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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte SINUE GOMEZ, ROBERT MICHAEL MORENA, DOUGLAS MILES NONI JR, JAMES JOSEPH PRICE, and SARA JEAN SICK

Appeal 2020-001462
Application 15/585,817
Technology Center 1700

Before ROMULO H. DELMENDO, MICHAEL P. COLAIANNI, and JANE E. INGLESE, *Administrative Patent Judges*.

INGLESE, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant[1] requests review under 35 U.S.C. § 134(a) of the Examiner's final rejection of claims 19–34.[2] We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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[1] We use the word "Appellant" to refer to the "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies Corning Incorporated as the real party in interest. Appeal Brief filed July 24, 2019 ("Appeal Br.") at 2.
[2] Final Office Action entered November 26, 2018 ("Final Act.") at 1.

CLAIMED SUBJECT MATTER

Appellant claims a method of improving the scratch resistance of a glass. Appeal Br. 2. Claim 19, the sole pending independent claim, illustrates the subject matter on appeal, and reads as follows:

> 19. A method of improving the scratch resistance of a glass, the method comprising:
>
> a. treating a surface of the glass with an acid at a predetermined temperature for a predetermined time;
>
> b. removing non-silica components from the surface; and
>
> c. forming a porous silica-rich layer on the surface of the glass, wherein *the silica-rich layer extends from the surface to a depth of greater than or equal to 100 nm to less than or equal to 600 nm into the glass*.

Appeal Br. Claims Appendix (emphasis added).

REJECTIONS

The Examiner maintains the following rejections in the Examiner's Answer entered October 23, 2019 ("Ans."):

I. Claims 19–31, 33, and 34 under 35 U.S.C. § 103 as unpatentable over Amin;[3] and

II. Claim 32 under 35 U.S.C. § 103 as unpatentable over Amin in view of Elmer.[4]

FACTUAL FINDINGS AND ANALYSIS

Upon consideration of the evidence relied upon in this appeal and each of Appellant's contentions, we reverse the Examiner's rejections of

[3] Amin et al., US 2009/0197048 A1, published August 6, 2009.
[4] Thomas H. Elmer, *Leaching E-Glass,* 778–782 (1984).

claims 19–34 under 35 U.S.C. § 103, for the reasons set forth in the Appeal and Reply Briefs, and below.

Claim 19 requires the recited method to comprise, in part, forming a porous silica-rich layer on the surface of a glass that extends from the surface into the glass to a depth of greater than or equal to 100 nm to less than or equal to 600 nm.

The Examiner finds that Amin discloses improving the scratch resistance of a glass article by treating a surface of the glass with an acid, which the Examiner finds forms a porous silica-rich layer on the surface of the glass. Final Act. 3–4 (citing Amin Abstr.; ¶¶ 15, 73, 74). The Examiner finds that although Amin discloses that the preferred depth of the silica-rich layer is less than 50 nm, Amin more broadly discloses that the surface of the glass has a root mean square (RMS) roughness of 50–5000 nm, which the Examiner determines "overlaps" the depth range recited in claim 19. Ans. 4 (citing Amin ¶ 15, 74). The Examiner reasons that although "RMS roughness is not directly equivalent to the depth[,] given that it is the root mean square of the peak-to-valley heights (i.e. root mean square of the depth across the surface) it is apparent that a RMS roughness of 50–5000 nm overlaps a depth of greater than or equal to 100 nm to less than or equal to 600 nm." Ans. 4.

The Examiner finds that Amin also discloses that the depth of the silica-rich layer is selected "based on the desired balancing between the improved adhesion of the subsequent layer and a depth whereby the mechanical properties are not affected." Ans. 4 (citing Amin ¶¶ 73–74). The Examiner determines that the depth of the silica-rich layer, therefore, is a result-effective variable, and concludes that it would have been obvious to

optimize the depth "to obtain the desired chemical and mechanical properties," and in so doing, to arrive at a depth as recited in claim 19. Final Act. 4; Ans. 4.

On the record before us, however, the Examiner does not provide sufficient reasoning to explain why the relied-upon disclosures of Amin would have led one of ordinary skill in the art to form a porous silica-rich layer on the surface of a glass that extends from the surface into the glass to a depth of greater than or equal to 100 nm to less than or equal to 600 nm, as required by claim 1, for reasons expressed by Appellant (Appeal Br. 4–6; Reply Br. 3–4), and discussed below.

Amin discloses a glass article that includes a chemically strengthened layer coated with an exterior amphiphobic layer. Amin ¶¶ 9, 73. Amin discloses forming the chemically strengthened layer by exchanging potassium ions for sodium and/or lithium ions present in the glass. Amin ¶¶ 9, 57. Amin discloses activating a surface portion of the chemically strengthened layer via an acid treatment before application of the amphiphobic coating to enhance adhesion of the amphiphobic coating. Amin ¶ 73. Amin discloses that the acid treatment removes chemically exchanged ions (potassium ions) to a selected depth, which Amin discloses is typically in the range of ≤ 50 nm, "whereby the mechanical performance of the chemically strengthened glass (for example, strength, scratch resistance, impact damage resistance) is not affected." Amin ¶ 74. Amin discloses that in a preferred embodiment, the acid treatment removes the exchanged (potassium) ions to a depth in the range of 5–15 nm, and Amin describes an exemplary process in which an acid treatment is "carried out such that the exchanged K ions are removed to a depth of 10 nm (0.01 μm),

a depth that does not effect [*sic*] the mechanical performance of the glass." Amin ¶ 75.

Amin discloses "another embodiment" in which the glass article includes a textured or patterned surface disposed between the chemically strengthened layer and the exterior amphiphobic layer. Amin ¶ 32; Fig. 2. Amin discloses that the textured or patterned surface may be formed by acid/alkali etching, lithography, or by bonding particles to the chemically strengthened layer. Amin ¶¶ 15, 32; Fig. 2. Amin discloses that acid/alkali etching produces a "roughness in the range of 50 nm to 5 μm (5000 nm) in RMS roughness." Amin ¶ 15.

Amin thus discloses conducting an acid treatment to remove chemically exchanged (potassium) ions from the surface of a glass article to a depth typically in the range of ≤ 50 nm, preferably 5–15 nm, and Amin exemplifies removing exchanged ions to a depth of 10 nm. These depth values disclosed in Amin are all far below the range of greater than or equal to 100 nm to less than or equal to 600 nm recited in claim 19. Although the Examiner asserts that Amin more broadly discloses that the surface of the glass has a root mean square (RMS) roughness of 50–5000 nm, this disclosure in Amin describes an alternative embodiment of Amin's invention that involves forming a glass article having a textured or patterned surface, and does not more broadly describe the depth to which chemically exchanged ions are removed from the surface of a glass as the Examiner asserts.

Furthermore, although the Examiner states that "it is apparent that a RMS roughness of 50–5000 nm overlaps a depth of greater than or equal to 100 nm to less than or equal to 600 nm" (Ans. 4), the Examiner does not

provide technical reasoning supported by objective evidence establishing that mean square roughness corresponds to, or is equivalent to, the depth of a silica-rich layer as recited in claim 1, such that the asserted overlap would exist. The Examiner's assertion of overlap thus appears to be based on speculation, which does not constitute a sufficient basis for establishing prima facie obviousness. *In re Warner*, 379 F.2d 1011, 1017 (CCPA 1967) ("The Patent Office . . . may not . . . resort to speculation, unfounded assumptions or hindsight reconstruction to supply deficiencies in its factual basis."); *In re Sporck*, 301 F.2d 686, 690 (CCPA 1962).

Moreover, as discussed above, Amin discloses selecting a depth for removal of chemically exchanged ions that will not affect the mechanical performance of the chemically strengthened glass, and Amin discloses that such depth is typically in the range of ≤ 50 nm. One of ordinary skill in the art would have understood this disclosure to implicitly indicate that removing chemically exchanged ions to a depth greater than 50 nm may adversely affect the mechanical performance of the glass.

Although the Examiner states that one of ordinary skill in the art would have optimized the ion removal depth "to obtain the desired chemical and mechanical properties," and in so doing, would have arrived at a depth of greater than or equal to 100 nm to less than or equal to 600 nm as recited in claim 19, the Examiner does not provide sound technical reasoning supported by objective evidence to establish that one of ordinary skill in the art would have disregarded Amin's explicit disclosure of removing chemically exchanged ions to a typical depth ≤ 50 nm, preferably 5–15 nm, and implicit disclosure that removing ions to a greater depth may adversely affect the mechanical performance of the glass. Thus, the Examiner does

not persuasively show that one of ordinary skill in the art seeking to optimize the chemically exchanged ion removal depth of typically ≤ 50 nm disclosed in Amin reasonably would have arrived at a removal depth significantly greater than Amin's preferred—or optimal—depth of 5–15 nm, so as to arrive at a depth of greater than or equal to 100 nm to less than or equal to 600 nm as recited in claim 19. *In re Sebek*, 465 F.2d 904, 907 (CCPA 1972) ("Where, as here, the prior art disclosure suggests the outer limits of the range of suitable values, and that the optimum resides within that range, and where there are indications elsewhere that in fact the optimum should be sought within that range, the determination of optimum values outside that range may not be obvious.").

Consequently, on the record before us, the Examiner does not provide a sufficient factual basis to support the Examiner's conclusion that the depth of the silica-rich layer recited in claim 19 would have been obvious. We, accordingly, do not sustain the Examiner's rejection of claim 19, and rejections of claims 20–34, which each depend from claim 19, under 35 U.S.C. § 103.[5]

CONCLUSION

Claims	35 U.S.C. §	Reference(s)/ Basis	Affirmed	Reversed
19–31, 33, 34	103	Amin		19–31, 33, 34
32	103	Amin, Elmer		32
Overall Outcome				19–34

REVERSED

[5] The Examiner does not rely on Elmer for any disclosure that cures the deficiencies of the Examiner's reliance on Amin. Final Act. 7.