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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MOKHLES MUSTAPHA MEZGHANI,
MUSTAFA AL IBRAHIM, and
JOHANNES JACOBUS MARIA BUITING

Appeal 2017-010166
Application 13/902,333
Technology Center 2800

Before GEORGE C. BEST, AVELYN M. ROSS, and
SHELDON M. McGEE, *Administrative Patent Judges*.

BEST, Administrative Patent Judge.

DECISION ON APPEAL

The Examiner finally rejected claims 1–33 of Application 13/902,333 under 35 U.S.C. § 101 as directed toward non-statutory subject matter. Final Act. (August 19, 2016). Appellants[1] seek reversal of the rejection pursuant to 35 U.S.C. § 134(a). We have jurisdiction under 35 U.S.C. § 6.

For the reasons set forth below, we ***affirm***.

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[1] Saudi Arabian Oil Co. is identified as an applicant and the real party in interest. Appeal Br. 2.

BACKGROUND

The '333 Application relates generally to oil exploration and production, and, "more particularly, to estimating capillary pressure for basin exploration and reservoir development and production." Spec. ¶ 1. Capillary pressure is a property of the particular basin that may be used to compute the original hydrocarbon in place and estimate a basin recovery factor. *Id.* ¶ 2. Reservoir modeling and simulation allows prediction of reservoir dynamic behavior, reduces uncertainties on reservoir model predictions, and allows optimization of exploration activities and reservoir development. *Id.*

Claim 1 is representative of the '333 Application's claims and is reproduced below from the Claims Appendix.

> 1. A computer-implemented method for determining capillary pressure in a reservoir, the method comprising:
>
> accessing well log data associated with the reservoir from a well log for a well, the well log data comprising permeability log data, porosity log data, water saturation log data, and oil saturation log data;
>
> determining Thomeer parameters from the permeability log data, the porosity log data, the water saturation log data, and the oil saturation log data, the Thomeer parameters comprising a fractional bulk volume, a pore geometrical factor, and a minimum entry pressure, the determining comprising:
>
> determining a modeled permeability;
>
> determining a modeled porosity;
>
> determining a modeled water saturation, and
>
> evaluating an objective function based on one or more linear equality constraints, one or more linear inequality constraints, and one or more nonlinear equality constraints, the objective function comprising:

$$F(T) = \frac{w}{2}\|(1 - Sw_{FAL}) - So(T)\|^2 + \frac{(1-w)}{2}\|T - \hat{T}\|^2$$

wherein T is the Thomeer parameters,

Sw_{FAL} is the value of the water saturation data,

So(T) is a modeled oil saturation;

the one or more linear equality constraints comprising:

$$\sum_{i=1}^{n} B\, v_i(Pc) = \alpha * \phi_{FAL}$$

wherein Bv_i is a fractional bulk of volume occupied by mercury,

Pc is an applied capillary pressure;

α is the conversion factor from mercury-air to oil-water,

n is the number of pore systems in the reservoir,

ϕ_{FAL} is the porosity data;

the one or more linear inequality constraints comprising:

$Bv_i^{min} \leq Bv_i(Pc) \leq Bv_i^{max}\ for\ 1 \leq i \leq n$

$G_i^{min} \leq G_i \leq G_i^{max}\ for\ 1 \leq i \leq n$

wherein G_i is the pore geometrical factor,

$Pd_i^{min} \leq Pd_i \leq Pd_i^{max}\ for\ 1 \leq i \leq n$

wherein Pd_i is a minimum entry pressure,

$If\ Bv_i(Pc) \neq 0\ then\ Bv_i + 1(Pc) \leq Bv_i(Pc)\ for\ 1 \leq i \leq n-1,$

$Pd_i \leq Pd_i + 1\ for\ 1 \leq i \leq n-1,$ and

the one or more nonlinear equality constraints comprising:

$K(T) = K_{FAL}(20)$

wherein *K(T)* is the modeled permeability,

K_{FAL} is the permeability log data; and

> determining the capillary pressure of the reservoir using a Thomeer model having the determined Thomeer parameters.

Appeal Br. 23–24.

Claims 11, 20, and 32 are the other independent claims on appeal. Claim 11 is a *Beauregard* claim embodying the method of claim 1, claim 20 is a claim directed to a system comprising one or more processors programmed to evaluate the function described in claim 1, and claim 32 is directed to a generalized computer-implemented method for determining capillary pressure in a reservoir.

REJECTION

On appeal, the Examiner maintains the following rejection: Claims 1–33 are rejected under 35 U.S.C. § 101 because the claimed invention is directed to a judicial exception (i.e., a law of nature, a natural phenomenon, or an abstract idea) without significantly more.

DISCUSSION

The Patent Act defines patent-eligible subject matter as including "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof." 35 U.S.C. § 101. The courts have created certain exceptions to the literal scope of § 101. In particular, laws of nature, natural phenomena, and abstract ideas are not patent-eligible. *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 71 (2012).

Since the Supreme Court's decision in *Alice Corp. v. CLS Bank Int'l*, 134 S. Ct. 2347 (2014), patent-eligible subject matter has been distinguished from patent-ineligible laws of nature, natural phenomena, and abstract ideas

using a two-step process. *Id.* at 2355. The first step requires us to "determine whether the claims at issue are directed to one of those patent-ineligible concepts." *Id.* If they are, we must then analyze whether the claim elements, either individually or as an ordered combination, contain an "'inventive concept'" that "'transform[s] the nature of the claim' into a patent-eligible application." *Id.* (quoting *Mayo*, 566 U.S. at 72–73).

Appellants present separate arguments for two groups of claims: Group A, consisting of claims 1–31, and Group B, consisting of claims 32 and 33. *See* Appeal Br. 10–22. We address these groups separately below.

Group A

Appellants argue for reversal of the rejection of claims 1–31 as an undifferentiated group. Appeal Br. 10–17. We select claim 1 as representative of this group. Claims 2–31 stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv) (2015).

For the reasons set forth below, we determine that claim 1 of the '333 Application is directed to patent-ineligible subject matter.

Step 1. Appellants argue that the Examiner erred by determining that claim 1 is directed to an abstract idea. Appeal Br. 10–13. In particular, Appellants argue that the Examiner erred by

(1) failing "to properly identify the abstract idea to which the claims as a whole are directed," *id.* at 10;

(2) analogizing claim 1 to "economic concepts found by the courts to be abstract ideas," *id.* at 11;

(3) ignoring the fact that claim 1 is directed to a clear improvement in computer-related technology, *id.* at 11–12; and

(4) ignoring the fact that claim 1 does not preempt all processes for achieving the desired result, *id.* at 12–13.

We address these arguments in turn.

First, Appellants argue that the Examiner reversibly erred because

> [u]nder the first step of the *Alice* inquiry, the Examiner must determine whether the claim as a whole is directed to excluded subject matter such as an abstract idea. Here, Appellant[s] respectfully submit[] that the rejection fails to properly identify the abstract idea to which the claims as a whole are directed. Instead the Examiner has merely taken almost all of the claim elements recited in [Appellants'] claims and labeled that language to be an abstract idea.[] Appellant[s] respectfully assert[] that this practice deviates from the examination required by *Alice* and is improper.

Appeal Br. 10–11 (citation omitted).

This argument does not persuade us that the Examiner reversibly erred. The Examiner identified the claim steps determined to be an abstract idea. The fact that the Examiner did not give that portion of the claim a pithy name that identifies the nature of the abstract idea is not reversible error. To the extent that such a name is required, we determine that Appellants' claim is directed to the abstract idea of using inverse problem theory to estimate Thomeer parameters from well log data. *See, e.g.*, Spec. ¶¶ 33–75.

Second, Appellants argue that the Examiner erred because the Examiner stated that

> [t]he claim recites, in part, a computerized method for performing the steps of computing a value representing the capillary pressure of the reservoir. These steps describe the concept of an algorithm or formula for computing a value *i.e.*[,] capillary pressure. The concept described in claim 1 is not meaningfully different than those economic concepts found by

> the courts to be abstract ideas *e.g.*[,] a mathematical relationship/formula.

Final Act. 2.

Appellants argue that claim 1, when taken as a whole, is not directed to an economic concept. Appeal Br. 11.

This argument is not persuasive of reversible error. The Examiner did not say that claim 1 encompassed an economic concept. Rather, the Examiner determined that, *for the purpose of determining whether claim 1 is directed to patent-ineligible subject matter,* that there was no meaningful difference between the subject matter of claim 1 and economic concepts courts have found to be patent-ineligible *for the purpose of the § 101 analysis*. Final Act. 2. Making this sort of analogy is not reversible error.

Third, Appellants argue that claim 1 is analogous to the claims at issue in *McRO, Inc. v. Bandai Namco Games America Inc.*, 837 F.3d 1299 (Fed. Cir. 2016). Appeal Br. 11–12. In *McRO*, the Federal Circuit determined that the claims at issue were not directed to an abstract idea because they were focused on a specific improvement of the relevant technology. *McRO*, 837 F.3d at 1316 ("When looked at as a whole, claim 1 is directed to a patentable, technological improvement of the existing . . . techniques."); *see also Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1336 (Fed. Cir. 2016) (finding claims directed to a specific improvement in the way computers operate to be patent-eligible).

Appellants argue that claim 1, as a whole, is directed to "a clear improvement in computer-related technology." Appeal Br. 11. According to Appellants,

> prior to the invention described in the present application, it was not possible to accurately determine capillary pressures from standard well log data. As a result, the embodiments

> recited in the claims enable performance of a function not previously performable by a computer. By enabling the use of capillary pressure determinations from standard well log data, the recited embodiments provide for the more efficient (i.e., less costly and time-consuming) determinations of capillary pressure of a reservoir.

Id. at 12.

"The Supreme Court has suggested that claims 'purport[ing] to improve the functioning of the computer itself,' or 'improv[ing] an existing technological process' might not succumb to the abstract idea exception." *Enfish*, 822 F.3d at 1335 (citing *Alice*, 134 S. Ct. at 2358–59). Appellants seek to invoke this exception. Appeal Br. 11–12. We, therefore, must ask whether the focus of claim 1 is on a specific asserted technological improvement or, instead, on a process that qualifies as an abstract idea for which computers are merely invoked as a tool. *See Enfish*, 822 F.3d at 1335–36; *see also McRO*, 837 F.3d at 1314 ("We therefore look to whether the claims in these patents focus on a specific means or method that improves the relevant technology or are instead directed to a result or effect that itself is the abstract idea and merely invoke generic processes and machinery.").

We begin by looking to the language of claim 1. At a very general level, claim 1 is directed to a three step process, the steps comprising (1) data acquisition, (2) determining Thomeer parameters from the acquired data using a particular set of calculations, and (3) determining reservoir capillary pressure using the results from step (2). When seen at this level of generality, it is clear that claim 1 is directed to the abstract idea of using inverse problem theory to determine Thomeer parameters from well log data, i.e., step (2). Step (1) merely requires the computer to gather data, and

step (3) uses the determined Thomeer parameters to perform a standard calculation of reservoir capillary pressure.

Thus, we determine that claim 1 is directed to an abstract idea. We note that our determination is consistent with other cases involving similar claims. For example, the Federal Circuit has determined claims to be directed to an abstract idea where "[t]he focus of the asserted claims . . . is on collecting information, analyzing it, and displaying certain results of the collection and analysis." *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353 (2016). As the Federal Circuit has explained:

> Information as such is an intangible. Accordingly we have treated collecting information, including when limited to particular content (which does not change its character as information), as within the realm of abstract ideas. In a similar vein, we have treated analyzing information by steps people go through in their minds, or by mathematical algorithms, without more, as essentially mental processes within the abstract-idea category.

Id. at 1353–54 (citations omitted).

In this case, claim 1 combines the abstract ideas of data collection and mathematical manipulation of the collected data. As such, it is clearly focused upon an abstract idea.

In this regard, claim 1 of the '333 Application is similar to the claims in dispute in *Parker v. Flook*, 437 U.S. 584 (1978).

> In *Flook*, claims requiring the use of a specific equation were unpatentable because they simply provided a new and presumably better method of calculating alarm limit values. The mathematical formula itself was an abstract idea and the computer implementation was purely conventional because the use of computers for automatic monitoring-alarming was well known.

McRO, 837 F.3d at 1312 (quote marks, brackets, and citations omitted).

In sum, we determine that claim 1 of the '333 Application is directed to an abstract idea.

Fourth, Appellants argue that claim 1 is not an abstract idea because it does not preempt all processes for determining reservoir capillary pressure. Appeal Br. 12–13. Appellants assert that "the clear absence of preemption is an independent confirmation that claims 1–31 are not directed to the judicial exception of an abstract idea and are thus patentable subject matter." *Id.*

We disagree. We begin by noting that Appellants are considering whether claim 1 preempts all methods of determining reservoir capillary pressure. This is the wrong question because it is framed at too high a level of abstraction. The proper question is whether claim 1 preempts all use of the underlying abstract idea, which is the use of inverse problem theory to derive Thomeer parameters from well log data. *See Alice*, 134 S. Ct. at 2354–55 (explaining that the judicially created exception placing abstract ideas outside the scope of patentable subject matter arises from concerns about preemption).

For the purpose of this opinion, it does not matter whether claim 1 preempts all use of inverse problem theory to derive Thomeer parameters from well log data. Even if we were to assume that it does not, a finding that claim 1 is directed to patent-eligible subject matter is not compelled. As the Federal Circuit has explained, "[w]hile preemption may signal patent ineligible subject matter, the absence of complete preemption does not demonstrate patent eligibility." *Ariosa Diagnostics Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1379 (Fed. Cir. 2015).

Step 2. Appellants argue that claim 1 includes significantly more than the alleged abstract idea. Appeal Br. 13–17. In particular, Appellants argue that claim 1 effects an improvement in another technology or technical field

and thus is analogous to the claims in *Diamond v. Diehr*, 450 U.S. 175 (1981), or *In re Abele*, 684 F.2d 902, 908–09 (CCPA 1982). *Id.*

For the following reasons, we do not find Appellants' arguments persuasive.

In the second step of the *Alice* test, we consider the elements of each claim, individually and as an ordered combination, to determine whether additional elements transform the nature of the claim into a patent-eligible application of the law of nature, natural phenomenon, or abstract idea. *See Mayo*, 566 U.S. at 77–80. "The Supreme Court has described the second step of this analysis as a search for an 'inventive concept'—i.e., an element or combination of elements that is 'sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself.'" *Ariosa Diagnostics*, 788 F.3d at 1375 (quoting *Mayo*, 566 U.S. at 72–73).

Once again, we begin by looking to claim 1's language. In addition to the abstract idea, claim 1 requires implementing the abstract idea in a computer environment, a data collection step, and an additional calculation step. None of the additional elements added by claim 1 are sufficient to transform the subject matter of claim 1 into a patent-eligible invention.

We begin considering claim 1's preamble, which requires that implementation of the abstract idea using a computer. As the Supreme Court has stated,

> if a patent's recitation of a computer amounts to a mere instruction to implement an abstract idea on a computer, that addition cannot impart patent eligibility. This conclusion accords with the pre-emption concern that undergirds our § 101 jurisprudence. Given the ubiquity of computers, . . . wholly generic computer implementation is not generally the sort of additional feature that provides any practical assurance that the

> process is more than a drafting effort designed to monopolize the abstract idea itself.

Alice, 134 S. Ct. at 2358 (internal quote marks, brackets, ellipses, and citations omitted).

Similarly, routine data collection of the sort required by claim 1 is insufficient to impart patentability. *See, e.g.*, *OIP Techs., Inc. v. Amazon.com, Inc.*, 788 F.3d 1359, 1364 (Fed. Cir. 2015) (explaining that "well-understood, routine, conventional data-gathering activities . . . do not make the claims patent eligible.").

Finally, claim 1's step of "determining the capillary pressure of the reservoir using a Thomeer model having the determined Thomeer parameters" also is insufficient. As the '333 Application's Specification explains, the Thomeer model is routinely used to determine reservoir capillary pressure using input values of the Thomeer parameters. Spec. ¶¶ 16–31. This step is not sufficient to render the subject matter of claim 1 patent-eligible. As the Federal Circuit has explained,

> [w]ithout additional limitations, a process that employs mathematical algorithms to manipulate existing information to generate additional information is not patent eligible. "If a claim is directed essentially to a method of calculating, using a mathematical formula, even if the solution is for a specific purpose, the claimed method is nonstatutory."

Digitech Image Techs., LLC v. Elecs. for Imaging Inc., 758 F.3d 1344, 1351 (Fed. Cir. 2014) (quoting *Flook*, 437 U.S. at 595 (internal quotations omitted)).

Nor does consideration of the method recited in claim 1 as an ordered set of steps demonstrate an inventive concept sufficient to transform a claim directed to a patent-ineligible abstract idea into patent-eligible subject matter. As discussed above, the additional elements added to the abstract

idea in claim 1 amount to nothing more than an instruction to take the abstract idea, apply it with a computer, and then perform additional mathematic calculations.

We have considered Appellants' arguments that claim 1 is analogous to claims found to be patent eligible in *Diehr* and *Abele*. Appeal Br. 14, 16. We find these arguments to be unpersuasive.

As the Supreme Court explained, *Diehr's* overall process was patent eligible because of the way the additional steps of the process integrated the known mathematical equation into the process as a whole. *Mayo*, 566 U.S. at 80–81. Those steps included "'installing rubber in a press, closing the mold, constantly determining the temperature of the mold, constantly recalculating the appropriate cure time through the use of the formula and a digital computer, and automatically opening the press at the proper time.'" *Id.* (quoting *Diehr*, 450 U.S. at 187). Indeed, as the Court noted in *Alice*, the process in *Diehr* used a thermocouple to constantly record the temperature within the rubber mold, which was "something 'the industry ha[d] not been able to obtain.'" 134 S. Ct. at 2358 (quoting *Diehr*, 450 U.S. at 178 and n.3).

In contrast, claim 1 directs a computer to access standard well log data that is routinely maintained in the industry, use an arguably novel and nonobvious mathematical technique to derive Thomeer parameters from this standard data set,[2] and then perform a standard calculation of reservoir capillary pressure. Thus, claim 1 is, if anything, the negative image of *Diehr*'s claims. Appellants' proposed analogy, therefore, is unpersuasive.

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[2] We express no opinion regarding whether the subject matter of claim 1 is, in fact, novel and not obvious as those terms are used in §§ 102 and 103.

The proposed analogy to the claims in *Abele* is similarly unpersuasive. In *Abele*, the Federal Circuit found that claims directed to a method used to improve the quality of a CAT scan image while reducing the patient's exposure to x-rays were patent eligible using the *Freeman/Walter/Abele* test. *Abele*, 684 F.2d at 908–09. The Court found that applicants had discovered "an application of an algorithm to process steps which are themselves part of an overall process which is statutory." *Id.* at 909.

In this case, however, the abstract idea is substantially the entirety of the claimed subject matter. The portions of claim 1 that are not part of the abstract idea are themselves routine. Appellants do not argue that they would be patentable in the absence of those portions of the claim that constitute the abstract idea.

Group B

Appellants argue for reversal of the rejection of claims 32 and 33 as a group. Appeal Br. 17–22. We select claim 32 as representative of this group. Claim 33 will stand or fall with claim 32. 37 C.F.R. § 41.31(c)(1)(iv).

Claim 32 reads:

> 32. A computer-implemented method for determining capillary pressure in a reservoir, the method comprising:
>
> accessing well log data associated with the reservoir for a well log for a well, the well log data comprising permeability log data, porosity log data, water saturation log data, and oil saturation log data;
>
> determining a fractional bulk volume, a pore geometrical factor, and a minimum entry pressure from the well log data, the determining comprising:
>
> evaluating an objective function measuring the difference between the permeability log data and the modeled

> permeability, the porosity log data and a modeled porosity, and the oil saturation log data and a modeled oil saturation, the modeled permeability, the modeled porosity, and the modeled oil saturation each a function of the fractional bulk volume, the pore geometrical factor, and the minimum entry pressure; and determining the capillary pressures of the reservoir using the fractional bulk volume, the pore geometrical factor, and the minimum entry pressure,.[3]

Appeal Br. 32.

Appellants' arguments for reversal of the rejection of claim 32 as directed to a patent-ineligible abstract idea are substantially the same as the arguments presented with respect to the rejection of claim 1. *See* Appeal Br. 17–22. As discussed above, we did not find those arguments persuasive with respect to claim 1, and we also do not find them persuasive with respect to the rejection of claim 32. We, therefore, affirm the rejection of claims 32 and 33 under 35 U.S.C. § 101 as directed to patent-ineligible subject matter.

CONCLUSION

For the reasons set forth above, we affirm the rejection of claims 1–33 of the '333 Application.

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

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[3] For the purpose of this opinion, we assume that the final comma in claim 32 as reproduced in the Claims Appendix is a typographical error. If prosecution of the '333 Application continues, correction is suggested.