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PATENT APPLICATION

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IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	**Jennifer Shih et al.**	**Confirmation No.:**	**2716**
Application No.:	**10/703,762**	**Examiner:**	**SMOOT, Stephen W.**
Filing Date:	**November 7, 2003**	**Group Art Unit:**	**2813**

Title: Sealing Openings in Micro-Electromechanical Systems

Mail Stop Appeal Brief - Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF REPLY BRIEF

Transmitted herewith is the Reply Brief with respect to the Examiner's Answer mailed on April 6, 2009 .

This Reply Brief is being filed pursuant to 37 CFR 1.193(b) within two months of the date of the Examiner's Answer.

(Note: Extensions of time are not allowed under 37 CFR 1.136(a))

(Note: Failure to file a Reply Brief will result in dismissal of the Appeal as to the claims made subject to an expressly stated new ground rejection.)

No fee is required for filing of this Reply Brief.

If any fees are required please charge Deposit Account 08-2025.

Respectfully submitted,
Jennifer Shih et al.

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REPLY BRIEF

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Sir:

This is a Reply Brief under Rule 41.41 (37 C.F.R) in response to the Examiner's Answer of April 6, 2009 (the "Examiner's Answer" or the "Answer"). In Section 10, the Answer contains a response to some of the arguments made in Appellant's brief. Appellant now responds to the Examiner's Answer as follows.

Status of Claims

Claims 49-56 were withdrawn under a previous Restriction Requirement and were subsequently cancelled without prejudice or disclaimer. Claim 58 has also been cancelled previously without prejudice or disclaimer.

Claims 57 and 59-64 have been allowed and are not at issue in this appeal.

The final Office Action further indicated the presence of allowable subject matter in claims 2, 7-10, 15, 20-23, 27, 32-35 and 39-48. Accordingly, these claims are not directly at issue in this appeal, but are included here due to their dependence on finally-rejected base claims.

Thus, claims 1, 3-6, 11-14, 16-19, 24-26, 28-31 and 36-38 are currently pending in the application and stand finally rejected. Accordingly, Appellant appeals from the final rejection of claims 1, 3-6, 11-14, 16-19, 24-26, 28-31 and 36-38, which claims are presented in the Appendix of the Brief.

Grounds of Rejection to be Reviewed on Appeal

The Answer maintains the following grounds of rejection.

(1) Claims 1, 3, 5, 11-14, 16, 18, 24 and 25 were rejected under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 7,008,812 to Carley ("Carley").

(2) Claims 4, 6, 17 and 19 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Carley and U.S. Patent App. Pub. No. 2002/0157475 to Onose et al. ("Onose").

(3) Claims 26, 28, 30 and 36 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Carley and U.S. Patent No. 6,099,598 to Yokoyama et al. ("Yokoyama").

(4) Claims 29 and 31 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Carley, Yokoyama and Onose.

(5) Claims 37 and 38 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Carley and U.S. Patent No. 6,323,834 to Colgan et al. ("Colgan").

According, Appellant hereby requests review of each of these grounds of rejection in the present appeal.

Argument

(1) Claims 1, 3, 5, 11-14, 16, 18, 24 and 25 are patentable over Carley:

Claim 1:

Claim 1 recites: "A method of sealing a micro-electromechanical system (MEMS), said method comprising successively depositing and etching a sealing material to seal an opening in said MEMS." In contrast, Carley utterly fails to teach or suggest this subject matter.

As Appellant has previously noted, Carley teaches deposition, without etching, of a single seal layer (26) that seals the holes (20) into the MEMS cavity (22). (Carley, col. 5, lines 21-22). Thus, Carley clearly fails to teach or suggest "successively depositing and etching a sealing material to seal an opening in said MEMS."

In response, the Answer argues as follows.

> Carley applies a seal layer (26) to seal holes (20), thereby effectively sealing a MEMS structure (14) in a cavity (22), and then etch the seal layer (26) to expose a contact pad (6). The appellant dismisses this reasoning as being irrelevant to the claimed method as set forth in claim 1. The examiner disagrees because claim 1 is open to embodiments that feature depositing one layer of sealing material to seal a MEMS and successively etching the sealing material provided that the MEMS remains sealed.

(Answer, p. 10).

Appellant respectfully disagrees.

Claim 1 clearly recites that ***both*** the depositing and etching steps are used to produce the result of sealing the opening, i.e., "successively depositing and etching a sealing material *to seal an opening in said MEMS*." (Claim 1). Thus, the language of claim 1 clearly indicates that the opening is not sealed until at least one etching has been performed.

In contrast, as stated in the Answer, "Carley applies a seal layer (26) to seal holes (20), thereby effectively sealing a MEMS structure (14) in a cavity (22)." (Answer, p. 10). Thus, the structure is sealed following deposition of the seal layer and *without any etching step*.

As the Answer further makes clear, any subsequent etching taught by Carley has nothing to do with sealing the MEMS structure. Rather, Carley teaches "etch[ing] the seal layer (26) *to expose a contact pad* (6)." (Answer, p. 10) (emphasis added).

Thus, Carley clearly does not teach or suggest the claimed method in which ***both*** the depositing and etching steps are used to produce the result of sealing the opening, i.e., "successively depositing and etching a sealing material *to seal an opening in said MEMS*." (Claim 1).

In applying Carley, the Answer is essentially taking the position that claim 1 recites depositing material to seal a MEMS structure and then etching for some other purpose, like exposing a contact pad. This is *not* what claim 1 recites. Consequently, it is simply incorrect for the Examiner to argue that Carley's teaching of a single deposition which alone seals the MEMS is within the scope of claim 1. Carley clearly and inescapably does not teach or suggest "successively depositing and etching a sealing material to seal an opening in said MEMS." (Claim 1) (emphasis added).

Moreover, "[t]The prior art reference—in order to anticipate under 35 U.S.C. § 102—must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements 'arranged as in the claim.'" *NetMoneyIn v. Verisign*, (Fed. Cir. 2008) (quoting *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542 (Fed. Cir. 1983)). Additionally, "[t]he materials on which a process is carried out must be accorded weight in determining the patentability of a process. *Ex parte Leonard*, 187 USPQ 122 (Bd. App. 1974)." (See MPEP § 2116).

Under these applicable standards, Carley clearly fails to teach or suggest anything like the method recited in claim 1. "A claim is anticipated [under 35 U.S.C. § 102] 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. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Carley of claim 1 and its dependent claims should not be sustained.

Claim 13:

Claim 13 recites:

> A method of forming a micro-electromechanical system (MEMS), said method comprising:
> forming a cavity in a material;
> forming components of said MEMS in said cavity; and
> successively depositing and etching a sealing material to seal an opening into said cavity.

In contrast, as demonstrated above with regard to claim 1, Carley only teaches depositing, *without etching*, a single seal layer (26) to seal the holes (20) into the MEMS cavity (22). (Carley, col. 5, lines 21-22). Thus, Carley does not and cannot teach or suggest the method of claim 13 including "successively depositing and etching a sealing material to seal an opening into said cavity." There is no such teaching or suggestion in Carley.

"A claim is anticipated [under 35 U.S.C. § 102] 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. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Carley of claim 13 and its dependent claims should not be sustained.

(2) Claims 4, 6, 17 and 19 are patentable over Carley and Onose:

This rejection should not be sustained for at least the same reasons given above in favor of the patentability of claims 1 and 13.

(3) Claims 26, 28, 30 and 36 are patentable over Carley and Yokoyama:

Claim 26 recites:

> A method of in-fab packaging of a micro-electromechanical system (MEMS), said method comprising:
> fabricating said MEMS at a fabrication facility; and,
> at said fabrication facility, *successively depositing and etching a sealing material to seal an opening in said MEMS.*

(Emphasis added).

In contrast, as demonstrated above with regard to claim 1, Carley does not teach or suggest a method including "successively depositing and etching a sealing material to seal an opening in said MEMS." Carley only teaches depositing, *without etching*, a single seal layer (26) to seal the holes (20) into a MEMS cavity (22) containing the MEMS microstructure (14). (Carley, col. 5, lines 21-22). For at least this reason, the rejection of claim 26 should not be sustained.

Additionally, Carley clearly does not teach or suggest the claimed method of claim 26 including expressly performing the step of successively depositing and etching a sealing material to seal an opening in said MEMS "*at said fabrication facility*' were the MEMS structure was fabricated. There is no such teaching or suggestion in Carley. Consequently, the final Office Action and Answer cite to the teachings of Yokoyama on this point. Specifically, the Office Action cites Yokoyama as teaching "a transporter (101), which implies that the entire fabrication system is housed within the same fabrication facility." (final Office Action of September 22, 2008, p. 6).

This appears to be an argument that Yokoyama *inherently* teaches the claimed fabrication of a MEMS and sealing of an opening in the MEMS in the same fabrication facility. As such, this argument is clearly insufficient to establish unpatentability.

"To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.' 'Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" *In re Robertson*, 49 USPQ2d 1949, 1950 (Fed. Cir. 1999) (citations omitted). "[T]he examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic *necessarily* flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (BPAI 1990) (emphasis in original); see also, MPEP § 2112 (quoting Levy).

In response, the Answer argues that "Yokoyama et al. are completely silent with respect to the need or requirement for more than one facility to contain their fabrication system." (Answer, p. 12). This argument clearly does not establish that Yokoyama *necessarily* teaches the claimed method of performing MEMS fabrication and sealing in the same facility.

To the contrary, the Answer is clearly not aware of the current and traditional practice in this industry. Appellant's specification states the following.

> [0003] Typically, MEMS are fabricated at one facility and then moved to another location or another facility for packaging. Packaging MEM systems is costly and complex and is currently not done in fabrication facilities. This two-location process, however, dramatically increases the expense of the product.

(Appellant's specification, paragraph 0003).

It is specifically because of Appellant's novel approach to sealing the MEMS that fabrication and sealing can more readily be performed in a single facility.

> [0048] As described, the in-fab packaging methodology described herein incorporates a deposition-etch-deposition sequence to seal the chamber without bridging. The purpose of the initial deposition and etch is to reduce the diameter of the opening to be sealed without leaving any substantial deposition on the surface of the pixel plate or the exposed bottom capacitor plate. The second deposition seals the reduced opening and passivates the device.

(Appellant's specification, paragraph 0048).

The Answer further argues that "the transporter (101) specifically disclosed by Yokoyama et al. is an oval-shaped conveyor belt with a circumference of 60 meters as indicated in column 13, lines 31-35, which would also imply the use of the same fabrication facility (e.g. the same factory, the same plant, the same worksite, the same mailing address, etc.)." (Answer, p. 12). Appellant respectfully disagrees. It is unclear how the use of a conveyor belt implies that, contrary to the usual practice in the art, fabrication and sealing of the MEMS taught by Carley are *necessarily* being performed in the same facility as claimed.

Clearly, the final Office Action and Answer have not established that Yokayama "*necessarily*" teaches one of skill in the art the claimed fabrication of a MEMS and sealing of an opening in the MEMS in the same fabrication facility. For at least this additional reason, no *prima facie* case of unpatentability as to claim 26 has yet been made.

The Supreme Court recently addressed the issue of obviousness in *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727 (2007). The Court stated that the *Graham v. John Deere Co. of Kansas City*, 383, U.S. 1 (1966), factors still control an obviousness inquiry. Under the analysis required by *Graham v. John Deere*, 383 U.S. 1 (1966) to support a rejection under § 103, the scope and content of the prior art must first be determined, followed by an assessment of the differences between the prior art and the claim at issue in view of the ordinary skill in the art.

In the present case, the scope and content of the prior art, as evidenced by Carley and Yokoyama, clearly did not include the claimed method 26 including "at said fabrication facility, *successively depositing and etching a sealing material to seal an opening in said MEMS*." (Emphasis added). Moreover, Carley and Yokoyama have not been shown to necessarily teach or suggest the claimed fabrication of a MEMS and sealing of an opening in the MEMS in the same fabrication facility.

These differences between the cited prior art and claimed subject matter are significant because the technique discovered and disclosed by Applicant, and its advantages, were not available in the cited prior art. Consequently, the cited prior art will not support a rejection of claim 26 under 35 U.S.C. § 103 and *Graham*.

(4) Claims 29 and 31 are patentable over Carley, Yokoyama and Onose:

This rejection should not be sustained for at least the same reasons given above in favor of the patentability of claim 26.

(5) Claims 37 and 38 are patentable over Carley and Colgan:

Claim 37 recites:

> A method of forming a micro-electromechanical system (MEMS) comprising a Digital Light Device (DLD), said method comprising:
> forming a cavity in a material;
> forming a pixel plate and a bottom capacitor plate of said DLD in said cavity; and
> successively depositing and etching a sealing material to seal an opening into said cavity.

In contrast, as demonstrated above with regard to claim 1, Carley does not teach or suggest a method including "*successively depositing and etching a sealing material to seal an*

opening into [a MEMS] cavity." Carley only teaches depositing, *without etching*, a single seal layer (26) to seal the holes (20) into a MEMS cavity (22) containing the MEMS microstructure (14). (Carley, col. 5, lines 21-22). Consequently, Carley clearly does not teach or suggest the claimed method of claim 37 including "successively depositing and etching a sealing material to seal an opening into said cavity." There is no such teaching or suggestion in Carley.

The teachings of Colgan do not remedy this demonstrated deficiency of Carley. Moreover, the Answer does not argue that Colgan teaches or suggests this subject matter, relying solely on the misreading of Carley addressed above.

Under the analysis required by *Graham v. John Deere*, 383 U.S. 1 (1966) to support a rejection under § 103, the scope and content of the prior art must first be determined, followed by an assessment of the differences between the prior art and the claim at issue in view of the ordinary skill in the art. In the present case, the scope and content of the prior art, as evidenced by Carley and Colgan, clearly did not include the claimed method 37 including "successively depositing and etching a sealing material to seal an opening into said cavity." This difference between the cited prior art and claimed subject matter is significant because the technique discovered and disclosed by Applicant, and its advantages, were not available in the cited prior art. Consequently, the cited prior art will not support a rejection of claim 37 under 35 U.S.C. § 103 and *Graham*.

In view of the foregoing, it is submitted that the final rejection of the pending claims is improper and should not be sustained. Therefore, a reversal of the Rejection of September 22, 2008 is respectfully requested.

Respectfully submitted,

DATE: June 5, 2009

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