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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte SHENG FANG

Appeal 2018-007017
Application 13/230,071
Technology Center 2800

Before MONTÉ T. SQUIRE, BRIAN D. RANGE, and
MERRELL C. CASHION, JR., *Administrative Patent Judges*.

RANGE, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner’s decision to reject claims 1, 3–5, 7–12, 16–18, and 21. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM IN PART.

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 “Baker Hughes, a GE company, LLC.” Appeal Br. 1.

CLAIMED SUBJECT MATTER²

Appellant describes the invention as relating to “exploration for hydrocarbons involving electrical investigations of a borehole penetrating an earth formation.” Spec. ¶ 1. The invention relates to inductive measuring tools where an antenna induces current through a rock formation and the magnitude of the induced current is measured. *Id.* ¶ 3. Claim 1 is illustrative:

1. A method of estimating at least one parameter of interest of an earth formation using an electromagnetic (EM) tool, comprising:

conducting drilling operations to convey the EM tool in a borehole penetrating the earth formation;

producing an electric current in the formation using a transmitter on the tool;

measuring an electromagnetic transient response to the current using a receiver on the tool in the borehole to obtain electromagnetic information; and

estimating the at least one parameter of interest using the electromagnetic transient information obtained using the receiver and a model of transient electromagnetic responses in the earth formation dependent on a depth of the receiver when the electromagnetic transient information was obtained, wherein the model approximates the earth formation as two thin conductive sheets below the earth surface comprising an upper sheet representing an upper portion of the earth formation above the tool and a lower sheet representing a lower portion of the earth formation below the tool; and

controlling operations in the earth formation using the at least one parameter.

² In this Decision, we refer to the Final Office Action dated May 1, 2017 (“Final Act.”), the Appeal Brief filed January 30, 2018 (“Appeal Br.”), the Examiner’s Answer dated April 18, 2018 (“Ans.”), and the Reply Brief filed June 18, 2018 (“Reply Br.”).

Appeal Br. 23 (Claims App.). The second independent claim on appeal, claim 9, recites an apparatus with a processor configured to estimate parameters similarly to claim 1. *Id.* at 25.

REJECTIONS

On appeal, the Examiner maintains an objection to Appellant's July 17, 2015, amendment to the Specification. Final Act. 9; Ans. 2. The Examiner also maintains (Ans. 2) the following rejections on appeal:

- A. Claims 1, 3–5, 7–12, 16–18, and 21 under 35 U.S.C. § 112 as failing to comply with the written description requirement. Final Act. 10.
- B. Claims 9–12 under 35 U.S.C. § 112 as indefinite. *Id.* at 13
- C. Claims 1, 3–5, 7–12, and 16–18 under 35 U.S.C. § 101 as being directed to a judicial exception (abstract ideas). *Id.* at 14.

The Examiner has withdrawn all obviousness rejections under 35 U.S.C. § 103. Ans. 2.

OPINION

Amendments to the Specification. Appellant seeks our review of the Examiner's objection to an amendment of the Specification. Appeal Br. 5. Typically, decisions an examiner makes during examination of a discretionary, procedural, or nonsubstantive nature not directly connected with the merits of issues involving rejections are reviewable by petition under 37 CFR § 1.181 to the Director, not by appeal. *In re Berger*, 279 F.3d 975, 984–85 (Fed. Cir. 2002). The Manual of Patent Examining Procedure states that “[o]rdinarily, an objection is petitionable, and a rejection is appealable” but also provides an exception: “when the objection is ‘determinative of the rejection’ the matter may be addressed by the Board.”

MPEP § 1201 (9th ed. Rev. 08.2017, Jan. 2018). The MPEP further clarifies that where “both the claims and specification contain new matter either directly or indirectly, and there has been both a rejection and objection by the examiner, the issue becomes appealable and should not be decided by petition.” MPEP § 2163.06(II).

The appeal here exemplifies a rare circumstance where the Board should address an objection.

Appellant seeks to amend the Specification’s paragraph 23 statement that “M is an electric moment of transmitter coil 210” to instead state that “M is the product between the magnetic moment of transmitter coil 210 and the area of the receiver coil 220 times the number of turns of the receiver coil 220.” Appeal Br. 5 (emphasis omitted); *see also* Ans. 2–3. The Examiner objects to this amendment and, simultaneously, rejects claim 8 as lacking written description support. Final Act. 9, 11–12. Claim 8 recites, among other things, “M is a product between a magnetic moment of the transmitter and an area of the receiver times the number of turns of the receiver.” Appeal Br. 24 (Claims App.). Because the Examiner’s objection to the amendment is determinative of the rejection of claim 8, we address Appellant’s arguments regarding the objection on the merits. MPEP § 2163.06(II).

Appellant argues that the proposed amendment is a correction rather than constituting new matter. Appeal Br. 5–14. An amendment may cure an obvious error where a person skilled in the art would not only recognize the existence of error but also the appropriate correction. MPEP § 2163.07; *In re Oda*, 443 F.2d 1200 (CCPA 1971) (“when the nature of this error is known it is also known how to correct it”); *see also Koito Mfg. Co., Ltd. v. Turn-*

Key-Tech, LLC, 381 F.3d 1142, 1154 (Fed. Cir. 2004) (“A change to correct an error is not considered new matter if ‘one skilled in the art would appreciate not only the existence of an error in the specification but what the error is’” (quoting *In re Oda*, 443 F.2d at 1206)).

Here, the preponderance of the evidence indicates that a person of skill in the art would recognize that the original Specification’s statement that “M is an electric moment of transmitter coil 220” is an error. The preponderance of the evidence does not, however, support that a person of skill in the art would appreciate the appropriate correction. We agree with the findings and determinations made by the Examiner in this regard (Ans. 2–7), and we provide further discussion below for emphasis.

As Appellant explains, the units of the Specification’s equation (Spec. ¶ 23) making use of M as a variable will not balance (i.e., have the same units on both the left and right side of the equation) if M were, as the original Specification states, an electric moment. *See* Appeal Br. 7–8 (explaining equation and electric dipole moment); *see also* Ans. 4 (agreeing that a person of skill in the art would recognize an error “insofar as the right hand side of the disclosed equation does not yield units of voltage”). The preponderance of the evidence also supports that a person of skill in the art would recognize that M often represents a magnetic dipole moment. Appeal Br. 8–9; *see also* Oct. 3, 2014, Declaration of Dr. Sheng Fang, 2 (“Fang Decl.”). Appellant, however, is not trying to merely correct M to be defined as a magnetic moment rather than, as the Specification states, an electric moment. Instead, Appellant seeks to change “electric moment” into “the product between the magnetic moment of transmitter coil 210 and the area of the receiver coil 220 times the number of turns of the receiver coil 220.”

The preponderance of the evidence does not support that a person of skill in the art would recognize that this is how the Specification must be corrected.

The Examiner finds that the Specification's equation at paragraph 23 is an equation for Appellant's inventive model and finds that a person of skill in the art would *not* know that M must necessarily be "a product between a magnetic moment of the transmitter and an area of the receiver times the number of turns of the receiver." We agree. As the Examiner explains, even if a person of skill in the art recognized that M is magnetic moment (because, as Dr. Fang testifies, "the variable for a magnetic moment is commonly referred to as M " (Fang. Decl. ¶ IV)), the units on the left and right hand sides of the equation still would not balance. There is no reason to assume that additional corrections to reach a balanced equation must necessarily come from M being not just a magnetic moment (as would be typical according to Dr. Fang) but instead must be, as Appellant now urges, the product of magnetic moment, area of the receiver and turns of the receiver. Ans. 4–5; Appeal Br. 6–8. We agree with the Examiner that the Appellant's argument is untenable because, on the one hand, Appellant argues that a person of skill in the art would recognize M to be a magnetic moment and, on the other hand, Appellant argues that M is something different—i.e., magnetic moment times area times turns. Ans. 5. We further agree with the Examiner that the Grimm reference³ referring to $M_T * M_R$ in another context is insufficient for a person of skill in the art to know that M , in the context of Specification paragraph 23, must also be $M_T * M_R$. Ans. 7.

³ The Grimm reference is R.E. Grimm, A comparison of time domain electromagnetic and surface nuclear magnetic resonance sounding for subsurface water on Mars, *J. of Geophys. Res.*, 108, E4, 8037 (2003).

The Examiner also explains that recognition of an error in the paragraph 23 equation does not necessarily lead to the conclusion that it was the definition of M that was in error—rather, the “units could be incorrect due to other parts of the equation.” Ans. 4. For example, one of the exponents in the equation could be incorrect, or another variable in the equation could be incorrectly defined by the text. *Id.* at 6. The Examiner’s analysis in this regard is sound and is not persuasively rebutted by Appellant.

In the Reply Brief, Appellant argues that Dr. Fang made a “plain assertion” contrary to the Examiner’s findings. We disagree. Dr. Fang testifies that “the variable for a magnetic moment is commonly referred to as M .” Fang. Decl. ¶ IV. He then states that the M of the equation represents M_T times M_R (*id.* ¶ 5), but he does *not* testify that a person of skill in the art would have recognized that M in the equation should be corrected to M_T times M_R . Thus, even based on Dr. Fang’s testimony, a person of skill in the art—without being told otherwise—would have thought (at best for Appellant) that M should refer to magnetic moment.

Because Appellant’s arguments do not establish error, we sustain the Examiner’s objection.

Rejection A, written description, claim 1. Claim 1 recites a method which, among other things, requires estimation of a parameter and “controlling operations in the earth formation using the at least one parameter.” Appeal Br. 23 (Claims App.). The Examiner rejects claim 1 as lacking written description support for this recitation. Final Act. 11.

To determine whether the written description requirement is met, we consider “whether the disclosure of the [earlier] 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.” *Hologic, Inc. v. Smith & Nephew, Inc.*, 884 F.3d 1357, 1361 (Fed. Cir. 2018) (alteration in original). While no particular form of disclosure is required, “a description that merely renders the invention obvious does not satisfy the [written description] requirement.” *Ariad Pharm. v. Eli Lilly and Co.*, 598 F.3d 1336, 1352 (Fed. Cir. 2010) (en banc).

Here, Appellant argues that claim 1’s “controlling operations in the earth formation using the at least one parameter” recitation is supported by paragraphs 16–19 of the Specification. We agree. Paragraph 16 states that “The surface control unit 140 displays desired drilling parameters and other information on a display/monitor 143 that is utilized by an operator to control the drilling operations.” Spec. ¶ 16. Elsewhere, the Specification indicates that a parameter may be estimated based on electromagnetic transient responses (as claim 1 recites). *See, e.g., Id.* ¶ 10. These passages, in combination, would reasonably convey to a person of skill in the art that Appellant possessed the “controlling operations . . . parameter” recitation. We, therefore, do not sustain the Examiner’s related Section 112 written description rejection of claim 1 and of the claims that depend from claim 1 (claims 3–5, 7, 8, 16–18, and 21).

Rejection A, written description, claims 5, 12, and 21. Claim 5 depends from claim 1 and recites estimating a boundary distance and “controlling operations in the earth formation using the at least one boundary distance.” Appeal Br. 24 (Claims App.). Claim 21 also depends from claim 1 and recites estimating a boundary distance and “using the boundary distance to steer the BHA [bottom hole assembly] during drilling operations.” *Id.* at

26. Claim 12 depends from claim 9, an apparatus claim, and requires that the processor of claim 9 be configured to “control operations in the earth formation using the at least one boundary distance.” *Id.* at 25–26. In a manner similar to the rejection of claim 1, the Examiner objects to these claims as lacking written description support because, according to the Examiner, the original Specification does not indicate control of operations based on a parameter including boundary distance. Final Act. 11. Appellant’s argument is the same as for claim 1. Appeal Br. 15.

We again determine that Appellant’s argument identifies error. The Specification states that “[t]he surface control unit 140 displays desired drilling parameters and other information on a display/monitor 143 that is utilized by an operator to control the drilling operations.” Spec. ¶ 16. The Specification also explains, “In step 450, a boundary distance may be estimated using the at least one parameter of interest.” *Id.* at 25. Thus, a person of skill in the art would recognize that Appellant’s method produces information, and would understand that this “other information” (*Id.* ¶ 16) could be used to control drilling operations. Control of the drilling operations could include steering a BHA. *Id.* ¶ 12. We, therefore, do not sustain the Examiner’s related Section 112 written description rejection of claims 5, 12, and 21.

Rejection A, written description, claim 8. Claim 8 recites an equation from paragraph 23 (addressed above) and defines M as “a product between a magnetic moment of the transmitter and an area of the receiver times the number of turns of the receiver.” Appeal Br. 24 (Claims App.). The Examiner rejects claim 8 for lacking written description support for the substantially the same reason the Examiner objected to amendment of the

Specification. Final Act. 11–12. Above, we sustained the Examiner’s objection to Appellant’s proposed amendment of the Specification that would include this language. Appellant does not argue that this language has written description support absent the proposed amendment. We, therefore, sustain this rejection.

Rejection A, written description, claim 9. Claim 9 recites, among other things, “wherein the model approximates the earth formation as two thin conductive sheets below the earth surface comprising an upper sheet representing an upper portion of the earth formation including a **host rock** above the tool and a lower sheet representing a lower portion of the earth formation including a **host rock** below the tool.” Appeal Br. 24–25 (Claims App.) (emphasis added). The Examiner rejects claim 9 as lacking support for a host rock represented in the sheets. Final Act. 12.

The Specification does not use the term “host rock” at all. Appellant nonetheless argues that the Specification supports the host rock recitations of claim 9 at Figure 3 and paragraph 23 of the Specification. Appeal Br. 14–15.⁴ We do not agree. Figure 3, at most, indicates earth above and below the height of thin sheet conductors. It does not indicate that the model representation of the earth formation includes host rock. Paragraph 23 likewise only indicates earth formation is above and below the tool. It also does not indicate that the model representation includes host rock. Ans. 8.

Because Appellant’s arguments do not identify error, we sustain the Examiner’s rejection of claim 9 and claims 10–12 (which depend from claim

⁴ At page 4 of the Reply Brief, Appellant states that the Examiner’s position is “laughable.” Reply Br. 4. This rhetoric is unhelpful to our decision-making process.

9) based on lack of written description support for the “host rock” recitations.

Rejection B, indefiniteness, claims 9–12. The Examiner rejects claims 9–12 as indefinite. Final Act. 13. Appellant does not dispute the rejection. We, therefore, summarily affirm the rejection. *See Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential), (cited with approval in *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.”)).

Rejection C, statutory subject matter, claims 1, 3–5, 7–12, and 16–18.

A. The Examiner’s Rejection

The Examiner rejects claims 1, 3–5, 7–12, and 16–18 under 35 U.S.C. § 101 as being directed to a judicial exception. Final Act. 14. In particular, the Examiner explains the abstract idea of independent claim 1 as follows:

[T]he abstract idea is covered in the step of estimating the at least one parameter of interest using the electromagnetic transient information obtained using the receiver and a model of transient electromagnetic responses in the earth formation dependent on a depth of the receiver when the electromagnetic transient information was obtained, wherein the model approximates the earth formation as two thin conductive sheets below the earth surface comprising an upper sheet representing an upper portion of the earth formation above the tool and a lower sheet representing a lower portion of the earth formation below the tool; and controlling operations in the earth formation using the at least one parameter. The estimating step involves estimating a value using a necessarily mathematical model of

physical laws governing transient electromagnetic responses in an earth formation.

Id. at 14–15 (emphasis omitted). Similarly, the Examiner explains the abstract idea of independent claim 9 as follows:

the abstract idea is the step [of estimating] at least one parameter of interest of the earth formation using the electromagnetic transient information and a model of transient electromagnetic responses in the earth formation dependent on a depth of the at least one antenna when the electromagnetic transient information was obtained, wherein the model approximates the earth formation as two thin conductive sheets below the earth surface comprising an upper sheet representing an upper portion of the earth formation including a host rock above the tool and a lower sheet representing a lower portion of the earth formation including a host rock below the tool.

Id. at 15.

B. Principles of Law

An invention is patent-eligible if it claims a “new and useful process, machine, manufacture, or composition of matter.” 35 U.S.C. § 101. The U.S. Supreme Court, however, has long interpreted 35 U.S.C. § 101 to include implicit exceptions: “[l]aws of nature, natural phenomena, and abstract ideas” are not patentable. *E.g.*, *Alice Corp. v. CLS Bank Int’l*, 573 U.S. 208, 216 (2014).

In determining whether a claim falls within an excluded category, we are guided by the Court’s two-part framework, described in *Mayo* and *Alice*. *Id.* at 217–18 (citing *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 75–77 (2012)). In accordance with that framework, we first determine what concept the claim is “directed to.” *See Alice*, 573 U.S. at 219 (“On their face, the claims before us are drawn to the concept of intermediated settlement, *i.e.*, the use of a third party to mitigate settlement

risk.”); *see also* *Bilski v. Kappos*, 561 U.S. 593, 611 (2010) (“Claims 1 and 4 in petitioners’ application explain the basic concept of hedging, or protecting against risk.”).

Concepts determined to be abstract ideas, and thus patent ineligible, include certain methods of organizing human activity, such as fundamental economic practices (*Alice*, 573 U.S. at 219–20; *Bilski*, 561 U.S. at 611); mathematical formulas (*Parker v. Flook*, 437 U.S. 584, 594–95 (1978)); and mental processes (*Gottschalk v. Benson*, 409 U.S. 63, 67 (1972)). Concepts determined to be patent eligible include physical and chemical processes, such as “molding rubber products” (*Diamond v. Diehr*, 450 U.S. 175, 191 (1981)); “tanning, dyeing, making waterproof cloth, vulcanizing India rubber, smelting ores” (*id.* at 182 n.7 (quoting *Corning v. Burden*, 56 U.S. 252, 267–68 (1853))); and manufacturing flour (*Benson*, 409 U.S. at 69 (citing *Cochrane v. Deener*, 94 U.S. 780, 785 (1876))).

In *Diehr*, the claim at issue recited a mathematical formula, but the Court held that “a claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula.” *Diehr*, 450 U.S. at 187; *see also id.* at 191 (“We view respondents’ claims as nothing more than a process for molding rubber products and not as an attempt to patent a mathematical formula.”). Having said that, the Court also indicated that a claim “seeking patent protection for that formula in the abstract . . . is not accorded the protection of our patent laws, and this principle cannot be circumvented by attempting to limit the use of the formula to a particular technological environment.” *Id.* (citation omitted) (citing *Benson* and *Flook*); *see, e.g., id.* at 187 (“It is now commonplace that

an *application* of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection.”).

If the claim is “directed to” an abstract idea, we turn to the second part of the *Alice* and *Mayo* framework, where “we must examine the elements of the claim to determine whether it contains an ‘inventive concept’ sufficient to ‘transform’ the claimed abstract idea into a patent-eligible application.” *Alice*, 573 U.S. at 221 (quotation marks omitted). “A claim that recites an abstract idea must include ‘additional features’ to ensure ‘that the [claim] is more than a drafting effort designed to monopolize the [abstract idea].’” *Id.* (alterations in original) (quoting *Mayo*, 566 U.S. at 77). “[M]erely requir[ing] generic computer implementation[] fail[s] to transform that abstract idea into a patent-eligible invention.” *Id.*

In January 2019, the U.S. Patent and Trademark Office (USPTO) published revised guidance on the application of § 101. 2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50 (Jan. 7, 2019) (“2019 Revised Guidance”).⁵ Consistent with the 2019 Revised Guidance and the October 2019 Update, we first look to whether the claim recites:

- (1) any judicial exceptions, including certain groupings of abstract ideas (i.e., mathematical concepts, certain methods of organizing human activity such as a fundamental economic practice, or mental processes) (“Step 2A, Prong One”); and

⁵ In response to received public comments, the Office issued further guidance on October 17, 2019, clarifying the 2019 Revised Guidance. USPTO, *October 2019 Update: Subject Matter Eligibility* (the “October 2019 Update”) (available at https://www.uspto.gov/sites/default/files/documents/peg_oct_2019_update.pdf).

(2) additional elements that integrate the judicial exception into a practical application (*see* MPEP § 2106.05(a)–(c), (e)–(h) (9th ed. Rev. 08.2017, Jan. 2018)) (“Step 2A, Prong Two”).⁶

2019 Revised Guidance, 84 Fed. Reg. at 52–55.

Consistent with the guidance, only if a claim (1) recites a judicial exception and (2) does not integrate that exception into a practical application, do we then look, under Step 2B, to whether the claim:

(3) adds a specific limitation beyond the judicial exception that is not “well-understood, routine, conventional” in the field (*see* MPEP § 2106.05(d)); or

(4) simply appends well-understood, routine, conventional activities previously known to the industry, specified at a high level of generality, to the judicial exception.

2019 Revised Guidance, 84 Fed. Reg. at 52–56.

C. Guidance Step 1: Do independent claims 1 and 9 fall within a statutory category?

Pursuant to 35 U.S.C. § 101 and consistent with Step 1 of the Guidance, we first consider whether the claimed subject matter falls within the four statutory categories explicitly set forth in § 101: “[p]rocess, machine, manufacture, or composition of matter.” Guidance, 84 Fed. Reg. at

⁶ This evaluation is performed by (a) identifying whether there are any additional elements recited in the claim beyond the judicial exception, and (b) evaluating those additional elements individually and in combination to determine whether the claim as a whole integrates the exception into a practical application. *See* 2019 Revised Guidance - Section III(A)(2), 84 Fed. Reg. 54–55.

53–54; *see also* 35 U.S.C. § 101. Here, claim 1 recites “a method of estimating at least one parameter of interest” and, thus, falls within the “method” category. Claim 9 recites “[a]n apparatus” that comprises, for example, “a drill string” and “at least one antenna” and therefore falls within the “machine” category. Thus, each claim on appeal falls within a statutory category.

D. Guidance Step 2A Prong 1: Do independent claims 1 and 9 recite a judicial exception?

Pursuant to the U.S. Supreme Court’s *Mayo* and *Alice* framework and consistent with the next step of the Guidance, we consider whether the claim recites a judicial exception. Guidance, 84 Fed. Reg. at 51. The Guidance synthesizes the key concepts identified by the courts as abstract ideas into three primary subject-matter groupings: mathematical concepts, certain methods of organizing human activity (e.g., a fundamental economic practice), and mental processes. *Id.* at 52. For the reasons discussed below, independent claims 1 and 9 (and, thus, all claims on appeal) each recite a mathematical concept.

Claim 1 recites, among other things, the following estimating step:
estimating the at least one parameter of interest using the electromagnetic transient information obtained using the receiver and a model of transient electromagnetic responses in the earth formation dependent on a depth of the receiver when the electromagnetic transient information was obtained, wherein the model approximates the earth formation as two thin conductive sheets below the earth surface comprising an upper sheet representing an upper portion of the earth formation above the tool and a lower sheet representing a lower portion of the earth formation below the tool

Appeal Br. 23 (Claims App.). The Specification explains that the recited estimation may be performed, for example, by applying the equation of

paragraph 23. Spec. ¶ 23. Figure 4 further indicates that the estimation is performed with a mathematical model. Spec. ¶ 25, Fig. 4. The recited estimation is thus a mathematical calculation which is one of the mathematical concepts identified in the revised guidance. 2019 Revised Guidance, 84 Fed. Reg. at 52; *see also, e.g., Diamond*, 450 U.S. 175 at 191 (“A mathematical formula as such is not accorded the protection of our patent laws.”). The recitation, therefore, is an abstract idea.

Our analysis of claim 9 is similar. Claim 9 recites, among other things, a processor configured to estimate a parameter:

at least one processor configured to estimate at least one parameter of interest of the earth formation using the electromagnetic transient information and a model of transient electromagnetic responses in the earth formation dependent on a depth of the at least one antenna when the electromagnetic transient information was obtained, wherein the model approximates the earth formation as two thin conductive sheets below the earth surface comprising an upper sheet representing an upper portion of the earth formation including a host rock above the tool and a lower sheet representing a lower portion of the earth formation including a host rock below the tool.

Appeal Br. 25 (Claims App.). The recited estimation that the processor must be configured to perform is, for the reasons we provide with regard to claim 1, a mathematical calculation which is one of the mathematical concepts identified in the revised guidance. The recitation, therefore, is an abstract idea.

E. Guidance Step 2A Prong 2: Is the claim “directed to” the recited judicial exception?

Because each independent claim (and thus all claims on appeal) recites an abstract idea, we now determine, pursuant to the precedent of the U.S. Supreme Court and our reviewing court and consistent with the

Guidance, whether the recited judicial exception is integrated into a practical application. 2019 Revised Guidance, 84 Fed. Reg. at 51. According to the Guidance, when a claim recites a judicial exception and fails to integrate the exception into a practical application, the claim is “directed to” the judicial exception. *Id.* The claim may integrate the judicial exception when, for example, it reflects an improvement to technology or a technical field. *Id.* at 55.

Here, Appellant argues, for example, that the claims require “components [to] operate in an unconventional manner to achieve an improvement in tool functionality.” Appeal Br. 16; *see also* Reply Br. 7–8 (arguing improvement in tool functionality). We agree with Appellant that claims 1 and 9 are not “directed to” a judicial exception because the claims integrate the recited mathematical calculation into an improvement to claim 1’s recited method and claim 9’s recited apparatus. In particular, at least according to Appellant, the estimation using an approximation as two thin conductive sheets improves upon existing technology. Reply Br. 6–9.

The Examiner maintains that the only improvement is to an abstract idea such that the claim is still abstract. Ans. 9. The Examiner is correct that our reviewing court has stated that “a claim for a new abstract idea is still an abstract idea.” *Id.* (quoting *Synopsys v. Mentor Graphics Corp.*, 839 F.3d 1138 (Fed. Cir. 2016)). Claims 1 and 9, however, each improve upon a downhole measuring device rather than only improving upon an abstract idea. We emphasize that we do not assess novelty of the recited claims (whether as a whole or with respect to individual elements) when evaluating, under step one of *Alice*, whether the claim is directed to an abstract idea. *See* 2019 Revised Guidance, 84 Fed. Reg. at 55 (“[r]evised Step 2A specifically

excludes consideration of whether the additional elements represent well-understood, routine, conventional activity”); *see also, e.g., Diehr*, 450 U.S. at 184–185 (determining that process for transforming raw rubber into cured rubber that makes use of a mathematical equation is patentable subject matter without assessing whether rubber presses were previously known).

The claims before us are similar to, for example, those of *SiRF Tech., Inc. v. Int’l Trade Comm’n*, 601 F.3d 1319, 1331–33 (Fed. Cir. 2010). In *SiRF Tech.*, the claims at issue recited a method for calculating the position of a GPS receiver by providing pseudoranges and making various estimates. *Id.* at 1332. Our reviewing court determined that a GPS receiver is a machine and is integral to each claim at issue. *Id.* The court further determined that the GPS receiver in the claims “places a meaningful limit on the scope of the claims.” *Id.* at 1332–1333.

Although *SiRF Tech.* predates, for example, the Supreme Court’s *Alice* precedent, the decision is nonetheless instructive to the present claims. Claim 1 requires an “electromagnetic (EM) tool” akin to the GPS receiver of *SiRF Tech.* Claim 1 also requires drilling to move the tool into a borehole, producing current through the tool, and, ultimately, controlling operations in the earth formation⁷ using the estimated parameter. Claim 9 requires an apparatus that comprises a drill string, an electromagnetic (EM) tool with an antennae, and a processor configured as claim 9 recites. Thus, claims 1 and 9

⁷ The Examiner states that the controlling operations recitation could merely be “performing further abstract calculations.” Final Act. 14. We disagree. The operations must be “in the earth formation” according to claim 1. Given this wording and the Specification’s context (*see, e.g., Spec.* ¶ 16), we construe claim 1’s “operations” as requiring physical operations within the earth.

as a whole each require a downhole electromagnetic tool for evaluating earth formations. The claims cannot be performed without this particular machine. These recitations, like the GPS receiver in *SiRF Tech.*, place a meaningful limit on the scope of the claims. *SiRF Tech.* at 1332–1333; *see also Thales Visionix Inc. v. U.S.*, 850 F.3d 1343 (Fed. Cir. 2017) (holding that claims directed to system for tracking object’s motion with two inertial sensors were patent eligible); *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1337 (Fed. Cir. 2016) (holding that claim directed to self-referential table to improve computer databases was patent eligible); *McRO, Inc. v. Bandai Namco Games Am.*, 837 F.3d 1299 (Fed. Cir. 2016) (holding that claim focused on specific asserted improvement in computer animation was patent eligible).

The Examiner attempts to distinguish *SiRF Tech.* by stating that *SiRF* is directed to GPS devices whereas “the instant application is directed to modeling an earth formation using conventional downhole equipment to gather data.” Ans. 13. Conventionality, or lack thereof, is not relevant to this step of the analysis, however. *See* 2019 Revised Guidance, 84 Fed. Reg. at 55. We also note that prior GPS devices existed at the time of *SiRF Tech.* *SiRF Tech., Inc.*, F.3d at 1323 (“The patents-in-suit . . . are directed to various improvements over conventional A-GPS technology.”).

Because independent claims 1 and 9 integrate the recited abstract idea into a practical application, we determine that claims 1 and 9 are not “directed to” an abstract idea. We, therefore, do not sustain the Examiner’s rejections under 35 U.S.C. § 101.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 3-5, 7-12, 16-18, 21	112	written description	8-12	1, 3-5, 7, 16-18, 21
9-12	112	indefiniteness	9-12	
1, 3-5, 7-12, 16-18	101	subject matter eligibility		1, 3-5, 7-12, 16-18
Overall Outcome			8-12	1, 3-5, 7, 16-18, 21

We also sustain the Examiner’s objection under 35 U.S.C. § 132(a) (as stated in the Final Office Action at pages 9–10) to Appellant’s July 17, 2015, amendment as explained above.

TIME PERIOD FOR RESPONSE

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