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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte YOICHI KIMURA

Appeal 2019-000539
Application 14/403,678
Technology Center 3700

Before PHILLIP J. KAUFFMAN, JEREMY M. PLENZLER, and
ALYSSA A. FINAMORE, *Administrative Patent Judges*.

PLENZLER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner's decision rejecting claims 25–27, 35, 36, 41, and 43. We have jurisdiction under 35 U.S.C. § 6(b).²

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 Shikoku Instrumentation Co., Ltd. Appeal Br. 2.

² Appellant appeals from a Non-Final Office Action, mailed March 1, 2018 (“Non-Final Act.”). The Non-Final Action incorporates by reference reasoning detailed in an earlier Final Office Action, mailed September 22, 2017 (“Final Act.”).

CLAIMED SUBJECT MATTER

Claim 25 is independent. Claims 26, 27, 35, 36, 41, and 43 depend from claim 25. Claim 25 is reproduced below.

25. A heat exchanger comprising:

a heat source;

a heat insulating material to cover an exposed surface of the heat source;

a heat transfer structure to contact with a heat exchange target fluid;

a heat transfer member that transfers heat from the heat source to the heat transfer structure, thus performing heat-transfer through a contact surface of the heat transfer structure with the fluid; and

a fluid outlet to be connected to an apparatus for a chemical reaction process,

wherein the heat transfer structure includes a body having an inlet, an outlet, and a flow passage for the fluid, and a plurality of heat conductors mounted to the body,

an inner wall surface of the flow passage for the fluid, the inner wall surface defining a contact surface with the fluid, is made of a material stable against the fluid,

the heat transfer member comprises a heat transfer plate having a higher thermal conductivity than a material of the body,

the heat conductors are made of a material having a higher thermal conductivity than the material of the body,

the heat conductors have a pin-like configuration and are mounted along the flow passage for the fluid at positions where the heat conductors are not contacted with the fluid, and

a plurality of the heat conductors extend from each of the heat transfer plate so as to interpose the flow passage therebetween.

REJECTIONS

1. Claims 25–27, 41, and 43 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Andry (US 7,230,334 B2, issued June 12, 2007), Andrews (US 2011/0056734 A1, published Mar. 10, 2011), and Cowans (US 5,471,850, issued Dec. 5, 1995).

2. Claim 35 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Andry, Andrews, Cowans, and Edwards (US 7,464,462 B2, issued Dec. 16, 2008).

3. Claim 36 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Andry, Andrews, Cowans, and Chu (US 6,821,625 B2, issued Nov. 23, 2004).³

OPINION

Appellant presents arguments with respect to claim 25, and does not specifically address dependent claims 26, 27, 41, and 43, which depend from claim 25. *See generally* Appeal Br. 3–7; Reply Br. 2–4. Appellant argues the patentability of claims 35 and 36 solely on the basis that Edwards and Chu, respectively, do not remedy perceived deficiencies in the combined teachings of Andry, Andrews, and Cowans, as applied to parent claim 25. Appeal Br. 7.

Andry describes electronic module 100, which includes high-performance integrated circuit (“IC”) chips 102, 103 bonded to opposite sides of cooling module 101. Andry 3:62–66, Fig. 1. Andry’s cooling

³ The Examiner withdrew, in the Answer, an earlier rejection of claim 40 under 35 U.S.C. § 103(a) as being unpatentable over Andry, Andrews, Cowans, and Kimbara (US 2009/0314474 A1, published Dec. 24, 2009). Non-Final Act. 4; Ans. 5. Claim 40 is not before us in this appeal.

module 101 can be integrated with micro-channel cooling device 300 having inlets I, outlets O, and fins 303 defining flow channels 304 through which coolant fluid flows between the inlets and outlets. Andry 3:36–38, 42–45, 5:20–42, Figs. 1, 3A.

Andrews describes submount 100 for electronic device 120. Submount 100 includes electrically insulating substrate 110 mounting thermally conductive pads 116, 118 on opposite surfaces of the substrate. Thermally conductive vias 112, 113 facilitate the flow of heat from the electronic device 120, through pad 116, to pad 118. Andrews ¶¶ 23, 41, 42, 44, 46, Fig. 2.

Cowans describes a subcooler system for cooling IC unit 80. The subcooler system includes heat sink 22, which is in contact with IC unit 80; and cold probe 28 in which compressed fluid is expanded so as to draw heat from the heat sink. Cowans 2:32–39, 3:59–61, 4:27–32, 42–49, Fig. 4. According to Cowans, “[i]nsulation 86 on both sides of the chip 80 . . . and over the heat sink 22, is used to minimize losses.” Cowans 7:41–43.⁴

Appellant argues that Andry, Andrews, and Cowans are non-analogous art because they do not address problems related to corrosion of devices by fluid to be heated or cooled; or problems related to contamination of high-purity substances. Appeal Br. 5; Reply Br. 3.

⁴ The reference numeral 86 does not appear in the side sectional view of Figure 4 of Cowans. Nevertheless, in context with the other disclosure in Cowans, insulation 86 refers to the section marked with alternating solid and broken hatch lines. Heat sink 22, which is fabricated from monolithic copper, Cowans 4:32–33, appears with solid hatch lines immediately below insulation 86. Heat probe 28 is wedged between heat sink 22 and IC unit 80. Cowans 4:42–47; 7:54–64.

Two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed and, (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

In re Bigio, 381 F.3d 1320, 1325 (Fed. Cir. 2004).

The Examiner correctly finds that Andry, Andrews, and Cowans relate to the same field of endeavor as the claimed subject matter. Ans. 6. The Specification explains that the claimed heat exchanger and heat exchange method “can be applied to a wide range of fields as high-efficiency heat exchangers in heating and evaporating apparatuses, cooling and condensing apparatuses, etc.” Spec. 62; *see also* Spec. 1 (“The present invention relates to heat exchange technology having no limitations in application fields.”). The teachings of Andry, Andrews, and Cowans fall within the field of heat exchange systems and methods. *See, e.g.*, Andry 1:9–13 (“[T]he present invention relates to apparatus and methods for integrating microchannel cooling modules within high-density chip packages and system-on-a-package modules comprising multiple high-performance IC chips.”); Andrews, Title (“ELECTRONIC DEVICE SUBMOUNTS WITH THERMALLY CONDUCTIVE VIAS AND LIGHT EMITTING DEVICES INCLUDING THE SAME”); Cowans 1:10–14 (“This invention pertains to systems and methods for overcoming the thermal buildup effects in dense circuit components.”).

Because Andry, Andrews, and Cowans are within the same field of endeavor as the subject matter of claim 25, we need not consider whether they are reasonably pertinent to any particular problem with which the

named inventors are involved. The Examiner correctly finds that Andry, Andrews, and Cowans are analogous art.

Appellant also contends that the Examiner has exercised improper hindsight, that is, that the Examiner has not articulated sufficient reason why one of ordinary skill in the art would have combined the teachings of Andry, Andrews, and Cowans. Appeal Br. 6–7; Reply Br. 3–4. In particular, Appellant argues that the combined teachings of Andry, Andrews, and Cowans fail to address problems related to corrosion of devices by fluid to be heated or cooled, in general; or the recitation of “a fluid outlet to be connected to an apparatus for a chemical reaction process,” in particular. Appeal Br. 7; Reply Br. 2.

Andry and Cowans teach exchanging heat with a target fluid, even if the heat exchange is for the purpose of dissipating heat generated by an electronic device. Furthermore, addressing problems related to corrosion of devices by a fluid to be heated or cooled represents an unrecited intended purpose for the claimed subject matter. Ans. 6–7. As to the recitation of “a fluid outlet to be connected to an apparatus for a chemical reaction process,” the words “to be connected” indicate that the recitation merely identifies a potential use of the claimed heat exchanger that might be implemented by means of the outlet or outlets O taught by Andry. Final Act. 3. As such, these elements do not patentably distinguish the claimed subject matter from the combined teachings of Andry, Andrews, and Cowans. *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997).

Finally, Appellant argues that the teachings of Cowans would not have suggested modifying a heat exchanger so as to include “a heat insulating material to cover an exposed surface of the heat source,” as

recited in claim 25. Cowans’s IC chip 80, in combination with monolithic copper heat sink 22 with which the IC chip is in thermal communication, acts as a heat source for heating refrigerant fluid in heat probe 28. Cowans 4:27–33, 7:40–43, Figs 3, 4.

The Examiner correctly finds that Cowans teaches insulating the combination of IC chip 80 and heat sink 22 to prevent parasitic energy losses. Non-Final Act. 3–4. In view of this teaching, the Examiner finds that one of ordinary skill in the art would have had reason to insulate the heat source in Andry’s system to reduce energy losses and to “facilitate precise control of the operating temperature of the components being cooled.” Non-Final Act. 4. Even assuming that the “harmful effects of parasitic losses are a problem particular to . . . very large scale integrated circuit[s]” (Reply Br. 2), a fact that Appellant has alleged but not proven, the Examiner proposes modifying Andry’s electronic module in a fashion satisfying the limitations of claim 25. Preventing parasitic losses would have been a valid reason for modifying such a module. Beyond this, Appellant has not presented any reason why the Examiner’s rationale might be in error. As such, the Examiner’s reasoning is valid and not a product of improper hindsight.

CONCLUSION

In summary:

Claims Rejected	Basis	Affirmed	Reversed
25–27, 41, and 43	§ 103(a) Andry, Andrews, Cowans	25–27, 41, and 43	
35	§ 103(a) Andry, Andrews, Cowans, Edwards	35	

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Claims Rejected	Basis	Affirmed	Reversed
36	§ 103(a) Andry, Andrews, Cowans, Chu	36	
Overall Outcome		25–27, 35, 36, 41, and 43	

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