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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/340,670	07/25/2014	Laurence Ralph Morey	SP13-218	3738
22928	7590	07/02/2020	EXAMINER	
CORNING INCORPORATED			UTT, ETHAN A	
SP-TI-3-1			ART UNIT	PAPER NUMBER
CORNING, NY 14831			1783	
			NOTIFICATION DATE	DELIVERY MODE
			07/02/2020	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte LAURENCE RALPH MOREY, JONATHAN DAVID PESANSKY,
KEVIN BARRY REIMAN, BENJAMIN ALLEN STEVENS, and
BRIAN PAUL STRINES

Appeal 2018-005633
Application 14/340,670
Technology Center 1700

Before ADRIENE LEPIANE HANLON, JEFFREY R. SNAY, and
MERRELL C. CASHION, JR., *Administrative Patent Judges*.

HANLON, *Administrative Patent Judge*.

DECISION ON APPEAL

A. STATEMENT OF THE CASE

The Appellant¹ filed an appeal under 35 U.S.C. § 134(a) from an Examiner's decision finally rejecting claims 2–20, 28–35, 37–41, and 66 under 35 U.S.C. § 103 as unpatentable over Barefoot et al.² in view of Allan et al.³ Claims 43–59

¹ We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Corning Incorporated. Appeal Brief dated January 19, 2018 (“Br.”), at 2.

² US 2010/0035038 A1, published February 11, 2010 (“Barefoot”).

³ US 2010/0009154 A1, published January 14, 2010 (“Allan”).

are also pending but have been withdrawn from consideration. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

The claims on appeal are directed to a strengthened glass article. The Appellant's Figure 1, reproduced below, illustrates a strengthened glass article according to the Appellant's invention.

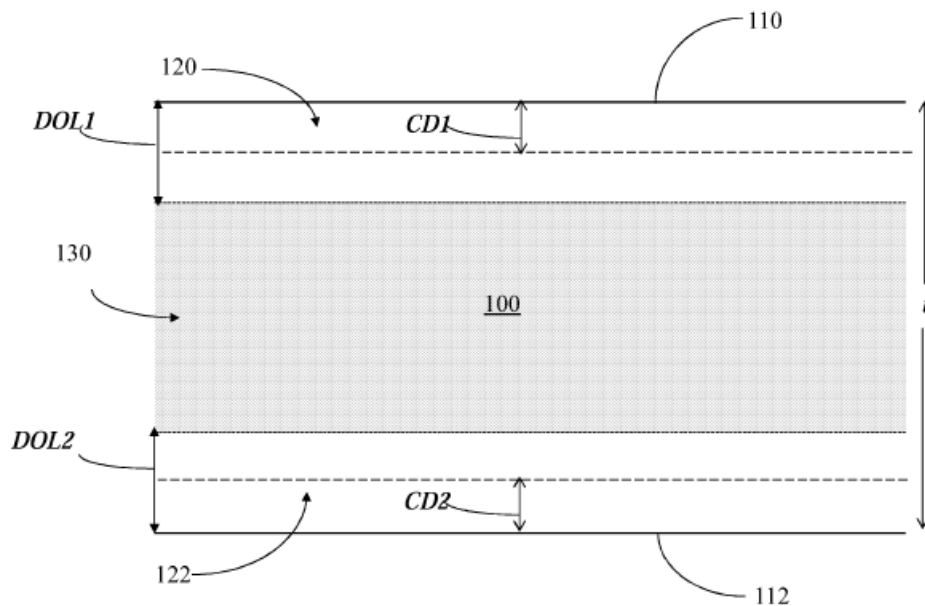


FIG. 1

Appellant's Figure 1 is a cross-sectional schematic view of a chemically strengthened glass article according to one embodiment of the disclosed invention.

The Appellant discloses that glass article 100 has a first compressive layer 120 extending from first surface 110 to a depth of layer DOL_1 and a second compressive layer 122 extending from second surface 112 to a second depth of layer DOL_2 . Spec. ¶27. The glass article 100 is also said to have a central region 130 between compressive layers 120 and 122. *Id.* The Appellant discloses that

central region 130 is under a tensile stress or central tension CT, which balances or counteracts the compressive stresses of layers 120 and 122, respectively. *Id.*

The glass article 100 is also said to include intermediate critical depths CD₁ and CD₂ within compressive stress layers 120 and 122, respectively. *Id.* The Appellant discloses that intermediate critical depths CD₁ and CD₂ and the compressive stresses at these critical depths are sufficient to increase survivability of the inventive glass article 100 by enveloping or encasing a flaw introduced by a sharp impact to first and second surfaces 110, 112 of the glass article 100. *Id.*; *see also* Appellant's Fig. 2.

Representative claim 5 is reproduced below from the Claims Appendix to the Appeal Brief. The limitation at issue is italicized.

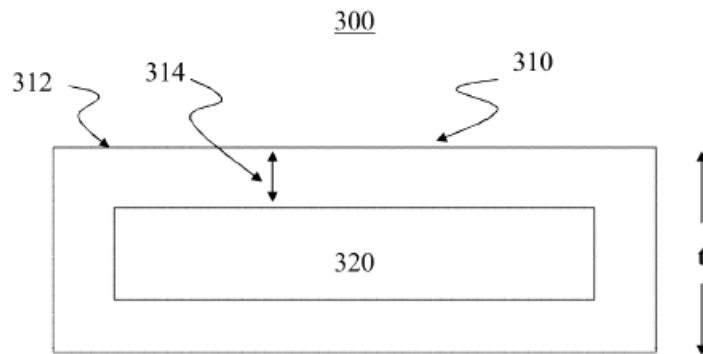
5. A strengthened glass article comprising:
 - a thickness $t \leq 1$ mm,
 - an inner region under a central tension CT, and
 - at least one compressive stress layer adjacent the inner region and extending within the strengthened glass article from a surface of the strengthened glass article to a depth of layer DOL, wherein the DOL is greater than or equal to 70 μm ,
 - wherein the strengthened glass article is under a compressive stress at the surface CSs,
 - wherein the strengthened glass article is an alkali aluminosilicate glass article comprising 0 mol% Li₂O, and at least 3 mol % Al₂O₃, and
 - wherein the strengthened glass article has a stress profile such that *a compressive stress CSD at an intermediate critical depth of 50 μm below the surface of the strengthened glass article is at least 10% of CSs.*

Br. 11.

Similarly, independent claims 28 and 38 are directed to a strengthened glass article and a strengthened glass, respectively, having “a stress profile such that a compressive stress CSD at an intermediate critical depth of $50\ \mu\text{m}$ below the surface of the strengthened glass article is at least 10% of a compressive stress at the surface CSs.” Br. 13, 14 (emphasis added).

B. DISCUSSION

Barefoot discloses a strengthened glass article as illustrated in Figure 3, reproduced below.



Barefoot Figure 3 is a schematic representation of a strengthened glass article.

Barefoot discloses that strengthened glass article 300 has a thickness t , an outer region 310 extending from surface 312 to a depth of layer DOL 314, and an inner region 320. Barefoot ¶ 29. Barefoot discloses that outer region 310 is strengthened so as to be under a compressive stress CS. *Id.* The compressive stress CS in the outer region 310 is said to give rise to a central tension CT, or tensile stress, in inner region 320, which balances the compressive stress. *Id.* Barefoot discloses that the depth of the compressive stress layer DOL 314 is the depth from the surface to the point where the measured compression stress is

reduced to zero stress at the boundary with the tensile stress zone (i.e., inner region 320). *Id.*

The Examiner finds “Barefoot does not explicitly state the strengthened glass article 300 exhibits a compressive stress CS_D at an intermediate critical depth of 50 μm below the surface 312 of the strengthened glass article 300 being at least 10% of CSs” as recited in the claims on appeal. Ans. 4.⁴ Nonetheless, the Examiner finds:

Barefoot indicates the DOL and CSs [(i.e., compressive stress at the surface of the glass article)] of a strengthened glass article generally dictate the frangibility of the strengthened glass article as can be determined by, for instance, point impact testing and are dependent upon the process used to strengthen the glass article Additionally, given frangible behavior is the result of excessive CT within a strengthened glass article . . . , one of ordinary skill in the art would appreciate increasing at least one of the DOL and/or CSs in a strengthened glass article would improve the resistance to fracturing or cracking.

Ans. 4 (citations omitted).

The Examiner finds that “DOL and CSs, and therefore CS_D (which depends on the DOL and CSs) and CT, are optimizable, result-effective variables for obtaining a strengthened glass article with low frangibility achieved by varying parameters known to those of ordinary skill in the art.” Ans. 5; *see also* Ans. 4 (quoting Barefoot ¶ 41).

Based on those findings, the Examiner concludes that it would have been obvious to one of ordinary skill in the art to modify Barefoot’s strengthened glass article to have a compressive stress CS_D as claimed by increasing at least one of the

⁴ In this Decision on Appeal, we refer to the statement of the rejection reproduced in the Examiner’s Answer dated March 8, 2018 (“Ans.”), from the Final Office Action dated January 20, 2017. *See* Ans. 3.

DOL and CSs to provide a strengthened glass article which is low in frangibility.⁵

Ans. 6.

The Appellant argues that “Barefoot is directed to balancing the CSs, central tension (CT), and depth of layer (DOL) at a given thickness to achieve a nonfrangible glass.” Br. 7. The Appellant argues that “frangibility is a completely different concept than making it more difficult for flaws/cracks to propagate into a central tension region as achieved by the recited CSD to CSs relationship recited in the claims.” Br. 7. The Appellant directs our attention to paragraph 16 of Barefoot which describes frangible behavior as follows:

Frangible behavior is characterized by at least one of: breaking of the strengthened glass article (e.g., a plate or sheet) into multiple small pieces (e.g., [\leq] 1 mm); the number of fragments formed per unit area of the glass article; multiple crack branching from an initial crack in the glass article; and violent ejection of at least one fragment a specified distance (e.g., about 5 cm, or about 2 inches) from its original location; and combinations of any of the foregoing breaking (size and density), cracking, and ejecting behaviors. As used herein, *the terms “frangible behavior” and “frangibility” refer to those modes of violent or energetic fragmentation of a strengthened glass article absent any external restraints, such as coatings, adhesive layers, or the like. [Emphasis added.]*

Conversely, Allan discloses that

a glass plate is deemed to be *not frangible* if it either does not break or breaks with less than five multiple cracks branching from an initial crack with pieces ejected less than two inches from their original location when subjected to a point impact by an object or a drop onto a solid surface with sufficient force to break the glass plate.

Allan ¶ 15 (emphasis added).

⁵ The Examiner relies on Allan to show that DOL and CSs increase with temperature and/or immersion time in an ion exchange process. Ans. 5.

The Appellant argues that “there is no teaching or suggestion in Barefoot or Allan that the CSD to CSs relationship affects frangibility.” Br. 7. Therefore, the Appellant argues that the rejection on appeal is based on impermissible hindsight. Br. 8.

The Appellant’s argument is persuasive of reversible error. Barefoot discloses that the observed differences in behavior between a glass plate which exhibits *frangible behavior* and a glass plate which exhibits *non-frangible behavior* can be attributed to a difference in central tension CT. Barefoot ¶ 25. The Examiner finds that “[s]ince CSD depends on DOL and CSs and CSs is related to CT, it follows that CSD, and therefore the relationship of CSD to CSs, is related to frangibility.” Ans. 19. Based on those relationships, the Examiner explains that DOL and CSs, as result-effective variables, “are modified to give the claimed CSD.” Ans. 20. The Examiner, however, has failed to show that optimizing DOL and CSs to provide a strengthened glass article having a desired frangibility as disclosed in Barefoot would necessarily result in the claimed CSD. *See* Br. 8 (arguing that the Examiner has not established a connection between frangibility and the claimed CSD to CSs relationship). For that reason, the obviousness rejection is not sustained.

C. CONCLUSION

The Examiner’s decision is reversed.

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
2–20, 28–35, 37–41, 66	103	Barefoot, Allan		2–20, 28–35, 37–41, 66

Appeal 2018-005633
Application 14/340,670

REVERSED