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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MIKA SILVENNOINEN, JORMA MANNINEN, and JUHA MARTINMAA

Appeal 2018-008609
Application 15/133,391
Technology Center 2800

Before LINDA M. GAUDETTE, MONTÉ T. SQUIRE, and SHELDON M. MCGEE, *Administrative Patent Judges*.

MCGEE, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1–11 and 13–20.

We have jurisdiction. 35 U.S.C. § 6(b).

We affirm.

[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 ABB Technology OY. Appeal Br. 2.

CLAIMED SUBJECT MATTER

The claims are directed to power electronic assemblies and methods of producing such assemblies. *See, e.g.*, Claims 1 and 14. Claim 1 is illustrative of the claimed subject matter, and is reproduced below with key limitations at issue in this appeal italicized:

> 1. A power electronic assembly comprising a power electronic module having multiple of semiconductor power electronic switch components, the power electronic module comprising a *base plate*,
>
> the power electronic assembly comprising further a cooling arrangement for cooling the power electronic module, the cooling arrangement comprising a cooling surface adapted to be attached against the base plate of the power electronic module, wherein
>
> the cooling arrangement comprises further *one or more heat pipes formed in the cooling surface* for spreading the heat in the cooling arrangement and removing the heat from the cooling arrangement, and
>
> wherein the power electronic assembly comprises further *a carbon based material layer arranged between the base p[l]ate of the power electronic module and the cooling surface of the cooling arrangement*, the carbon based material layer being adapted to spread the heat generated by the semiconductor power electronic switch components and to transfer the heat from the power electronic assembly to the cooling arrangement.

REJECTIONS

On appeal, the Examiner maintains the anticipation rejection of claims 1, 3, 5–7, 14, and 16 under 35 U.S.C. § 102(a)(2) over Hammel.[2] Ans. 3; Final Act. 9–11. The Examiner also maintains obviousness rejections of

[2] Hammel, US 8,559,475 B2, issued October 15, 2013.

remaining claims 2, 4, 8–11, 13, 15, and 17–20 under 35 U.S.C. § 103 over Hammel combined with other prior art. Ans. 3–4; Final Act. 11–20.

OPINION

We address the claims separately to the extent they are so argued by Appellant.

Claim 1[3]

The Examiner finds that Hammel discloses the structure recited in claim 1. Final Act. 9–10. Appellant disagrees, and asserts the Examiner erred by finding Hammel discloses "a base plate," "one or more heat pipes formed in the cooling surface," and "a carbon based material layer arranged between the base plate . . . and the cooling surface of the cooling arrangement." Appeal Br. 6–9. We address these arguments in turn.

"*a base plate*"

To evince the recited "base plate," the Examiner relies on Hammel's element 2 which is described as "a ceramic-metal substrate" that is "made of a ceramic layer" that is "provided on both sides with a metallization 4 or 5" "by copper foils, which are applied full-surface to the respective top surface side of the ceramic layer 3 by means of [direct copper bond] technology." Hammel 4:57–62; Final Act. 9.

Appellant asserts this finding is erroneous because Hammel's ceramic-metal substrate is not a "base plate" because it is "not a metallic plate." Appeal Br. 6. Appellant asserts the Specification sets forth the

[3] Appellant argues the anticipation rejection as a group. Appeal Br. 6–9. Pursuant to our rules, we select claim 1 for disposition of the appeal of this rejection. 37 C.F.R. § 41.37(c)(1)(iv).

structure and function of the base plate, noting that power electronic module components "are typically mounted on a substrate that is thermally connected to the base plate of the module. The base plate is a metallic piece integrated to the bottom of the module and it is intended to be attached to a surface of a cooling member, such as heat sink." *Id.* (citing Spec. 1:18–22). Appellant also asserts Hammel's substrate is not a "base plate" because "Hammel's substrate/cooling element attachment suffers from the problem of different thermal expansion coefficients," and "the problems presented by the two alternative designs of Hammel and the present inventions are distinguishable." *Id.* at 6–7. Appellant also alleges that the Examiner applied an unreasonably broad claim construction of the term "base plate" in view of the Specification's identification of base plates as metallic, and because "base plates are understood in the art as being metallic." Reply Br. 2.

We discern no persuasive merit in Appellant's arguments regarding the claimed "base plate." First, we are unpersuaded by Appellant's argument that the Examiner's claim construction of "base plate" is unreasonably broad in view of the Specification and how this term would be understood by the skilled artisan. While the "Background of the Invention" portion of the Specification indicates the base plate is metallic, another portion of the Specification is not as restrictive as to the base plate's makeup. *See* Spec. 5:2–3 ("The base plate is [an] integral part of the module and is *typically* metallic to enable to transfer heat via the base plate." (emphasis added)). Moreover, we observe that Appellant points us to no special definition of the term "metallic" in the Specification. Appeal Br. 6–9; Reply Br. 2–3. We, therefore, apply the ordinary usage of the term

"metallic," noting it may be defined as "containing or yielding metal."[4] Thus, the term "metallic" in its ordinary and customary usage does not necessarily describe an item that is 100% metal. Here, Hammel's "ceramic-metal substrate 2" undisputedly *contains metal* in the form of "copper foils, which are applied full-surface to the respective top surface side of the ceramic layer 3." Hammel, 2:57–61.

We also are unpersuaded by Appellant's assertions of purported functional differences between Hammel and the claimed device. As correctly noted by the Examiner, "Hammel anticipates the claimed invention because Hammel discloses all claimed elements . . . and the structural relationships between claimed elements that the Appellant's claimed invention requires." Ans. 5.

"one or more heat pipes formed in the cooling surface"

The Examiner relies on Hammel's elements 11.1 and 11.2, defining pipe 11, to evince the "one or more heat pipes formed in the cooling surface." Final Act. 9. Appellant disputes this finding, asserting that Hammel's heat pipe "extends through" the cooling arrangement, rather than being "formed in" the cooling surface as claimed. Appeal Br. 7; *see also* Reply Br. 3 (asserting Hammel's passage 11 "passes 'through' the middle of the cooling element").

This argument is not persuasive because Appellant does not embellish this argument with an explanation regarding how—precisely—Hammel's heat pipe 11 is not "formed in" the cooling surface, and thus structurally different than the claimed assembly. To the extent Appellant is arguing that

[4] Dictionary.com (accessed Dec. 11, 2019), https://www.dictionary.com/browse/metallic.

the term "formed in" must mean "at the surface," i.e., not "through" the cooling surface, the Specification, at page 5, is informative on this point:

> According to the present invention, the cooling arrangement comprises one or more heat pipes. The heat pipes are *formed in* the cooling surface of the cooling arrangement for spreading the heat in the cooling arrangement and for removing the heat.
>
> At least one of the heat pipes is *preferably* arranged *at the surface* of the cooling surface, that is, *the surface of the heat pipe forms part of the cooling surface* of the cooling arrangement. The at least one heat pipe is *thus visible in the surface of the cooling arrangement*. As it is preferred to have the cooling surface even, the at least one heat pipe is formed such that the *surface of the heat pipe is even with the rest of the surface* leaving no gaps that could hinder the thermal connection.

Spec. 5:10–20 (emphases added).

Thus, although the Specification indicates that a heat pipe *may be* "formed in" the cooling surface by being arranged preferably "*at* the surface of the cooling surface," such an arrangement is not necessary for the heat pipe to be "formed in" the cooling surface. Indeed, claim 5, dependent from claim 1, further requires "wherein at least one of the one or more heat pipes is arranged *at the surface* of the cooling surface of the cooling element." Appeal Br. 13 (Claims Appendix, emphasis added). *See* 35 U.S.C. § 112(d) ("[A] claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed.").

"a carbon-based material layer arranged between the base plate . . . and the cooling surface of the cooling arrangement"

The Examiner finds that Hammel's layer 13 meets this limitation. Final Act. 9. Appellant's argument regarding this limitation essentially

relies on Appellant's unpersuasive argument regarding the base layer—namely, "Hammel does not disclose a carbon based material layer between a base plate and a cooling surface" because "Hammel does not disclose a base plate." Appeal Br. 8. Notably, Appellant does not dispute the Examiner's finding that Hammel discloses a carbon based material layer, but rather makes an assertion about the *placement* of such a layer. *Id.* This argument fails to reveals reversible error in the Examiner's finding that Hammel discloses the recited "base plate" [Hammel, element 2], "cooling arrangement" [Hammel, element 11, defined by elements 11.1 and 11.2], and a carbon based material layer therebetween [Hammel, element 13]. Final Act. 9; Hammel, Fig. 5.

Therefore, for these reasons and those provided by the Examiner in the Final Action and Answer, we sustain the rejection of claim 1, as well as the rejections of claims 3–11 and 13–20 not separately argued.

Claim 2

Claim 2, dependent from claim 1, requires the carbon-based material layer to be "a separate layer of natural graphite, pyrolytic graphite or synthetic graphite." The Examiner finds that Hammel does not disclose such a carbon-based material and relies on Jang for this disclosure. Final Act. 12. The Examiner determines the skilled artisan would have been motivated to modify Hammel's layer 13 with the graphite of Jang to achieve "a corrosion-resistant coating" that may also "increase contact resistance." *Id.*

Appellant argues that Hammel does not disclose a carbon based material layer that is a "separate layer" as recited in claim 2. Appeal Br. 9. For support, Appellant points to Hammel's disclosure that discusses how

layer 13 is applied via "a suitable surface process" thus making it "part of the cooling element 11" and not a "separate layer." *Id.* at 9–10.

Appellant's argument is not persuasive. As correctly noted by the Examiner, Hammel's "Figure 5 clearly illustrates element 13 . . . as a separate layer because element 13 is distinct from Hammel's cooling element 11." Ans. 8. Furthermore, Hammel assigns different element numbers to compensating layer 13 and cooling element 11, and expressly states that layer 13 "is *applied . . . directly to* the cooling element 11," which further supports layer 13 as being distinct from element 11. Hammel, 4:23–24 (emphasis added).

For these reasons and those provided by the Examiner, Appellant does not persuade us of reversible error in the rejection of claim 2.

CONCLUSION

We affirm the Examiner's rejections of claims 1–11 and 13–20.

DECISION SUMMARY

Claims Rejected	**35 U.S.C. §**	**Reference(s)/Basis**	**Affirmed**	**Reversed**
1, 3, 5–7, 14, 16	102(a)(2)	Hammel	1, 3, 5–7, 14, 16	
2, 19	103	Hammel, Jang	2, 19	
17, 18, 20	103	Hammel, Jang, Zarrabi	17, 18, 20	
4	103	Hammel, Zarrabi	4	
8, 9	103	Hammel, Annacchino	8, 9	
10	103	Hammel, Buffenbarger	10	
11	103	Hammel, Akita	11	
13	103	Hammel, Silvennoinen	13	
15	103	Hammel, Schulz-Harder	15	
Overall Outcome			1–11, 13–20	

TIME PERIOD FOR RESPONSE

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

AFFIRMED

Add A Page | Delete Last Page

Notice of References Cited	Application/Control No. 15/133,391	Applicant(s)/Patent Under Reexamination	
	Examiner	Art Unit	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification	
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Dictionary.com (accessed Dec. 11, 2019), https://www.dictionary.com/browse/metallic.
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
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metallic [m*uh*-**tal**-ik] SHOW IPA

SEE SYNONYMS FOR *metallic* ON THESAURUS.COM

adjective

1 of, relating to, or consisting of metal.

2 of the nature of or suggesting metal, as in luster, resonance, or hardness:
metallic green; a harsh metallic sound.

3 *Chemistry*.
a (of a metal element) being in the free or uncombined state:
metallic iron.
b containing or yielding metal.

noun

4 *Textiles*.
a a yarn or fiber made partly or entirely of metal and having a metallic appearance.
b a fabric made of such a yarn or fiber.