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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* LILONG LI,  
MAGDALENA TRAICO SANDOR, and SONGHUA CHEN

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Appeal 2019-002201  
Application 14/429,254  
Technology Center 2800

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Before LINDA M. GAUDETTE, GEORGE C. BEST, and  
MICHAEL G. McMANUS, *Administrative Patent Judges*.

McMANUS, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant<sup>1</sup> seeks review of the Examiner's decision to reject claims 1–22. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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<sup>1</sup> 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 Halliburton Energy Services, Inc. Appeal Br. 3.

### CLAIMED SUBJECT MATTER

The present application generally relates to “estimating subterranean fluid viscosity based on nuclear magnetic resonance (NMR) data associated with a subterranean region.” Specification, filed March 18, 2015 (“Spec.”), ¶ 1.

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

1. A method of determining subterranean fluid viscosity based on nuclear magnetic resonance (NMR) logging data, the method comprising:

accessing a viscosity model that relates a subterranean fluid viscosity variable to an apparent hydrogen index variable, wherein a relaxation time variable is not used in said viscosity model;

computing an apparent hydrogen index value for a subterranean region based solely on nuclear magnetic resonance (NMR) logging data acquired from the subterranean region; and

computing a subterranean fluid viscosity value for the subterranean region based on the viscosity model and the apparent hydrogen index value.

Appeal Brief, filed Sept. 6, 2018 (“Appeal Br.”), 17 (Claims App’x).

### REJECTION

The Examiner maintains the following rejection: Claims 1–22 are rejected for lack of subject matter eligibility. Final Action, dated April 16, 2018 (“Final Act.”), 7–15.

## DISCUSSION

**Rejection 1.** The Examiner rejected claims 1–22 as patent ineligible. *Id.* The Examiner determined that the claims are directed to a judicial exception to 35 U.S.C § 101 and do not claim “significantly more” than the judicial exception. *Id.*

An invention is patent-eligible if it claims a “new and useful process, machine, manufacture, or composition of matter.” 35 U.S.C. § 101. However, the Supreme Court 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 Supreme Court’s two-step framework, described in *Mayo* and *Alice*. *Alice*, 573 U.S. 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 id.* 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 mental processes (*Gottschalk v. Benson*, 409 U.S. 63, 69 (1972)). If the claim is “directed to” an abstract idea, we turn to the second step 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. “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.* (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 PTO published revised guidance on the application of § 101. *2019 Revised Patent Subject Matter Eligibility Guidance*, 84 Fed. Reg. 50 (Jan. 7, 2019) (“Guidance”). Under the Guidance, 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); and

(2) additional elements that integrate the judicial exception into a practical application (*see* MPEP § 2106.05(a)–(c), (e)–(h)).

Only if a claim (1) recites a judicial exception and (2) does not integrate that exception into a practical application, do we then look 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.

*See* Guidance.

Step 1

Section 101 provides that “[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.” 35 U.S.C. § 101.

Initially, we determine that claims 1–8, 19, and 20 recite a “method.” A method is considered a process under section 101. *See* 35 U.S.C. § 100(b). Claims 9–14, 21, and 22 recite a “system.” These claims require at least a nuclear magnetic resonance measurement system, a data processing apparatus, and a memory storing computer-readable instructions. Appeal Br. 18 (Claims App.). Accordingly, we regard the claims as directed to a “manufacture” under 35 U.S.C. § 101. Claims 15–18 are to a “non-transitory computer-readable medium.”<sup>2</sup> Media of this type may also qualify as a “manufacture” under 35 U.S.C. § 101. *See In re Beauregard*, 53 F.3d 1583, 1584 (Fed. Cir. 1995).

Accordingly, under Step 1 of our analysis, the claims are to processes or manufactures that fall within a statutory class of invention.

Step 2A, Prong 1

Under Step 2A, Prong 1 of the Guidance, we must determine whether claim 1, being directed to a statutory class of invention, nevertheless recites a judicial exception.

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<sup>2</sup> Claims 16–18 are rejected as directed to “transitory” matter which does not fall within any statutory category. Final Act. 13–14 (citing *In re Nuijten*, 500 F.3d 1346, 1357 (Fed. Cir. 2007)). We do not accept the Examiner’s reasoning in this regard as these claims incorporate each of the limitations of claim 15, from which they depend, including the requirement that the computer readable medium be “non-transitory.” *See* 35 U.S.C. § 112(d).

In finding claim 1 to be ineligible, the Examiner determines as follows:

Claim 1 is directed to a method, which is directed to accessing a mathematical model, computing an apparent hydrogen index, and computing a subterranean fluid viscosity value, which are all based on nuclear magnetic resonance data[.]

Claim 1 is directed to an abstract idea because it is directed to the fundamental process of using mathematical formulas/models to determine viscosity. A mathematical formula/model is a patent-ineligible abstract idea. *Alice Corp.*, 134 S. Ct. at 2355, citing *Parker v. Flook*, 437 U.S. 564, 589 (1978) (“Reasoning that an algorithm, or mathematical formula, is like a law of nature, Benson applied the established rule that a law of nature cannot be the subject of a patent.”).

Final Act. 8. The Examiner further finds that the process of claim 1 can be performed in the human mind. *Id.*

Appellant does not clearly argue that claim 1 (or any claim) does not “recite” an abstract step. *See Appeal Br., generally.*

Claim 1 requires “accessing a viscosity model.” The Specification teaches as follows regarding viscosity models:

Process 400 includes accessing a viscosity model that relates a subterranean fluid viscosity variable to an apparent hydrogen index variable (402). For example, the model may include an equation (e.g.,  $\eta = aHI_{app}^2 + bHI_{app} + c$ , or another equation) or a database that specifies a relationship (e.g., a linear relationship, a polynomial relationship, etc.) or correlation among respective variables that represent the subterranean fluid viscosity, the apparent hydrogen index, and others.

Spec. ¶ 41. Thus, the viscosity model “relates a subterranean fluid viscosity variable to an apparent hydrogen index variable.” *Id.* That is, the model determines a mathematical relationship between fluid viscosity and apparent

hydrogen index. This recites a mathematical concept, which is abstract. *See* Guidance 52.

Claim 1 further requires “computing an apparent hydrogen index value” and “computing a subterranean fluid viscosity value.” Appeal Br. 17 (Claims App.). The Specification teaches that “the hydrogen index of a particular substance can be calculated by finding the ratio of the concentration of hydrogen atoms per volume (e.g., cm<sup>3</sup>), to that of pure water to a given temperature (e.g., 75°C).” Spec. ¶ 30. The Specification additionally teaches that “in some cases, a fitted function 304a-d can be a quadratic equation in the form:

$$\eta = aHI_{app}^2 + bHI_{app} + c$$

***where  $\eta$  is a variable representing the subterranean fluid viscosity.*** *Id.* ¶ 38 (emphasis added). In view of such teachings, these “computing” steps fall within the category of “mathematical formulas or equations, mathematical calculations,” i.e., mathematical concepts, which are abstract ideas. *See* Guidance 52.

Accordingly, we determine that claim 1 (and its dependent claims 2–8, 19, and 20) recites abstract subject matter that falls within a judicial exception to § 101. As the system claims (claims 9–14, 21, and 22) and *Beauregard* claims (claims 15–18) include the same limitations, we additionally find that these claims recite a judicial exception to § 101.

#### Step 2A, Prong 2

Next, we determine whether the claim is directed to the abstract concept itself or whether it is instead directed to some technological implementation or application of, or improvement to, this concept. *See, e.g., Alice*, 573 U.S. at 223 (discussing *Diamond v. Diehr*, 450 U.S. 175 (1981)).

Appellant treats the claims collectively, arguing that when viewed as a whole the Claims are directed to a concrete concept of unconventionally determining a viscosity of a subterranean region based on a viscosity model and an apparent hydrogen index value, wherein the viscosity model does not use a common variable such as a relaxation time variable, and the apparent hydrogen index value is computed based solely on NMR logging data.

Appeal Br. 8.

The Guidance provides that a claim that integrates a judicial exception into a practical application is not “directed to” the judicial exception. Guidance 54. One evaluates integration into a practical application by identifying whether there are any additional elements recited in the claim beyond the judicial exception and evaluating those additional elements individually and in combination to determine whether they integrate the exception into a practical application. *Id.* at 54–55. Here, each step of claim 1 is abstract. Appellant does not present argument regarding any specific tangible claim limitation in the context of integration into a practical application. *See* Appeal Br. 7–9. Accordingly, Appellant has not shown any “additional elements” that incorporate the abstract steps into a practical application.

In its Reply Brief, Appellant argues that the Examiner “over-generalizes the Claims and ignores claim terms that impose meaningful limits on the judicial exception.” Reply Br. 2. Appellant then argues that the Examiner does not accord sufficient weight to the details of the subterranean model, the apparent hydrogen index value and subterranean fluid viscosity value computations. *Id.*

Appellant’s argument lacks merit as it concerns the details of an abstract step, not any additional (nonabstract) element. Accordingly, there is no showing of error applicable to Step 2A, prong 2 of the analysis for any claim.

Step 2B

Next, we determine whether the claim includes additional elements that render the claims patent eligible because the additional elements provide significantly more than the judicial exception. *Alice*, 573 U.S. at 217–18 (quoting *Mayo*, 566 U.S. at 72–73). In particular, we consider whether any additional elements or combination of elements add a specific limitation or limitations that transform the subject matter of a claim into a patent eligible “inventive concept.”

As above, each step of the process of claim 1 is abstract in nature, accordingly, there are no “additional elements” to provide significantly more than the judicial exception. This is also true of method claims 2–7, 19, and 20 (each of which adds mathematical step limitations) which depend from claim 1. Claims 15–18 are similar to claims 1–4 apart from the “non-transitory computer-readable medium” limitation which is generic in nature. *See Spec.* ¶ 53; Fig. 7. Accordingly, we determine that claims 1–7 and 15–20 do not include additional limitations that provide significantly more than the judicial exception.

Appellant presents separate argument with regard to claims 8–14. Appeal Br. 13–14. Claim 8 includes a limitation requiring “a downhole NMR logging instrument” and claims 10–14 require “a nuclear magnetic resonance (NMR) measurement system.” *Id.* at 13. Appellant argues that these machines “implement important steps of the respective method and

system as they acquire the NMR logging data that provides the sole basis for computing the apparent hydrogen index.” *Id.* The Examiner finds that “the NMR measurement system as claimed is generic, well-known and has a conventional and routine functionality in this technology, e.g. downhole NMR logging instruments function to log downhole NMR data; thus, nothing significantly more is added.” Final Act. 3–4; Answer 11. Appellant does not specifically dispute that the recited measurement devices are conventional. *See* Appeal Br., *generally*.

Accordingly, we determine that Appellant has not shown error in the Examiner’s conclusion that “the down hole NMR measurement logging instrument of Claim 8, and the nuclear magnetic resonance measurement system of Claim 9, are well-known, routine and conventional in the art and do not amount to significantly more than the abstract idea.” Answer 11; *see also id.* at 13.

Although not argued by Appellant, we further note that independent claim 9 (a system claim) requires “a computing system,” a “data processing apparatus,” and a “memory storing computer-readable instructions” in addition to a “nuclear magnetic resonance (NMR) measurement system.” Appeal Br. 18 (Claims App.). We consider these additional elements both individually and in combination to determine whether they amount to significantly more than the identified abstract elements. Guidance 56.

When considered individually, computing systems, data processing apparatus, and computer memory are well-understood, routine, conventional activities previously known to the industry. Spec. ¶¶ 2, 57, 59. Even when considered as an ordered combination, the additional elements perform as

expected and are merely well-understood, routine, conventional components commonly used in the industry. *Id.*

Appellant additionally argues that the present claims do not preempt the use of the judicial exceptions (abstract steps) at issue. Appeal Br. 14–15. Appellant cites the PTO’s July 2015 Update, Appendix 1 in support of its argument that the claims do not preempt the use of “the alleged abstract idea” and are therefore directed toward patent eligible subject matter. *Id.* Appellant cites to Example 26 which concerns a claim to an internal combustion engine comprising “an air intake manifold, an exhaust manifold, a combustion chamber, a throttle position sensor, an exhaust gas recirculation valve, and a control system. *July 2015 Update: Subject Matter Eligibility*, 80 Fed. Reg. 45429 (July 30, 2015) (hereinafter “July 2015 Guidance”), App. 1 at 20. The July 2015 Guidance provides that “the claim’s description of an internal combustion engine having manifolds, valves, and sensors forming a specific structure that uses the control system to optimize exhaust gas recirculation makes it clear that the claim as a whole would clearly amount to significantly more than any recited exception.” *Id.*

Appellant additionally cites to Example 2 of the PTO’s *2014 Interim Guidance on Patent Subject Matter Eligibility* (“2014 Interim Guidance”).<sup>3</sup> Appeal Br. 15. The 2014 Interim Guidance teaches that a robotic arm having a sensor and a control system that uses information from the sensor to adjust the velocity of the end effector of the arm to achieve smooth motion is patent eligible. 2014 Interim Guidance 32.

The examples cited by Appellant differ from the instant claims due to the manner in which the multiple nonabstract limitations function as an

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<sup>3</sup> 79 Fed. Reg. 74618–33 (Dec. 16, 2014).

ordered combination. The present claims have either no nonabstract elements or a limited number of conventional nonabstract elements specified at a high level of generality.

Further, the Federal Circuit has held that “the absence of complete preemption does not demonstrate patent eligibility.” *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1379 (Fed. Cir. 2015). Accordingly, Appellant has not shown error on this basis.

### CONCLUSION

The Examiner’s rejection is affirmed.

In summary:

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1-22	101	Subject Matter Eligibility	1-22	

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

**AFFIRMED**