UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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*Ex parte* SUBHAM SETT and SHAWN JAY CUNNINGHAM

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Appeal 2007-1055
Application 10/831,012
Technology Center 2800

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Decided: March 23, 2007

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Before EDWARD C. KIMLIN, BRADLEY R. GARRIS, and THOMAS A. WALTZ, *Administrative Patent Judges*.

KIMLIN, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1, 4, 5, 7, 9, and 11-21. Claim 1 is illustrative:

1. A method for fabricating a micro-scale device having internal heat spreading capability to reduce operating temperature, comprising the steps of :

forming a heterostructure on a substrate comprising one or more dielectric layers and a first conductive layer having a first array of electrical

transmission lines separated from the substrate by at least one of the dielectric layers such that the first array is electrically isolated from the substrate;

embedding a thermally conductive element in the one or more dielectric layers at a location of the heterostructure where a heat transfer path can be established in response to a thermal gradient generally directed from the first array to the thermally conductive layer,

wherein adjacent transmission lines of the first array are separated from each other by a distance ranging from approximately 25 to approximately 250 microns, and wherein the thermally conductive element has an out-of-plane thickness ranging from approximately 0.1 to approximately 1 microns.

The Examiner relies upon the following references as evidence of obviousness:

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| Fathy | US 6,154,176 | Nov. 28, 2000 |
| Gotro | US 2002/0162685 A1 | Nov. 7, 2002 |
| Swanson | US 6,580,170 B2 | Jun. 17, 2003 |

Appellants' claimed invention is directed to a method for fabricating a micro-scale device having internal heat spreading capability. The method entails separating a first array of electrical transmission lines from a substrate with a dielectric layer and embedding a thermally conductive element in one of the dielectric layers. Adjacent transmission lines of the array are separated from each other by a distance ranging from about 25 to about 250 microns, and the thickness of the thermally conductive element is approximately 0.1 to approximately 1 micron.

Appealed claims 1, 4, 5, 7, 9, and 11-21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fathy in view of Gotro. The appealed claims also stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Swanson in view of Gotro.

We have thoroughly reviewed the respective positions advanced by Appellants and the Examiner. As a result, we concur with the Examiner that the claimed subject matter would have been obvious to one of ordinary skill in the art within the meaning of § 103 in view of the collective teachings of Fathy and Gotro. Accordingly, we will sustain the Examiner's rejection of the appealed claims over the combination of Fathy and Gotro. We will not, however, sustain the Examiner's rejection over the combined teachings of Swanson and Gotro.

We consider first the Examiner's rejection of the appealed claims over Fathy in view of Gotro. We agree with the Examiner that figure 5 of Fathy depicts an array of electrical transmission lines (509) separated from substrate (502) by a dielectric material, and that metal core layer (504) meets the requirement of the claimed thermally conductive element. Fathy teaches that the metal core layer (504) "provides thermal management, as it is essentially a built-in heat sink, for efficient spreading of generated heat" (col. 2, ll. 11-12). As appreciated by the Examiner, and emphasized by Appellants, Fathy is silent with respect to the distance separating the adjacent transmission lines and the thickness of the conductive element. However, while we agree with Appellants that the Examiner improperly

relies upon Gotro for teaching the separation distance between conductive elements in separate layers, we agree with the Examiner that one of ordinary skill in the art would have found it obvious to determine the optimum spacing between adjacent transmission lines and the thickness of the conductive element. It is well settled that where patentability is predicated upon a change in a condition of a prior art feature, such as a change in size, concentration, or the like, the burden is on the applicant to establish with objective evidence that the change is critical, i.e., it leads to a new, unexpected result. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990); *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

In the present case, Appellants' specification attaches no particular criticality to either the distance between adjacent transmission lines or the thickness of the thermally conductive element. The Specification, at page 11, simply prefers a thickness within the claimed range for the thermally conductive element, which preference would seem to allay any suggestion of criticality. Similarly, the Specification, at page 14, only states that the distance between adjacent transmission lines can be in the range recited in the appealed claims. While Appellants' Reply Brief points to figure 4 of the Specification as evidence of criticality, the Specification merely demonstrates that a thermally conductive element having a thickness of 1 micron is superior to having no thermally conductive element with respect to reducing the maximum temperature reached. The Specification provides no

comparison between values within the claimed ranges for separation distance and thickness and values that would have been used by one of ordinary skill in the art in devices of the type disclosed by Fathy. Hence, Appellants have not established with objective evidence that the claimed distance between adjacent transmission lines and thickness for the thermally conductive element are critical parameters with respect to providing unexpected results.

We note that figure 6 of Fathy also depicts a thermally conductive element (606) and an array of electrical transmission lines (616) separated from substrate (602) by a dielectric material (604). Appellants maintain that element (610) of Fathy is not described as being thermally conductive. Appellants submit that Fathy merely teaches that element (606) is a ground plane. However, Gotro evidences that it was known in the art that such power ground planes are used to dissipate heat from electronic components (see ¶ 0009). Hence, we agree with the Examiner that element (606) of Fathy qualifies as a thermally conductive element that dissipates heat to at least the unspecified degree claimed.

Appellants also contend that transmission lines (616) of Fathy "are embedded in the layer 604, and so are not separated from layer 602 by a dielectric layer as required by the claims" (Reply Br. 8, third para.). However, although transmission lines (616) are embedded in dielectric layer (604), the fact remains that lines (616) are separated from substrate (602) by the dielectric (604) into which they are embedded.

Regarding separately argued claims 14 and 19 which specify that the thermally conductive elements are patterned to lie between intersections of transmission lines, we agree with the Examiner that it would have been obvious for one of ordinary skill in the art to select any particular pattern for the thermally conductive elements in the absence of evidence of criticality. However, Appellants have proffered no such evidence of record.

We will not sustain the Examiner's § 103 rejection of the appealed claims over Swanson in view of Gotro. We agree with Appellants that there is no factual basis for concluding that electrical transmission lines (34) of Swanson are separated from substrate (30) by a dielectric material. The Examiner appreciates that the dielectric layer separating the electrical transmission lines from the substrate is not shown in the drawing but cites Swanson at col. 4, ll. 15-30. However, we agree with Appellants that there is no basis for interpreting the relevant portion of Swanson as teaching or suggesting a dielectric layer between the transmission lines and the substrate.

In conclusion, based on the foregoing, the Examiner's decision rejecting the appealed claims is affirmed.

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)(iv) (2006).

AFFIRMED

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