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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte LIGANG WANG, ZHENBIN GE, XIANWEI ZHAO,
AVERY P. YUEN, and STEPHEN C. COOL

Appeal 2020-004305
Application 15/484,979
Technology Center 2800

Before TERRY J. OWENS, BEVERLY A. FRANKLIN, and
JAMES C. HOUSEL, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner's decision to reject claims 1–3, 5–10, and 12–20. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ We use the word Appellant to refer to “applicant” as defined in 37 C.F.R. § 1.42(a). Appellant identifies the real party in interest as Apple Inc. (Appeal Br. 2).

CLAIMED SUBJECT MATTER

The claims are directed to electronic devices having scratch-resistant antireflection coatings. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. An electronic device, comprising:
 - a visible light camera;
 - a transparent member that overlaps the visible light camera;
 - and
 - a visible light antireflection coating on the transparent member that includes a stack of thin-film interference filter layers including an uppermost thin-film interference filter layer and a lowermost thin-film interference filter layer that is between the uppermost thin-film interference layer and the transparent member, wherein the uppermost thin-film interference filter layer is a silicon oxide layer having a thickness of less than 80 nm; and
 - a graded index adhesion layer between the lowermost thin-film interference filter layer and the transparent member, wherein the graded index adhesion layer changes composition smoothly between the lowermost thin-film interference filter layer and the transparent member.

REFERENCES

The prior art relied upon by the Examiner is:

Name	Reference	Date
Cutherell	US 2006/0017706 A1	Jan. 26, 2006
Nose	US 2008/0158702 A1	July 3, 2008
Cho	US 7,483,212 B2	Jan. 27, 2009
Lee	US 9,013,795 B2	Apr. 21, 2015
Mashimo	US 2015/0138638 A1	May 21, 2015
Yang	US 9,478,698 B2	Oct. 25, 2016

REJECTIONS

The claims stand rejected under 35 U.S.C. § 103² as follows: claims 1–3, 5, and 6 over Mashimo in view of Yang and Cho; claims 7 and 8 over Mashimo in view of Yang, Cho, and Lee; claim 9 over Mashimo in view of Yang, Cho, Lee, and Cutherell; claims 10 and 15 over Mashimo in view of Nose; claims 12–14 over Mashimo in view of Nose and Lee; and claims 16–20 over Mashimo in view of Lee.

OPINION

The Appellant argues claims 1, 10, 13, and 16 (Appeal Br. 7–13). We therefore limit our discussion to those claims. Claims that depend from them stand or fall with the respective claims we address. *See* 37 C.F.R. § 41.37(c)(1)(iv) (2013).

Claim 1

Claim 1 requires an electronic device having a graded index adhesion layer which changes composition smoothly between a lowermost thin-film interference filter layer and a transparent member.

Yang discloses a light-emitting device (2) having, between a transparent substrate (20) and a semiconductor light-emitting stack (23), a bonding layer (21) comprising first (211) and second (212) bonding layers with a continuous or gradient refractive index variation (col. 2, ll. 3–13; col. ll. 21–32; Fig. 3).

² “Section 103 forbids issuance of a patent when ‘the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.’” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007).

Cho discloses a semiconductor light-emitting device comprising a layer (11) made of a first material and a layer (14) made of a second material between which is a graded-refractive index layer (12) comprising configuration layers 12a–12e whose composition changes by multi-target co-deposition gradually from the first material to the second material such that the graded-refractive index material (12)’s refractive index continuously changes from the first material layer (11)’s refractive index to the second material layer (14)’s refractive index (col. 5, ll. 36–44, 55–62; col. 6, ll. 32–34; Fig. 1).

The Appellant argues that Cho does not disclose a layer which changes composition smoothly but, rather, discloses a stack of discrete configuration layers with a compositional change between each sequential layer (Appeal Br. 9).

Cho’s illustration of the refractive index in Figure 1(b) and the composition in Figure 1(c) as changing continuously instead of changing stepwise at each of the configuration layers (12a–12e) in Figure 1(a), and Cho’s disclosures that the graded-refractive index layer (12)’s refractive index can change continuously and that its layers “may be formed by multi-target co-deposition with a composition of (the first material)_x(the second material)_{1-x}(0<x<1)” (col. 5, ll. 54–57; col. 6, ll. 32–34) would have indicated to one of ordinary skill in the art that the composition of the graded-refractive index layer (12) can change smoothly from the composition of the first material to the composition of the second material.

Claims 10 and 13

Claim 10 requires an electronic device comprising 1) a visible light antireflection coating including thin film interference filter layers each with

a thickness greater than 20 nm, and 2) a single adhesion layer which comprises a mixture of aluminum oxide and silicon oxide and has a surface contacting a transparent member and an opposing surface contacting the visible light antireflection coating. Claim 13 depends from claim 10 and requires that the transparent member comprises a sapphire member.

Mashimo discloses an optical element comprising an antireflection film having, on an optical member (10) which can be glass or sapphire, alternating low refractive index SiO₂ films (22a, 22b) and high refractive index Ta₂O₅ films (21a, 21b) (¶¶ 66–69, 85; Fig. 16).

The Appellant argues that “Mashimo fails to show or suggest that all of the silicon oxide layers can have a thickness greater than 20 nm and achieve the appropriate level of antireflection” (Appeal Br. 10).

That argument is not well taken in view of Mashimo’s disclosure that for each optical element having an SiO₂ film thickness of 33.7 or 33.3 nm (optical elements 1 and 2 (¶¶ 66, 67)) “the reflectance is less than or equal to 0.8% within a wavelength range of 400 nm to 700 nm and has a sufficient antireflection function” (¶ 70).

Nose discloses a silicon dioxide/aluminum oxide adhesive layer (C) between an aluminum layer (A) and a resin substrate (S) (¶¶ 15, 16; Fig 1).

The Appellant argues that “Nose fails to show or suggest that the adhesive layer can be used between a glass substrate and metal oxide layers, and it therefore cannot be incorporated between Mashimo’s non-resin substrate and overlying metal oxide layers” (Appeal Br. 11). The Appellant further argues that “Nose fails to show or suggest that the adhesive layer is compatible with a sapphire member or with overlying thin-film metal oxide layers” (Appeal Br. 12) and that,

“[t]herefore, one of ordinary skill would not modify Mashimo’s optical stack to include Nose’s adhesion layer between a sapphire substrate and metal oxide layers” (*id.*).

Nose adheres a silicon dioxide/aluminum oxide layer (L) to each side of a metal oxide (titanium oxide/lanthanum oxide) layer (H) (¶19; Fig. 4). Hence, Nose would have indicated to one of ordinary skill in the art that the silicon dioxide/aluminum oxide adhesive layer (C) would be useful between Mashimo’s metal oxide (e.g., glass or sapphire) substrate and low or high refractive index metal oxide layer (¶¶ 46, 66, 85). *See In re O’Farrell*, 853 F.2d 894, 903–04 (Fed. Cir. 1988) (“Obviousness does not require absolute predictability of success For obviousness under § 103, all that is required is a reasonable expectation of success”).

Claim 16

Claim 16 requires an electronic device comprising a visible light antireflection coating including a stack of thin-film interference layers having an uppermost silicon oxide layer with a thickness of 80 nm or less and further including a fluoropolymer layer directly on the uppermost silicon oxide layer.

Mashimo discloses an antireflection film including an uppermost SiO₂ film which has a thickness of 88 or 81 nm and has a fluoropolymer layer directly thereon (¶¶ 125, 126, 140, 141).

The Appellant argues:

Mashimo’s antireflection coating cannot be modified to have an uppermost silicon oxide layer with a thickness of 80 nm or less and a fluoropolymer layer directly on the uppermost silicon oxide layer, as Mashimo discloses that “the antireflection

film is easily damaged” (see paragraph 6). One of ordinary skill would not remove the surface protection film from embodiments in which the uppermost layer has a thickness of less than 80 nm, and would therefore not form a fluoropolymer layer directly on an uppermost silicon oxide layer with a thickness of 80 nm or less. Doing so would reduce the protection for the coating. [Appeal Br. 13]

Mashimo’s disclosure that the antireflection film “is hardly damaged even when being rubbed and has high scratch resistance” (¶ 6) appears to apply to all of Mashimo’s antireflection films including those in Examples 3 and 8 wherein the antireflection film has an uppermost 88 or 81 nm thick SiO₂ film with a fluoropolymer layer directly thereon. Mashimo does not indicate that the antireflection film would be subject to damage if the uppermost SiO₂ film has a thickness less than 81 nm, such as 80 nm.

CONCLUSION

For the above reasons, we are not persuaded of reversible error in the Examiner’s rejections. Accordingly, we affirm the rejections.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–3, 5, 6	103	Mashimo, Yang, Cho	1–3, 5, 6	
7, 8	103	Mashimo, Yang, Cho, Lee	7, 8	
9	103	Mashimo, Yang, Cho, Lee, Cutherell	9	

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10, 15	103	Mashimo, Nose	10, 15	
12–14	103	Mashimo, Nose, Lee	12–14	
16–20	103	Mashimo, Lee	16–20	
Overall Outcome			1–3, 5–10, 12–20	

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED