UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte RICHARD D. THORNTON and TRACY M. CLARK

Appeal 2009-0092
Application 11/172,006
Technology Center 2800

Decided: January 9, 2009

Before MAHSHID D. SAADAT, ROBERT E. NAPPI, and JOHN A. JEFFERY, *Administrative Patent Judges*.

JEFFERY, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from the Examiner's rejection of claims 16 and 17. Claims 18-21 have been indicated as containing allowable subject matter (App. Br. 5; Ans. 2). We have jurisdiction under 35 U.S.C. § 6(b). We reverse.

STATEMENT OF THE CASE

Appellants invented a synchronous motor having a field structure and an armature. The motor is arranged so that the half pole magnets at the ends of the field structure minimize a third force harmonic between the field structure and the armature without increasing the sixth force harmonic. This design eliminates cogging forces.[1] Claim 16 reads as follows:

> 16. In a synchronous motor comprising one or more field structures and one or more armatures, the field structure having poles defining a magnetic field and the armature having teeth with slots therebetween and coil windings wound in those slots, the improvement wherein
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> > half-poles at the end of at least one field structure are arranged so as to minimize a third force harmonic between the field structure and the armature without increasing a sixth harmonic therebetween.

The Examiner relies upon the following as evidence in support of the rejection:

André W. van Zyl et al., *Novel Secondary Design for a Linear Synchronous Motor using a Split-Pole Magnet Arrangement*, 1999 IEEE AFRICON - 5TH AFRICON CONF. IN AFRICA 627 (1999) (hereafter "van Zyl").

Appellants' Admitted Prior Art ("AAPA") in Figures 3A and 3B and pages 12 and 13 of the present application.

(1) Claim 16 stands rejected under 35 U.S.C. § 102(b) as being anticipated by van Zyl (Ans. 4).

[1] *See generally* Spec. 3:19-20 and 33-35, 8:4-7, 8:31-9:12, 11:4-32, and 12:26-13:35.

(2) Claim 16 also stands rejected under 35 U.S.C. § 102(b)[2] as being anticipated by AAPA (Ans. 4-5).

(3) Claim 17 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over van Zyl.

Rather than repeat the arguments of Appellants or the Examiner, we refer to the Briefs and the Answer[3] for their respective details. In this decision, we have considered only those arguments actually made by Appellants. Arguments which Appellants could have made but did not make in the Briefs have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii).

ANTICIPATION REJECTION OVER VAN ZYL

We first address the rejection of independent claim 16 under 35 U.S.C. § 102(b) as being anticipated by van Zyl. The Examiner finds that van Zyl discloses half poles at the ends of the field magnet and, therefore, inherently discloses the half poles are arranged "so as to minimize a third force harmonic between the field structure and the armature without increasing a sixth harmonic therebetween" (Ans. 4). Appellants argue van Zyl does not disclose explicitly or inherently the recited half poles'

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[2] Although the Examiner has not provided evidence establishing that the subject matter of the admitted prior art was available to the public more than one year before the effective filing date of the present invention to substantiate a statutory bar under § 102(b), Appellants have not disputed the asserted qualification of this reference as prior art under that section. We therefore presume the reference qualifies as prior art under § 102(b) absent evidence to the contrary.

[3] Throughout this opinion, we refer to (1) the Appeal Brief filed July 20, 2007, (2) the Examiner's Answer mailed November 21, 2007, and (3) the Reply Brief filed January 22, 2008.

functional arrangement that make the third and sixth force harmonics behave as recited (App. Br. 12-15; Reply Br. 5).

ISSUE

Have Appellants shown the Examiner erred in finding that van Zyl inherently discloses half poles of the field structure "arranged so as to minimize a third force harmonic between the field structure and the armature without increasing a sixth harmonic therebetween," as recited in claim 16?

FINDINGS OF FACT

The record supports the following findings of fact (FF) by a preponderance of the evidence.

1. Van Zyl discloses a synchronous motor with split or half poles at the end of a field structure or magnet (van Zyl, abstract and p. 629; Fig. 1(c)).
2. Van Zyl is silent as to whether the half poles are arranged so as to minimize a third force harmonic between the field magnet and the armature without increasing a sixth harmonic.
3. The Specification explains that the end magnet's or half pole's size, such as height and length, and the spacing from its neighboring magnets in the periodic array eliminates the third harmonic term without increasing the sixth harmonic term (Spec. 13:4-30).
4. The Specification states that eliminating the lowest or sixth harmonics between a field magnet and an armature reduces cogging (Spec. 9:34-35 and 11:16-23; Figs. 5A and B).

5. The Specification states:

> There are two distinct problems that can be addressed when designing the end magnets for an array: terminating flux from the neighboring periodic magnet array and reducing or eliminating cogging associated with the end magnets. Using half-length magnets at each ends of the otherwise periodic arrays partially solves both these problems.

(Spec. 12:35-38).

6. The Specification explains how cogging forces are generated using a prior art stable equilibrium system and an unstable equilibrium system having half poles at the end of a field magnet. When the field moves relative to the armature, these cogging forces fluctuate (Spec. 8:36-9:11).
7. The Specification discusses using half-length magnets at the end of periodic arrays leaves the main frequency component of a cogging force at half the frequency of the cogging force from the periodic array (Spec. 12:37-13:4).

PRINCIPLES OF LAW

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). "Inherency . . . may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999) (citations omitted).

During examination of a patent application, a claim is given its broadest reasonable construction "in light of the specification as it would be interpreted by one of ordinary skill in the art." *In re Am. Acad. Of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004).

ANALYSIS

Van Zyl discloses a synchronous motor with split or half poles at the end of a field structure or magnet (FF 1). Van Zyl is silent as to whether the half poles are arranged so as to minimize a third force harmonic between the field magnet and the armature without increasing a sixth harmonic (FF 2). The Examiner finds that the half poles of van Zyl inherently disclose these harmonic behaviors (Ans. 4 and 7-8).

As instructed by *Am. Acad. Of Sci.*, 367 F.3d at 1364, claims during examination are given their broadest reasonable construction "in light of the specification as it would be interpreted by one of ordinary skill in the art." Turning to the Specification to understand the phrase "half-poles . . . are arranged so as to minimize a third force harmonic between the field structure and the armature without increasing a sixth harmonic therebetween," the disclosure explains that the end magnet's or half pole's size, such as height and length, and the spacing from the periodic array eliminate the third harmonic term without increasing the sixth harmonic term (FF 3). Thus, as the Examiner states (Ans. 8), while the specific geometry and spacing of the end magnets are not structurally recited in claim 16, we find the above-recited phrase of claim 16 requires the half pole magnets to have a particular geometry and spacing from its neighboring magnets in the periodic array in order to behave as recited.

The Specification explains that eliminating force harmonics between a field magnet and an armature reduces cogging (FF 4). The Specification further states:

> There are two distinct problems that can be addressed when designing the end magnets for an array: terminating flux from the neighboring periodic magnet array and reducing or eliminating cogging associated with the end magnets. Using half-length magnets at each ends of the otherwise periodic arrays partially solves both these problems.

(FF 5). Thus, since positioning half poles at the end the magnets can reduce and eliminate cogging, we agree with the Examiner (Ans. 11) that van Zyl's half poles also reduce harmonics between the field magnet and armature. However, using van Zyl's half poles alone with no information relating to the pole's geometry does not demonstrate which harmonics are minimized and which harmonics are not increased, as claim 16 requires.

Moreover, the Examiner has not provided the evidence demonstrating the half poles in van Zyl necessarily *minimize* a third force harmonic without increasing a sixth harmonic. First, reducing a force harmonic is not necessarily the same as minimizing a force harmonic. Minimizing a force harmonic means to select the greatest reduction in the force harmonic, while reducing a force harmonic may only mean the force harmonic's value has been decreased. Second, "the mere fact that a certain thing may result from a given set of circumstances is not sufficient" to anticipate a claim. *Robertson*, 169 F.3d at 745. Van Zyl fails to address the harmonic characteristics of the system (FF 2). Therefore, while the van Zyl's poles may possibly reduce and even minimize the specifically recited third force harmonic between the field structure and the armature without increasing a

sixth force harmonic, the record before us simply does not reasonably support the Examiner's position that the end poles necessarily behave in the recited manner.

The Examiner relies on *In re Schreiber*, 128 F.3d 1473 (Fed. Cir. 1997) to argue that the limitation "half poles at the end of at least one field structure are arranged so as to minimize a third force harmonic between the field structure and the armature without increasing a sixth harmonic therebetween" is a functional limitation that fails to distinguish the synchronous motor structurally (Ans. 6). As *Schreibe*r explains:

> [W]here the Patent office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on.

Schreiber, 128 F.3d at 1478 (quoting *In re Swinehart*, 439 F.2d 210, 213 (CCPA 1971). In response to the Examiner's finding that van Zyl inherently meets the above-quoted functional limitation, Appellants refer to the Specification to demonstrate that the third harmonic is minimized, while the sixth harmonic is not increased, by selecting the appropriate height and length of the end magnets and the spacing between end magnet and its neighbor (App. Br. 13). In contrast, van Zyl does not discuss any of the end magnets' dimensions or spacing from their neighboring magnets. We, therefore, find this sufficient proof that the subject matter shown in van Zyl does not inherently possess the characteristics of the claimed functional recitation.

For the foregoing reasons, Appellants have shown error in the Examiner's anticipation rejection of independent claim 16 based on van Zyl.

ANTICIPATION REJECTION OVER AAPA

The Examiner finds the Specification admits the half poles at the end of a field structure "minimize a third force harmonic between the field structure and the armature without increasing a sixth harmonic" (Ans. 4-5). Appellants contend this portion of the disclosure discusses cogging force sources and does not discuss the arrangement of the magnets to minimize harmonics (App. Br. 15-16; Reply Br. 6).

ISSUE

Have Appellants shown the Examiner erred in finding that AAPA discloses half poles of the field structure "arranged so as to minimize a third force harmonic between the field structure and the armature without increasing a sixth harmonic therebetween," as recited in claim 16?

ANALYSIS

The Specification discusses reducing or eliminating cogging forces and, thus, reducing harmonics associated with the end magnets by using half magnets (FF 5). However, as explained above, this portion of the Specification fails to discuss that the half poles minimize harmonics or which particular harmonics are affected by reducing or eliminating the cogging forces. Moreover, the Specification explains that positioning half-length magnets at the end of periodic arrays will leave the main frequency component of a cogging force at half the frequency of the cogging force

from the periodic array (FF 7). This portion of the Specification also does not discuss force harmonics.

The Specification further explains how cogging forces are generated using a prior art stable equilibrium system and an unstable equilibrium system having half poles at the end of a field magnet. When the field moves relative to the armature, these cogging forces fluctuate (FF 6). There is, however, no discussion of minimizing the harmonic forces between a field structure and an armature as recited. While these disclosed half magnets may possibly minimize the specifically-recited third force harmonic between the field structure and the armature without increasing a sixth harmonic, we do not find the half poles necessary behave in such a manner. We are, therefore, also constrained by the record before us to find that the AAPA does not anticipate the limitation "half poles at the end of at least one field structure are arranged so as to minimize a third force harmonic between the field structure and the armature without increasing a sixth harmonic," as recited in claim 16.

For the foregoing reasons, Appellants have shown error in the Examiner's anticipation rejection of independent claim 16 based on the AAPA.

OBVIOUSNESS REJECTION OVER VAN ZYL

Claim 17 recites specific relative dimensions for the recited field structure, including the wavelength, the gap, the length and height of the periodic and end magnets, and the spacing between the end magnets and its neighbors. The Examiner rejects claim 17 as being obvious over van Zyl and by optimizing result effective variables as discussed in *In re Boesch*, 617

F.2d 272 (CCPA 1980). The Examiner additionally refers to Ackermann to support this position (Ans. 5).[4] Appellants argue van Zyl does not provide specific relative dimensions and that *Boesch* is inapplicable (App. Br. 16-19; Reply Br. 7-10).

ISSUE

Have Appellants shown the Examiner erred in finding that van Zyl in combination with concept of optimizing result effective variables teaches the relative dimension limitations, as recited in claim 17?

FINDINGS OF FACT

The record supports the following additional findings of fact (FF) by a preponderance of the evidence.

8. The Examiner admits the relative dimensions of claim 17 are not found in van Zyl (Ans. 5).
9. Van Zyl discusses the half pole end magnet design creates a maximum amount of flux that flows in the back iron to be half of the maximum flux in the conventional magnet arrangement (van Zyl, 629-30).

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[4] Although the Examiner cites B. Ackermann et al., *New technique for reducing cogging forces in a class of brushless DC motors*, IEE PROCEEDINGS-B 315 (1992) to show the relative dimensions of the field structure are "ordinary design choices," the Examiner relies only on van Zyl in the obviousness rejection (Ans. 5). Since Ackermann was not relied upon in the rejection, it is not before us. *See In re Hoch*, 428 F.2d 1341, 1342 n.3 (CCPA 1970) ("Where a reference is relied on to support a rejection, whether or not in a 'minor capacity,' there would appear to be no excuse for not positively including the reference in the statement of the rejection.").

PRINCIPLES OF LAW

"[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456 (CCPA 1955); *see also In re Boesch*, 617 F.2d 272, 276 (CCPA 1980).

ANALYSIS

Van Zyl does not discuss any parameters or features of the magnet other than the maximum flux (FF 9). As the Examiner admits the relative dimensions of claim 17 are not found in van Zyl (FF 8), we do not find that the general working conditions of claim 17 are disclosed by van Zyl or that van Zyl recognizes the field structure parameters recited in claim 17 are a function of minimizing the third force harmonic between the field structure and the armature without increasing a sixth harmonic. Moreover, as van Zyl only recognizes the end magnets can reduce the amount of flux that flows in the back iron (FF 9), the prior art fails to recognize the claimed parameters are result-effective variables of minimizing the third force harmonic between the field structure and the armature without increasing a sixth harmonic as set forth in *Boesch*.

While an obviousness "analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim," *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (Fed. Cir. 2007), there must be "an apparent reason to combine the known elements in the fashion claimed by" the prior art. *Id.* Based on the record before us, we do not find an apparent reason to modify the half poles in van Zyl to have the relative dimensions recited in claim 17.

Lastly, we find that van Zyl does not meet the limitations of dependent claim 17 for the same reasons articulated in connection with independent claim 16.

For the foregoing reasons, Appellants have shown error in the Examiner's obviousness rejection of independent claim 17 based on van Zyl.

CONCLUSIONS

(1) Appellants have shown the Examiner erred in finding that van Zyl inherently discloses half poles of the field structure "arranged so as to minimize a third force harmonic between the field structure and the armature without increasing a sixth harmonic therebetween," as recited in claim 16.

(2) Appellants have shown the Examiner erred in finding that AAPA discloses half poles of the field structure "arranged so as to minimize a third force harmonic between the field structure and the armature without increasing a sixth harmonic therebetween," as recited in claim 16.

(3) Appellants have shown the Examiner erred in finding that van Zyl in combination with concept of optimizing result effective variables teaches the relative dimension limitations, as recited in claim 17.

ORDER

We reverse the Examiner's rejection of claims 16 and 17.

REVERSED

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NUTTER MCCLENNEN & FISH LLP
WORLD TRADE CENTER WEST
155 SEAPORT BOULEVARD
BOSTON, MA 02210-2604