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CORNING INCORPORATED
SP-TI-3-1
CORNING, NY 14831

EXAMINER
JOHNSON, NANCY ROSENBERG

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JAYMIN AMIN, SHANDON DEE HART,
KARL WILLIAM KOCH III, ERIC LOUIS NULL, XU OUYANG,
CHARLES ANDREW PAULSON, and JAMES JOSEPH PRICE

Appeal 2019-004778
Application 14/707,106
Technology Center 1700

Before MICHAEL P. COLAIANNI, GEORGE C. BEST, and
N. WHITNEY WILSON, *Administrative Patent Judges*.

WILSON, *Administrative Patent Judge.*

DECISION ON APPEAL

Appellant[1] appeals under 35 U.S.C. § 134(a) from the Examiner's August 28, 2018 decision finally rejecting claims 1–8, 10–12, 14–19, 21, 24, 25, 27, 29–31, 33, and 35–39 ("Final Act."). We have jurisdiction over the appeal 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. Appellant identifies Corning Incorporated as the real party in interest (Appeal Br. 2).

CLAIMED SUBJECT MATTER

Appellant's disclosure generally relates to durable anti-reflective articles and methods for making them, and more particularly to articles with multi-layer anti-reflective coatings exhibiting abrasion resistance, low reflectivity, and colorless transmittance and/or reflectance (Spec. ¶ 2). Details of the claimed article are set forth in representative claim 1, which is reproduced below from the Claims Appendix to the Appeal Brief:

1. An article comprising:

a substrate having a major surface; and

an anti-reflective coating having a physical thickness of from about 0.3 μm to about 1 μm disposed on the major surface, the anti-reflective coating comprising an anti-reflective surface, wherein the anti-reflective coating comprises a plurality of layers, the plurality of layers comprising at least one low RI layer, and at least one high RI layer, and wherein a total physical thickness of the high RI layers is ≥70% of the total physical thickness of the anti-reflective coating,

wherein the article exhibits a maximum hardness of about 10 GPa or greater as measured by a Berkovich Indenter Hardness Test along an indentation depth of about 50 nm or greater;

wherein the article exhibits:

a single side average visible photopic light reflectance of about 2% or less, and

a b* value, in reflectance, in the range from about - 5 to about 1 as measured on the anti-reflective surface only at all incidence illumination angles in the range from about 0 degrees to about 60 degrees.

REJECTIONS

1. Claims 1–4, 6–8, 10–15, 18, 19, 21, 24, 25, 27, 29–31, 33, and 35–39 are rejected under 35 U.S.C. § 103 as unpatentable over Reymond[2] in view of Lu,[3] as evidenced by Suzuki.[4]

2. Claim 5 is rejected under 35 U.S.C. § 103 as unpatentable over Reymond in view of Lu, as evidenced by Suzuki, and further in view of Watanabe.[5]

3. Claim 16 is rejected under 35 U.S.C. § 103 as unpatentable over Reymond in view of Lu, as evidenced by Suzuki, and further in view of Lee.[6]

4. Claim 17 is rejected under 35 U.S.C. § 103 as unpatentable over Reymond in view of Lu, as evidenced by Suzuki, and further in view of Suzuki.

DISCUSSION

Appellant argues the independent claims together (*see*, Appeal Br. 12). Accordingly, we will focus our discussion on the rejection of claim 1 over Reymond in view of Lu, as evidenced by Suzuki.

The Examiner finds that Reymond discloses an anti-reflective film comprising high and low refractive index layers but does not disclose thicknesses for the layers such that the high refractive index layers would be at least 70% of the physical thickness of the film (Final Act. 5, citing

[2] Reymond et al., US 2009/0104385 A1, published April 23, 2009.
[3] Lu et al., US 2007/0030569 A1, published February 8, 2007.
[4] Suzuki et al., US 2010/0027383 A1, published February 4, 2010.
[5] Watanabe et al., US 2009/0052041 A1, published February 26, 2009.
[6] Lee et al., US 2010/0028607 A1, published February 4, 2010.

Reymond Abstract). The Examiner further finds that Lu teaches the addition of a middle refractive index layer—which, according to the Examiner, may be considered a high refractive index layer because its refractive index (1.63–2.05) is greater than the low refractive index layer of Reymond (1.40–1.55)—to optimize the overall performance of the broad band anti-reflection coating (Final Act. 5). Therefore, according to the Examiner, it would have been obvious to include Lu's middle refractive index layer—comprising aluminum oxynitride—in Reymond's antireflection coating to achieve a coating which is durable and has good antireflection characteristics (*id.*, citing Lu ¶ 29). Doing so would mean that the total thickness of the high refractive index layers would exceed 70%, as required by claim 1 (Final Act. 5–6).

Appellant contends that the teachings of the references as a whole would have suggested to a person of skill in the art not to add Lu's layer to Reymond's stack, but instead to keep the total thickness of Reymond's stack the same, so that the coating resulting from the combination would still not have the requisite percentage of the high refractive index material (Appeal Br. 13–14). This is because, according to Appellant, a person of skill in the art

> would not have added high index material thickness to the stack, because Reymond specifically teaches that when a layer (either high or low index layer) includes a superposition of layers (having different materials) such is acceptable as long as ". . . each of [the sub-layers] satisfies the indicated refractive index and in which the sum of their geometrical thicknesses also remains the value indicated for the layer in question."

(Appeal Br. 14, citing Reymond ¶ 25, emphasis in original).

Appellant further contends that because Lu's medium index layer has a reflective index which largely overlaps with Reymond's high index materials, if Lu's medium index layer were incorporated into Reymond's stack, it would be immediately adjacent to one of Reymond's high index layers, and that nothing in Lu suggests that its medium index layer could be the top layer on an anti-reflective stack (Appeal Br. 14).

The Examiner responds by finding that the refractive index of Lu's middle index material—aluminum oxynitride—is different from Reymond's high index material, and that a person of skill in the art would not necessarily have sought to replace one of Reymond's high index layers with Lu's middle index layer, but instead would have added Lu's layer to garner the properties touted by Lu: durability and good anti-reflection characteristics (Ans. 4–6; Lu ¶ 29).

Upon consideration of the arguments and evidence set forth by Appellant and the Examiner, we determine that the preponderance of the evidence of record supports the obviousness rejection, essentially for the reasons set forth by the Examiner in the Final Action and the Answer. We add the following for emphasis.

As explained by the Examiner, Reymond's system is not limited to only four layers. Reymond states that its invention "relates to an antireflection multilayer having at least one sequence of four alternating layers, namely layers of high and low refractive indices." Reymond ¶ 16. This description does not exclude a 5-layer system. A system in which Lu's middle index material was placed on top of a sequence of layers as shown

below, would still meet the general structure described by Reymond (at least 4 layers, alternating high and low index layers):

Lu's Middle index layer
Low index layer
High index layer
Low index layer
High index layer
SUBSTRATE

Appellant also argues (Reply Br. 3) that Reymond suggests that a four layer arrangement is preferred, relying on Reymond's statement that:

> The best results and compromises between the various properties desired (such as described previously) have especially been obtained when at least one of the geometrical thicknesses and/or one of the indices of the four layers of the multilayer according to the invention have been chosen from the following intervals.

(Reymond ¶ 26). However, this passage does not state that 4 layers are preferred, only that the 4 layers which make up the preferred high/low/high/low sequence should have the recited properties.

While Appellant correctly notes that the refractive index for Lu's aluminum oxynitride layer largely overlaps with the refractive index of Reymond's high index materials, the Examiner has identified an independent reason why a person of ordinary skill in the art would have added the aluminum oxynitride layer to Reymond's stack (i.e., that it would impart durability and good anti-reflection characteristics). Once that combination was made, the stack would then have the claimed percentage of high index material.

Accordingly, Appellant has not demonstrated reversible error in the rejection. Because Appellant relies on the same arguments with respect to

the rejections of dependent claims 5, 16, and 17, we affirm those rejections for the same reasons.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–4, 6–8, 10–15, 18, 19, 21, 24, 25, 27, 29–31, 33, 35–39	103	Reymond, Lu, Suzuki	1–4, 6–8, 10–15, 18, 19, 21, 24, 25, 27, 29–31, 33, 35–39	
5	103	Reymond, Lu, Suzuki, Watanabe	5	
16	103	Reymond, Lu, Suzuki, Lee	16	
17	103	Reymond, Lu, Suzuki	17	
Overall Outcome			1–8, 10–12, 14–19, 21, 24, 25, 27, 29–31, 33, 35–39	

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