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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ROMINA DIGNE,
OLIVIER CALLEBERT, and ROMAIN ROUX

Appeal 2015-004740
Application 13/060,457
Technology Center 1700

Before ROMULO H. DELMENDO, GEORGE C. BEST, and JEFFREY R. SNAY, *Administrative Patent Judges*.

BEST, *Administrative Patent Judge.*

DECISION ON APPEAL

The Examiner finally rejected claims 1, 4, and 8–13 of Application 13/060,457 under 35 U.S.C. § 103(a) as obvious and also rejected claim 4 under 35 U.S.C. § 112, ¶ 4. Final Act. (February 14, 2014). Appellants[1] seek reversal of these rejections pursuant to 35 U.S.C. § 134(a). We have jurisdiction under 35 U.S.C. § 6.

For the reasons set forth below, we AFFIRM.

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[1] IFP Energies Nouvelles is identified as the real party in interest. Br. 1.

BACKGROUND

The '457 Application describes processes for converting heavy hydrocarbons into gasoline and propylene. Spec. 1. In particular, a process for the co-production of propylene and at least a minimum yield of gasoline is described. *Id.*

The fluid catalytic cracking (FCC) process converts heavy hydrocarbon feeds into lighter hydrocarbons, including gasoline and liquefied gas (LPG). *Id.* Propylene is a component of LPG. *Id.* The particular blend of lighter hydrocarbons produced by an FCC process depends, *inter alia*, upon the particular conditions used in the process. *Id.* By adjusting the conditions, the amount of propylene produced can be increased. *Id.* In general, increasing the amount of propylene produced in an FCC process reduces the yield of gasoline produced. *Id.*

Claim 1 is representative of the '457 Application's claims and is reproduced below:

> 1. A process for the co-production of gasoline and propylene from a heavy hydrocarbon feed with an initial boiling point of more than 340°C using a catalytic cracking unit followed by an oligomerization unit which can function in accordance with two regimes termed "maxi propylene" and "maxi gasoline", in which:
>
> - for the "maxi propylene" regime, the feed for the oligomerization unit is constituted by the C4 cut or the C4/C5 olefinic cut derived from catalytic cracking and the effluents from the oligomerization unit are separated into a C8+ oligomer cut which is recycled at least in part to the inlet to the catalytic cracking unit, the gasoline cut from the process being constituted by the gasoline cut produced in the catalytic cracking unit and the oligomer cut derived from the oligomerization unit which is not recycled for catalytic cracking; in which in the "maxi propylene" regime, catalytic cracking is carried out in

two distinct FCC reactors in dropper mode, the first FCC reactor carrying out cracking of the heavy feed operates at a reactor outlet temperature (ROT1) in the range 550°C to 700°C, and a C/O ratio in the range 15 to 50, and the second FCC reactor carrying out cracking of C8+ oligomers derived from the oligomerization unit (termed the light feed) operates at a reactor outlet temperature (ROT2) in the range 570°C to 700°C, with a C/O ratio in the range 15 to 50;

- for the "maxi gasoline" regime, the feed for the oligomerization unit is constituted by the olefinic C3/C4 cut derived from catalytic cracking, and the effluents from the oligomerization unit are separated into a C6+ oligomer cut which is added to the gasoline cut derived from catalytic cracking to constitute the gasoline produced by the process; in which in the "maxi gasoline" regime, catalytic cracking is carried out in two reactors operating in riser mode, the reactor outlet temperature (ROT) is in the range 500°C to 580°C, and the C/O ratio is in the range 5 to 20;

the propylene being obtained in the two regimes from effluents of catalytic cracking after separation in one or more distillation columns.

Supp. Br. 1 (filed September 24, 2014) (Corrected Claims App.).

REJECTION

On appeal, the Examiner maintains[2] the following rejection:

1. Claims 1, 4, and 8–13 are rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Duplan,[3] Avidan,[4] and Gauthier.[5] Final Act. 7.

DISCUSSION

In arguing for the reversal of the rejection of claims 1, 4, and 8–13, Appellants do not specifically cite the limitations of any particular claim. See Br. 2–5. Accordingly, we select claim 1—the only independent claim on appeal—as representative of the group of the appealed claims. 37 C.F.R. § 41.37(c)(1)(iv). Dependent claims 4 and 8–13 will stand or fall with claim 1.

We begin—as we must—by considering the language of claim 1. During prosecution, the PTO gives the language of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account any definitions or other enlightenment provided by the written description contained in the applicant's specification. *In re Morris*, 127 F.3d 1048, 1054–55 (Fed. Cir. 1997).

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[2] The Examiner has withdrawn the § 112, ¶ 4 rejection of claim 4. Answer 11.

[3] US 2005/0121361 A1, published June 9, 2005.

[4] US 4,822,477, issued April 18, 1989.

[5] US 6,641,715 B1, issued November 4, 2003.

Claim 1 is a process claim. A process claim consists of a series of steps to be performed. Claim 1, however, is not written in a manner that clearly recites these steps. We, therefore, look to interpret the claim's language in a manner that defines a series of steps comprising the claimed process.

The first portion of claim 1 states that the claim is directed to a process for transforming a heavy hydrocarbon feed into propylene and gasoline using an apparatus that can carry out either a "maxi propylene" process or a "maxi gasoline" process. The rest of the claim sets out the steps in these processes. Because the maxi propylene and maxi gasoline processes cannot be performed simultaneously on the same apparatus, the first step in the claimed process is the selection of which process will actually be performed.

Our interpretation is consistent with the'457 Application's Specification, which states:

> The process of the invention means that two types of production corresponding to two distinct regimes can be carried out:
>
> - a regime termed "maxi propylene" corresponding to a maximum production of propylene while maintaining a minimum or even slightly increased gasoline yield with respect to the potential yield of the catalytic cracking unit alone; or
> - a regime termed "maxi gasoline", corresponding to a maximum production of gasoline without the production of propylene.
>
> One of the advantages of the invention is to be able to swing over time from one to the other of the two regimes defined above. It is also possible to operate the unit in any intermediate mode between the "maxi propylene" and "maxi gasoline" regimes.

Spec. 3.

In view of the foregoing, we interpret claim 1 as follows:

1. A process for the co-production of gasoline and propylene from a heavy hydrocarbon feed with an initial boiling point of more than 340°C using a catalytic cracking unit followed by an oligomerization unit which can function in accordance with two regimes termed "maxi propylene" and "maxi gasoline", comprising:

   selecting either a "maxi propylene" mode or a "maxi gasoline" mode," wherein

   a. the "maxi propylene" mode comprises

      i. supplying the heavy hydrocarbon feed to the catalytic cracking unit;

      ii. cracking the heavy hydrocarbon feed in a first FCC reactor operated in dropper mode with a reactor outlet temperature (ROT1) in the range of 550°C to 700°C, and a C/O ratio in the range of 15 to 50;

      iii. cracking a C8+ cut in a second FCC reactor operated in dropper mode at a reactor outlet temperature (ROT2) in the range 570°C to 700°C, with a C/O ratio in the range 15 to 50;

      iv. supplying the effluent of the catalytic cracking unit to a first separation zone comprising one or more distillation columns;

      v. obtaining propylene from the first separation zone;

      vi. obtaining a first gasoline cut from the first separation zone;

      vii. obtaining an oligomerization feed comprising either a C4 cut or a C4/C5 cut from the first separation zone;

viii. supplying the oligomerization feed to the oligomerization unit;

ix. supplying the oligomerization unit effluent to a second separation zone;

x. obtaining the C8+ oligomer cut from the second separation zone; and

xi. supplying at least a portion of the C8+ oligomer cut to the second FCC reactor in the catalytic cracking unit;

wherein the total gasoline cut produced by the "maxi propylene" mode is constituted by the first gasoline cut and the portion of the C8 + oligomer cut not supplied to the second FCC reactor in the catalytic cracking unit;

and wherein

b. the "maxi gasoline" mode comprises

i. supplying the heavy hydrocarbon feed to a catalytic cracking unit comprising a first FCC reactor and a second FCC reactor

ii. operating the first and second FCC reactors in riser mode at a reactor outlet temperature (ROT) in the range of 500°C to 580°C, and a C/O ratio in the range of 8 to 20;

iii. supplying the effluent of the catalytic cracking unit to a first separation zone comprising one or more distillation columns;

iv. obtaining a first gasoline cut from the first separation zone obtaining a C3/C4 cut from the first separation zone;

v. supplying the C3/C4 cut to an oligomerization unit;

vi. supplying the oligomerization unit effluent to a second separation zone comprising one or more distillation columns;

vii. obtaining a second gasoline cut comprising a C6 + oligomer cut from the second separation zone;

viii. obtaining a C4 cut from the second separation zone; and

ix. obtaining propylene from the second separation zone;

wherein the total gasoline cut produced by the "maxi gasoline" mode is constituted by the first gasoline cut and the second gasoline cut.

First, Appellants argue that the Examiner erred in finding that the combination of Duplan, Avidan, and Gauthier describes or suggests the step of selecting either a "maxi propylene" mode or a "maxi gasoline" mode. Br. 5.

This argument is not persuasive. As the Examiner explained:

> **Duplan** teaches that the co-production of propylene and gasoline can be altered depending on the particular economic situation in which either maximum production of propylene is sought or high gasoline yield is sought ([0133]–[0134]). It would therefore be obvious to a person of ordinary skill in the art to adjust which olefinic fraction is provided to the oligomerization unit in order to obtain either additional propylene or gasoline depending on if a maximum production of propylene is sought or if a high gasoline yield is sought. Therefore, **Duplan** is considered to teach operating the oligomerization unit in a "maxi propylene" regime while **Avidan** teaches operating the oligomerization unit in a "maxi gasoline" regime. It would be obvious to a person of ordinary skill in the art to recognize the combination of prior art elements would produce a method in which an oligomerization unit could be operated either in a "maxi propylene" or "maxi gasoline" regime during the co-production of both propylene and gasoline.

Final Act. 9. *See also* Answer 15 ("Although Duplan teaches producing more propylene than gasoline, Duplan also teaches that the co-production of proplyene and gasoline can be altered depending on the particular economic situation . . . . Therefore, Duplan recognizes that the co-production process can be altered/modified based on the desired product.").

We do not discern error in the Examiner's findings and reasoning in this regard.

Second, Appellants argue that the Examiner erred in finding that Duplan describes or suggests the steps of the maxi propylene process:

> [Duplan's] disclosure is respectfully submitted not to suggest to one person of ordinary skill in the art a process wherein a heavy feed is subjected to cracking, and the effluent separated into gasoline, and C_{3-4} hydrocarbons, with C_3 hydrocarbons recovered and C_4 olefins then oligomerized, separated to recover C_8-oligomers which can then be used as gasoline or recycled to cracking. See present Figure 1 and claim 1.

Br. 3.

Appellants' arguments are not persuasive. As the Examiner found, Final Act. 8, Duplan supplies a heavy hydrocarbon feedstock to an FCC reactor. *See* Duplan Fig. 1; ¶ 151 (nature of feedstock for FCC reactor **R3**); ¶ 28 (properties of vacuum distillate in feedstock). The effluent from FCC reactor **R3** is introduced into separation zone **S3**. *Id.* ¶ 153. The propylene produced by the FCC process is recovered from separation zone **S3** via line **12**. *Id.* ¶ 158. Separation zone **S3** also isolates a C4/C5 cut that can be introduced into oligomerization reactor **R2** via line **10**. *Id.* ¶¶ 149, 153–155. The effluent from oligomerization reactor **R2** is introduced into separation zone **S2**. *Id.* ¶ 149. Separation zone **S2** isolates, *inter alia*, C8+ oligomers. *Id.* At least a portion of these oligomers are fed back into reactor **R3**. *Id.* The Examiner further found that Gauthier describes operating a dropper

reactor at temperatures between 500°C and 700°C with a C/O ratio of 5–20. Final Act. 11. Because these ranges overlap the claimed ranges, the Examiner correctly concluded that the claimed operating temperatures and catalyst ratios were prima facie obvious. We, therefore, conclude that the Examiner did not err in finding the steps of the maxi propylene process obvious.

Third, Appellants argue that the Examiner's conclusion is erroneous because the embodiment which introduces the C4/C5 cut into the oligomerization unit via line **10** is not the preferred embodiment. Br. 3–4.

This argument is not persuasive. In an obviousness inquiry, the fact that a specific embodiment is taught to be preferred is not controlling, since all disclosures of the prior art, including unpreferred embodiments, must be considered. *Merck & Co. v. Biocraft Labs., Inc.*, 874 F.2d 804, 807 (Fed. Cir. 1989) (citing *In re Lamberti,* 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976)); *see also In re Inland Steel Co.*, 265 F.3d 1354, 1361 (Fed. Cir. 2001) (explaining that a preferred embodiment does not necessarily teach away from a non-preferred embodiment); *In re Boe*, 355 F.2d 961, 965 (CCPA 1966) (all of the disclosures in a reference, including non-preferred embodiments, "must be evaluated for what they fairly teach one of ordinary skill in the art").

Fourth, Appellants argue that the Examiner erred by concluding that a person of ordinary skill in the art would have combined the Duplan, Avidan, and Gauthier to arrive at the "maxi gasoline" process. Br. 5. In particular, Appellants argue that such a combination would "vitiate the entire advantage of Duplan." *Id.* As discussed above, the Examiner correctly determined that Duplan discusses varying the relative amounts of propylene and gasoline produced in a catalytic cracking process according to the relative value of

propylene versus gasoline at the time the process is carried out. *See* Final Act. 9. Appellants' argument, therefore, is not persuasive.

Thus, we affirm the Examiner's rejection of claims 1, 4, and 8–13.

CONCLUSION

For the reasons set forth above, we affirm the Examiner's rejection of claims 1, 4, and 8–13 of the '457 Application.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED