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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BAOMING GE, LIHUA CHEN,
YAN ZHOU, SHUITAO YANG, and FAN XU

Appeal 2019-004938
Application 15/437,714
Technology Center 2800

Before JAMES C. HOUSEL, BRIAN D. RANGE, and
MERRELL C. CASHION, JR., *Administrative Patent Judges*.

Opinion for the Board filed by *Administrative Patent Judge* CASHION.

Opinion Concurring filed by *Administrative Patent Judge* HOUSEL.

CASHION, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), the Appellant¹ appeals from a Final Office Action, dated August 27, 2018, rejecting claims 1–3, 5, 6, 8–16, and 18–20. We have jurisdiction under 35 U.S.C. § 6.

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

We AFFIRM IN PART.

Claim 1 is illustrative of the subject matter on appeal and is reproduced below:

1. A powertrain for a vehicle comprising:

an electric machine coupled with a first inverter;

a traction battery coupled between a neutral terminal of the electric machine and a negative terminal of the first inverter to provide power to the electric machine during electric propulsion of the vehicle; and

a second inverter coupled in parallel with the first inverter with respect to a direct current (DC) bus, and configured to drive a second electric machine.

Independent claim 11 is related to a method of controlling a power train. Independent claim 15 is also related to a power train for a vehicle but differs from claim 1 principally in that it includes additional features.

Appellant (*see generally* Appeal Br.) requests review of the following rejections from the Examiner's Final Office Action:

I. Claims 11–14 are rejected under 35 U.S.C. § 112(a) as failing to comply with the written description requirement.

II. Claims 11–14 are also rejected under 35 U.S.C. § 112(a) as failing to comply with the enablement requirement.

III. Claims 1, 2, 15, and 20 rejected under 35 U.S.C. § 102(a)(1) as anticipated by Hickam (US 2013/0001944 A1, published January 3, 2013).

IV. Claims 6, 9, and 19 rejected under 35 U.S.C. § 103 as unpatentable over Hickam.

V. Claims 3, 16, 5, 8, 18, and 10 rejected under 35 U.S.C. § 103 as unpatentable over Hickam and Taniguchi (US 2008/0278102 A1, published November 13, 2008).

OPINION

After review of the respective positions the Appellant and the Examiner present, we REVERSE the Examiner’s rejections of claims 11–14 under 35 U.S.C. § 112(a) based on lack of written description and lack of enablement for the reasons the Appellant provides in the Appeal and Reply Briefs, but AFFIRM the Examiner’s prior art rejections of claims 1–3, 5, 6, 8–10, 15, 16, and 18–20 under §§ 102(a)(1), and 103 for the reasons the Examiner provides in the Final Office Action and the Answer. We add the following for emphasis.

Rejections under 35 U.S.C. § 112(a)²

a. Written Description Requirement

The purpose of the written description requirement in 35 U.S.C. § 112(a) is to “clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed.” *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc) (quoting *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1562–63 (Fed. Cir. 1991) (citation omitted)). In addition, the written description requirement of 35 U.S.C. § 112(a) applies to all claims including original claims that are part of the disclosure as filed. *Ariad*, 598 F.3d at 1349. As stated by the Federal Circuit, “[a]lthough many original claims will satisfy the written description requirement, certain claims may not.” *Ariad*, 598 F.3d at 1349; *see also*

² We limit our discussion to independent claim 11 for both, the written description and the enablement rejection under 35 U.S.C. § 112(a).

LizardTech, Inc. v. Earth Res. Mapping, Inc., 424 F.3d 1336, 1343–46 (Fed. Cir. 2005); *Regents of the University of California v. Eli Lilly & Co.*, 119 F.3d 1559, 1568 (Fed. Cir. 1997).

The Examiner has the initial burden of presenting evidence or reasoning to explain why persons skilled in the art would not recognize in the original disclosure a description of the invention defined by the claims. *See In re Wertheim*, 541 F.2d 257, 263 (CCPA 1976). “[T]he test for sufficiency is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.” *Ariad*, 598 F.3d at 1351 (citations omitted). This test “requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art.” *Id.* “Based on that inquiry, the specification must describe an invention understandable to that skilled artisan and show that the inventor actually invented the invention claimed.” *Id.*

The Examiner finds that the phrase “less than all phases” in claim 11 fails to comply with the written description requirement. Final Act. 3. In the context of the claim, the language reads “offsetting the phase signals by a direct current (DC) bias applied to less than all phases of the electric machine such that a rotational torque of the electric machine associated with the DC bias is zero.” According to the Examiner, the Specification discloses that “[t]he phase signals are offset by a direct current (DC) bias applied to at least one phase of the electric machine such that a rotational torque of the electric machine associated with the DC bias is zero.” Final Act. 3; Spec. ¶ 5. The Examiner asserts that the language “at least one phase” is different from “less than all phases” because the phrase “at least one phase could be

one phase, two phases or three phases whereas less than all phases only applies to either two phases or one phase.” Final Act. 3.³

After consideration of the Appellant’s arguments (Appeal Br. 6), we agree with the Appellant that there is reversible error in the Examiner’s determination that claims 11–14 do not comply with the written description requirement of 35 U.S.C. § 112(a).

Initially, the Examiner contends that “at least one phase could be one phase, two phases or three phases whereas less than all phases only applies to either two phases or one phase.” Final Act. 3. The Examiner’s contention is based on Appellant’s Exemplary embodiment of Figure 5, directed to a 3-phase wye. Spec. ¶ 46. In the Answer, the Examiner ties the lack of written description to the enablement requirement by arguing that Appellant did not disclose an embodiment or point to any other portion of the Specification in support of the disputed language. Ans. 6.

As the Examiner acknowledges, the Specification discloses “[t]he phase signals are offset by a direct current (DC) bias applied to at least one phase of the electric machine such that a rotational torque of the electric machine associated with the DC bias is zero.” Final Act. 3 (citing to Spec. ¶ 5). The Examiner’s interpretation of both the disputed language and the language in the Specification is contradictory. According to the Examiner, the disclosed language “at least one phase” could be one phase, two phases or three phases. Final Act 3. That is, the disclosed phrase encompasses all

³ The disputed language “less than all phases” was added by an amendment entered April 24, 2018 to replace the language “at least one phase” that appears on page 5 of the Specification. Appellant does not provide any explanation in support of the amendment. *See generally* Remarks dated April 24, 2018.

phases of a 3-phase wye. The Examiner's contention with respect to the disputed language is that it does not include all phases of a 3-phase wye but, instead would only include a single phase or two phase. *Id.* Yet, the Examiner's explanation implicitly recognizes that there is adequate written support for the embodiments comprising a single phase or two phases. That is, the Examiner's contention recognizes that the disputed claim language "less than all phases" falls within the embodiments contemplated by "at least one phase." While the Examiner argues that the Specification does not include embodiments having "less than all phases," all that is required to satisfy the written description requirement is that "the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Ariad*, 598 F.3d at 1351 (citations omitted). *See also In re Johnson*, 558 F.2d 1008, 1019 (CCPA 1977) ("[the] specification, having described the whole, necessarily described the part remaining.").

Moreover, our reviewing court has set forth two ways disclosure to support a claim's recited genus can meet the written description requirement:

A genus can be described by disclosing: (1) a representative number of species in that genus; or (2) its "relevant identifying characteristics," such as "complete or partial structure, other physical and/or chemical properties, functional characteristics when coupled with a known or disclosed correlation between function and structure, or some combination of such characteristics."

In re Alonso, 545 F.3d 1015, 1019 (Fed. Cir. 2008) (quoting *Enzo Biochem, Inc. v. Gen-Probe Inc.*, 323 F.3d 956, 970 (Fed. Cir. 2002)).

The Examiner's contention essentially acknowledges that the disputed language "less than all phases" represents a number of species of the broader disclosed language (genus) "at least one phase," which meets the first prong of *Alonso*.

Thus, the Examiner has not established that the original disclosure is insufficient to reasonably convey to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.

Accordingly, we reverse the Examiner's prior art rejection of claims 11–14 under 35 U.S.C. § 112(a) as failing to comply with the written description requirement for the reasons the Appellant presents and we give above.

b. Enablement Requirement

A specification complies with the 35 U.S.C. § 112(a) enablement requirement if it allows those of ordinary skill in the art to make and use the claimed invention without undue experimentation. *See In re Wright*, 999 F.2d 1557, 1561 (Fed. Cir. 1993); *Atlas Powder Co. v. E.I. du Pont De Nemours & Co.*, 750 F.2d 1569, 1576 (Fed. Cir. 1984). Factors to be considered in determining whether a disclosure would require undue experimentation "include (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims." *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988). Enablement is a question of law involving underlying factual inquiries. *See Genentech, Inc. v. Novo Nordisk*

A/S, 108 F.3d 1361, 1365 (Fed. Cir. 1997); *see also In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988).

The Examiner finds that the phrase “a direct current (DC) bias applied **to less than all phases** of the electric machine such that a rotational torque of the electric machine associated with the DC bias is zero” in claim 11 fails to comply with the enablement requirement because the disclosure does not describe how one ordinary skill in the art would use less than all phases (three phases) to make the rotational torque zero. Final Act. 3. The Examiner finds Application Figure 1 shows that the DC bias is applied equally in all three phases. *Id.* at 3–4. According to the Examiner, the Specification does not describe an embodiment detailing how the DC bias is applied to less than all phases to achieve the same effect. *Id.* at 4. The Examiner concludes that it would require undue experimentation for one skilled in the art to make and/or use the invention absent further guidance. *Id.*

After consideration of the Appellant’s arguments (Appeal Br. 6), we agree with the Appellant that there is reversible error in the Examiner’s determination that claims 11–14 do not comply with the enablement requirement of 35 U.S.C. § 112(a).

The Specification discloses an embodiment of the invention in Figures 5 and 6 directed to a 3-phase wye. According to the Specification, the DC component is a current flow with the traction battery such that one-third of battery current passes through each phase winding of the generator (e.g., 502). As the DC component passes equally in each phase, the DC component does not apply a torque on the generator rotor, so it will not affect generation/propulsion operation of generator (e.g., 502).

Spec. ¶ 48.

Although this exemplary embodiment teaches splitting the DC component current flow equally among all phases, the Examiner does not explain persuasively why this exemplary embodiment is insufficient to guide one skilled in the art to apply the DC component current flow to less than all phases of the electric machine such that a rotational torque of the electric machine associated with the DC bias is zero. The Examiner's assertion that it would require undue experimentation for one skilled in the art to make and/or use the invention absent further guidance (Final Act. 4) also lacks persuasive merit because the Examiner fails to provide an adequate analysis, as required by *Wands*, to support this assertion.

Accordingly, we reverse the rejection of claims 11–14 under 35 U.S.C. § 112(a) as failing to comply with the enablement rejection for the reasons presented by Appellant and given above.

Rejection under 35 U.S.C. § 102(a)(1)

Appellant presents arguments only for independent claim 1. *See generally* Appeal Br. Accordingly, we select claim 1 as representative of the claimed subject matter and decide all issues as to this appealed rejection based on the arguments presented for claim 1.

After review of the respective positions that Appellant presents in the Appeal and Reply Briefs and the Examiner presents in the Final Office Action and the Answer, we AFFIRM the Examiner's prior art rejection of claims 1, 2, 15, and 20 under 35 U.S.C. § 102(a)(1) for the reasons the Examiner presents in the Final Office Action and the Answer. We add the following.

Independent claim 1 recites a powertrain for a vehicle comprising “a traction battery coupled between a neutral terminal of the electric machine and a negative terminal of the first inverter *to provide power to the electric machine during electric propulsion of the vehicle*” (emphasis added).

The Examiner finds Hickam discloses a powertrain for a vehicle comprising a traction battery as claimed that provides power to an electric machine during electric propulsion of the vehicle. Final Act. 5–6; Hickam ¶ 12. In the Answer, the Examiner finds that Hickam’s machine 104 operates by using the supply current from the traction battery 102 and continues to operate as long as the battery supplies the current. Ans. 3. The Examiner further finds that Hickam discloses the propulsion machine 104 is propelling ground engaging system 119 to move the electric drive machine when the gear train 118 is powered as disclosed in Hickam’s paragraphs 21 and 22. *Id.* at 4. Thus, the Examiner finds that Hickam teaches operating the propulsion motor using the current from the battery 102. *Id.* In addition, the Examiner further finds that the claim phrase “to provide power to the electric machine during electric propulsion of the vehicle” is a statement of intended use that fails to differentiate the claimed invention from the powertrain of the prior art. *Id.* at 5.

Before we address the merits of the rejection of claim 1 under 35 U.S.C. 102(a)(1), we must first determine if the claim 1 functional language “to provide power to the electric machine during electric propulsion of the vehicle” is a statement of intended use as the Examiner asserts. Final Act. 5.

It is well-settled that a statement of intended use does not impart patentability to apparatus or composition claims unless it recites structure or

functional features that distinguish over the prior art. *Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 809 (Fed. Cir. 2002); *see also In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997). “Statements in the claims that define and limit the device are material limitations, for purposes of . . . distinguishing from the prior art.” *Schreiber*, 128 F.3d at 1481. To the extent that functional limitations imply structure, they cannot be ignored. *See, e.g., Textron Innovations Inc. v. Am. Eurocopter Corp.*, 498 F. App'x 23, 28 (Fed. Cir. 2012) (“In certain circumstances functional language may be used to add limitations to an apparatus claim.”) (citing *K-2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1363 (Fed. Cir. 1999) (“[T]he functional language tells us something about the structural requirements”)).

Here, the disputed functional language recites that the traction battery, coupled as claimed, *provides power to the electric machine during electric propulsion of the vehicle*. The Examiner does not present any analysis as to whether the disputed functional language does in fact limit the claimed traction battery or powertrain. Instead, the Examiner reaches a conclusion that the disputed functional language is simply a statement of intended use. Final Act. 5. However, the Examiner negates the issue of intended use, or at least does not ignore the implied structure of the disputed functional language, by finding Hickam discloses a traction battery coupled to an electric machine to provide power to the electric machine during electric propulsion of the vehicle as claimed. Final Act. 6; Ans. 3–4. That is, the Examiner recognizes that there is a structural limitation implied by the disputed functional language. In view of this, we agree with Appellant that the disputed functional language, when read in the context of the limitation in question, is structural in nature and describes the manner in which the

claimed traction battery is coupled to an electric machine to supply power to the electric machine during electric propulsion of the vehicle. Appeal Br. 3.

Having established that the disputed functional language of claim 1 implies a structure to permit the traction battery, coupled as claimed, to provide power to the electric machine during propulsion of the vehicle, we now address the merits of the rejection of claim 1 under 35 U.S.C. § 102(a)(1).

For the Examiner to carry the burden of establishing a prima facie case of anticipation, the Examiner must establish where each and every element of the claimed invention, arranged as required by the claim, is found in a single prior art reference, either expressly or under the principles of inherency. *See generally Schreiber*, 128 F.3d at 1477.

The Examiner asserts that paragraphs 12, 21, 22, and 28 establish that Hickam starts and maintains the propulsion of the vehicle when the battery is connected to the machine 104, which is sufficient to establish anticipation under 35 U.S.C § 102. Final Act. 5; Ans. 3–4.

There is no dispute that Hickam discloses a powertrain for a vehicle comprising the specific components recited in claim 1, including “a traction battery coupled between a neutral terminal of the electric machine and a negative terminal of the first inverter.” *See generally* Appeal Br. and Ans. Instead, Appellant argues that Hickam does not disclose battery 102 as structurally configured to provide power to propulsion motor 104 while propulsion motor 104 is propelling ground engaging system 119. Appeal Br. 3.

Appellant's argument does not point to reversible error in the Examiner's determination of anticipation.

Referring to the portions of Hickam the Examiner relies upon, Hickam discloses using a battery 102 "to supply electric current to the plurality of inductive windings L₁, L₂ and L₃ of a propulsion motor [electric machine] 104." Hickam ¶ 12. Hickam also discloses that the plurality of inductive windings L₁, L₂ and L₃ of the propulsion motor 104 can accumulate energy based on a magnetic field created when the supplied electric current flows through them. *Id.* at 13. Hickam discloses that a controller 106 may be configured to regulate a first plurality of switches of the first inverter 108 to cause a collapse of the accumulated energy in the inductive windings L₁, L₂ and L₃ of the propulsion motor 104 to release/discharge electrical energy, thereby producing an electromotive force (EMF) proportional to the time rate of change of the magnetic flux. *Id.* ¶ 14. Hickam discloses that propulsion motor 104 may include inductive windings L₁, L₂ and L₃ in the form of stator windings configured to drive a rotor to power a gear train 118, thereby driving the electric drive machine 100. *Id.* ¶ 22.

Based on these disclosures, one skilled in the art would have understood that battery 102 provides power to the electric machine 104, through the inductive elements L₁, L₂ and L₃, during electric propulsion of a vehicle. Appellant does not present a persuasive argument rebutting the Examiner's findings regarding, for example, the teachings at Hickman paragraph 22.

Appellant's exemplary Figure 5 embodiment, comprising an electric machine 502 having three windings connected to the traction battery 504, is

essentially identical to the embodiment shown in Hickam's Figure 1 (battery 102 connected to electrical machine 104 having windings L₁, L₂ and L₃). In view of this, Appellant's argument that Hickam's battery 102 is not capable of providing power to propulsion motor 104 while propulsion motor 104 is propelling ground engaging system 119 lacks persuasive merit because it does not address the reasons the Examiner presents in support of the rejection. Appeal Br. 5; Ans. 3-4. Given that the claimed power train and Hickam's powertrain comprise essentially the same components arranged as claimed, Appellant has not explained persuasively why the arrangement of Hickam's powertrain traction battery/electrical machine is not configured to operate as argues. Appeal Br. 3. Appellant has not explained adequately why the powertrain with the claimed traction battery/electrical machine arrangement operates any differently from Hickam's disclosed powertrain having the same traction battery/electrical machine arrangement.

Accordingly, we AFFIRM the Examiner's rejection of claims 1, 2, 15, and 20 under 35 U.S.C. § 102(a)(1) for the reasons the Examiner presents in the Final Office Action and the Answer and we give above.

Rejections under 35 U.S.C. § 103

Appellant relies on the arguments presented for the rejection under 35 U.S.C. § 102(a)(1) to address the respective rejections of claims 3, 5, 6, 8, 9, 10, 16, 18, and 19 under 35 U.S.C. § 103.

Accordingly, we AFFIRM the Examiner's prior art rejections of claims 3, 5, 6, 8, 9, 10, 16, 18, and 19 under 35 U.S.C. § 103 for the reasons the Examiner presents and we give above.

DECISION SUMMARY

Because neither of the affirmed rejections reach all the claims, our decision is an affirmance in part.

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
11-14	112(a)	Written Description		11-14
11-14	112(a)	Enablement		11-14
1, 2, 15, 20	102(a)(1)	Hickam	1, 2, 15, 20	
6, 9, 19	103	Hickam	6, 9, 19	
3, 5, 8, 10, 16, 18	103	Hickam, Tanuguchi	3, 5, 8, 10, 16, 18	
Overall Outcome			1-3, 5, 6, 8-10, 15, 16, 18-20	11-14

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED IN PART

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BAOMING GE, LIHUA CHEN,
YAN ZHOU, SHUITAO YANG, and FAN XU

Appeal 2019-004938
Application 15/437,714
Technology Center 2800

HOUSEL, *Administrative Patent Judge*, concurring.

Although I concur completely with the majority in the outcome regarding the Examiner's written description, enablement, anticipation, and obviousness rejections, I write separately to express my view that claims 11–13 lack enablement as to the entire scope of the claimed invention. In this regard, I note, as did the Examiner (Final Act. 3), that the disclosure fails to describe how a DC bias can be applied to less than all phases of a motor (presumably multiphase) without generating any rotational torque in the motor. However, as the majority finds, the Examiner fails to elaborate on why this failure prevents those skilled in the art from applying a DC bias to less than all phases of a motor such that rotational torque associated with the DC bias is zero without undue experimentation given Appellant's disclosure.

However, although the absence of such an analysis applying the *Wands* factors necessitates our reversal of the Examiner's enablement

rejection, the situation involving applying a DC bias to at least a single phase of a multi-phase motor nonetheless warrants a scope of enablement rejection. Those skilled in the art would have at least an undergraduate degree in electrical engineering and at least several years of experience working with hybrid electric vehicles (HEVs) and motor control in such vehicles. As such, the skill in the art is reasonably high which weighs in favor of enablement. As the Examiner finds (Ans. 6), and Appellant does not dispute, “none of the [disclosed] embodiments show the DC bias applied to less than [all of the] phases.” Nor does Appellant direct our attention to any portion of the disclosure providing guidance as to how the DC bias should be applied to less than all of the phases in such a manner as to generate no rotation torque in the motor. In my view, Appellant has not enabled those skilled in the art to apply a DC bias to less than all a motor’s phases without generating a rotational torque. It is not clear whether one would merely apply the DC bias equally to fewer than all the motor’s phases (as was done in the case of applying the bias to all of the motor’s phases) and still obtain a rotational bias of zero or whether the DC bias applied to each phase fewer than all the motor’s phases would need to be individually controlled (and if so, how) so as to obtain this result. Indeed, in my view, those skilled in the art would not be able to obtain a zero rotational torque by applying a DC bias to a single motor phase because a rotational torque would be expected in such a case. Thus, it is my view that the Specification fails to enable those skilled in the art, at the least, to apply a DC bias to only one of a motor’s phases such that a rotational torque of the motor associated with the bias is zero.