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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/369,459	02/09/2012	Daijitsu Harada	P5298US00	2041

38834 7590 07/01/2020

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP
8500 LEESBURG PIKE
SUITE 7500
TYSONS, VA 22182

EXAMINER	
OCHYLSKI, RYAN M	

ART UNIT	PAPER NUMBER
1743	

NOTIFICATION DATE	DELIVERY MODE
07/01/2020	ELECTRONIC

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Ex parte DAIJITSU HARADA
and MASAKI TAKEUCHI

_____

Appeal 2018-005617
Application 13/369,459
Technology Center 1700

_____

Before ADRIENE LEPIANE HANLON, JENNIFER R. GUPTA, and DEBRA L. DENNETT, *Administrative Patent Judges*.

HANLON, *Administrative Patent Judge*.

DECISION ON APPEAL

A. STATEMENT OF THE CASE

The Appellant[1] filed an appeal under 35 U.S.C. § 134(a) from an Examiner's decision finally rejecting claims 1, 2, 5–8, and 10–17 under 35 U.S.C. 103(a) as unpatentable over Hieda et al.[2] in view of Tanabe et al.[3] Claim 9 is also pending

[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 Shin-Etsu Chemical Co., Ltd. Appeal Brief dated November 10, 2017 ("App. Br."), at 2.
[2] US 6,162,564, issued December 19, 2000 ("Hieda").
[3] US 2006/0068300 A1, published March 30, 2006 ("Tanabe").

but has been withdrawn from consideration.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

We REVERSE.

The claims on appeal are directed to a circular mold-forming substrate. The Appellant discloses that the substrate is especially suited to form a mold for use in nanoimprint lithography. Spec. 5, ll. 15–17.

Representative claim 1 is reproduced below from the Claims Appendix to the Appeal Brief. The limitations at issue are italicized.

1. A circular mold-forming substrate comprising:

an outer area and *a circular mold role area*;

wherein the circular mold-forming substrate has a diameter of 125 mm to 300 mm;

wherein the circular mold role area is an area that is capable of forming a topological pattern;

wherein the outer area surrounds the circular mold role area;

wherein the circular mold role area has a diameter of up to 125 mm; and

wherein a variation of thickness of the circular mold role area is up to 2 μm;

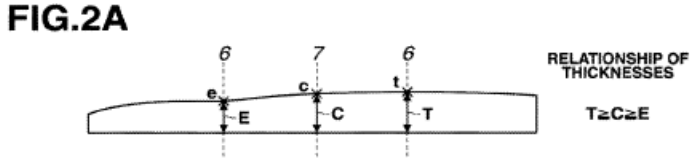
wherein the circular mold-forming substrate satisfies the relationship: $T \geq C \geq E$;

wherein *within the circular mold role area has a thickness T at the thickest point t* that first comes in contact with a resin layer on a recipient substrate, a thickness C at the center c, and *a thickness E at point e that is the intersection between line t-c and the periphery of the circular mold role area* which is remote from t and last comes in contact with the resin layer on the recipient substrate; and

wherein the circular mold-forming substrate satisfies the relationship: 0.6 μm ≥ T-E ≥ 0.3 μm.

App. Br. 14.

As for the linear relationship: $T \geq C \geq E$, the Appellant's Figure 2A, reproduced below, is illustrative.



Appellant's Figure 2A is a cross-sectional view of a mold-forming substrate with the claimed thickness variation.

The Appellant discloses that "[i]f the mold-forming substrate is profiled so that the substrate thicknesses may meet the relationship: $T \geq C \geq E$, formation of defects from bubbles in the transfer step can be mitigated." Spec. 8, ll. 1–4. In other words,

> the site on the mold surface that last comes in contact with the resin layer on the recipient substrate is the point of thickness E. Since the point of thickness E is at the boundary of the pattern-formed region, bubbles or foreign particles, if any in the resin layer, will escape out of the pattern-formed region, giving no impact to the transferred pattern.

Spec. 8, ll. 8–14.

As for the relationship: $0.6\ \mu m \geq T\text{-}E \geq 0.3\ \mu m$, the Appellant discloses:

> If the difference is more than 0.6 μm, which indicates a thickness variation of more than 0.6 μm, then a misalignment can occur between the pattern to be formed on the mold-forming substrate and the pattern being transferred, resulting in pattern errors. If the difference is less than 0.3 μm, this substrate thickness difference is insufficient for bubbles or foreign particles to escape outside, and bubbles or foreign particles will rather collect near the center of the pattern-formed region, with a possibility of forming defects in the transferred pattern despite fulfillment of the relationship: $T \geq C \geq E$.

Spec. 8, l. 30–9, l. 5.

B. DISCUSSION

Hieda and Tanabe both disclose mask blank substrates. The Examiner finds Hieda discloses a circular substrate having a diameter of 200 mm, which is within the range recited in claim 1, and allows for a circular mold role area that could be up to 125 mm as claimed. Final Act. 3.[4]

The Examiner finds Hieda does not disclose the claimed thickness relationship (i.e., 0.6 μm ≥ T-E ≥ 0.3 μm)

> which, put another way, is a requirement that in an area capable of forming a topological pattern, there is a convex curvature in the area that encompasses the *shortest linear distance from a thickest point [t]* at least just beyond a center of the circular mold role area *to a second point on the periphery of mold role area [e]* that is on the opposite side of the center from the thickest point and *collinear with the line defined by the thickest point [t] and the center of the circular mold [c]*, wherein the thickness difference between the thickest point [t] and second point [e] is between .3 and .6 microns, inclusive.

Final Act. 3–4 (emphasis added).

The Examiner, however, finds that the convex shapes disclosed in Tanabe suggest the claimed relationship 0.6 μm ≥ T-E ≥ 0.3 μm, recited in claim 1. Final Act. 4. More specifically, the Examiner directs our attention to Tanabe's Figure 8 which, according to the Examiner,

> shows an exemplary convex shape wherein the maximum thickness is at 0.076 μm, and the minimum thickness dips to -0.390 μm, for a total pre-chucking flatness variation from the thickest point to the edge of 0.466 μm (a value near the exact center of the claimed inequality), as can be verified in Table 1 on Page 7 of Tanabe. Indeed, for all convex Examples, Tanabe discloses convexity values well within the range of 0.6 μm ≥ T-E ≥ 0.3 μm.

[4] Final Office Action dated January 27, 2017.

Ans. 6.[5]

In response, the Appellant argues that the flatness measurement area relied on by the Examiner in Tanabe's Figure 8 is a 148 mm square area and the value of T-E differs depending on the size of the measurement area. Reply Br. 3.[6] More specifically, the Appellant argues:

> [T]here are two figures illustrated in FIG. 8. The left one shows the flatness measurement area of a 148 mm square, whereas the right one shows that of a 132 mm square. The 132 mm square measurement area may be closer in scope to the presently claimed invention, *i.e.* a diameter of up to 125mm. Thus, when a skilled artisan at the time of invention were to read the Max and Min values in the right figure of FIG. 8, to calculate in the same manner as asserted by the Examiner, Max value is 0.059 and Min value is -0.119, thus
> T-E = 0.059 - (-0.119) = 0.178 μm. This is clearly not within the presently claimed range feature.

Reply Br. 3.

> Moreover, the Appellant argues that
>
> when the Max and Min values of each 132 mm square figures in FIGS. 8-17 are evaluated and calculated in the same manner, as disclosed above, a skilled artisan would understand that each figure has a smaller value than 0.3 μm, which is outside of the scope of the presently claimed invention . . . .

Reply Br. 4. Thus, in contrast to the claimed invention, the Appellant argues that the small difference in Tanabe's substrate thicknesses makes it difficult to avoid the introduction of bubbles or foreign particles. App. Br. 12.

[5] Examiner's Answer dated March 8, 2018.
[6] Reply Brief dated May 8, 2018.

The Appellant's argument is persuasive of reversible error. Two substrates are depicted in each of Tanabe's Figures 8–17.[7] The left hand substrate in each Figure is identified as "Mask 148 (Flatness)," referring to a 148 mm square area 16 of the substrate depicted in Tanabe's Figure 1, and the right hand substrate in each Figure is identified as "Mask 132 (Flatness)," referring to a 132 mm square area 14 of the substrate depicted in Tanabe's Figure 1. Tanabe ¶ 123. Tanabe discloses that the 132 mm square area is a *pattern area* of the substrate. Tanabe ¶ 123.

The claimed values T, C, and E are collinear and within the *circular mold role area* which has a diameter of "up to 125 mm." App. Br. 14. Therefore, we concur with the Appellant that the 132 mm square area of Tanabe's substrate, which represents the *pattern area* of the substrate, rather than the 148 mm square area relied on by the Examiner, is closer in scope to the circular mold role area recited in claim 1.

The difference between each of the Max and Min values reported for "Mask 132 (Flatness)" in Tanabe's Figures 8–17 is less than 0.3 μm, with 0.210 μm in Tanabe's Figure 9 being the highest value. Therefore, we find that Tanabe's substrate does not satisfy the claimed relationship: 0.6 μm ≥ T-E ≥ 0.3 μm, especially where the Examiner has failed to show that the points corresponding to T and E are collinear as claimed.

The Examiner also finds that "the optimum or workable range of the convexity would require only ordinary skill." Final Act. 4. To the extent that the Examiner is taking the position that optimizing the T and E values of Tanabe's substrate would have been within the ordinary level of skill in the art, the Examiner

[7] Figures 8–17 correspond to Tanabe's inventive Examples 1–10. Tanabe ¶¶ 64–73. Figures 18–20, on the other hand, correspond to Comparative Examples 1–3. Tanabe ¶¶ 74–76.

has failed to show that T and E, as defined in claim 1, were known to be result-effective variables at the time of the Appellant's invention. *See In re Antonie*, 559 F.2d 618, 620 (CCPA 1977) (it is not obvious to optimize a parameter that was not recognized to be a result-effective variable); *see also* App. Br. 9 (arguing that "Tanabe does not disclose an [a, sic] result-effective variable that would have been obvious to be optimized"). Moreover, the Examiner has failed to show that a T-E value encompassed by the range recited in claim 1 would have been desirable in Tanabe. *See In re Sebek*, 465 F.2d 904, 907 (CCPA 1972) (the determination of optimum values outside a range disclosed in the prior art may not be obvious); *see also* Reply Br. 3 (arguing that "there is no reason or motivation for a skilled artisan to achieve the presently claimed feature 0.6 μm ≥ T-E ≥ 0.3 μm").

For the reasons set forth above, the obviousness rejection of claims 1, 2, 5–8, and 10–17 is not sustained.

C. CONCLUSION

The Examiner's decision is reversed.

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 2, 5–8, 10–17	103(a)	Hieda, Tanabe		1, 2, 5–8, 10–17

REVERSED