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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MICHAEL W. LYNCH and KENNETH J. KLUG

Appeal 2019-000633
Application 13/725,003
Technology Center 1700

Before ROMULO H. DELMENDO, MARK NAGUMO, and MICHAEL G. McMANUS, *Administrative Patent Judges*.

McMANUS, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant[1] seeks review of the Examiner's decision to reject claims 1, 2, 4, 7, 8, 10, and 12. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42 and as listed in the Supplemental Application Data Sheet filed June 24, 2013. Appellant, Equistar Chemicals LP, is also identified as the real party in interest. Appeal Br. 2.

BACKGROUND

The present application generally relates to a process for preparing olefin polymers using chromium catalysts. Spec. ¶ 2. The Specification indicates that "the present invention provides a process for the polymerization of olefin carried out in the presence of a Cr-oxide supported catalyst, a co-catalyst, and an effective amount of hydrogen thereby obtaining an increased catalyst activity." *Id.* ¶ 9.

Claims 1 and 12 are illustrative of the subject matter on appeal and are reproduced below with certain limitations bolded for emphasis:

1. A process for polymerizing an olefin comprising:
   (i) forming an activated silica supported hexavalent chromium catalyst comprising the steps of:
      (a) preparing a homogeneous solution comprising an organic or inorganic chromium compound in a protic or aprotic polar solvent,
      (b) bringing the resulting solution from (a) into contact with a silica material to form a solid,
      (c) removing the solvent from the resulting solid formed in (b) at a temperature of 20–150 °C for forming a chromium catalyst precursor, and
      (d) **calcining the chromium catalyst precursor** at a temperature of 540–800 °C under oxidative conditions **to form the activated silica supported hexavalent-chromium catalyst**; and
   (ii) polymerizing an olefin in the presence of:
      (a) **the silica supported hexavalent-chromium catalyst**,
      (b) a co-catalyst comprising triethyl boron compound in an amount corresponding to a boron to chromium atomic ratio of 1–10, and

(c) hydrogen at a concentration of 0.03–1.18 mole% and a pressure of 25–340 psi based upon the total polymerization contents;

wherein the hexavalent-chromium catalyst has a higher mileage when the polymerizing step takes place in the presence of triethyl boron and hydrogen as compared to the mileage of the hexavalent-chromium catalyst when the polymerizing step takes place in the absence of triethyl boron or hydrogen.

12. The process of claim 1, wherein polymerizing of the olefin is performed in the presence of hydrogen at a concentration of 0.07-1.5 mole% based upon the total polymerization contents.

Appeal Br. 10, 11 (Claims App.) (emphasis added).

REJECTIONS

The Examiner maintains the following rejections:

1. Claim 12 is rejected under pre-AIA 35 U.S.C. § 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends. Final Act. 3.
2. Claims 1, 2, 4, 7, 8, 10, and 12 are rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Nooijen et al. (WO 2010/115614 A1, published October 14, 2010 ("Nooijen")) and further in view of Schneider et al. (US 2008/0177013 A1, published July 24, 2008 ("Schneider")). *Id.* at 4–8.

DISCUSSION

Rejection 1. The Examiner rejected claim 12 for improper dependency. *Id.* at 3. Claim 12 depends from claim 1 and further requires that "polymerizing of the olefin is performed in the presence of hydrogen at a concentration of 0.07-1.5 mole% based upon the total polymerization contents." Appeal Br. 11 (Claims App.). The Examiner determines that the upper limit for the range of hydrogen concentration recited in claim 12 goes beyond the "0.03–1.18 mole%" stated in claim 1. Final Act. 3; *see also* 35 U.S.C. § 112, ¶ 4. Appellant does not substantively respond to such rejection. Accordingly, we summarily affirm. *See* 37 C.F.R. § 41.37(c)(1)(iv) (2012); *Hyatt v. Dudas*, 551 F.3d 1307, 1313–14 (Fed. Cir. 2008); *see also* Manual of Patent Examining Procedure (MPEP) § 1205.02 (8th ed. July 2010) ("If a ground of rejection stated by the examiner is not addressed in the appellant's brief, that ground of rejection will be summarily sustained by the Board.").

Rejection 2. The Examiner rejected claims 1, 2, 4, 7, 8, 10, and 12 as obvious over Nooijen in view of Schneider. Final Act. 4–8. The Appellant argues the claims as a group. Appeal Br. 4–8. We select claim 1 as representative, and the remaining claims on appeal will stand or fall with claim 1 pursuant to 37 C.F.R. § 41.37(c)(1)(iv).

The primary reference, Nooijen, is "directed to a slurry phase polymerisation process for the preparation of ethylene-α-olefin copolymers by polymerising ethylene in the presence of a chromium containing catalyst and a diluent." Nooijen, Abstract. The Examiner finds that Nooijen teaches steps (i)(d) and (ii)(a), (b), and (c). Final Act 5.

The secondary reference, Schneider, is directed toward "[n]ovel supported, titanized chromium catalysts for the homopolymerization of ethylene and the copolymerization of ethylene with α-olefins." Schneider, Abstract. The Examiner finds that Schneider teaches steps (i)(a), (b), and (c). Final Act. 6.

The Examiner concedes that "[t]he combination of Nooijen et al. and Schneider et al. is silent with respect to the chromium catalyst being a hexavalent-chromium catalyst having a mileage when polymerizing in the presence of triethylboron and hydrogen higher than the mileage of the hexavalent-chromium catalyst polymerizing in the absence of triethylboron or hydrogen." Final Act. 6. The Examiner determines, however, that one of ordinary skill in the art would have would have expected the chromium catalyst of Nooijen and Schneider to be hexavalent and to have a higher mileage "because Schneider et al. teaches the chromium catalyst is prepared according to claimed steps (a)-(c), and [Nooijen] activates the chromium catalyst in dry air [page 10, line 8] and polymerizes ethylene in the presence of triethylboron and hydrogen as claimed." *Id.* at 6–7.

The Examiner additionally determines that the burden is shifted, under *In re Best*, 562 F.2d 1252, 1255 (CCPA 1977), to the Applicant to show that the chromium catalyst of Nooijen and Schneider would not have been expected to have a mileage higher than one that polymerizes in the absence of triethylboron or hydrogen. *Id.* at 7.

Appellant seeks review of this rejection. Appeal Br. 4–8. Appellant argues that the references relied upon by the Examiner fail to teach the "hexavalent-chromium catalyst" required by claim 1. *Id.* at 6. Appellant points out Schneider's teaching that "[e]xamples of suitable chromium

compounds are chromium trioxide and chromium hydroxide and also salts of trivalent chromium with organic and inorganic acids." *Id.* (citing Schneider ¶ 34). Appellant asserts that this portion of Schneider concerns chromium (III) catalysts rather than chromium (VI) catalysts as required by claim 1. *Id.*

Appellant additionally argues that embodiments of the claimed process display surprising and advantageous benefits. *Id.* at 7. Appellant argues that the claimed process yields advantageous catalyst mileage under hydrogen supplemented conditions. *Id.*

Appellant further argues that catalyst mileage has not been demonstrated to be an art-recognized result-effective variable; accordingly, optimization to obtain the results of the claimed process would not have been obvious. *Id.* at 7–8.

In the Answer, the Examiner determines Appellant's arguments to be unpersuasive. Answer 8–11. The Examiner finds that the Specification teaches that "[i]n step a) preference is given to using chromium compound having a valence of *less than six, particularly preferably Cr (III) compounds* . . . . Particular preference is given to salts of acids *which during activation are converted essentially into chromium (VI).*" *Id.* at 8 (citing Spec. ¶ 23) (emphasis in original). That is, the present Application describes a method that starts with trivalent chromium compounds and converts the starting compounds to the hexavalent state. *Id.* (citing Spec. ¶ 37).

The Examiner finds that Nooijen includes similar teachings. *Id.* The Examiner cites to a portion of Nooijen that discloses "a catalyst having a chromium component on a high titania silica-titania cogel support, obtained by heat-activation in an oxygen-containing ambient to convert at least a

portion of any chromium in a *lower valent state to the hexavalent state*." *Id.* (citing Nooijen at 8:14–17) (emphasis in original). The Examiner further finds that Schneider teaches to "calcine[] the precatalyst comprising the trivalent chromium compound at 500°C to 800°C in an oxygen-containing atmosphere." Answer 8 (citing Schneider ¶ 14). The Examiner concludes that since Schneider heats the trivalent chromium compounds in an oxygen-containing atmosphere to a temperature within the claimed range, the chromium catalyst of Schneider would be expected to be converted to the hexavalent state. *Id.* at 8–9.

Appellant did not file a Reply Brief.

We find the Examiner's reasoning to be persuasive. Both Schneider and the Specification teach to use trivalent chromium in chromium catalyst preparation. *See* Spec. ¶ 23; Schneider ¶ 34. Further, Schneider teaches similar process steps including heating under oxidizing conditions. *See* Schneider ¶¶ 33–39; Answer 8–9. Appellant has not shown error in the Examiner's reasoning that the hypothetical combined process would have resulted in a hexavalent-chromium catalyst.

The Examiner further finds that Appellant has failed to show that the claimed process exhibits unexpected benefits relative to the prior on several bases. *Id.* at 9–11. In its Appeal Brief, Appellant specifically discusses Examples 16–20 of Table 3 of the Specification and Examples 21–25. Appeal Br. 7. As found by the Examiner, Examples 16–20 lack triethyl boron (TEB) and, thus, fall outside the claims. Answer 10; Spec., Table 3. Examples 21–25 include triethyl boron co-catalyst, but exhibit catalytic activity *lower than* shown in a prior example lacking triethyl boron but employing a comparable hydrogen pressure. Spec., Table 3 (compare

Example 4 with Example 23); *see also id.* ¶ 51. Nor has Appellant shown that the cited test results are commensurate in scope with the claims (*e.g.*, Appellant has not cited to test results showing hydrogen pressure greater than 340 psi). *See In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003) ("the applicant's showing must be commensurate in scope with the claimed range").

Accordingly, Appellant has failed to show that the use of both triethyl boron and the recited hydrogen pressure leads to greater polymerization activity. For at least this reason, we find Appellant's arguments regarding surprising and advantageous benefits to be unpersuasive.

In regard to Appellant's argument that "optimization to obtain the results of the claimed process would not have been within the grasp of one of ordinary skill in the art." Appeal Br. 7–8. We adopt the Examiner's determination that "the Office action never set forth that catalyst mileage was an art recognized, result-effective variable that could be optimized. Appellants are arguing against a position that was not made in the Office action." Answer 10–11.

Accordingly, Appellant has not shown error in the rejection.

CONCLUSION

In summary:

Claims Rejected	Basis	Affirmed	Reversed
12	§ 112, ¶ 4	12	
1, 2, 4, 7, 8, 10, and 12	§ 103(a), Nooijen in view of Schneider	1, 2, 4, 7, 8, 10, and 12	
Overall Outcome		1, 2, 4, 7, 8, 10, and 12	

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