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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte XIAO GUANG YANG and THEODORE JAMES MILLER¹

Appeal 2019-000850
Application 14/336,741
Technology Center 2800

Before BEVERLY A. FRANKLIN, MICHELLE N. ANKENBRAND, and
CHRISTOPHER C. KENNEDY, *Administrative Patent Judges*.

KENNEDY, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134(a) from the Examiner’s decision rejecting claims 9–11, 13, 14, 16, 17, 19, and 20. We have jurisdiction under 35 U.S.C. § 6(b). We AFFIRM.

BACKGROUND

The subject matter on appeal relates to methods of charging a battery. *E.g.*, Spec. ¶ 1; Claim 9. Claim 9 is reproduced below from page 10 (Claims Appendix) of the Appeal Brief:

¹ We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. The Appellant identifies the real party in interest as Ford Global Technologies, LLC. Appeal Br. 2.

9. A method of charging a battery cell comprising:
charging, by a controller, the battery cell at a current based on a constant charge power level such that the battery cell acquires charge at a predetermined rate and a battery voltage continually increases during charging without a constant voltage phase; and
terminating the charging when the battery voltage exceeds a recommended maximum voltage by a variable amount defined by the current and a battery resistance.

REJECTIONS ON APPEAL²

The claims stand rejected under 35 U.S.C. § 103 as follows:

1. Claims 9, 11, 13, 14, 16, and 17 over Andrieu (US 5,604,418, issued Feb. 18, 1997), Zhong (US 2012/0177959 A1, published July 12, 2012), and Lee (US 5,986,437, issued Nov. 16, 1999) as evidence by Battery University (*Charging Lithium-ion*, Battery University (June 25, 2014), web.archive.org/web/20140625074339/http://batteryuniversity.com/learn/article/charging_lithium_ion_batteries (last accessed June 5, 2020)), Schweiger (Hans-Georg Schweiger et al., *Comparison of Several Methods for Determining the Internal Resistance of Lithium Ion Cells*, 10 Sensors 5604 (June 3, 2010)), and ThomasNet (*Types of Uninterruptible Power Supply (UPS) Systems*, ThomasNet, <http://www.thomasnet.com/articles/electrical-power-generation/ups-system-types> (last accessed June 5, 2020)). Final Act. 3–4.
2. Claim 10 over Andrieu, Zhong, Lee, and Schaefer (US 2012/0169297 A1, published July 5, 2012) as evidenced by Battery University and ThomasNet. Final Act. 8.

² The Appellant does not challenge the prior art status of any reference on which the Examiner relies.

3. Claim 19 over Andrieu, Zhong, Lee, and Ostergaard (US 2002/0000788 A1, published Jan. 3, 2002) as evidenced by Battery University. Final Act. 9.

4. Claim 20 over Andrieu, Lee, Frey (US 2013/0015809 A1, published Jan. 17, 2013), and Dong (US 2015/0162758 A1, published June 11, 2015, and claiming priority to a foreign document dated Dec. 10, 2013). Final Act. 10.³

ANALYSIS

The Appellant presents arguments only for claim 9. We select claim 9 as representative, and the remaining claims on appeal will stand or fall with claim 9.

After review of the cited evidence in the appeal record and the opposing positions of the Appellant and the Examiner, we determine that the Appellant has not identified reversible error in the Examiner's rejections. Accordingly, we affirm the rejections for reasons set forth below, in the Final Action dated January 25, 2018, and in the Examiner's Answer dated August 29, 2018.

³ The rejection headers in the Final Action appear to include some errors. For example, the Examiner appears to rely on Frey in Rejection 2 but does not list Frey in the header for Rejection 2. *See* Final Act. 8. The Examiner does list Frey in the header for Rejection 4, but the Examiner does not cite or discuss Frey in the analysis of Rejection 4. *See id.* at 10. It appears that the Examiner may have mistakenly listed Frey instead of Zhong. Because the Appellant does assert reversible error on the basis of these apparent errors, we identify them here only to suggest that the Examiner may wish to correct them in the event of further examination of the application on appeal.

The Examiner's statement of the rejection appears at pages 4–5 of the Final Action. Of particular relevance to the issues that the Appellant raises in this appeal, the Examiner finds that (1) Andrieu teaches charging a battery cell “at a current . . . based on a constant charge power . . . such that the cell voltage continually increases during charging without a constant voltage phase,” but that “Andrieu fails to explicitly teach that the current is based on a constant charge power level . . . such that the battery acquires charge at a predetermined rate,” and (2) Andrieu teaches terminating charging when the battery voltage exceeds a recommended maximum voltage by a variable amount defined by the current and a battery resistance, but that “Andrieu fails to explicitly teach terminating [] charging the battery [when] voltage exceeds a predetermined voltage.” Final Act. 4–5 (citing Andrieu at Abstract, Figs. 1–3).

As to (1), the Examiner finds that “Zhong teaches that the [charging] current is based on a constant charge power level such that the battery acquires charge at a predetermined rate,” and that “Zhong teaches this invention improves heat dissipation and safety, reduces self-discharge, and general performance.” *Id.* at 5 (internal citations omitted).

As to (2), the Examiner finds that “Lee teaches performing constant current [charging] until the battery reaches a predetermined voltage . . . whereby the battery charging is terminated in order to protect the battery from damage of overcharge, decrease size, and increase efficiency.” *Id.* (internal citation omitted). The Examiner determines that it would have been obvious to “modify Andrieu with Lee to protect the battery, decrease size, and increase the efficiency.” *Id.*

In view of those and other findings, the Examiner concludes that it would have been obvious “to modify Andrieu in view of Lee with Zhong to provide improved heat dissipation, safety, and performance, and reduced self-discharge.” *Id.*

In the Appeal Brief, the Appellant first argues that, because “Andrieu teaches that the reference voltage during the first [charging] step is constant,” Andrieu does not teach or suggest terminating charging when the battery “voltage exceeds a recommended maximum voltage by an amount that varies during charging.” Appeal Br. 6.

That argument is not persuasive of reversible error. In Andrieu’s abstract, Andrieu teaches a charging method in which, during “a first step,” “a constant current is imposed and . . . the voltage across said storage cell is allowed to increase until it reaches a reference value.” Andrieu at Abstract. Andrieu teaches that “[t]he method of the invention is characterized in that, at each instant, said reference voltage is equal to the sum of the end-of-charge voltage of the cell plus the product of the current multiplied by the ohmic resistance of the cell.” *Id.*

In column 3, Andrieu elaborates and describes one embodiment in which a first charging step achieves an end-of-charge voltage value of 4.2 V. Andrieu at 3:47–50. However, Andrieu also describes an alternative embodiment in which a first step charges the battery to a “reference voltage . . . calculated by summing the end-of-charge voltage (4.2 V) and the product of the current (1 A) multiplied by the ohmic resistance (0.1 Ω) of the storage cell, i.e. 4.3 V.” *Id.* at 3:56–65. Andrieu then proceeds to its “second step.” *Id.* at 3:66. On this record, it is unclear how Andrieu’s disclosure of a first step involving charging to a reference voltage that is

calculated by summing the end-of-charge voltage and the product of the current multiplied by the ohmic resistance differs from the recitation in claim 9 of charging to a “voltage [that] exceeds a recommended maximum voltage by a variable amount defined by the current and a battery resistance,” particularly given that the Appellant has not argued that both Andrieu’s current *and* Andrieu’s ohmic resistance are constant. *See In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011) (“[I]t has long been the Board’s practice to require an applicant to identify the alleged error in the examiner’s rejections . . .”).

In any event, the Examiner proposes modifying Andrieu’s constant current charging with Zhong’s constant power charging because Zhong teaches “improve[d] heat dissipation and safety.” Final Act. 5. Thus, even were the Appellant correct, based on Andrieu’s constant current charging, that, “Andrieu teaches that the reference voltage during the first step is constant,” Appeal Br. 6, the Appellant’s argument fails to address the Examiner’s rationale, which relies on Andrieu in combination with Zhong’s disclosure of constant power charging. *See In re Keller*, 642 F.2d 413, 426 (CCPA 1981) (“[O]ne cannot show non-obviousness by attacking references individually where, as here, the rejections are based on combinations of references.”).

On this record, we are not persuaded of reversible error in the Examiner’s determination that the combined prior art teaches or suggests the disputed subject matter.

The Appellant also argues that Lee does not specify a voltage at which charging is terminated. Appeal Br. 7. That argument is not persuasive because the Examiner relies on the combination of Andrieu and Zhong—not

Lee— as teaching or suggesting the specific voltage at which a first charging step ends, and the Examiner relies on Lee for the disclosure of terminating charging when a predetermined voltage is reached “to protect the battery from damage due to overcharging.” Lee at 5:18–20. It would have been obvious to a person of ordinary skill in the art to terminate charging at the maximum voltage disclosed by Andrieu, i.e., $U_r = U_f + (I_c \times R)$, because that is the voltage at which Andrieu teaches ending a first charging step. See Andrieu at 2:20–25.

The Appellant also argues that Zhong “does not indicate the manner in which” its constant power charging “is performed,” and that, “[a]s Andrieu is based on a constant current, the incorporation of the constant power of Zhong would be incompatible with the constant current charging mode of Andrieu.” Appeal Br. 7. That argument is not persuasive. To the extent that constant power charging and constant current charging differ in ways relevant to the patentability of the claims,⁴ the record indicates that constant current and constant power are alternative charging methods, and the Examiner determines that a person of ordinary skill in the art would have been motivated to use constant power charging as Zhong discloses to “improve[] heat dissipation and safety, reduce[] self-discharge, and [improve] general performance.” Final Act. 5. The Appellant does not meaningfully or persuasively dispute that determination. Zhong is presumed

⁴ The Examiner appears to find that Andrieu’s constant current charging falls within the scope of the term “charging . . . at a current based on a constant charge power level.” See Final Act. 4 (“[A]s the current is constantly being supplied, electrical power is constantly being applied, see the ThomasNet evidence; thus constant current is based on constant charge [i.e. electrical] power.” (bracketed material in original)).

to be enabling, *In re Antor Media Corp.*, 689 F.3d 1282, 1287–88 (Fed. Cir. 2012) (prior art references are presumed to be enabling), and the Appellant provides no persuasive explanation or evidence as to (1) why a person of ordinary skill in the art would have considered Zhong’s constant power charging to be incompatible with Andrieu, or (2) why incorporating Zhong’s constant power charging into Andrieu would have been beyond the ordinary level of skill in the art. *See In re Pearson*, 494 F.2d 1399, 1405 (CCPA 1974) (“Attorney’s argument in a brief cannot take the place of evidence.”).

On this record, we are not persuaded of reversible error in the Examiner’s rejection of claim 9.

CONCLUSION

In summary:

| Claims Rejected | 35 U.S.C. § | References | Affirmed | Reversed |
|------------------------|--------------------|---------------------------------|------------------------------|-----------------|
| 9, 11, 13, 14, 16, 17 | 103 | Andrieu, Zhong, Lee | 9, 11, 13, 14, 16, 17 | |
| 10 | 103 | Andrieu, Zhong, Lee, Schaefer | 10 | |
| 19 | 103 | Andrieu, Zhong, Lee, Ostergaard | 19 | |
| 20 | 103 | Andrieu, Lee, Frey, Dong | 20 | |
| Overall Outcome | | | 9–11, 13, 14, 16, 17, 19, 20 | |

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

AFFIRMED