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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte PETER DIEHL, ZBYNEK STRANAK, GUILLAUME HEBERT, and MILAN RISIAN

Appeal 2018-003674
Application 12/960,585[1]
Technology Center 3700

Before: MICHAEL C. ASTORINO, CYNTHIA L. MURPHY, and TARA L. HUTCHINGS, *Administrative Patent Judges*.

HUTCHINGS, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1, 4, 8, 9, 12, 13, 15, 16, 19, 20, and 24. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

CLAIMED INVENTION

Appellants' claimed invention "relates to a heat exchanger, particularly an exhaust gas heat exchanger with a tube bundle." Spec. ¶ 2.

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[1] Appellants identify Hanon Systems as the real party in interest. App. Br. 1.

Claims 1 and 20 are the independent claims. Claim 1, reproduced below, is illustrative of the claimed subject matter on appeal:

> 1. A heat exchanger comprising:
>
> a tube bundle including a plurality of heat exchanger tubes, each of the heat exchanger tubes having an inlet, an outlet, an outer surface, and a generally U-shaped bend region disposed between two straight tube ends, wherein the two straight tube ends are formed as flat tubes and the bend region is formed as a circular tube, wherein the bend regions of adjacent ones of the heat exchanger tubes are arranged in an alternating offset arrangement;
>
> a jacket part disposed around the tube bundle to enclose at least a portion of the tube bundle, wherein an interior is formed between the tube bundle and the jacket part to receive a coolant around the outer surface of each of the heat exchanger tubes;
>
> a casing cover coupled to the jacket part to form a fluid tight seal therebetween, wherein the inlet and the outlet of each of the heat exchanger tubes fluid-tightly passes through the casing cover and extends outside of the casing cover; and
>
> a partition wall coupled to the casing cover and projecting between the two straight tube ends of each of the heat exchanger tubes, wherein the coolant enters the interior of the jacket part through a coolant inlet formed in the casing cover to a first side of the partition wall and exits the interior of the jacket part through a coolant outlet formed in the casing cover to a second side of the partition wall to cause the coolant to follow a substantially U-shaped flow path around the partition wall, wherein a ratio of a cross-sectional perimeter to a cross-sectional flow area of each of the heat exchanger tubes is larger along the straight tube ends of each of the heat exchanger tubes than at the bend region of each of the heat exchanger tubes.

REJECTION[2]

Claims 1, 4, 8, 9, 12, 13, 15, 16, 19, 20, and 24 are rejected under 35 U.S.C. § 103(a) as unpatentable over an Capelle (DE 10 2008 001 660 A1, pub. Jan. 15, 2009), Hagemeister (US 4,800,955, iss. Jan. 31, 1989), Beasley (US 4,730,669, iss. Mar. 15, 1988), Bradley, Jr. (US 5,425,414, iss. June 20, 1995), and Thomae (DE 34 13 999 A1, pub. Nov. 7, 1985).[3, 4] Ans. 2.

ANALYSIS

Independent Claim 1, and Dependent Claims 2, 3, 7, 8, and 10–12

We are persuaded by Appellants' argument that the Examiner erred in rejecting independent claims 1 and 20 under 35 U.S.C. § 103(a) because the Examiner has failed to provide an apparent reason why one skilled in the art would modify the disclosure of the cited references of record in the fashion claimed in claims 1 and 20. App. Br. 8–18. In rejecting independent claims 1 and 20 under § 103(a), the Examiner relies on Capelle as disclosing substantially all of the limitations. *See* Ans. 3–4. The Examiner

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[2] The rejection of the claims under 35 U.S.C. § 112, second paragraph, has been withdrawn. Ans. 2; *see also* Adv. Act. 2.

[3] We treat the Examiner's identification of canceled claim 23 among the claims subject to rejection as inadvertent error.

[4] In response to the Non-Final Action mailed on March 6, 2017, Appellants filed an Amendment on August 7, 2017 to return the claims to a form previously presented on June 7, 2016. *See* Amend. 9. The Examiner entered the August 2017 Amendment as a matter of right. Adv. Act. 1. Appellants assert that the rejection set forth in the Final Office Action mailed on July 22, 2016 ("Final Act.") is applicable to the appealed claims, instead of the rejection set forth in the Non-Final Office Action mailed on March 6, 2017. App. Br. 9. The Examiner agrees with Appellants. *Compare* Ans. 2 *with* Final Act. 3 (identifying the rejection of the claims under 35 U.S.C. § 103(a)).

acknowledges that Capelle does not teach that "the two straight tube ends are formed as flat tubes" and that "a ratio of a cross-sectional perimeter to a cross-sectional flow area of each of the heat exchanger tubes is larger along the straight tube ends of each of the heat exchanger tubes than at the bend region of the heat exchanger tubes," as recited in claim 1, and similarly recited in claim 20. *Id.* at 4. The Examiner finds that "the use of tubes of noncircular, flattened profile is well known in the art." *Id.* at 4–5 (citing Hagemeister, Fig. 3; and Beasley, Figs. 1–4). And the Examiner reasons that replacing Capelle's straight tubes with flat tubes is a simple substitution of one known element for another with predictable results. *Id.* at 5.

Beasley relates to an improved diamond shaped tube-to-header joint for heat exchanger applications. Beasley, col. 1, ll. 8–15. With reference to Figure 1, Beasley shows a heat exchanger core assembly having a plurality of flat oval tube members and fin elements bonded between adjacent pairs of tube members. *Id.* at col. 2, ll. 19–23. Figures 2–4 of Beasley show different views of the tube members shown in Figure 1. As shown in Figures 1–4 of Beasley, there is no U-shaped bend region of the heat exchanger tubes, much less any transition in tubes from the U-shaped bend region (i.e., circular) to the straight tube ends (i.e., flat), as required by claims 1 and 20.

Hagemeister describes a heat exchanger with U-shaped tubes in a matrix array of columns and rows. Hagemeister, col. 4, ll. 25–27, Fig. 3. The tubes are oval in cross section to provide streamlined flow of gases therearound. *Id.* at col. 4, ll. 45–48. Hagemeister does not dislose any transition between flat tubes and a circular tube, as called for in claims 1 and 20.

Capelle discloses a heat exchanger for the exhaust case of a motor vehicle. Capelle ¶ 1. As shown in Figure 1, the exhaust heat exchanger includes U-shaped exchanger tubes that are circular. Like Hagemeister, Capelle does not describe that a U-shaped tube is formed as a circular tube at a bend region and as flat tubes at the straight ends or otherwise changes tube cross-sectional flow area, as required by claims 1 and 20.

Therefore, it is unclear why, and the Examiner does not adequately explain why, one of ordinary skill in the art, armed with general knowledge of flat tubes, would have been motivated to modify Capelle to form the two straight tube ends as flat tubes, instead of circular tubes, while keeping the bend region as a circular tube, as required by claims 1 and 20.

The Examiner additionally finds that: (1) oval tubes provide streamlined flow (Ans. 5 (citing Hagemeister, col. 4, ll. 45–48)); (2) elliptical or compressed tubes offer less resistance to air flow and are more tightly spaced while maintaining a high percentage of open area through a coil (*id.* (citing Bradley, col. 3, ll. 46–49)); and (3) Cappelle is concerned with efficient utilization of space within a heat exchanger (*id.* at 5–6 (citing Capelle ¶¶ 23–24)). The Examiner concludes it would have been obvious for one or ordinary skill in the art to form Capelle's tubes in a noncircular, flattened profile shape to provide reduced resistance to fluid flow over the tubes, and a more compact design. *Id.* at 6. Yet, the findings regarding the benefits of elliptical or compressed tubes fail to describe why one of ordinary skill in the art would be motivated to modify Capelle to provide flat tubes at the straight end and a circular tube at the bend region, as required by claims 1 and 20.

The Examiner finds that the prior art recognizes that bending elliptical tubes is difficult. Ans. 6 (citing Bradley, col. 3, l. 54). The Examiner further finds that round tube bends connected with elliptical straight tubes are known. *Id.* (citing Thomae, Fig. 2); *see also* Bradley, Fig. 3. The Examiner concludes that it would have been obvious to modify Capelle's straight end tubes to be flat tubes and leave the bend region as a circular tube in order to provide the known advantages of flat tubes while avoiding the difficulties associated with providing flattened bend regions. *Id.* at 6–7. We are not persuaded that the Examiner established, on this record, that a person of ordinary skill in the art would have had an apparent reason, to modify Capelle to result in the claimed invention, particularly in light of the structural differences among the cited references. As such, the Examiner has failed to establish a prima facie case of obviousness. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (holding that a prima facie case of obviousness requires showing that one of ordinary skill in the art would have had both an apparent reason to modify the prior art and predictability or a reasonable expectation of success in doing so).

Therefore, we do not sustain the Examiner's rejection of independent claims 1 and 20, and the claims depending therefrom under 35 U.S.C. § 103(a).

DECISION

The Examiner's rejection of claims 1, 4, 8, 9, 12, 13, 15, 16, 19, 20, and 24 under 35 U.S.C. § 103(a) is reversed.

REVERSED