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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte BAYER MATERIALSCIENCE AG

Appeal 2007-3396
Application 11/008,592¹
Technology Center 1700

Decided: August 29, 2007

Before RICHARD TORCZON, SALLY GARDNER LANE, and
MICHAEL P. TIERNEY, *Administrative Patent Judges*.

TORCZON, *Administrative Patent Judge*.

DECISION ON APPEAL

The claims on appeal broadly relate to processes for the production of molded polyurethane articles having a compressed shell and a cellular core (integral-skin foams) using inorganic zeolites.² All pending claims stand rejected. The appellant (Bayer) seeks review of the rejection. We affirm.

¹ Norbert Eisen, Hans-Detlef Arntz & Lutz Liebegott, *Process for the production of polyurethane integral skin foams* (filed 9 December 2004).

² Specification (Spec.) 1:3-5.

THE CLAIMS

Claims 1-7 are pending. Bayer does not provide separate arguments for subgroups of claims so we treat the claims as standing or falling together and select the sole independent claim as representative of the group.³

Claim 1 defines the invention as follows:⁴

A process for the production of polyurethane integral skin foams comprising

- (1) preparing a polyol formulation (A) comprising
 - a) at least one polyol component having a OH number of from 20 to 1050 and a functionality of from 2 to 6, or a mixture of polyol components having a mean OH number of from 250 to 650 and a mean functionality of from 2.5 to 5,
 - b) optionally, one or more chain extenders and/or crosslinkers,
 - c) optionally, one or more activators,
 - d) water and
 - e) optionally, one or more additives and auxiliary substances, and
- (2) reacting formulation (A) with an isocyanate component (B) comprising
 - f) one or more organic and/or modified organic polyisocyanates and/or polyisocyanate pre-polymers and
 - g) one or more inorganic zeolites.

The Board is obligated to construe pending claims as broadly as their terms reasonably allow.⁵ The phrase "polyurethane integral skin foams"

³ 37 C.F.R. § 41.37(c)(1)(vii).

⁴ Claim language is reproduced from the claim appendix of the Appeal Brief (Br.).

⁵ *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989).

means molded polyurethane foams with a compressed shell and a cellular core.⁶ Integral-skin foams may be soft to rigid.⁷

Claim 1 uses the transition "comprising" three times: (1) in describing the process steps, (2) in describing the polyol formulation, and (3) in describing the isocyanate component. Use of "comprising" opens the limitation so described to the inclusion of additional, unlisted elements.

Bayer uses "polyol" and "polyhydroxyl" interchangeably in its specification.⁸ Hence, we construe "polyols" to be a synonym for polyhydroxyls in the relevant art.

Elements b), c), and e) are included "optionally", which means that they are not limiting.⁹ Reduced to essentials, formulation (A) must have at least an appropriate polyol component and water, while component (B) must have at least an appropriate polyisocyanate and an inorganic zeolite.

THE REJECTIONS

All claims are rejected under 35 U.S.C. § 103 as directed to subject matter that would have been obvious to a person having ordinary skill in the art. The examiner relies on patents to Horn,¹⁰ Skowronski,¹¹ and Eisen¹² as

⁶ Spec. 1:3-5.

⁷ Spec. 2:7-10.

⁸ Spec. 2:20-25 & 3:24-4:10.

⁹ *In re Johnston*, 435 F.3d 1381, 1384, 77 USPQ2d 1788, 1790 (Fed. Cir. 2006) (optional elements do not limit a claim).

¹⁰ Peter Horn et al., *Production of chlorofluorocarbon-free, urethane-containing moldings having a cellular core and a compacted peripheral zone*, US 5,334,620 A1 (issued 2 August 1994) (Horn).

¹¹ Michael J. Skowronski and Kenneth G. Trout, *High equivalent weight polyester polyols for closed cell, rigid foams*, US 5,660,926 A1 (issued 26 August 1997) (Skowronski).

evidence of obviousness.¹³ The examiner has also rejected all claims under a double-patenting theory as having been obvious in view of the Eisen patent claims and the Horn and Skowronski patents.

OBVIOUSNESS

In analyzing obviousness, the scope and content of the prior art must be determined, the differences between the prior art and the claims ascertained, and the ordinary level of skill in the art resolved. Objective evidence of the circumstances surrounding the origin of the claimed subject matter (so-called secondary considerations) may also be relevant. Such secondary considerations guard against the employment of impermissible hindsight.¹⁴

Scope and content of the prior art

The Horn patent

Horn teaches processes for producing soft-elastic to rigid urethane moldings having a cellular core, a compact peripheral zone, and a smooth surface using polyisocyanate and water, rather than chlorofluorocarbons, as the blowing agent.¹⁵ In discussing the prior art, Horn notes that using

¹² Norbert Eisen and Daniel Seidlitz, *Method for producing soft to semi-rigid polyurethane integral foamed materials*, US 6,590,003 B2 (issued 8 July 2003) (Eisen).

¹³ Examiner's Answer (Ans.) 3.

¹⁴ *Graham v. John Deere Co.*, 383 U.S. 1, 17, 36 (1966), cited with approval in *KSR Int'l v. Teleflex Inc.*, 127 S. Ct. 1727, 82 USPQ2d 1385 (2007). The record on appeal does not contain objective evidence of secondary considerations.

¹⁵ Horn 1:8-19.

zeolites in water-based processes reacting polyols with polyisocyanates improves the flame-resistance of such foams. The prior art also teaches using polyols with mean hydroxyl (OH) functionality of at least 2.2 and a mean hydroxyl number of at least 300.¹⁶

Horn specifically teaches a process of reacting in a closed mold with compaction:¹⁷

- a) an organic and/or modified organic polyisocyanate with
- b) at least one relatively high-molecular-weight compound containing at least two reactive hydrogen atoms,
- c) optionally, a low-molecular-weight chain extender and/or crosslinking agent, in the presence of
- d) a blowing agent,
- e) a catalyst,
- f) additives, wherein one of the additives is an amorphous, microporous silica gel, and,
- g) optionally, assistants.

The high-molecular weight compound b) has a functionality of from 2 to 8. The precise functionality relates to the resulting foam rigidity: a higher functionality results in a more rigid foam. Polyols are recommended as being particularly successful.¹⁸ In each of Horn's examples, a "urethane-containing quasi-prepolymer" called Component B is prepared by reacting a polyisocyanate with a polyol or polyol mixture having a hydroxyl number of 250.¹⁹

¹⁶ Horn 2:8-28.

¹⁷ Horn 2:56-3:12 & claim 1.

¹⁸ Horn 4:51-5:5.

¹⁹ Horn 15:30-38, 16:28-38 & 17:18-32.

Horn teaches that in low-density (softer) foams it is advantageous to use crystalline microporous molecular sieves in combination with the amorphous microporous silica gel.²⁰ Several zeolites are listed as particularly suitable crystalline microporous molecular sieves.²¹ One of the zeolites recommended is faujasite, which Bayer requires as the zeolite in its dependent claim 7.²² According to Horn, it is expedient to mix the silica gel with the high molecular weight compound to improve the processing properties and stability of this component of the system.²³ Horn also, however, notes background art in which zeolites are added to both the polyol and polyisocyanate components.²⁴

The Skowronski patent

Skowronski relates to the preparation of insulating foams using high equivalent weight polyester polyols to permit the use of blowing agents other than conventional fully halogenated chlorofluorocarbons.²⁵ Any hydrogen-containing blowing agent may be used although the focus is on organic blowing agents, like hydrogen-containing halocarbons and hydrocarbons. Water is suggested as a co-blowing agent with the hydrogen-containing halocarbons.²⁶

Skowronski notes that it is conventional to preformulate two components, a polyisocyanate component and a polyol component that are to

²⁰ Horn 11:45-50.

²¹ Horn 11:51-12:15.

²² Br. 12.

²³ Horn 11:33-42.

²⁴ Horn 2:19-28.

²⁵ Skowronski 1:9-15.

²⁶ Skowronski 10:1-31.

be reacted together, with the remaining ingredients distributed between these two components or added as yet another component.²⁷ If water is used, Skowronski teaches that it is convenient to add it with the polyol.²⁸

Bayer appears to question whether Skowronski is even analogous art. Bayer argues that those in the art would not regard Skowronski's teachings relating to closed-cell rigid foams to apply to Horn's and its own integral-skin foams. It is not clear from the argument why this should necessarily be true. No evidence is provided to support the argument. We cannot accept bare argument as fact.²⁹ Instead, we find compelling Horn's belief that closed-cell rigid foams were pertinent in view of Horn's disclosure of such a foam using zeolites in both the polyol and polyisocyanate components as relevant background art.³⁰

Bayer also argues that Skowronski does not teach the use of zeolites and that its teachings cannot be combined with those of Horn to produce the invention.³¹ These arguments are misdirected. The examiner does not rely on Skowronski to teach the use of zeolites, so its deficiency in this regard is hardly fatal to the rejection.³² Similarly, the rejection does not rest on a physical combination of the respective teachings of the references, but rather on what the combined teachings of the references would mean to those in the

²⁷ Skowronski 12:19-26.

²⁸ Skowronski 12:40-42.

²⁹ *In re Geisler*, 116 F.3d 1465, 1470, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997).

³⁰ Horn 2:19-28.

³¹ Br. 5; Reply 3.

³² *Nat'l Steel Car, Ltd. v. Canadian Pac. Rwy., Ltd.*, 357 F.3d 1319, 1336-37, 69 USPQ2d 1641, 1654 (Fed. Cir. 2004) (noting that different references contribute distinct teachings in support of the overall analysis).

art.³³ The very narrow point for which the examiner cites Skowronski—that additives may be used with either preformulated component—is so consistent with what Horn already teaches or suggests that those in the art would not be troubled by the lack of zeolites and less relevant teachings also found in Skowronski.

The Eisen patent

Eisen relates to the production of polyurethane integral foams using a fluoroalkane as the blowing agent.³⁴ Specifically, a process in which:³⁵

- a) organic and/or modified organic polyisocyanates and/or polyisocyanate prepolymers are reacted with
 - b) at least one polyol component with an OH number of 20 to 200 and a functionality of 2 to 6, preferably 2 to 3,
 - c) optionally in combination with a polyol component with an OH number of 201 to 899 and a functionality of 2 to 3, and with
 - d) at least one chain lengthening component with an OH or amine number of 600 to 1,850 and a functionality of 2 to 4, and with
 - e) optionally additives, activators and/or stabilizers which are known per se
- in the presence of water and in the presence of 1,1,1,3,3-pentafluorobutane and blowing agent mixtures comprising at least one further fluoroalkane.

Eisen is consistent with, but for claim 1 less instructive than, Horn. Consequently, we focus on the Horn/Skowronski rejection.

³³ *In re Etter*, 756 F.2d 852, 859, 225 USPQ 1, 6 (Fed. Cir. 1985) (en banc).

³⁴ Eisen 1:8-14.

³⁵ Eisen 1:54-2:5.

Differences between the prior art and claim 1

Horn does not teach premixing the zeolites with the isocyanate component. Horn's zeolite, if it is used at all, is added to an amorphous microporous silica gel additive.³⁶ In Horn's broadest teaching, the additive is present when the polyisocyanate and polyol are reacted,³⁷ which would include but does not require premixing the additive with the polyisocyanate. Indeed, Horn teaches that it is "expedient" to mix the silica gel additive with the high-molecular weight compound to improve processing properties and stability of the polyol component.³⁸

Bayer urges that Horn is different because it requires the use of an amorphous microporous silica gel.³⁹ This requirement is not a real difference given the use of "comprising" in defining the (B) component of claim 1. The (B) component is open to the inclusion of a silica gel.

Bayer also urges that Horn only teaches adding the zeolite to the polyol formulation.⁴⁰ We do not, and indeed cannot, read Horn so narrowly. A reference cannot be limited to its examples or preferred embodiments, but rather must be appreciated for all it says to those in the art.⁴¹ Horn teaches adding zeolites to both the polyol and polyisocyanate components in the production of closed-cell rigid foams, which Horn represents as relevant background art. For integral-skin foams, Horn teaches that zeolites in silica

³⁶ Horn 11:51-12:15.

³⁷ Horn 2:56-3:12 & claim 1.

³⁸ Horn 11:33-42.

³⁹ Br. 4.

⁴⁰ Br. 4; Reply 1-2.

⁴¹ *In re Schreiber*, 128 F.3d 1473, 1479, 44 USPQ2d 1429, 1433 (Fed. Cir. 1997); *ArthroCare Corp. v. Smith & Nephew, Inc.*, 406 F.3d 1365, 1372, 74 USPQ2d 1749, 1755 (Fed. Cir. 2005).

gel may be added for some applications. Horn further teaches that it is "expedient" to mix the silica gel with the polyol component to improve the processing properties and stability of the polyol component. Expediency is not necessity. Horn does not teach that the process would not work if the zeolite were not added to the polyol component or if it were added to the polyisocyanate component instead. While Bayer is correct that Horn does not teach adding zeolites to the polyisocyanate component, Horn does suggest it by noting the expediency of the alternative and by noting that the prior art adds zeolites to both components. Horn by no means teaches away from adding zeolites to the polyisocyanate component.⁴²

Skowronski is not directed to integral-skin foams and does not teach the use of zeolites.

As Bayer notes, Eisen does not teach the use of zeolites.⁴³

The ordinary level of skill in the art

We look to the evidence of record—the applicant's disclosure, the cited references, and any declaration testimony—in resolving the ordinary level of skill in the art. We focus on what those of skill in the art know and can do.⁴⁴ Bayer has not provided testimony on the level of skill

The specification exhibits relatively little confidence in the knowledge of those in the art since it gives fairly precise directions on what ingredients

⁴² *In re Fulton*, 391 F.3d 1195, 1200, 73 USPQ2d 1141, 1145 (Fed. Cir. 2004) (preferred alternatives do not teach away); *In re Inland Steel Co.*, 265 F.3d 1354, 1361, 60 USPQ2d 1396, 1402 (Fed. Cir. 2001) (lack of an advantage is not a teaching away).

⁴³ Br. 8.

⁴⁴ *Ex parte Jud*, 2006 WL 4080053 at *2 (BPAI) (rehearing with expanded panel).

to use and reveals little of direct relevance in the prior art. Indeed, the background art that Bayer cites, while similar to what Eisen discloses, is much less relevant than the older Horn patent.

Horn reveals broad familiarity in the polyurethane foam art with the use of polyisocyanate and polyol components in water to avoid the use of more dangerous or otherwise undesirable ingredients. Horn provides detailed discussions of suitable ingredients and their specific uses, including polyisocyanates, polyhydroxyls (polyols), initiators, chain extenders, cross linkers, blowing agents, catalysts, silica gel additives, surfactants, fillers, and flame-proofing agents.⁴⁵ Horn also expresses confidence that those in the art would readily apply the teachings of related processes (such as for closed-cell rigid foams) and the broader literature.⁴⁶

Bayer suggests that the large number of crystalline microporous molecular sieves that Horn teaches makes selection of a zeolite improbable.⁴⁷ To the contrary, Horn shows confidence that others in the art have sufficient skill to select zeolites as appropriate from among the many choices with very little guidance.

Those of skill in the art would appreciate that additional ingredients may be added to either the polyisocyanate component or the polyol component. Both Horn and Skowronski teach as much for the related close-cell rigid foam art. Skowronski also suggests it when noting that adding water to the polyol component is "convenient" rather than necessary. Similarly, Horn teaches that it is "expedient" to add the silica gel to the

⁴⁵ Horn 3:21-13:54.

⁴⁶ Horn 2:19-28 and 13:35-43.

⁴⁷ Br. 4.

polyol component rather than necessary. In either case, adding the ingredient to the polyol component may provide advantages, but those of skill in the art would not understand either reference to teach away from the alternative of adding the ingredient to the polyisocyanate component.

Bayer also argues that those in the art would not have expected the use of zeolites in the polyisocyanate component to result in better Shore D hardness values for the resulting integral-skin foam.⁴⁸ The argument is misdirected because the rationale underlying the claimed invention need not be the same as the rationale in the prior art.⁴⁹ Horn notes at least two reasons to use zeolites: flame and heat resistance⁵⁰ and for some customized formulations.⁵¹ If the use of zeolites provides other lagniappes, so much the better.

Objective evidence of secondary considerations

The only evidence Bayer provides of secondary considerations is in the specification. Bayer says the use of inorganic zeolites in the isocyanate component provides surprisingly good results relative to European published Application 0 319 866 A2. Bayer also provides three comparative examples said to show the improvement.

We must give weight to evidence of secondary considerations in the specification if the specification states that the results were not expected and

⁴⁸ Br. 7.

⁴⁹ *In re Dillon*, 919 F.2d 688, 692-94, 16 USPQ2d 1897, 1901-02 (Fed. Cir. 1990) (en banc).

⁵⁰ Horn 2:19-28.

⁵¹ Horn 11:45-50.

demonstrates substantially improved results.⁵² The comparison, however, must be with the closest prior art.⁵³ Moreover, the comparison must be representative of what the prior art teaches and what is now claimed.⁵⁴ For instance, an older or less related reference may be entitled to less weight as evidence of what would have been expected as of the applicant's filing date.⁵⁵

Bayer's specification states that the result was "[s]urprisingly...greatly improved" compared to the process of the European application. For the purposes of this decision, we assume that the word "surprisingly" indicates Bayer thought the improvement was unexpected. The specification does not, however, substantiate the improvement with any data showing the nature or degree of the improvement. Moreover, Bayer has not provided the European application as evidence on appeal⁵⁶ so we cannot evaluate its teachings even if we were so inclined. Thus, we cannot assess whether the European application is newer or more relevant to what is now claimed than the Horn patent, for example. On the present record, we have no more than Bayer's unsupported assurance of surprising improvement, to which we can accord little weight.

Bayer also provides three comparative examples showing foams made with (1) no zeolite, (2) 6 wt.% zeolite in the polyol formulation, and

⁵² *Geisler*, 116 F.3d at 1470-71, 43 USPQ2d at 1366.

⁵³ *Abbott Labs. v. Andrx Pharm., Inc.*, 452 F.3d 1331, 1345, 79 USPQ2d 1321, 1332 (Fed. Cir. 2006).

⁵⁴ *In re Harris*, 409 F.3d 1339, 1344, 74 USPQ2d 1951, 1955 (Fed. Cir. 2005).

⁵⁵ *Geisler*, 116 F.3d at 1470-71, 43 USPQ2d at 1366.

⁵⁶ Br. 13, Evidence Appendix.

(3) 4 wt.% zeolite in the polyisocyanate component.⁵⁷ In all three examples, the sum of the weight percentages for the polyol formulation exceeds 100%, which immediately raises questions about the reliability of the data reported. Assuming the data is reliable and representative of the prior art for the purpose of this discussion, since the art teaches the use of zeolites, the closest comparison would be between examples (2) and (3). Only one result is reported for both examples (2) and (3): the Shore D hardness, which are 38 and 44, respectively.⁵⁸ This comparison shows nearly 16% greater hardness with less zeolite when the zeolite is added to the polyisocyanate. This difference in degree for a single example does not by itself establish the sort of significant difference in kind required in the case law.⁵⁹

In any case, the comparison is not representative of what those in the art would have expected. The closest prior art, Horn, suggests that the zeolite may be added to the polyol component, the polyisocyanate component, or both. Consequently, Bayer's examples (2) and (3) are equally representative of what the prior art teaches. Since they are equally representative of the prior art expectations, the comparison cannot establish unexpected results for the claimed invention compared to the prior art.

⁵⁷ Spec. 6:17-10:5. Although the specification says "parts by weight" for the polyol formulation components, the appeal brief confirms that weight percent is what is intended. Br. 9.

⁵⁸ Spec. 9, table. Example (1) has a Shore D hardness of 33.

⁵⁹ *Harris*, 409 F.3d at 1344, 74 USPQ2d at 1955 (32-43% increase not an unexpected result); *Abbott Labs.*, 452 F.3d at 1345, 79 USPQ2d at 1332.

Conclusion

A person having ordinary skill in the art would have considered the subject matter of claim 1 to have been obvious based on the teachings of the Horn patent alone. The Skowronski and Eisen patents, while not necessary, are consistent with a conclusion of obviousness. Since the other claims stand or fall with claim 1, the obviousness rejection for claims 1-7 is **AFFIRMED**.

OBVIOUSNESS-TYPE DOUBLE PATENTING

The obviousness-type double-patenting rejection adds nothing to this examination. On the facts of this record, where the availability of the Eisen patent as prior art is not an issue, the rejection appears to be just a more complicated repetition of the obviousness rejection. It is difficult to imagine a circumstance on this record where we could affirm this rejection but not the obviousness rejection.

Since we have affirmed the obviousness rejection, this rejection is **DISMISSED** as moot without prejudice to being reasserted in light of new facts or claims.

AFFIRMED

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