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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ADAM MICHAEL WHITE

Appeal 2018-002863
Application 14/231,802
Technology Center 2800

Before BEVERLY A. FRANKLIN, CHRISTOPHER C. KENNEDY, and
JENNIFER R. GUPTA, *Administrative Patent Judges*.

GUPTA, *Administrative Patent Judge*.

DECISION ON APPEAL¹

Appellant² appeals under 35 U.S.C. § 134(a) from the Examiner’s
final decision rejecting claims 1–15. We have jurisdiction under 35 U.S.C.
§ 6(b).

We AFFIRM.

¹ In this Decision, we refer to the Specification filed April 1, 2014 (“Spec.”), the Final Office Action dated September 16, 2016 (“Final Act.”), the Appeal Brief filed July 31, 2017 (“Br.”), and the Examiner’s Answer dated October 13, 2017 (“Ans.”).

² Appellant identifies the real party in interest as Hamilton Sundstrand Corporation. Appeal Br. 2.

The subject matter on appeal relates to matrix converters, and in particular to a matrix converter that includes both normally-on and normally-off switches. Spec. ¶ 1. Matrix converters provide AC-to-AC conversion, and are often utilized to achieve three-phase AC power conversion in a single stage without the use of intermediate energy storage elements. *Id.* ¶ 2. Claim 1, reproduced below with emphasis to highlight a key disputed limitation, is illustrative of the claims on appeal.

1. A power conversion system comprising:
 - a power source configured to produce an input power;
 - a matrix converter* configured to convert the input power to output power, the matrix converter *comprising*:
 - a plurality of normally-on switches* configured to conduct current from the input power to the output power based upon a first respective control voltage, wherein each of the plurality of normally-on switches conducts current when the first respective control voltage is zero; *and*
 - a plurality of normally-off switches* configured to conduct current from the input power to the output power based upon a second respective control voltage, wherein each of the plurality of normally-off switches does not conduct current when the second respective control voltage is zero; and
 - a controller configured to control the plurality of normally-on switches and the plurality of normally-off switches to control the output power, *wherein the plurality of normally-on switches provide the input power directly as the output power when the controller is inactive.*

Appeal Br. 11 (Claims App.).

REJECTIONS

The Examiner maintains the following rejections on appeal (Final Act. 2–15; Ans. 3):

Rejection 1: Claims 1 and 10 under 35 U.S.C. § 102 (a)(1) as being anticipated by Kuzumaki et al. (US 2012/0087167 A1, published April 12, 2012) (“Kuzumaki”);

Rejection 2: Claims 1–7 under 35 U.S.C. § 103 over Sakakibara (US 2009/0257261 A1, published October 15, 2009) and Ueno (US 2014/0169045 A1, published June 19, 2014);

Rejection 3: Claim 8 under 35 U.S.C. § 103 over Sakakibara, Ueno, and Takeda et al. (US 2014/0117917 A1, published May 1, 2014) (“Takeda”);

Rejection 4: Claim 9 under 35 U.S.C. § 103 over Sakakibara, Ueno, Takeda, and Kitanaka (US 2011/0062908 A1, published March 17, 2011);

Rejection 5: Claims 10–14 under 35 U.S.C. § 103 over Takeda and Ueno; and

Rejection 6: Claim 15 under 35 U.S.C. § 103 as being unpatentable over Takeda, Ueno, and Kitanaka.

DISCUSSION

After review of the cited evidence in light of the Appellant’s and the Examiner’s opposing positions, we determine that Appellant has not identified reversible error in the Examiner’s rejections. Accordingly, we affirm the rejections for the reasons set forth below, in the Final Office Action, and in the Examiner’s Answer.

Rejection 1

The Examiner finds that Kuzumaki's Figure 1 teaches a power conversion device that meets all the limitations of claim 1's power conversion system, including a matrix converter (Kuzumaki's inverter main circuit 3). Final Act. 13–14; *see also* Kuzumaki ¶¶ 24–25.

Appellant contends that a matrix converter is an AC-AC converter that receives a multi-phase AC input and provides a multi-phase AC output. Appeal Br. 5. Appellant argues that Kuzumaki's inverter main circuit 3 is not an AC-AC converter, but rather is a DC-AC converter that receives a DC input and converts the DC input to AC output. *Id.*

Appellant's argument is persuasive of reversible error. Appellant's Specification teaches that matrix converters provide AC-to-AC conversion. Spec. ¶ 2; *see also* Ueno ¶¶ 7, 49 (disclosing that a matrix converter performs AC-to-AC power conversion). Kuzumaki, however, teaches that inverter main circuit 3 converts DC power to AC power. The Examiner's response that the claims do not define or require that the main converter is an AC-to-AC converter (Ans. 4) is inadequate because a preponderance of the evidence supports Appellant's contention that a matrix converter is generally understood in the art as an AC-to-AC converter, and thus the claim need not define or recite that the matrix converter is an AC-to-AC converter. Accordingly, we do not sustain the rejection of claims 1 and 10 under 35 U.S.C. § 102(a)(1).

Rejections 2–6

Appellants argue claims 1–15 as a group. Appeal Br. 6–10. We choose claim 1 as representative and claims 2–15 will stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner finds that Sakakibara teaches a power conversion system that includes a matrix converter including a plurality of on and off switches, S_{ur} , S_{us} , S_{ut} , S_{vr} , S_{vs} , S_{vt} , S_{wr} , S_{ws} , S_{wt} . Final Act. 2–3 (citing Sakakibara, Fig. 1); *see also* Sakakibara ¶¶ 49–50.

In addition, the Examiner finds that Ueno teaches a matrix converter that employs a plurality of on and off switches. Final Act. 4 (citing Ueno, Figs. 1, 2, 7).

Appellant argues that Sakakibara and Ueno fail to teach or suggest a matrix converter that includes both normally-on and normally-off switches such that the normally-on switches “provide the input power directly as output power when the controller is inactive.” Appeal Br. 6 (emphasis omitted).

Appellant’s argument is not persuasive of reversible error. As the Examiner explains, it is well known in the art that normally-on switches are, by default, in conductive state (closed) so current will continue to flow through the switches even when the control voltage is zero until a control signal is received to change the state of the switch to an open state. Ans. 6–7. Likewise, normally-off switches will, by default, remain open until a control signal is received to change the state of the switch to a closed state, and thus will remain in non-conductive state when control voltage is zero. *Id.*

In addition, the recitation “wherein the plurality of normally-on switches provide the input power directly as the output power *when the controller is inactive*” (emphasis added) is similar to the conditional limitations discussed in *Ex parte Schulhauser*, No. 2013–007847, 2016 WL 6277792 (PTAB Apr. 28, 2016) (precedential) (holding that in a method

claim, a step reciting a condition precedent does not need to be performed if the condition precedent is not met). Although the limitations at issue in *Schulhauser* were rendered conditional by the recitation of “if,” *see Schulhauser*, 2016 WL 6277792, at *3–5, on this record, we discern no meaningful distinction between the recitation of “if” and the recitation of “when” recited in claim 1. Thus, the broadest reasonable interpretation of claim 1 encompasses a power conversion system where the controller is not inactive. *See Schulhauser*, 2016 WL 6277792, at *3–4 (concluding that the broadest reasonable interpretation of a claim encompassed situations in which conditional method steps “need not be reached”). As such, we find no reversible error in the Examiner’s finding and reasoning that Sakakibara and Ueno renders claim 1’s power conversion system obvious. *Schulhauser*, 2016 WL 6277792, at *4 (“The Examiner did not need to present evidence of the obviousness of the remaining method steps of claim 1 that are not required to be performed under a broadest reasonable interpretation of the claim.”).

In view of the foregoing, we sustain the rejections of claims 1–15 under 35 U.S.C. § 103.

DECISION

The rejection of claims 1 and 10 under 35 U.S.C. 102 (a)(1) based on Kuzumaki is reversed.

The rejection of claims 1–7 are rejected under 35 U.S.C. 103 over Sakakibara and Ueno is affirmed.

The rejection of claim 8 under 35 U.S.C. 103 over Sakakibara, Ueno, and Takeda is affirmed.

Appeal 2018-002863
Application 14/231,802

The rejection of claim 9 under 35 U.S.C. 103 over Sakakibara, Ueno, Takeda, and Kitanaka is affirmed.

The rejection of claims 10–14 under 35 U.S.C. 103 over Takeda and Ueno is affirmed.

The rejection of claim 15 under 35 U.S.C. 103 over Takeda, Ueno, and Kitanaka 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).

AFFIRMED