 5 molar percent ethane and no more than 1 molar percent methane, and wherein the purified recycle stream comprises no more than ~~20~~ 10 molar percent C_{2+}.

25. (Currently Amended) A method comprising: ~~plurality of process equipment configured to:~~

receiving ~~receive~~ a hydrocarbon feed stream, wherein the hydrocarbon feed stream comprises carbon dioxide, natural gas liquid (NGL), and heavy hydrocarbons, wherein the NGL comprises C_3-C_8 hydrocarbons, and wherein the heavy hydrocarbons comprise C_{9+} hydrocarbons; ~~stream;~~

separating ~~separate~~ the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream, wherein the heavy hydrocarbon rich stream comprises most of the C_{9+} hydrocarbons in the hydrocarbon feed stream, and wherein the carbon dioxide recycle stream comprises most of the carbon dioxide and most of the C_3-C_8 hydrocarbons in the hydrocarbon feed stream; ~~stream;~~

separating ~~separate~~ the carbon dioxide recycle stream into a sour NGL ~~natural gas liquids (NGL)~~ rich stream and a purified carbon dioxide recycle stream, wherein the sour NGL rich stream comprises some of the C_3-C_8 hydrocarbons in the carbon dioxide recycle stream, and wherein the purified carbon dioxide recycle stream comprises most of the carbon dioxide in the carbon dioxide recycle stream; ~~stream;~~

separating the sour NGL rich stream into a sweet NGL rich stream and a carbon dioxide rich stream, wherein the sweet NGL rich stream comprises the substantially all of the C_3-C_8 hydrocarbons in the source NGL rich stream, and wherein the carbon dioxide rich stream comprises substantially all of the carbon dioxide in the sour NGL rich stream;

combining ~~combine~~ a carbon dioxide makeup stream from a source external to the method ~~process equipment~~ with the purified carbon dioxide recycle stream; and

subsequently injecting ~~inject~~ the combined carbon dioxide makeup stream and the purified carbon dioxide recycle stream into a subterranean formation, ~~formation.~~

wherein the carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream, and

wherein the hydrocarbon feed stream, the carbon dioxide recycle stream, and the sour NGL rich stream are not subjected to cryogenic conditions, membranes, and carbon dioxide recovery solvents between being received and being separated into the heavy hydrocarbon rich stream, the purified carbon dioxide recycle stream, the sweet NGL rich stream, and the carbon dioxide rich stream.

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26. (Currently Amended) The method ~~process equipment~~ of claim 25, further comprising: ~~wherein the process equipment is further configured to:~~

compressing ~~compress~~ the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrating at least part of ~~dehydrate~~ the carbon dioxide recycle stream using a dehydration solvent after separating the hydrocarbon feed stream and prior to separating the carbon dioxide recycle stream; and

cooling ~~cool~~ the carbon dioxide recycle stream with the purified carbon dioxide recycle stream.

27. (Currently Amended) The method ~~process equipment~~ of claim 26, further comprising: ~~wherein the process equipment that is configured to separate the carbon dioxide recycle stream is configured to:~~

~~separate the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream;~~

cooling ~~cool~~ the sour NGL rich stream;

expanding ~~expand~~ the sour NGL rich stream; and

~~sweeten the sour NGL rich stream after cooling and expanding the sour NGL rich stream, thereby producing the NGL rich stream; and~~

cooling ~~cool~~ the carbon dioxide recycle stream using the purified carbon dioxide recycle stream.

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28. (Currently Amended) The method ~~process equipment~~ of claim 25, wherein the heavy hydrocarbon rich stream comprises at least 90 molar percent of the C_{9+} hydrocarbons in the hydrocarbon feed stream, wherein the carbon dioxide recycle stream comprises at least 90 molar percent of the carbon dioxide in the hydrocarbon feed stream, wherein the sweet NGL rich stream comprises at least ~~90~~ 60 molar percent of the C_{4+} hydrocarbons in the carbon dioxide recycle stream, wherein the sweet NGL rich stream comprises no more than 5 molar percent ethane and no more than 1 molar percent methane, wherein the purified carbon dioxide recycle stream comprises at least 90 molar percent of the carbon dioxide and at least 90 molar percent of the methane from the carbon dioxide recycle stream, and wherein the purified carbon dioxide recycle stream comprises no more than ~~20~~ 10 molar percent C_{2+}.

29. (Currently Amended) The method of claim 1, wherein the sweet NGL rich stream comprises from 20 molar percent to ~~35~~ 40 molar percent of the C_{3+} hydrocarbons from the carbon dioxide recycle stream, and wherein the purified carbon dioxide recycle stream comprises at least 94 molar percent of the carbon dioxide, at least 94 molar percent of the methane, and at least 93 molar percent of the ethane from the carbon dioxide recycle stream.

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30. (Currently Amended) The method of claim 1, wherein separating the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream comprises: ~~consists of:~~

~~separating the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream;~~

~~optionally~~ refluxing part of the purified carbon dioxide recycle stream;

~~optionally~~ reboiling part of the sour NGL rich stream; and

~~optionally cooling, throttling, and/or sweetening~~ cooling and throttling the sour NGL rich stream. ~~stream, thereby producing the NGL rich stream.~~

31. (Currently Amended) The method of claim 30, wherein the sour NGL rich steam comprises no more than 5 molar percent carbon dioxide, no more than 1 molar percent methane, and no more than ~~1~~ 5 molar percent ethane, and wherein the sweet NGL rich stream is substantially free of carbon dioxide.

32. (Currently Amended) The method ~~process equipment~~ of claim 10, wherein separating the recycle stream into the sour NGL rich stream and the purified recycle stream comprises: ~~consists of:~~

~~separating the recycle stream into the purified recycle stream and a sour NGL rich stream;~~

~~optionally~~ refluxing part of the purified recycle stream;

~~optionally~~ reboiling part of the sour NGL rich stream; and

~~optionally cooling, throttling, and/or sweetening~~ cooling and throttling the sour NGL rich stream. ~~stream, thereby producing the NGL rich stream.~~

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33. (Currently Amended) The method ~~process equipment~~ of claim 21, wherein the sour NGL rich steam comprises no more than 5 molar percent carbon dioxide, no more than 1 molar percent methane, and no more than ~~1~~ 5 molar percent ethane, and wherein the sweet NGL rich stream is substantially free of carbon dioxide.

34. (Cancelled)

35. (Currently Amended) The method ~~process equipment~~ of claim 22, further comprising combining ~~wherein the process equipment is further configured to combine~~ a carbon dioxide makeup stream from a source external to the method ~~process equipment~~ with the purified recycle stream and subsequently injecting ~~inject~~ the combined carbon dioxide makeup stream and the purified recycle stream into a subterranean formation.

36. (Cancelled)

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37. (Currently Amended) The method ~~process equipment~~ of claim 25, wherein separating the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream comprises: ~~consists of:~~

~~separating the carbon dioxide recycle stream into the purified carbon dioxide recycle stream and a sour NGL rich stream;~~

~~optionally~~ refluxing part of the purified carbon dioxide recycle stream;

~~optionally~~ reboiling part of the sour NGL rich stream; and

~~optionally cooling, throttling, and/or sweetening~~ cooling and throttling the sour NGL rich stream. ~~stream, thereby producing the NGL rich stream.~~

38. (Currently Amended) The method ~~process equipment~~ of claim 37, wherein the sour NGL rich steam comprises no more than 5 molar percent carbon dioxide, no more than 1 molar percent methane, and no more than ~~1~~ 5 molar percent ethane, and wherein the sweet NGL rich stream is substantially free of carbon dioxide.

39. (Cancelled)

40. (Currently Amended) The method ~~process equipment~~ of claim 25, wherein the sweet NGL rich stream comprises at least 90 molar percent C_{3+} hydrocarbons, wherein the sweet NGL rich stream comprises from 20 molar percent to ~~35~~ 40 molar percent of the C_{3+} hydrocarbons from the recycle stream, and wherein the purified carbon dioxide recycle stream comprises at least 94 molar percent of the carbon dioxide, at least 94 molar percent of the methane, and at least 93 molar percent of the ethane from the carbon dioxide recycle stream.

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41. (New) The method of claim 1, further comprising:

compressing the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrating at least part of the carbon dioxide recycle stream using molecular sieves prior to separating the carbon dioxide recycle stream;

combining a carbon dioxide makeup stream external to the method with the purified carbon dioxide recycle stream; and

injecting the combined carbon dioxide makeup stream and the purified carbon dioxide recycle stream into a subterranean formation.

42. (New) The method of claim 21, further comprising:

compressing the recycle stream prior to separating the recycle stream; and

dehydrating at least part of the recycle stream using molecular sieves after separating the hydrocarbon feed stream and prior to separating the recycle stream.

43. (New) The method of claim 25, further comprising:

compressing the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;

dehydrating at least part of the carbon dioxide recycle stream using molecular sieves after separating the hydrocarbon feed stream and prior to separating the carbon dioxide recycle stream; and

cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream.

OK TO ENTER: /K.R./

Atty. Docket: 2103-00902

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Eric Prim	§	
	§	Group Art Unit: 3784
Application No.: 12/122,336	§	
	§	Examiner: Keith Raymond
Filed: May 16, 2008	§	
	§	Confirmation No.: 8617
For: NATURAL GAS LIQUID RECOVERY PROCESS	§	
	§	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF EFS-WEB FILING

Pursuant to 37 C.F.R. §1.8, I hereby certify that this correspondence is being electronically submitted to the U.S. Patent and Trademark Office website, www.uspto.gov, on April 11, 2013.

Jerri Pearson

AMENDMENTS AND RESPONSE TO FINAL OFFICE ACTION DATED FEBRUARY 21, 2013

Sir:

In response to the Final Office Action dated February 21, 2013, the Applicant respectfully requests the following amendments to the above-identified application. The changes made are shown by underlining the added text and striking through the deleted text.

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 15 of this paper.

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12122336	PRIM, ERIC
	Examiner	Art Unit
	KEITH RAYMOND	3744

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
62	617, 618, 620, 622	10/20/2011	kraymond
585	818, 802, 833, 837	06/19/2012	kraymond

SEARCH NOTES		
Search Notes	Date	Examiner
inventor search	10/20/2011	kraymond
PLUS SEARCH	10/21/2011	kraymond
Consulted Lukas Baldridge	10/21/2011	kraymond
UPDATED SEARCH (SEE ATTACHED EAST SEARCH HISTORY)	02/08/2013	KR
UPDATED SEARCH (see attached EAST search history)	05/01/2013	KR
Consulted with Frantz Jules	03/15/2013	KR

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
EAST	INTERFERENCE SEARCH (see attached search history)	05/01/2013	KR

/KEITH RAYMOND/ Examiner.Art Unit 3744	

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12122336	PRIM, ERIC
	Examiner	**Art Unit**
	KEITH RAYMOND	3744

CPC		
Symbol	**Type**	**Version**

CPC Combination Sets				
Symbol	**Type**	**Set**	**Ranking**	**Version**

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	**SUBCLASS**	**CLAIMED**					**NON-CLAIMED**					
62	618	F	2	5	J	3 / 00 (2006.01.01)						
CROSS REFERENCE(S)		C	0	7	C	7 / 00 (2006.01.01)						
		C	0	7	C	7 / 10 (2006.01.01)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**	C	0	7	C	7 / 144 (2006.01.01)						
62	620 928 F											
585	802 818 833											

/KEITH RAYMOND/ Examiner.Art Unit 3744	05/01/2013	**Total Claims Allowed:**
(Assistant Examiner)	(Date)	26
/FRANTZ JULES/ Supervisory Patent Examiner.Art Unit 3744	05/03/2013	O.G. Print Claim(s) / O.G. Print Figure
(Primary Examiner)	(Date)	1 / 1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12122336	PRIM, ERIC
	Examiner	**Art Unit**
	KEITH RAYMOND	3744

/KEITH RAYMOND/ Examiner.Art Unit 3744	05/01/2013	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	26	
/FRANTZ JULES/ Supervisory Patent Examiner.Art Unit 3744	05/03/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12122336	PRIM, ERIC
	Examiner	**Art Unit**
	KEITH RAYMOND	3744

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	-	17	15	33										
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-	3	-	19	18	35										
3	4	-	20	-	36										
-	5	13	21	23	37										
-	6	14	22	24	38										
-	7	17	23	-	39										
-	8	11	24	25	40										
4	9	19	25	8	41										
9	10	20	26	16	42										
10	11	21	27	26	43										
-	12	22	28												
-	13	5	29												
-	14	6	30												
-	15	7	31												
-	16	12	32												

/KEITH RAYMOND/ Examiner.Art Unit 3744	05/01/2013	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	26	
/FRANTZ JULES/ Supervisory Patent Examiner.Art Unit 3744	05/03/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	227	62/928,929.CCLS.	US-PGPUB; USPAT; USOCR	OR	ON	2013/05/01 17:41
L2	23	62/928,929.CCLS. and ngl	US-PGPUB; USPAT; USOCR	OR	ON	2013/05/01 17:50
S1	119	62/618.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:18
S2	411	62/620.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:19
S3	303	62/617.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:19
S4	17	("4136738", "4374657", "4441900", "4451275", "4529411", "4563202", "4595404", "4664190", "4683948", "4762543", "4765407", "5019279", "5411721", "6128919", "6505683", "6648944", "6915662").pn.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:20
S5	2061	injection with (subterranean adj formation)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S6	790	injection with (subterranean adj formation) and (carbon adj dioxide)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S7	78	injection with (subterranean adj formation) with (carbon adj dioxide)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S8	1	"12122336"	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:23
S10	13	prim-eric.in.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/20 17:26
S12	50	("20110197629" "4964980" "4459142" "4889545" "5335504" "5881569" "6190540" "7219513" "20060283207"	US-PGPUB; USPAT;	OR	ON	2011/10/21 10:25

		"20090301133" "20100011810" "20100043488" "5345772" "4318723" "4451275" "4466946" "4529411" "4857078" "4869740" "5555748" "5669958" "5771712" "5799507" "5879431" "5890378" "5964923" "5983664" "6035641" "6109061" "6182469" "6516631" "6526777" "6610124" "6648944" "6823692" "6889523" "6915662" "7806965" "7883569" "7914606" "7955420" "8007571" "20020065446" "20030029190" "20040177646" "20080302012" "20080302239" "20080302240" "20080305019" "20080307706").pn.	USOCR			
S13	46	("20110197629" "20100179232" "20100219061" "6180684" "6040460" "6274096" "7192468" "7662215" "20050000360" "20080107581" "20100083697" "20110064648" "20110088896" "20110088897" "20110064648" "20110088896" "20110088897" "20090255294" "20110056237" "20110056237" "4094767" "20090324458" "20090324459" "20090324460" "20090324461" "20090324462" "20090248174" "20100069515" "4043897" "5952523" "5021232" "7294172" "4261420" "4747858" "6401486" "6604380" "7165423" "20060042312" "20090165498" "3664091" "3677534" "4348486" "4483834" "4542114" "4963339" "4999030" "5000925" "5173513" "6736955" "7235677").pn.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 10:25
S14	51	("4130403" | "4374657" | "4466946" | "4511382" | "4529411" | "4595405" | "4599096" | "4602477" | "4639257" | "4654063" | "4681612" | "4687498" | "4689062" | "4718921" | "4755193" | "4793841" | "4857078" | "4936887" | "5002590" | "5013338" | "5067971" | "5071451" | "5089033" | "5199962" | "5205843" | "5240472" | "5281255" | "5352272" | "5374300" | "5401300" | "5407467" | "5414190" | "5647227" | "5669958" | "5688307").PN. OR ("5964923").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 12:01
S15	350	62/622,928,929.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 14:00
S16	1167	62/617-638.ccls. and ((carbon adj dioxide) or CO2)	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 14:01
S17	18	62/617-638.ccls. and ((carbon adj dioxide) or CO2) and NGL and sour	US-PGPUB; USPAT; USOCR	OR	ON	2011/10/21 14:01

S18	1	"13096788"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:42
S19	751	62/618-620.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:49
S20	430	62/630-631.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:50
S23	226	62/928-929.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:51
S24	143	62/929.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:51
S25	25	"carbon dioxide reinjection"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 15:54
S26	408	"C9 hydrocarbon"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:43
S27	5	"C9 hydrocarbon" with separation	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:44
S28	784	"heavy hydrocarbon" with separation	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:46
S29	0	"heavy hydrocarbon" with separation with C9	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:46
S30	1	"heavy hydrocarbon" with separation with C8	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/07 16:46
S31	17	C9 with hydrocarbons with (removal or separation)	DERWENT	OR	ON	2012/03/08 10:06
S32	34	"5467722"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/08 15:49
S33	1	"5467722".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/08 15:49
S34	33	("5133190" | "5321946").PN. OR ("5467722").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/08 15:49

S35	1	"12605249"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/09 11:05
S37	1	"12605249"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/09 11:06
S38	1	"12605240"	US-PGPUB; USPAT; USOCR	OR	ON	2012/03/09 11:07
S39	128	62/618.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
S40	432	62/620.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
S41	343	62/617.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
S42	344	(S39 S40 S41) and oil	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
S43	220	(S39 S40 S41) and oil and "carbon dioxide"	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:30
S44	62	ngl and eor	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/02 10:36
S45	2	("2009/0100754").URPN.	USPAT	OR	OFF	2012/06/02 10:54
S46	49	("20020007733" | "20050172807" | "20050217479" | "20060283207" | "20070180855" | "20070208432" | "2475957" | "2886405" | "3130026" | "3791157" | "4061481" | "4140504" | "4157904" | "4171964" | "4252548" | "4278457" | "4305733" | "4441900" | "4449994" | "4453956" | "4475347" | "4509967" | "4511382" | "4533372" | "4701200" | "4923493" | "5062270" | "5120338" | "5141544" | "5157925" | "5257505" | "5265428" | "5375422" | "5615561" | "5775128" | "5852061" | "5890378" | "5950453" | "5956971" | "7152430" | "7155931" | "7191617" | "7204100" | "7210311" | "H000825").PN. OR ("7883569").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/02 10:55
S47	92	("2065112" | "2143283" | "2159434" | "2377966" | "2399142" | "2583601" | "2786652" | "2970106" | "3137654" | "3250080" | "3286778" | "3612192" | "4119417" | "4130403" | "4136747" |	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/02 10:58

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S50	1	"5685173".pn.	USPAT	OR	OFF	2012/06/05 11:57
S51	0	"20030051504"	USPAT	OR	OFF	2012/06/05 11:57
S52	1	"20030051504"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/05 11:58
S53	1	"6397631"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/05 11:58
S54	1	"12195450"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/05 11:59
S56	20	"LNG" and "carbon dioxide" and "reinjection" and "62".clas.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/05 12:00
S57	43	"LNG" and "carbon dioxide" and "reinjection"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/14 11:16
S58	1	sweetening with "ngl rich stream"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/14 11:24
S59	93	("2065112" | "2143283" | "2159434" | "2377966" | "2399142" | "2583601" | "2786652" | "2970106" | "3137654" | "3250080" | "3286778" | "3612192" | "4119417" | "4130403" | "4136747" | "4161222" | "4181675" | "4238211" | "4264338" | "4374657" | "4386944" | "4417449" | "4435191" | "4466946" | "4477419" | "4529411" | "4542010" | "4548619" | "4589896" | "4597777" | "4599096" | "4602477" | "4639257" | "4659343" | "4690695" | "4701187" | "4717395" | "4759780" | "4781907" | "4797141" | "4871378" | "4894068" | "4936887" | "4960579" | "4990168" | "5032148" | "5090971" | "5102432" | "5207806" | "5233837" | "5234471" |	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 11:18

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S60	24	h825	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:15
S61	0	(green with joe).in. and (morgan).in.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:19
S62	0	(green with joe).in. and (morgan).in.	US-PGPUB; USPAT; USOCR; FPRS	OR	OFF	2012/06/15 14:19
S63	12	(green with joe).in.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:19
S64	600	"carbon dioxide" and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:19
S65	1	"6128919".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:20
S66	0	53/22.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:26
S67	0	53/022.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:26
S68	437	95/51.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:28
S69	17	95/51.ccls. and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/15 14:28
S70	24	h825	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:02
S71	15	h825 and green	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:03
S72	1	h825 and green and freeman	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:03
S73	7	h825 and ngl	US-PGPUB;	OR	ON	2012/06/18 12:03

			USPAT; USOCR			
S74	1	"7853569".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:04
S75	0	000H825.pn.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:05
S76	0	00H825.pn.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:05
S77	0	00H825	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:05
S78	1	"7883569".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2012/06/18 12:05
S79	1	"sour ngl rich"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:08
S80	2	"sour ngl"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:08
S81	1	"7777088".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:36
S82	1476	585/818,802,833,837.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:39
S83	23	585/818,802,833,837.ccls. and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/18 12:40
S84	2	"20060156035"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/19 11:50
S85	1	"20080156035"	US-PGPUB; USPAT; USOCR	OR	OFF	2012/06/19 11:50
S86	18	("20080156035" | "4136738" | "4374657" | "4441900" | "4451275" | "4529411" | "4563202" | "4595404" | "4664190" | "4683948" | "4762543" | "4765407" | "5019279" | "5411721" | "6128919" | "6505683" | "6648944" | "6915662").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 10:32
S87	442	"three-phase separator"	US-PGPUB; USPAT;	OR	ON	2012/07/11 10:33

			USOCR			
S88	30	"three-phase separator" and lng	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 10:33
S89	349	62/630.ccls.	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 14:04
S90	26	"Ngl separation"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 15:57
S91	0	"Ngl separation" and "reid vapor pressure"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:00
S92	1400	"reid vapor pressure"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:00
S93	13	"reid vapor pressure" and ngl	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:00
S94	1	"light ngl" with psig	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:16
S95	24	"ngl" with psig	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:16
S96	3981	"250 psig"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:19
S97	40	"250 psig" and ngl	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:19
S98	40	"250 psig" and ngl	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/11 16:19
S99	1	"13096788"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 10:35
S100	0	"make-up ngl"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 11:50
S101	628	"make-up stream"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 11:50
S102	7	"make-up stream" and ngl	US-	OR	ON	2012/07/12

			PGPUB; USPAT; USOCR			11:50
S103	2	"20080016909"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 12:02
S104	7	"ngl reflux"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 13:27
S105	180	"debutanizer" and "depropanizer" and "deethanizer"	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 14:38
S106	25	"debutanizer" and "depropanizer" and "deethanizer" and ngl	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/12 14:38
S107	1	"4529411".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2012/07/16 10:42
S108	15	("make up" or "makeup" or make-up) with (CO2 or "carbon dioxide") and lng	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/08 16:10
S109	389	"makeup stream"	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/08 16:14
S110	10	"makeup stream" with (CO2 or "carbon dioxide")	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/08 16:14
S111	6	("20040127759" | "20050113623" | "6781014" | "6846951" | "7199276").PN. OR ("7470811").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/08 16:17
S112	1327	"CO2 injection" or "carbon dioxide injection"	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/08 16:36
S113	26	("CO2 injection" or "carbon dioxide injection") and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/08 16:36
S114	1	"4529411".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/09 13:22
S115	1	"20030161780"	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/09 13:56
S116	0	"compressor" with "dehyrator" and (CO2 or "carbon dioxide") and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/09 14:13

S117	0	"compressor" with "dehyrator" and (CO2 or "carbon dioxide")	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/09 14:13
S118	73	"compressor" with "dehydrator" and (CO2 or "carbon dioxide")	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/09 14:14
S119	3	"compressor" with "dehydrator" and (CO2 or "carbon dioxide") and ngl	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/09 14:14

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S120	15	(prim with eric).in.	US-PGPUB; USPAT; UPAD	OR	OFF	2013/05/01 17:18
S121	2	(prim with eric).in. and "carbon dioxide" and "sour ngl"	US-PGPUB; USPAT; UPAD	OR	OFF	2013/05/01 17:18
S122	0	((CO2 or carbon-dioxide or "carbon dioxide") and ("natural gas liquids" or ngl) and "heavy hydrocarbons" and "acid gas").in.	US-PGPUB; USPAT; UPAD	OR	OFF	2013/05/01 17:20
S123	1	((CO2 or carbon-dioxide or "carbon dioxide") and ("natural gas liquids" or ngl) and "heavy hydrocarbons" and "acid gas").clm.	US-PGPUB; USPAT; UPAD	OR	OFF	2013/05/01 17:20
S124	0	(hydrocarbon and "carbon dioxide" and ngl and recycle and sour and sweet).clm.	US-PGPUB; USPAT; UPAD	OR	OFF	2013/05/01 17:22
S125	0	(hydrocarbon and "carbon dioxide" and ngl and recycle and sour and sweet).clm.	US-PGPUB; USPAT; UPAD	OR	ON	2013/05/01 17:23
S126	0	(hydrocarbon and "carbon dioxide" and recycle and sour and sweet).clm.	US-PGPUB; USPAT; UPAD	OR	ON	2013/05/01 17:23
S127	0	(hydrocarbon and "carbon dioxide" and sour and sweet).clm.	US-PGPUB; USPAT; UPAD	OR	ON	2013/05/01 17:23
S128	45	(hydrocarbon and sour and sweet).clm.	US-PGPUB; USPAT; UPAD	OR	ON	2013/05/01 17:23
S129	8	(hydrocarbon and recycle and sour and sweet).clm.	US-PGPUB; USPAT; UPAD	OR	ON	2013/05/01 17:24
S130	1	C8 and ngl and "carbon dioxide" and sweet and sour	US-PGPUB;	OR	ON	2013/05/01 17:24

			USPAT; UPAD			
S131	21	ngl and "carbon dioxide" and sweet and sour	US-PGPUB; USPAT; UPAD	OR	ON	2013/05/01 17:24

5/ 1/ 2013 6:24:16 PM
C:\ Users\ kraymond\ Documents\ EAST\ Workspaces\ 12122336.wsp

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

30652 7590 05/08/2013
CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 500
PLANO, TX 75024

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Jerri Pearson	(Depositor's name)
/Jerri Pearson/	(Signature)
July 11, 2013	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/122,336	05/16/2008	Eric Prim	2103-00902	8617

TITLE OF INVENTION: Natural Gas Liquid Recovery Process

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$0	$0	$1780	08/08/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
RAYMOND, KEITH MICHAEL	3744	062-618000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Conley Rose, P.C.
2 Grant Rodolph
3 Nicholas K. Beaulieu

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Pilot Energy Solutions, LLC

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Houston, Texas

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 501515 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

☐ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature Grant Rodolph Date 7/11/13

Typed or printed name Grant Rodolph Registration No. 50487

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Electronic Patent Application Fee Transmittal

Application Number:	12122336
Filing Date:	16-May-2008
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Filer:	Grant Rodolph/Jerri Pearson
Attorney Docket Number:	2103-00902

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	1501	1	1780	1780
Publ. Fee- Early, Voluntary, or Normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**2080**

Electronic Acknowledgement Receipt

EFS ID:	16293979
Application Number:	12122336
International Application Number:	
Confirmation Number:	8617
Title of Invention:	Natural Gas Liquid Recovery Process
First Named Inventor/Applicant Name:	Eric Prim
Customer Number:	30652
Filer:	Grant Rodolph/Jerri Pearson
Filer Authorized By:	Grant Rodolph
Attorney Docket Number:	2103-00902
Receipt Date:	11-JUL-2013
Filing Date:	16-MAY-2008
Time Stamp:	19:02:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$2080
RAM confirmation Number	6028
Deposit Account	501515
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Issue Fee Payment (PTO-85B)	2103-00902_ISSUE_FEE_PAYMENT.pdf	257925 52e02caf574305bdd28d16c64840ccc04a364b4c	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	31711 6409ceebb305d9ae04019c562867e8b466cb69bf	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	289636		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/122,336	08/13/2013	8505332	2103-00902	8617

30652 7590 07/24/2013

CONLEY ROSE, P.C.
5601 GRANITE PARKWAY, SUITE 500
PLANO, TX 75024

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 1489 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Eric Prim, Midland, TX;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY.DOCKET NO./TITLE	REQUEST ID
12/122,336	05/16/2008	Eric Prim	2103-00902	126880

Acknowledgement of Change to Small Entity Status

The entity status change request below filed through Private PAIR on 12/08/2020 has been accepted.

CERTIFICATIONS:

Change of Entity Status:

X Applicant asserting small entity status. See 37 CFR 1.27.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

This portion must be completed by the signatory or signatories making the entity status change in accordance with 37 CFR 1.4(d)(4).

Signature:	/Grant Rodolph/
Name:	Grant Rodolph
Registration Number:	50487