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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte RAMA R. GORUGANTHU and
MICHAEL R. BRUCE

Appeal 2010-005235
Application 10/961,347
Technology Center 1700

Before JEFFREY T. SMITH, KAREN M. HASTINGS, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

COLAIANNI, *Administrative Patent Judge.*

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's non-final[1] rejection of claims 50 through 70 and 109 through 121. We have jurisdiction pursuant to 35 U.S.C. § 6.

We AFFIRM-IN-PART.

STATEMENT OF THE CASE

The subject matter on appeal is directed to a method of manufacturing. Claims 50, 58, 109, and 115 are illustrative:

> 50. A method of manufacturing, comprising:
>
> forming a resist film; and
>
> exposing the resist film with radiation transmitted through an array of solid immersion lenses adapted to be supported in a non -cantilevered manner.
>
> 58. A method of manufacturing, comprising:
>
> forming a resist film; and
>
> forming an array of solid immersion lenses on the resist film, so that there is a light transmissive pathway from the solid immersion lenses of the array to the resist film.
>
> 109. A method of manufacturing, comprising:
>
> forming a resist film; and

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[1] We note that Appellants properly appeal from the Examiner's non-final rejection mailed on July 31, 2009, since the claims on appeal have been twice rejected. *See* 35 U.S.C. § 134(a)("[a]n applicant for a patent, any of whose claims has been twice rejected, may appeal from the decision of the primary examiner to the Board of Patent Appeals and Interferences.").

forming an array of solid immersion lenses on the resist film, so that there is a light transmissive pathway from the solid immersion lenses of the array to the resist film; and

transmitting radiation through the array of solid immersion lenses to expose a plurality of regions in the resist film.

115. A method of manufacturing, comprising:

forming a resist film on a circuit device; and

exposing selected portions of the resist film with radiation transmitted through plural solid immersion lenses, the plural solid immersion lenses having respective shapes corresponding to preselected circuit structures to be patterned in the circuit device.

The Examiner maintains the following rejections:

1) Claims 50-57 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement;

2) Claims 115, 116, 118, 119, and 121 under 35 U.S.C. § 102(b) as anticipated by Cozier (US 6,441,359 B1, issued Aug. 27, 2002);

3) Claims 50 and 53 under 35 U.S.C. § 103(a) as unpatentable over Cozier in view of Quake (US 2003/0123155 A1, published Jul. 3, 2003);

4) Claim 52 under 35 U.S.C. § 103(a) as unpatentable over Cozier and Quake, and further in view of Legrand (US 6,301,055 B1, issued Oct. 9, 2001);

5) Claims 54 and 55 under 35 U.S.C. § 103(a) as unpatentable over Cozier and Quake, and further in view of Corle (US 5,121,256, issued Jun. 9, 1992);

6) Claim 56 under 35 U.S.C. § 103(a) as unpatentable over Cozier, Quake, and Corle, and further in view of Pierrat (US 2005/0007567 A1, published Jan. 13, 2005);

7) Claim 57 under 35 U.S.C. § 103(a) as unpatentable over Cozier and Quake, and further in view of Ghislain (US 5,939,709, issued Aug. 17, 1999);

8) Claims 58-60, 62, and 66-68 under 35 U.S.C. § 103(a) as unpatentable over Quake, in view of Hsu '886 (US 6,809,886 B2, issued Oct. 26, 2004);

9) Claim 63 under 35 U.S.C. § 103(a) as unpatentable over Quake and Hsu '886, and further in view of Coursey (US 6,893,958 B2, issued May 17, 2005) and Frosig (US 6,683,723 B2, issued Jan. 27, 2004);

10) Claim 64 under 35 U.S.C. § 103(a) as unpatentable over Quake and Hsu '886, and further in view of Coursey and Cozier;

11) Claim 65 under 35 U.S.C. § 103(a) as unpatentable over Quake and Hsu '886, and further in view of Ghislain;

12) Claims 69 and70 under 35 U.S.C. § 103(a) as unpatentable over Quake and Hsu '886, and further in view of Pierrat;

13) Claim 117 under 35 U.S.C. § 103(a) as unpatentable over Cozier in view of Pierrat;

14) Claims 50, 53-56, 58-60, 62, 66-70, 109, 111-115, and 117-121 under 35 U.S.C. § 103(a) as unpatentable over Hugle (US 5,517,279, issued May 14, 1996) in view of Corle;

15) Claim 52 under 35 U.S.C. § 103(a) as unpatentable over Hugle and Corle, and further in view of Legrand;

16) Claims 57 and 65 under 35 U.S.C. § 103(a) as unpatentable over Hugle and Corle, and further in view of Ghislain;

17) Claim 63 under 35 U.S.C. § 103(a) as unpatentable over Hugle and Corle, and further in view of Frosig;

18) Claim 64 under 35 U.S.C. § 103(a) as unpatentable over Hugle and Corle, and further in view of Cozier;

19) Claims 51, 61, and 110 under 35 U.S.C. § 103(a) as unpatentable over Hugle and Corle, and further in view of Wester (US 6,507,439 B1, issued Jan. 14, 2003) and Hsu '902 (US 7,083,902 B2, issued Aug. 1, 2006); and

20) Claim 116 under 35 U.S.C. § 103(a) as unpatentable over Hugle and Corle, and further in view of Cozier.

With respect to rejections (1), (2), (3), (8), Appellants' arguments focus on claims 50, 115, 50, and 58, respectively. (App. Br. 6-12, 14, and 15). Accordingly, we address Appellants' arguments with respect to these claims only.

With respect to rejections (4) through (7) and (15) through (19), for reasons evident below, we address each of these rejections.

With respect to rejections (9) through (12), Appellants provide no additional argument for these rejections and instead refer to the arguments made regarding the rejection of claim 58 in rejection (8). *Id.* at 14-17. Therefore, the claims under rejections (9) through (12) stand or fall with our decision regarding the rejection of claim 58 in rejection (8).

With respect to rejection (13), Appellants provide no additional argument for this rejection and instead refer to the arguments made

regarding the rejection of claim 115 in rejection (2). *Id.* at 18. Therefore, claim 117 in rejection (13) stands or falls with our decision regarding the rejection of claim 115 in rejection (2).

With respect to rejection (14), Appellants' arguments focus on claims 50, 58, 109, and 115. *Id.* at 19-21. Accordingly, we address Appellants' arguments with respect to these claims only.

With respect to rejection (20), Appellants provide no additional argument and instead refer to the arguments made regarding the rejection of independent claim 115 in rejection (14). *Id.* at 21-23. Therefore, claim 116 in rejection (20) stands or falls with our decision regarding the rejection claim 115 in rejection (14).

REJECTION (1)

ISSUE

Did the Examiner err in finding that the claim limitation [2] that requires the solid immersion lenses adapted to be supported in a "non-cantilevered manner" as stated in independent claim 50 was not described in the originally filed disclosure within the meaning of 35 U.S.C. § 112, first paragraph? We decide this issue in the negative.

PRINCIPLE OF LAW

As stated in *In re Kaslow*,

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[2] This claim limitation was added via an amendment filed on February 28, 2008.

> The test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter, rather than the presence or absence of literal support in the specification for the claim language.

707 F.2d 1366, 1375 (Fed. Cir.1983).

FACTUAL FINDINGS, ANALYSIS, AND CONCLUSION

Appellants argue that the newly added "non-cantilevered manner" feature recited in claim 50 is supported by the originally filed application such that it satisfies the written description requirement. (App. Br. 7). In that regard, Appellants argue that one of ordinary skill in the art would understand that their solid immersion lens is supported in a non-cantilevered manner since Appellants' Figure 3 illustrates solid immersion lens 36 supported by stage 50. *Id.*

While Appellants' Figure 3 illustrates that solid immersion lens 36 is supported by stage 50, we agree with the Examiner that there is nothing in the originally filed disclosure relied upon by Appellants that indicates that Appellants' solid immersion lens 36 may be supported in a non-cantilevered manner. We agree that "supported in a non-cantilevered manner" is broader than argued by Appellants such that the original disclosure simply does not provide written descriptive support for the full scope of the feature (Ans. 4). In this regard, Figure 3 does not illustrate that Appellants possessed any and all types of manners of support encompassed by the non-cantilevered manner feature.

Thus, we concur with the Examiner that a prima facie case of lack of written description has been established since the later claimed non-

cantilevered manner feature required by claim 50 was not described in the originally filed disclosure in such a way as to reasonably convey to one of ordinary skill in the art, at the time the application was filed, that the inventors had possession of the later claimed invention within the meaning of 35 U.S.C. § 112, first paragraph.

Accordingly, we sustain the Examiner's rejection (1).

REJECTIONS (2) AND (13)

ISSUE

Did the Examiner err in finding that Cozier teaches the plural solid immersion lenses having respective shapes corresponding to the preselected circuit structures to be patterned in the circuit device feature required by claim 115 within the meaning of § 102? We decide this issue in the negative.

PRINCIPLE OF LAW

Under 35 U.S.C. § 102, "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631-32 (Fed. Cir. 1987).

FACTUAL FINDINGS, ANALYSIS, AND CONCLUSION

Appellants argue that nowhere does Cozier teach the plural solid immersion lenses having respective shapes corresponding to the preselected circuit structures to be patterned in the circuit device feature required by claim 115. *Id.* In that regard, Appellants argue that while Cozier teaches at

column 3 that its cantilever tip, which includes a solid immersion lens, may be pyramidical or conical shape and that its solid immersion lens may have a spherical, aspherical, or elliptical shape, nowhere does Cozier teach the disputed claim feature. *Id.* We disagree.

As pointed out by the Examiner, the Specification discloses that virtually any lens shape may be used to form circuit structures (Ans. 29; Spec. para. [0051]). Accordingly, the requirement of claim 115 that "solid immersion lenses having respective shapes corresponding to preselected circuit structures to be patterned in the circuit device" reasonably includes any shaped lens that forms a circuit structure.

Appellants do not specifically challenge that Cozier teaches forming circuit structures using a solid immersion lenses (App. Br. 8-10; Reply Br. 6-8). Rather, Appellants' arguments focus on Cozier's failure to teach that the shape of the solid immersion lenses corresponds to the shape of the shape of the preselected circuit structures (App. Br. 9). In this regard, Cozier teaches using a solid immersion lens to form on a photoresist a photolithographic pattern, which is known to include the pattern of the preselected circuit structure on the circuit device. (Cozier, col. 5, ll. 47-55).

Thus, since Cozier's solid immersion lenses form a pattern on the photoresist, we agree with the Examiner that the solid immersion lenses have respective shapes that correspond to the preselected circuit structures to be patterned in the circuit device. For example, the spot in the photoresist formed by a solid immersion lens may form a preselected hole or via in the in the circuit device. This interpretation of Cozier is supported by Appellants' Specification disclosure that includes virtually any shape for the solid immersion lenses as noted above.

Appellants additionally argue that Cozier does not teach mixing different shapes. (Reply Br. 7). Appellants' argument is without persuasive merit because the feature argued by Appellants (i.e., the shapes of the solid immersion lenses are different) is not claimed and thus is not required by the claim. *See In re Self*, 671 F.2d 1344, 1348 (CCPA 1982) (stating that "[m]any of appellant's arguments fail from the outset because . . . they are not based on limitations appearing in the claims.").

Contrary to Appellants' argument that Cozier does not teach plural solid immersion lenses as required by the claim, Cozier teaches the use of an array of solid immersion lenses in order to allow for faster lithography. (Cozier, col. 7, ll. 41-45 and Figure 4). Cozier teaches that its solid immersion lenses may have different shapes such as spherical and elliptical. (Id. at col. 6, ll. 10-39). Indeed, Appellants acknowledge that Cozier teaches that different shapes may be used for its solid immersion lens. (App. Br. 9).

Accordingly, we sustain the Examiner's rejection (2). For the same reasons, we affirm the Examiner's rejection (13).

REJECTION (3)

ISSUE

Did the Examiner err in combining Cozier and Quake to arrive at the invention recited in claim 50 within the meaning of § 103? We decide this issue in the affirmative.

PRINCIPLE OF LAW

"[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning

with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).

FACTUAL FINDINGS, ANALYSIS, AND CONCLUSION

The Examiner states that it would have been obvious to one of ordinary skill in the art to substitute Quake's body portion 1354 (corresponding to the claimed solid immersion lenses adapted to be supported in a non-cantilevered manner feature as alleged by the Examiner) for Cozier's cantilever support in order to provide precision placement of the lenses. (Ans. 6 and 32).

Appellants argue that the Examiner has not provided a credible reason to combine Cozier and Quake to arrive at the claimed invention. (App. Br. 11 and 12). We agree with Appellants.

In reference to our above discussion, Cozier teaches using a solid immersion lens to form a photolithographic pattern on a photoresist. (Cozier, col. 5, ll. 47-55). Cozier teaches that its solid immersion lens is supported with a cantilever that moves the solid immersion lens closer to or away from the surface to be scanned. *Id.* at col. 2, ll. 47-51 and col. 5, ll. 26-44.

Quake teaches a solid immersion lens structure having spherical lens portions 1352 and body portion 1354 (corresponding to the solid immersion lens adapted to be supported in a non-cantilevered manner feature as alleged by the Examiner). (Quake, para. [0185]]).

Thus, it is unclear to us, and the Examiner has not explained, why one of ordinary skill would have substituted Quake's body portion 1354 for Cozier's cantilever support given that Quake's body portion 1354 is used to

form a solid immersion lens and that Cozier's cantilever support is used to *move* a solid immersion lens product closer to or away from the surface to be scanned.

The Examiner simply fails to provide any credible evidence or any persuasive explanation as to why it would have been obvious based on the teachings of Quake and Cozier to arrive at the claimed invention.

Accordingly, we do not sustain the Examiner's rejection (3).

REJECTIONS (4)-(7)

The Examiner relies on the same factual findings and determinations discussed above and does not provide any additional findings or determinations as to how any of the other applied prior art references would have satisfied these disputed claim features. Therefore, for the reasons stated above, we do not sustain the Examiner's rejections (4) through (7).

REJECTIONS (8) THROUGH (12)

ISSUE

Did the Examiner err in combining Quake and Hsu '886 to arrive at the invention recited in claim 58 within the meaning of § 103? We decide this issue in the negative.

PRINCIPLES OF LAW

"[A] court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

"A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994).

FACTUAL FINDINGS, ANALYSIS, AND CONCLUSION

Appellants argue that it would not have been obvious to employ a non-pliant photoresist of Hsu '886 as the pliant mold 340 in Quake. (App. Br. 15).

In addition, Appellants argue that because Hsu '886 is directed to a non-pliant photoresist and Quake is directed to a pliant mold 340, Hsu '886 teaches away from Quake. *Id.* We disagree with both of these arguments.

Quake teaches a method of forming an array of solid immersion lenses by forming a mold from first layer 1340 having cavities 1342 and casting a moldable material onto the first layer 1340 to form the array of solid immersion lenses. (Quake, paras. [0185] - [0186]).

While Quake does not explicitly teach that its mold is formed from a resist, Appellants do not specifically dispute the Examiner's finding that it is known to use a resist as a mold. (*Compare* Ans. 11 *with* App. Br. 14 and 15 and Reply Br. 9-11). For example, the Examiner finds and Appellants do not specifically dispute that Hsu '886 teaches that a photoresist may be used in forming a solid immersion lens. *Id.*

Thus, we agree with the Examiner that it would have been obvious to one of ordinary skill in the art, using no more than ordinary creativity, to

have employed a known resist to form Quake's mold in order to achieve the desired result (i.e., to form a solid immersion lens). *KSR*, 550 U.S. at 418.

With respect to Appellants' arguments that Hsu teaches away from Quake and that it would not have been obvious to use a non-pliant photoresist of Hsu '886 for the pliant mold 340 in Quake, Appellants' arguments are without persuasive merit because they are based on the assumption that Hsu '886 teaches the use of a non-pliant photoresist. However, as correctly pointed out by the Examiner at page 34 of the Answer, nowhere does Hsu '886 teach that its photoresist layer is non-pliant. In this regard, Appellants do not direct us to any credible evidence to support their argument that Hsu '886 teaches a non-pliant photoresist.

In addition, with respect to Appellants' teaching away argument, nowhere does Hsu '886 discourage the use of its photoresist as a resist to form a solid immersion lens. *Gurley*, 27 F.3d at 553.

Accordingly, we sustain the Examiner's rejection (8). For the same reasons, we affirm the Examiner's rejections (9) through (12).

REJECTIONS (14) AND (20)

Claim 50

The Examiner refers to Hugle's claim 1, figure 2, and column 7, lines 5-7 to support the finding that Hugle teaches the "supported in a non-cantilevered manner" feature required by claim 50. (Ans. 15 and 37).

Appellants argue that, contrary to the Examiner's statement, Hugle does not teach the "supported in a non-cantilevered manner" feature required by claim 50. (App. Br. 19). Specifically, Appellants argue that while

Hugle's column 5, lines 10-11 teaches three alternative arrangements of lens elements in an array, Hugle is silent regarding any specific support for the lens array. *Id.* We agree with Appellants.

While the portions of Hugle relied upon by the Examiner teach an array of lenses, none of the portions relied upon by the Examiner teach that the array of lenses may be supported in a non-cantilevered manner as required by the claim.

The Examiner simply does not direct us to any credible teaching or provide any persuasive explanation to support the Examiner's position that Hugle teaches the supported in a non-cantilevered manner feature required by claim 50.

Accordingly, we do not sustain the Examiner's rejection of claims 50 and 53-56 in rejection (14).

Claims 58 and 109

We begin by noting that while the term "on" is not expressly defined in the Specification, the broadest reasonable meaning of this term in its ordinary usage is a function word to indicate direct or indirect physical contact. *See, e.g.*, pages 1574 and 1575 of WEBSTER'S THIRD NEW WORLD INTERNATIONAL DICTIONARY (G. & C. Merriam Webster, 1971) (on defined as "used as a function word to indicate contiguity or dependence.").

Thus, the claim requires forming an array of solid immersion lenses in direct or indirect physical contact with the resist film. This is a reasonable interpretation in light of the Specification as it teaches that its solid immersion lens array 36 may be formed directly on (i.e., in direct physical contact with) the underlying resist film. (Spec. paras. [0040] and [0047]).

Turning our attention to the rejection, the Examiner alleges that Hugle teaches the array of lenses on the resist film feature required by claims 58 and 109. (Ans. 16 and 18). In that regard, while the Examiner acknowledges (Ans. 38) that Hugle's Figure 4 does not illustrate an array of lenses *in contact with* the resist film, the Examiner maintains that Hugle teaches the disputed claim feature because Hugle's Figure 4 illustrates a lens array 34 that is *spaced above* photoresist 35 (corresponding to the claimed resist film feature required by the claims) such that the lens array 34 is on the photoresist 35. *Id.*

Given the proper construction of the term "on" discussed above, we determine that the Examiner's interpretation of the term "on" to include a position that is spaced above the photoresist 35 is *unreasonably* broad. *See In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997). Indeed, as correctly argued by Appellants at page 19 of the Appeal Brief, while Hugle teaches at column 7, lines 14-18 that a light field passes through the lensing mechanism and an image forms on a photoresist layer, nowhere does Hugle teach that the lens array is formed "on the resist film" as required by the claims.

The Examiner simply directs us to no credible evidence to support the position that a person having ordinary skill in the art would have understood Appellants' disclosure to support this broader interpretation.

Accordingly, we do not sustain the Examiner's rejection of claims 58-60, 62, 66-70, 109, and 111-114 in rejection (14).

Claim 115

Appellants argue that, contrary to the Examiner's finding, Hugle does not teach the "plural solid immersion lenses having respective shapes corresponding to preselected circuit structures to be patterned in the circuit device" feature required by claim 115. (App. Br. 20). Specifically, Appellants argue that although Hugle at column 4, line 16 teaches that its lenses may be arranged to have different sizes, shapes, and configurations to match the geometries of different devices, this does not lead to the conclusion that solid immersion lenses can also be so designed. *Id.*

Appellants also argue that because of the more complex nature of solid immersion lenses, it is not such a simple matter, as in conventional lenses, to design solid immersion lenses such that the plural solid immersion lenses have respective shapes corresponding to preselected circuit structures as required by claim 115. *Id.* We disagree with Appellants' arguments.

Hugle teaches a method of photolithography that uses an array of microlenses to project a pattern from a photomask to a photoresist. (Hugle, col. 3, ll. 53-60 and col. 7, ll. 9-31). Hugle teaches that its lens arrays can be designed to have different cell sizes, shapes, and configurations to match the geometries of various devices. *Id.* at col. 4, ll. 15-18.

While Hugle is silent regarding the use of solid immersion lenses, Corle teaches that it is known to use solid immersion lenses in lithographic systems in order to provide improved definition in the transfer of patterns from a photomask to a photoresist. (Corle, col. 1, ll. 56 to col. 2, l. 4).

Thus, we agree with the Examiner that it would have been obvious to one of ordinary skill in the art to employ Corle's solid immersion lens as the

lens in Hugle's array of microlenses in order to provide improved definition in the transfer of patterns from a photomask to a photoresist.

With respect to Appellants' arguments that it would not have been within the skill level of one of ordinary skill in the art to employ Corle's solid immersion lens as the lenses in Hugle's array of microlenses because of the complex nature of solid immersion lenses, Appellants' argument is unpersuasive because Appellants do not direct us to any evidence other than mere argument to support their allegation regarding the complex nature of solid immersion lenses vis-à-vis the level of one of ordinary skill in the art. *In re Lindner,* 457 F.2d 506, 508 (CCPA 1972) (holding that mere attorney argument cannot take the place of evidence).

Accordingly, we sustain the Examiner's rejection of claims 115 and 117-121 in rejection (14). We further sustain the Examiner's rejection (20) for the same reasons.

REJECTIONS (15)-(19)

The Examiner relies on the same factual findings and determinations discussed above with regard to rejection (14) and does not provide any additional findings or determinations as to how any of the other applied prior art references would have satisfied these disputed claim features. Therefore, for the reasons stated above, we do not sustain the Examiner's rejections (15) through (19).

ORDER

The Examiner's decision is affirmed-in-part.

TIME PERIOD

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

AFFIRMED-IN-PART

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