UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DONAL E. BAKER, CURTIS J. PLUDE, GARY L. MILES, MARK W. PFEIFFER

Appeal 2007-0939
Application 10/931,274
Technology Center 2800

Decided: April 30, 2007

Before JOSEPH L. DIXON, JEAN R. HOMERE, and
ST. JOHN COURTENAY III, *Administrative Patent Judges*.

COURTENAY, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1-3, 5, 6, 8-11, 13, 14, 16, 17 and 20-23. Claims 4, 7, 12, 15, 18-19, 24, and 25 have been cancelled.

THE INVENTION

The disclosed invention is directed to a motor controller wherein a frequency of the motor's operation is utilized to provide a correction

function for eliminating a disturbance on a two-loop control path, with the elimination of the disturbance allowing the control path to provide a single loop correction on either path (Specification 1).

Representative claim 1 is illustrative:

1. A motor controller for a motor receiving three-phase voltage power from an inverter, said motor controller comprising:

a sensor path for sensing the three-phase voltage supplied by the inverter to the motor, and a position sensor for sensing an angular position of the motor, said sensed three-phase voltage being sent through a feedback loop operable with a first transformation block to transform said sensed three-phase voltage into two components, and said two components being associated with two axes;

said controller including summing blocks for receiving said two components, and comparing said two components to desired components, and said controller including two separate loops for separately processing each of said two components back toward said inverter by passing through a second transmission block, for changing said two components back into three components; and

a control block for taking a frequency of operation of the motor, and feeding an ARCTAN function based on said frequency back into said second transformation block.

THE REFERENCES

The Examiner relies upon the following references as evidence of anticipation and unpatentability:

Kojima	US 5,796,228	Aug. 18, 1998
Anghel	US 6,809,496 B2	Oct. 26, 2004

THE REJECTIONS

The following rejections are on appeal before us:

1. Claims 1, 6, 8, 9, 14, 16, and 20-23 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Kojima.
2. Claims 2, 3, 5, 10, 11, 13, and 17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the teachings of Kojima in view of Anghel.

Rather than repeat the arguments of Appellants or the Examiner, we make reference to the Briefs and the Answer for the respective details thereof.

OPINION

Only those arguments actually made by Appellants have been considered in this decision. It is our view, after consideration of the record before us, that the evidence relied upon supports the Examiner's rejection of the claims on appeal. Accordingly, we affirm.

STATEMENT OF LAW (§ 102)

In rejecting claims under 35 U.S.C. § 102, a single prior art reference that discloses, either expressly or inherently, each limitation of a claim invalidates that claim by anticipation. *Perricone v. Medicis Pharmaceutical Corp.*, 432 F.3d 1368, 1375-76, 77 USPQ2d 1321, 1325-26 (Fed. Cir. 2005), citing *Minn. Mining & Mfg. Co. v. Johnson & Johnson Orthopaedics, Inc.*, 976 F.2d 1559, 1565, 24 USPQ2d 1321, 1326 (Fed. Cir. 1992). Anticipation of a patent claim requires a finding that the claim at issue "reads on" a prior

art reference. *Atlas Powder Co. v. IRECO, Inc.*, 190 F.3d 1342, 1346, 51 USPQ2d 1943, 1945 (Fed Cir. 1999) ("In other words, if granting patent protection on the disputed claim would allow the patentee to exclude the public from practicing the prior art, then that claim is anticipated, regardless of whether it also covers subject matter not in the prior art.") (internal citations omitted).

Independent claims 1 and 9

We consider first the Examiner's rejection of claims 1 and 9 as being anticipated by Kojima. Since Appellants' arguments with respect to this rejection have treated these claims as a single group which stand or fall together, we will select independent claim 1 as the representative claim for this rejection because we find claim 1 is the broader claim. *See* 37 C.F.R. § 41.37(c)(1)(vii)(2004).

Appellants argue that Kojima does not disclose an ARCTAN function based upon a frequency of operation of the motor (Br. 4-5).

The Examiner disagrees. The Examiner argues that Kojima discloses the signal sent to the second transformation [block] contains the frequency of operation of the motor (Answer 5).

We begin our analysis by noting that the Examiner, as finder of fact, has read the recited "ARCTAN function" on Kojima's "$\tan^{-1}$ COMPUTING UNIT 41" (Fig. 8, col. 10, l. 67). We note the "θ1" output of "$\tan^{-1}$ COMPUTING UNIT 41" is shown in Fig. 7 as the single output of "PHASE CORRECTION SETTING CONTROL UNIT 21b" that feeds the rotational angle "θ1" (i.e., phase correction value, col. 11, ll. 2-3, col. 6, l. 30) into "TWO PHASE/THREE PHASE CONVERTER 4" (i.e., corresponding to

the recited "second transmission block"). *See* Kojima, col. 10, l. 67 through col. 11, l. 11. We further note that one of the inputs to "PHASE CORRECTION SETTING CONTROL UNIT 21b" (figs. 7 and 8) is the electric angular velocity (ω r) that is the output of "ANGULAR VELOCITY COMPUTING UNIT 3" (fig. 7, col. 11, l. 22).

After carefully reviewing the evidence before us, we find the argued language of the claim (i.e., "feeding an ARCTAN function *based on* said frequency") broadly but reasonably reads on Kojima's disclosure where "in addition to the drive frequency (ω 1) the actual electric angular velocity (ω r) obtained in the angular velocity computing unit 3 can also be used as the rotational *frequency* (ω) of the rotary magnet type multi-phase synchronous motor 1 …" (col. 11, ll. 21-25, emphasis added). Because we find that Kojima discloses all that is claimed, we will sustain the Examiner's rejection of representative claim 1 as being anticipated by Kojima.

Pursuant to 37 C.F.R. § 41.37(c)(1)(vii)(2004), we have decided the appeal with respect to independent claim 9 on the basis of the selected representative claim alone. Therefore, we will sustain the examiner's rejection of independent claim 9 as being anticipated by Kojima for the same reasons discussed *supra* with respect to claim 1.

Claims 6 and 14

We consider next the Examiner's rejection of claims 6 and 14 as being anticipated by Kojima.

Appellants argue that Kojima does not disclose a differentiator that differentiates an angle sensed by an angle position sensor to determine the frequency of operation of the motor, as claimed (Br. 5).

The Examiner disagrees. The Examiner asserts that Kojima shows the equivalent of a differentiator unit [i.e., fig. 1, "ANGULAR VELOCITY COMPUTING UNIT 3"] which differentiates the position signal J1 from position detector 2 to determine an angular velocity, i.e., the angular speed at which the motor is rotating that further correlates with the *frequency* of operation for a synchronous motor (Answer 6).

We will sustain the Examiner's rejection of claims 6 and 14 for essentially the same reasons set forth in the Answer. In particular, we agree with the Examiner's reasoning that "ANGULAR VELOCITY COMPUTING UNIT 3" inherently obtains an angular velocity signal by differentiating the angular position information (as provided by position sensor 2) with respect to time. Furthermore, we have found Kojima's ARCTAN function is calculated *based on* frequency (*see* discussion of claim 1 *supra*). We again point to Kojima's disclosure: i.e., "in addition to the drive frequency (ω 1) the actual electric angular velocity (ω r) obtained in the angular velocity computing unit 3 can also be used as the rotational *frequency* (ω) of the rotary magnet type multi-phase synchronous motor 1 …" (col. 11, ll. 21-25, emphasis added). Therefore, we find Kojima discloses all that is claimed.

Claims 8 and 16

We consider next the Examiner's rejection of claims 8 and 16 as being anticipated by Kojima.

Appellants argue that Kojima does not disclose a summation block that receives both the ARCTAN function and an angular position of the

motor. Appellants further argue that the language of claims 8 and 16 requires the output to be delivered to the second transformation block (Br. 5).

The Examiner disagrees. The Examiner points to signal J1, i.e., the output of position sensor 2, fig. 1. The Examiner further points to output signal "θ1" from block 21b, i.e., where signal "θ1" is the output of the ARCTAN function shown in fig. 8 (Answer 6).

We note that Kojima discloses a summation block (i.e., subtractor 16, fig. 1) that receives a first "θ1" signal from "PHASE CORRECTION SETTING CONTROL UNIT 49" and a second "Th" signal from "PHASE COMPUTING UNIT 9" (fig. 1), as follows:

> Still further, numeral 9 denotes a phase computing unit for performing an operation of an electric angular phase (Th) of the rotor on the basis of the position output (J1) of the absolute position detector 2, with this electric angular phase (Th) being indicative of a rotational angle in the d-q axis coordinate system viewed from an α–β where the phase axis coincides with the u phase axis of the three phases.
> (col. 1, l. 66 through col. 2, l. 5).

We note that the output of the summation block (i.e., subtractor 16, fig. 1) is provided as an input to "TWO-PHASE / THREE PHASE CONVERTER 4" (i.e., the output of the summation block is delivered to the second transformation block). (*See also* Kojima, col. 6, ll. 29-33). Therefore, we agree with the Examiner that the language of claims 8 and 16 broadly but reasonably reads on Kojima's disclosure. Because we find that Kojima discloses all that is claimed, we will sustain the Examiner's rejection of claims 8 and 16 as being anticipated by Kojima.

Claims 20 and 22

We consider next the Examiner's rejection of dependent claims 20 and 22 as being anticipated by Kojima.

Appellants argue that the Examiner has not shown that Kojima's ARCTAN function provides an indication of motor impedance angle (Br. 5).

The Examiner disagrees. The Examiner asserts that Kojima discloses in fig. 8 (and corresponding description) that the output of block 21b is the rotational angle [i.e., corresponding to the phase angle, *see* Kojima, col. 10, l. 67 through col. 11, l. 2] (Answer 6).

We note that the "θ1" output of "$\tan^{-1}$ COMPUTING UNIT 41" is shown in Fig. 7 as the single output of "PHASE CORRECTION SETTING CONTROL UNIT 21b" that feeds the rotational angle (i.e., phase correction value) "θ1" (col. 11, ll. 2-3, col. 6, l. 30) into "TWO PHASE/THREE PHASE CONVERTER 4" (i.e., corresponding to the recited "second transmission block" of claim 1). (*See* Kojima, col. 10, l. 67 through col. 11, l. 11).

In particular, we note that "La 36" represents the motor armature winding self inductance (*see* Fig. 8, element 36, col. 2, ll. 24, 34-35). In addition, "Ra 39" represents the motor armature winding resistance (*see* Fig. 8, element 39, col. 10, ll. 61-63). Because *inductance* (i.e., a positive reactance) and *resistance* are components of *impedance*, we find that Kojima's phase correction value "θ1" is representative of the motor impedance angle, i.e., where the ARCTAN of signal components (La/Ra) is the phase angle (col. 10, l. 67 through col. 11, l. 2). Therefore, we agree with the Examiner that the recited language (i.e., "wherein said ARCTAN

function provides an indication of a motor impedance angle") broadly but reasonably reads on Kojima's disclosure (claim 20, *see also* Kojima, figs. 7 and 8). Because we find that Kojima discloses all that is claimed, we will sustain the Examiner's rejection of claims 20 and 22 as being anticipated by Kojima.

Claims 21 and 23

We consider next the Examiner's rejection of dependent claims 21 and 23 as being anticipated by Kojima.

Appellants argue the Examiner has not shown that Kojima calculates the motor impedance angle at all, and certainly not *identically* (Br. 6).

We note that we have fully addressed the issue of calculating the motor impedance angle (see discussion of claims 20 and 22 *supra*). We find that Appellants have failed to rebut the Examiner's rejection of these claims with any meaningful analysis. Therefore, we find Appellants have failed to comply with the requirements of 37 C.F.R. § 1.111(b) by merely reciting the language of the claim and asserting that such language is not taught by the reference. We further note that a statement which merely points out what a claim recites will not be considered an argument for separate patentability of the claim. *See* 37 C.F.R. § 41.37(c)(1)(vii)(2004). Therefore, we do not find Appellants' argument persuasive, and we find that Appellants have not shown error in the Examiner's prima facie case of anticipation. Accordingly, we *pro forma* sustain the Examiner's rejection of claims 21 and 23 as being anticipated by Kojima.

STATEMENT OF LAW (§ 103)

"[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability." *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art. *See In re Kahn*, 441 F.3d 977, 987-988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006); *In re Young*, 927 F.2d 588, 591, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991).

Motivation

Appellants argue that the Examiner has impermissibly relied upon hindsight in formulating the rejections under § 103 (Br. 6).

The Examiner disagrees. The Examiner argues that it would have obvious to an artisan to modify Kojima's synchronous motor control system with Anghel's Park and Clarke transformations in order to realize a time-invariant system that facilitates direct torque control (Answer 5).

We do not agree with Appellants' assertion that the Examiner has impermissibly used hindsight in formulating the rejection. We note that Kojima and Anghel are each broadly directed to the control of synchronous motors. Therefore, we find the cited references are analogous by virtue of being from the same field of endeavor as the instant invention. *See In re Kahn*, 441 F.3d 977, 987, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006) ("The analogous-art test requires that the Board show that a reference is either in the field of the applicant's endeavor or is reasonably pertinent to the problem with which the inventor was concerned in order to rely on that reference as a basis for rejection.") (internal citation omitted).

> Furthermore, our reviewing court has recently reaffirmed:
>
> > [A]n implicit motivation to combine exists not only when a suggestion may be gleaned from the prior art as a whole, but when the 'improvement' is technology-independent and the combination of references results in a product or process that is more desirable, for example because it is stronger, cheaper, cleaner, faster, lighter, smaller, more durable, or more efficient … In such situations, the proper question is whether the ordinary artisan possesses knowledge and skills rendering him *capable* of combining the prior art references.

DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co., 464 F.3d 1356, 1368, 80 USPQ2d 1641, 1651 (Fed. Cir. 2006) (emphasis in original).

Here, we find the ordinary artisan who possessed knowledge and skills relating to synchronous motor controls systems would have been *capable of* combining Kojima's method of controlling a rotary magnet multi-phase synchronous motor with the "well known Clarke transformation (a, b, c/α, β) that converts three-phase quantities (a, b, c) into balanced two-phase quadrature quantities (α, β), as taught by Anghel (col. 3, ll. 38-42) for the purpose of realizing a *faster* and more *efficient* means for converting Kojima's "three phase alternating currents (I1u, I1v, I1w) flowing in the permanent magnet type synchronous motor 1 into currents (11d, 11q) in a biaxial rotating coordinate system (d-q axis coordinate system) rotating in synchronism with a frequency of an alternating voltage applied to a stator winding of the permanent magnet type synchronous motor 1" (*see* Kojima, col. 1, ll. 43-50, *see also* fig. 1, "THREE-PHASE / TWO-PHASE CONVERTER 5").

Likewise, we find the ordinary artisan who possessed knowledge and skills relating to synchronous motor controls systems would have been *capable of* combining Kojima's method of controlling a rotary magnet multi-phase synchronous motor with the "the well known Park transformation (α, β/d, q) that converts vectors in [a] 2-phase orthogonal stationary system (α, β) into the rotating reference frame (d, q) using the angle θ of the rotating frame," as taught by Anghel (col. 4, ll. 6-9) for the purpose of realizing a *faster* and more *efficient* means of implementing "d-axis current controller 6" and "q-axis current controller 7" (Kojima, col. 1, ll. 54-61). We note that Kojima's "d-axis current controller 6" amplifies "the difference between a d-axis component command (I1dcom) of a stator winding current of the permanent magnet type synchronous motor 1 and the actual value (I1d) thereof to make a current flow to achieve the command value" (col. 1, ll. 54-59). We further note that Kojima's "q-axis current controller 7" controls a "q-axis component of the stator winding current of the permanent magnet type synchronous motor 1" (Kojima, col. 1, ll. 59- 61).

Claim 17

We consider next the Examiner's rejection of dependent claim 17 as being unpatentable over the teachings of Kojima in view of Anghel. Appellants note that the language of claim 17 requires a motor that is utilized to drive an aircraft-based component. Appellants argue that Kojima does not disclose an aircraft-based motor (Br. 6).

We note that our reviewing court has determined that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097, 231 USPQ 375, 380 (Fed. Cir. 1986). Here, we agree with Appellants that Kojima does not teach an aircraft-based component. However, Kojima must be read, not in isolation, but for what it fairly teaches in combination with the prior art as a whole. We find Anghel explicitly teaches an electric motor control system for use in an *aircraft system* (col. 1, l. 53-56). We have fully addressed the issue of motivation *supra.* Because Appellants have not shown error in the Examiner's prima facie case of obviousness, we will sustain the Examiner's rejection of claim 17 as being unpatentable over the teachings of Kojima in view of Anghel.

Claims 2, 3, 5, 10, 11, and 13

Lastly, we consider the Examiner's rejection of dependent claims 2, 3, 5, 10, 11, and 13 as being unpatentable over the teachings of Kojima in view of Anghel. We have fully addressed the issue of motivation *supra.* We note that Appellants have not presented any substantive arguments directed separately to specific limitations of dependent claims 2, 3, 5, 10, 11, and 13. Because Appellants have not shown error in the Examiner's prima facie case of obviousness, we will sustain the Examiner's rejection of these claims as being unpatentable over the teachings of Kojima in view of Anghel.

DECISION

In summary, we have sustained the Examiner's rejection of all claims on appeal. Therefore, the decision of the Examiner rejecting claims 1-3, 5, 6, 8-11, 13, 14, 16, 17 and 20-23 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)(1)(iv).

AFFIRMED

PGC

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