

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Ex parte STEPHAN EHLERS, KOLN, JOSE F. PAZOS,
CHRISTIAN STEINLEIN, MICHAEL SCHNEIDER, JORG HOFMANN,
MAJID KEYVANI, and JOHN E. HAYES

Appeal 2007-0310
Application 10/260,498
Technology Center 1600

Decided: April 30, 2007

Before DONALD E. ADAMS, DEMETRA J. MILLS, and ERIC GRIMES,
Administrative Patent Judges.

GRIMES, *Administrative Patent Judge.*

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 involving claims to a process for preparing an ethylene oxide-capped polyol. The Examiner has rejected the claims as obvious. We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

BACKGROUND

The specification states that ethylene oxide-capped polyols are typically produced by polymerizing propylene oxide “in the presence of a basic catalyst (usually potassium hydroxide (‘KOH’)) to produce a polyol containing mostly secondary hydroxyl groups,” followed by ethoxylation, that is, adding ethylene oxide (“EO”) “to the catalyst containing mixture to convert some or most of the secondary hydroxyl groups to primary hydroxyl groups.” (Specification 1.) The specification states that, after ethoxylation, the basic catalyst is “neutralized with an acid and the precipitated salt is separated from the polyol by filtration or centrifugation, or the basic catalyst is removed” by another technique. (*Id.*)

The specification also states that double-metal cyanide (“DMC”) catalysts “can be used to produce polyether, polyester and polyetherester polyols,” but that “DMC catalysts cannot be used to directly produce EO-capped polyols” because “[w]hen EO is added to a polyoxypropylene polyol produced by DMC catalysis, the resulting product is a heterogeneous mixture of: (1) un-reacted polyoxypropylene polyol; and (2) highly ethoxylated polyoxypropylene polyol and/or polyethylene oxide.” (*Id.* at 2.)

The specification describes two processes for preparing EO-capped polyols. The first process involves combining a polyol produced in the presence of a DMC catalyst is combined with a basic catalyst, then ethoxylating the mixture to produce an EO-capped polyol, and adding acid to the EO-capped polyol, “with the proviso that no precipitate is formed by the reaction of the acid with the basic catalyst.” (*Id.* at 5.) The second process is similar, but the polyol produced in the presence of a DMC catalyst

is combined with a polyol prepared in the presence of a basic catalyst, rather than a basic catalyst itself; it also includes “the proviso that no precipitate is formed by the reaction of the acid with the basic catalyst.” (*Id.* at 6.)

DISCUSSION

1. CLAIMS

Claims 10-13, 25-28, and 67-78 are pending and on appeal. The claims subject to each rejection have not been argued separately and therefore stand or fall together. 37 C.F.R. § 41.37(c)(1)(vii). We will focus on claims 10 and 25, which are representative and read as follows:

10. A process for preparing an ethylene oxide-capped polyol comprising:

a) providing a polyol which has been produced in the presence of a double metal cyanide (DMC) catalyst;

b) adding a basic catalyst to the DMC-catalyzed polyol to produce a mixture comprising less than about 0.0375 wt.%, based on the total weight of the mixture, of the basic catalyst;

c) ethoxylating the mixture at a temperature of from about 130°C to about 220°C to produce an ethylene oxide-capped polyol; and

d) adding acid to the ethylene oxide-capped polyol;

with the proviso that no precipitate is formed by reaction of the acid with the basic catalyst.

25. A process for preparing an ethylene oxide-capped polyol comprising:

a) providing a polyol which was produced in the presence of a double metal cyanide (DMC) catalyst;

b) adding to the DMC-catalyzed polyol a polyol which has been produced in the presence of a basic catalyst to form a mixture comprising from about 0.1 to about 10 wt.%, based on the total weight of the mixture, of

the base-catalyzed polyol and less than about 0.0375 wt.%, based on the total weight of the mixture, of the basic catalyst;

c) ethoxylating the mixture at a temperature of from about 130°C to about 220°C to produce an ethylene oxide-capped polyol; and

d) adding acid to the ethylene oxide-capped polyol;

with the proviso that no precipitate is formed by reaction of the acid with the basic catalyst.

Thus, claim 10 is directed to a process for preparing an EO-capped polyol comprising adding a basic catalyst to DMC-catalyzed polyol, ethoxylating the mixture to form EO-capped polyol, and adding acid, where the acid does not react with the catalyst to form a precipitate.

Claim 25 is directed to a process for preparing an EO-capped polyol comprising adding polyol produced in the presence of a basic catalyst to DMC-catalyzed polyol to form a mixture comprising basic catalyst, ethoxylating the mixture to form EO-capped polyol, and adding acid, where the acid does not react with the catalyst to form a precipitate.

2. PRIOR ART

The Examiner relies on the following references:

Herold	US 4,355,188	Oct. 19, 1982
Doerge	US 4,430,490	Feb. 7, 1984
Nagata	JP 51-101099	Sep. 7, 1976 ¹
Pazos	JP 9-3186 A	Jan. 7, 1997 ²

¹ The citations are to the English-language translation of record.

² The citations are to U.S. Patent No. 5,563,221 to Pazos, which is indicated to be an equivalent.

3. OBVIOUSNESS REJECTION OF CLAIMS 10-13 AND 67-72

Claims 10-13 and 67-72 stand rejected under 35 U.S.C. § 103 as obvious over Herold in view of Nagata or Doerge. The Examiner argues that Herold teaches steps a-d of claim 10 except that it does not “disclose the specific concentration of the basic catalyst, the reaction temperature and that no precipitate is formed by reaction of the acid with the basic catalyst.” (Answer 4.) In particular, the Examiner argues that Herold teaches using a mineral acid to neutralize the basic catalyst. (Answer 5.)

The Examiner relies on Doerge as teaching “addition of a hydroxy-carboxylic acid, such as lactic acid, to a polyether polyol for neutralization of the alkaline catalyst contained therein without formation of a precipitate” and that the “polyether polyol to be treated contains the alkaline catalyst in amounts of about 0.01 to 1 percent by weight based on weight of polyether polyol.” (Answer 4.) The Examiner concludes that the “skilled artisan would have been motivated to substitute the hydroxy-carboxylic acid, such as lactic acid, as taught by Doerge, for the mineral acid of Herold et al., since Doerge teaches that such a substitution would allow one to neutralize the basic catalyst without forming a precipitate” and teaches the “advantages of not forming a precipitate.” (Answer 4-5.)

The Examiner relies on Nagata for its teaching that “a polyurethane foam prepared from a polyether polyol, which has been neutralized with dodecylbenzene sulfonic acid.” (Answer 5.) The Examiner argues that “the salt produced dissolves in the polyether polyol (see page 3 of Nagata et al.). See also [Nagata] example 1 wherein after neutralization with dodecylbenzenesulfonic acid a clear polyether polyol is obtained whereas in

comparative example one after neutralization with nitric acid a neutral salt is deposited.” (Answer 7.) The Examiner concludes that it would have been “obvious to substitute dodecylbenzene sulfonic acid . . . as the neutralizing acid in the process of Herold.” (Answer 5.)

The Examiner argues that the ethoxylation temperature of claim 10 would have the obvious “because changes in the temperature of an old process do[] not impart patentability unless the recited temperature range is critical, i.e., it produces a new and unexpected result.” (Answer 5.)

We conclude that the Examiner has set forth a prima facie case that the method of claim 10 would have been obvious. Herold describes a “process for obtaining polypropylene or polybutylene ether polyols prepared with a double metal cyanide complex catalyst” that “makes it possible to add ethylene oxide to the polyol and give polyether polyols containing high amounts of primary hydroxyl groups” (Herold, col. 2, l. 64, to col. 3, l. 5). The method comprises removing “the double metal cyanide complex catalyst residues . . . by treating the catalyst residue contained in the polyols with a strong base, thereby converting it into ionic species which can be removed by ion exchange or by neutralization and filtration,” and “adding ethylene oxide during or after the base treatment and prior to ion exchange or neutralization and filtration” to cap the polyols with primary hydroxyl groups (*id.* at col. 2, ll. 55-63).

Doerge states that “a considerable amount of polyether polyol is lost” in removing precipitated salt from a polyether polyol and “the removed salt and polyol can pose a disposal problem” (Doerge, col. 1, ll. 23-28). Doerge describes a process for preparing polyether polyols in the presence of an

alkaline catalyst in which the polyether polyol “reaction mixture is treated with a hydroxy-carboxylic acid adapted to neutralize the alkaline catalyst to provide a soluble neutralized catalyst and produce a clear reaction mixture without otherwise having removed the alkaline catalyst from the reaction mixture” (*id.* at col. 2, ll. 5-15). Doerge states that, after preparation of the polyether polyol, the reaction mixture usually contains about 0.01 to 1 percent by weight alkaline catalyst based on the weight of the polyether polyol (*id.* at col. 2, ll. 52-56). Doerge also states that polyether polyols that contain these soluble salts “can be satisfactorily used in modern polyurethane processing equipment” (*id.* at col. 1, ll. 45-47).

Nagata describes preparing a polyether polyol in the presence of an alkaline catalyst and subsequently neutralizing the product with a surfactant having an $-SO_3H$ or $-OSO_3H$ group, such as dodecylbenzenesulfonic acid (Nagata 2, 8). In this method, the catalyst is neutralized but not removed and instead dissolves in the polyether polyol (*id.* at 3). As such, a polyether polyol suited for producing polyurethane foam can be made without a troublesome catalyst removal operation (*id.* at 7).

We agree with the examiner that one of ordinary skill in the art would have been motivated by the teachings in Doerge or Nagata to neutralize the basic catalyst in the method of Herold using an acid that would not react with the basic catalyst to form a precipitate, such as Doerge’s hydroxy carboxylic acid or Nagata’s dodecylbenzene sulfonic acid. Therefore, we agree that the cited references would have suggested the method of claim 10 to those of ordinary skill in the art.

Appellants argue that Herold teaches the “removal of the catalyst residue and treating agent by acid precipitation and filtration” whereas “the instant claims specifically recite[] that no precipitate is formed by the addition of acid.” (Br. 6.) In addition, Appellants argue that “the Examiner has failed to point to any teaching of Nagata et al. regarding whether precipitates are formed in their invention by the addition of acid,” that “Doerge fails to supply the missing teaching to rectify the deficiencies of Herold,” and that “Doerge is not properly combinable with Herold et al. and Nagata et al. as Doerge does not teach precipitation of the acid, whereas Herold et al. do and Nagata et al. is silent.” (*Id.*)

We are not persuaded by these arguments. First, the Examiner does not rely on Herold for teaching that no precipitate is formed. Second, for the reasons discussed above, we agree with the Examiner that Doerge and Nagata each teach that “no precipitate is formed by reaction of the acid with the basic catalyst,” as recited in claim 10. Third, we agree with the Examiner that one of ordinary skill in the art would have been motivated to combine the references in order to avoid the need to remove precipitated salt.

We conclude that the Examiner has set forth a prima facie case that claim 10 would have been obvious over Herold in view of Nagata or Doerge, which Appellants have not rebutted. We therefore affirm the rejection of claim 10 under 35 U.S.C. § 103. Claims 11-13 and 67-72 fall with claim 10.

4. OBVIOUSNESS REJECTION OF CLAIMS 25-28 and 73-78

Claims 25-28 and 73-78 stand rejected under 35 U.S.C. § 103 as obvious over Pazos in view of Doerge and Nagata. The Examiner argues

that “Pazos teaches a method of preparing an ethylene oxide-capped polyol.” (Answer 5-6.)

The Examiner states that Pazos differs from claim 25 in that Pazos does not “expressly teach adding acid to the EO-capped polyol.” (Answer 8.) However, the Examiner argues that Pazos teaches “that following ethoxylation, the EO-capped product is typically purified to remove catalyst residues,” “that any suitable means of purifying the polyol can be used,” and that one of the references cited by Pazos is Herold, “which purifies the polyol by neutralization with an acid.” (*Id.*) Thus, the Examiner argues that “use of an acid is implicitly taught” by Pazos and that “one having ordinary skill in the art would have been motivated to utilize dodecylbenzenesulfonic acid, as taught by Nagata et al., or lactic acid, as taught by Doerge et al., in the process of Pazos for the same reasons the skilled artisan would substitute said dodecylbenzene sulfonic acid and/or lactic acid for the mineral acids in the process of Herold.” (*Id.*)

The Examiner also notes that “Pazos differs from [claim 25] when the base-catalyzed polyol content is greater than 10 wt.% and the basic catalyst content is [not] less than about 0.0375 wt.%.” (Answer 6.) However, the Examiner concludes that these features would have been obvious “because changes in temperature, concentrations, or other process conditions of an old process do[] not impart patentability unless the recited ranges are critical, i.e., they produce a new and unexpected result.” (*Id.*)

We conclude that the Examiner has set forth a prima facie case that the method of claim 25 would have been obvious. Pazos describes a “process for making ethylene oxide-capped polyols from double metal

cyanide-catalyzed polyols . . . compris[ing] blending a first polyol that contains an active double metal cyanide (DMC) catalyst with a second polyol that contains a basic catalyst,” and reacting the polyol blend with ethylene oxide (Pazos, col. 2, ll. 23-29). “When the polyols are blended together, some of the basic catalyst in the second polyol deactivates the DMC catalyst in the first polyol. The rest of the basic catalyst is available for catalyzing ethoxylation of the polyol blend.” (*Id.* at col. 4, ll. 5-8.)

In addition, Pazos discloses that “it is preferred to use from about 10 to about 90 wt. % of the first polyol and from about 10 to about 90 wt. % of the second polyol in the blend” (*id.* at col. 3, l. 66, to col. 4, l. 2); that the basic catalyst “is present in the polyol blend in an amount within the range of about 0.05 to about 2 wt. %” (*id.* at col. 4, ll. 8-10); and that the ethoxylation “reaction temperature is typically within the range of about 50° C. to about 220° C.” (*id.* at col. 4, ll. 37-39).

Finally, Pazos discloses that:

Following ethoxylation, the EO-capped product is typically purified to remove catalyst residues. Any suitable means for purifying the polyol can be used, including treatment with an ion-exchange resin, [etc.] . . . Suitable methods for purifying the EO-capped polyols are described, for example, in U.S. Pat. Nos. . . . 4,355,188 [Herold], the teachings of which are incorporated herein by reference.

(*Id.* at col. 4, ll. 42-51.)

Doerge and Nagata are discussed above. We agree with the Examiner that one of ordinary skill in the art would have found it obvious to combine one of the acids taught by Doerge or Nagata, which do not react with a basic catalyst to form a precipitate, with Pazos’ process for making EO-capped

polyols. The cited references therefore would have suggested the method of instant claim 25 to those of ordinary skill in the art.

Appellants argue that the Examiner has failed to “show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed.” (Br. 10.) In particular, Appellants argue that Pazos “fails to teach addition of an acid to the ethylene oxide-capped polyol whereas Doerge and Nagata et al. do.” (*Id.*)

We are not persuaded by these arguments. First, we agree with the Examiner that, through the incorporation by reference of Herold, Pazos does disclose or suggest adding acid to neutralize the basic catalyst. Second, for the reasons discussed above, we agree with the Examiner that Doerge and Nagata each teach that “no precipitate is formed by reaction of the acid with the basic catalyst,” as recited in claim 25. Third, we agree with the Examiner that one of ordinary skill in the art would have been motivated to combine Doerge and/or Nagata with Pazos in order to avoid the need to remove precipitated salt.

We conclude that the Examiner has set forth a prima facie case that claim 25 would have been obvious over Herold in view of Nagata and Doerge, which Appellants have not rebutted. We therefore affirm the rejection of claim 25 under 35 U.S.C. § 103. Claims 26-28 and 73-78 fall with claim 25.

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SUMMARY

The Examiner's position is supported by the preponderance of the evidence of record. We therefore affirm the rejection of claims 10-13, 25-28, and 67-78 under 35 U.S.C. § 103.

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

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