

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* MARVIN GLENN WONG, and  
ARTHUR FONG

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Appeal 2007-0750  
Application 10/427,656  
Technology Center 3700

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Decided: March 29, 2007

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Before EDWARD C. KIMLIN, CHUNG K. PAK, and  
CHARLES F. WARREN, *Administrative Patent Judges*.

KIMLIN, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1-4 and 7-17.

Claim 1 is illustrative:

1. An application specific heat sink assembly for dissipating heat from at least two electronic components, the application specific heat sink device comprising:

a heat-dissipating substrate selected for at least one of the following properties: size, shape, mass, coat, thermal conductivity, environmental resistance; and

at least two heat-dissipating studs, each one of the at least two heat-dissipating studs having a heat-dissipating layer and at least one intermediate layer, one of the at least one intermediate layer of each one of the at least two heat-dissipating studs in direct attachment to the heat-dissipating substrate, respectively, the heat dissipating layer of each one of the at least two heat-dissipating studs in direct attachment to an electronic component, respectively; wherein the heat-dissipating layer of at least two heat-dissipating studs comprises a coefficient of thermal expansion similar to the coefficient of thermal expansion of the electronic component mounted thereon, respectively; and wherein each layer of the at least one intermediate layer has a coefficient of thermal expansion between the coefficient of thermal expansion of the heat dissipating layer and the coefficient of thermal expansion of the heat-dissipating substrate.

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

Joshi	US 4,069,498	Jan. 17, 1978
Sherif	US 5,623,394	Apr. 22, 1997
Di Giacomo	US 6,214,647 B1	Apr. 10, 2001
Caletka	US 6,333,551 B1	Dec. 25, 2001
Pinneo	US 2002/0141155 A1	Oct. 3, 2002
Combs	US 6,734,552 B2	May 11, 2004

Appellants' claimed invention is directed to a heat sink assembly for dissipating heat from at least two electronic components. The assembly comprises a heat-dissipating substrate and at least two heat-dissipating studs. The studs comprise a heat-dissipating layer directly attached to an electronic

component and an intermediate layer directly attached to the heat-dissipating substrate. The heat-dissipating layer of the stud has a coefficient of thermal expansion (CTE) similar to the CTE of the electronic component, and the intermediate layer has a CTE that is between the CTE of the heat-dissipating layer and the CTE of the heat-dissipating substrate.

The appealed claims stand rejected under 35 U.S.C. § 103(a) as follows:

- (a) claims 1, 7-11, 13, 14, and 16 over Combs in view of Joshi,
- (b) claims 3, 4, 15, and 17 over Combs in view of Joshi and Caletka
- (c) claims 2 and 12 over Combs and Joshi in view of De Giacomo,
- (d) claims 1, 7-11, 13, 14, and 16 over Combs in view of Sherif.

Appellants do not present separate arguments for any of the dependent claims on appeal, nor do Appellants offer different substantive arguments against the claims separately rejected by the Examiner under 35 U.S.C. § 103(a). Accordingly, all the appealed claims stand or fall together.

We have thoroughly reviewed each of Appellants' arguments for patentability. However, we are in complete agreement 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 applied prior art. Accordingly, we will sustain the Examiner's rejections for essentially those reasons expressed in the Answer, and we add the following primarily for emphasis.

Appellants do not dispute the Examiner's factual determination that Combs, like Appellants, discloses a heat sink assembly comprising a heat-dissipating substrate (110) that may be copper, a heat-dissipating layer (124) that is in direct attachment to an electronic component (130), wherein the CTE of heat-dissipating layer (124) is similar to that of silicon, the material of the electronic component (130). Nor do Appellants dispute the Examiner's factual finding that the assembly of Combs also comprises an intermediate layer (122) between the heat-dissipating layer (124) and heat-dissipating substrate (110), which intermediate layer may be beryllium oxide. The examiner has also factually determined that the CTEs of silicon, beryllium oxide, and copper are 4.1, 8, and 17, respectively. Accordingly, the Examiner has presented substantial factual support for the conclusion that Combs, like Appellants, discloses a heat sink assembly comprising an intermediate layer between a heat-dissipating substrate and a heat-dissipating layer wherein the CTE of the intermediate layer is between the CTEs of the heat-dissipating substrate and heat-dissipating layer. The Examiner appreciates that Combs does not disclose more than one heat-dissipating stud and more than one electronic component, but Appellants do not contest the Examiner's legal conclusion that, based on the combined teachings of Combs and Joshi, "it would have been obvious to one having ordinary skill in the art at the time the invention was made to use Joshi's teaching in Combs' assembly for the purpose of cooling a plurality of chips while providing a dimensional stability and reworkability on each chip" (Answer 4, penultimate full sentence).

Appellants make the argument in their principal Brief that Combs does not teach or suggest that the CTE of Comb's layer (124) is between the CTE of the heat-dissipating layer and the CTE of the heat-dissipating substrate. However, as explained by the Examiner, Appellants' argument misses the thrust of the Examiner's rejection. The Examiner's rejection identifies layer (122) of Combs as the intermediate layer, not layer (124), which the Examiner identifies as the heat-dissipating layer that has a CTE similar to the silicon of electronic component (130).

Appellants' Reply Brief presents a different argument than that appearing in the principal Brief. Specifically, Appellants emphasize that "Combs merely indicates that the CTE of polymeric thermal interface (124) is **similar to** that of silicon" (Reply Br. 7, last paragraph). Appellants reason that "[a]s Combs is silent apart from this teaching, the CTE of a polymeric thermal interface (124) may in fact be greater than the CTE of an adapter element (122) and be **similar to** that of silicon" (sentence bridging pages 7 and 8 of Reply Br.).

We find no merit in Appellants' argument. Since the CTE of silicon is 4.1 and the CTE for beryllium oxide in layer (122) is 8, we find it unreasonable to conclude that the CTE of layer (124), which has a CTE similar to the 4.1 of silicon, is greater than the CTE of beryllium oxide in layer (122). Since Combs expressly teaches that "the coefficient of polymeric thermal expansion 'CTE' of the thermal interface (124) is similar to that of silicon to minimize stress on the semiconductor dye (130)" (col. 6, ll. 7-10), we find it reasonable to conclude that it would have been obvious to one of ordinary skill in the art that the CTE of Combs' layer (122) is intermediate the CTE's of layer 124 and heat-dissipating substrate (114).

As a final point, we note that Appellants base no argument upon objective evidence of nonobviousness, such as unexpected results, which would serve to rebut the inference of obviousness established by the Examiner.

In conclusion, based on the foregoing and the reasons set forth by the Examiner, 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)(iv)(effective Sept. 13, 2004).

AFFIRMED

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