UNITED STATES PATENT AND TRADEMARK OFFICE

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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 DINGDING CHEN,
CHRISTOPHER MICHAEL JONES,
DAVID L. PERKINS, and LI GAO

_____

Appeal 2018-000069
Application 14/435,394
Technology Center 2800

_____

Before GEORGE C. BEST, AVELYN M. ROSS, and
JENNIFER R. GUPTA, *Administrative Patent Judges.*

GUPTA, *Administrative Patent Judge.*

DECISION ON APPEAL[1]

Appellant[2] appeals under 35 U.S.C. § 134(a) from the Examiner's
final decision rejecting claims 1–15. We have jurisdiction under 35 U.S.C.
§ 6(b).

We AFFIRM-IN-PART.

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[1] In this Decision, we refer to the Final Office Action dated October 14,
2016 ("Final Act."), the Appeal Brief filed April 13, 2017 ("Appeal Br."),
the Examiner's Answer dated August 11, 2017 ("Ans."), and the Reply Brief
filed October 3, 2017 ("Reply Br.").
[2] Appellant is the Applicant, Halliburton Energy Services, Inc., which,
according to the Appeal Brief, is the real party in interest. Appeal Br. 2.

The subject matter of the claims on appeal relates to a method for designing integrated computational elements ("ICE") that utilizes a genetic algorithm to evolve the thickness of ICE layers using a constrained multi-objective function. Spec. 1, ll. 5–8. ICE structures are used in optical computing devices to perform calculations, as opposed to the hardwired circuits of conventional electronic processors. *Id.* at 4, ll. 4–5. When electromagnetic radiation interacts with a substance, unique physical and chemical information about the substance is encoded in the electromagnetic radiation that is transmitted through or radiated from the sample. *Id.* at ll. 5–8. This information is often referred to as the substance's spectral "fingerprint." *Id.* at ll. 8–9. The ICE structure extracts the spectral fingerprints of multiple characteristics or analytes within a substance and, using multivariate regression techniques, directly converts that information into a detectable output regarding the overall properties of the substance. *Id.* at ll. 9–12.

Claim 1, reproduced below from the Appeal Brief's Claims Appendix, is illustrative of the claims on appeal.

> 1. A method to design an integrated computation element ("ICE") structure, the method comprising:
>
> defining at least one characteristic of a proposed ICE structure comprising a plurality of ICE layers;
>
> selecting an ICE structure as defined by the at least one characteristic;
>
> utilizing a genetic algorithm to optimize a thickness of the plurality of ICE layers, thereby calculating one or more optimized designs; and
>
> outputting the one or more optimized designs.

Appeal Br. 13 (Claims App.).

REJECTIONS

The Examiner maintains[3] the following rejections on appeal:

Rejection 1: Claims 1–7 and 9–15 under 35 U.S.C. § 101 as directed to patent ineligible subject matter (Ans. 3); and

Rejection 2: Claims 1, 2, 4–8, and 10–15 under pre-AIA 35 U.S.C. § 102(b) as anticipated by Werner et al. (US 2011/0085232 A1, published April 14, 2011) ("Werner") (Ans. 10).

DISCUSSION

We review the appealed rejections for error based upon the issues identified by Appellant and in light of the arguments and evidence produced thereon. *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 . . . .")). After considering the evidence presented in this Appeal and each of Appellant's arguments, we are not persuaded that Appellant identifies reversible error except where otherwise explained below. Thus, where we affirm the Examiner's

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[3] The Examiner has withdrawn the rejection of claims 1–19 under 35 U.S.C. § 101 (Final Act. ¶ 2), the rejection of claims 1, 2, 4, and 13 under 35 U.S.C. § 112, second paragraph (Final Act. ¶ 4), the rejection of claims 1–8 and 10–15 under pre-AIA 35 U.S.C. § 102(b) as anticipated by Pelizzo (US 2010/0239822 A1, published September 23, 2010) ("Pelizzo") (Final Act. ¶ 18), and the rejection of claim 9 under pre-AIA 35 U.S.C. § 103(a) as obvious over Pelizzo or Werner in view of Shakespeare et al. (US 2012/0010841 A1, published January 12, 2012) ("Shakespeare") (Final Act. ¶ 32). Ans. 2.

rejection, we do so for the reasons expressed in the Final Office Action and the Answer. We add the following.

Rejection 1

Appellant argues the claims subject to Rejection 1 as a group. *See* Appeal Br. 4–8. We confine our discussion to claim 1, which we select as representative. 37 C.F.R. § 41.37(c)(1)(iv).

A two-step framework for determining whether claimed subject matter is judicially-excepted from patent eligibility under § 101 is set forth in *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 566 U.S. 66, 78–79 (2012), and further explained in *Alice Corp. v. CLS Bank International*, 134 S. Ct. 2347 (2014). The first step requires determining whether the claims at issue are directed to a patent-ineligible concept, such as an abstract idea. *See Alice*, 134 S. Ct. at 2355 (citing *Mayo*, 566 U.S. at 76–77). The second step requires examining "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*, 134 S. Ct. at 2357 (quoting *Mayo*, 566 U.S. at 72, 79).

We are not persuaded that the Examiner is overgeneralizing the claims as mere "mathematical procedures, operations and computations based on data provided" and has not considered the claims as a whole, as Appellant contends. Appeal Br. 7. Rather, the Examiner properly considered the elements of claim 1 as a whole under the two-step *Alice* analysis. Final Act. 5; Ans. 3–6. The Examiner explains that the claims are directed to an abstract idea of "optimizing a thickness of the ICE layers or optimizing the design of [an] ICE structure utilizing a genetic algorithm without additional elements that are sufficient to amount to significantly more." Final Act. 5.

The Examiner further explains that claim 1's steps of defining at least one characteristic and selecting an ICE structure are mere extra solution activity of data gathering for the algorithm procedures, operations, and computations, and the step of outputting the one or more optimized designs is post solution activity of displaying the results of those mathematical procedures, operations, and computations, and thus do not amount to significantly more than the abstract idea. *Id.*; Ans. 3, 5; *see also In re Bilski*, 545 F.3d 943, 963 (Fed. Cir. 2008) (en banc), *aff'd sub nom. Bilski v. Kappos*, 130 S. Ct. 3218 (2010) (characterizing data gathering steps as insignificant extra-solution activity); *Bilski*, 130 S. Ct. at 3230 (quoting *Diamond v. Diehr*, 450 U.S. 175, 191–92 (1981) ("the prohibition against patenting abstract ideas 'cannot be circumvented by attempting to limit the use of the formula to a particular technological environment' or adding 'insignificant postsolution activity.'").

Appellant argues that the claims are patent eligible because the present claims are directed to improvements in computer-related technology like those found patent eligible in *McRO, Inc. v. Bandai Namco Games America Inc.*, 837 F.3d 1299 (Fed. Cir. 2016). Appeal Br. 4–6. Contrary to Appellant's contention, the claims here are distinguishable from those the Federal Circuit determined to be patent eligible in *McRO*. The claimed improvement in *McRO* was in allowing computers to produce "accurate and realistic lip synchronization and facial expressions in animated characters" that previously could only be produced by human animators, unlike here, where the claimed improvement is in a mathematical technique—reducing the required computing requirement, power, and cost by using a simplified computational algorithm. Spec. 16, ll. 11–25. On this record, Appellant has

not sufficiently explained how the claimed method improves computer-related technology by allowing a computer to perform a function not previously performable by a computer. *See Alice*, 134 S.Ct. at 2358–59; *see also Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1336 (Fed. Cir. 2016).[4] In fact, Appellant's Specification admits that conventional ICE design optimization approaches are performed by a computer, albeit in a less efficient manner. Spec. 1, l. 29–2, l. 11, 16, ll. 11–28.

Moreover, Appellant has not adequately explained how the selection of an ICE design through application of a genetic algorithm (i.e., a mathematical algorithm) that optimizes the thickness of ICE layers "goes well beyond a mere mathematical concept." Appeal Br. 7.

Appellant argues that the claims do not seek to preempt or tie up any judicial exception, and therefore are patent eligible. Appeal Br. 8.

Appellant's argument is not persuasive because although "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). Additionally, where claims are deemed to recite only patent ineligible subject matter under the two-step *Alice* framework, as the Examiner has done here, "preemption concerns are fully addressed and made moot." *Id.*

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[4] The present claims are distinguishable from those found patent eligible in *Enfish* because they focus on tasks for which computers are invoked merely as a tool, not on an improvement to computer functionality itself. *Enfish*, 822 F.3d at 1336 ("the plain focus of the claims is on an improvement to computer functionality itself [, embodied in the self-referential table,] not on economic or other tasks for which a computer is used in its ordinary capacity.")

We have carefully considered Appellant's arguments, but we are not persuaded of reversible error in the Examiner's § 101 analysis. Accordingly, we sustain the rejection of claims 1–7 and 9–15.

Rejection 2

According to Appellant, an ICE structure is a specific type of optical element that extracts the spectral data of multiple characteristics within a substance and, using regression techniques, directly converts that information into a detectable output regarding the overall properties of the sample. Appeal Br. 9 (citing Spec. 3, l. 28–5, l. 25). Appellant argues that Werner's cited optical element is not an ICE structure as defined by Appellant, nor would one ordinarily skilled consider it as such because it is not capable of performing any regression-based analysis. Appeal Br. 10; *see also* Reply Br. 4 (Spec. 5, ll. 20–25 (citing US Patent Nos. 6,198,531, 6,529,276, and 7,920,258)).

Appellant's argument is persuasive of reversible error. According to Appellant's Specification, when electromagnetic radiation interacts with a substance, unique physical and chemical information about the substance is encoded in the electromagnetic radiation that is reflected from, transmitted through, or radiated from the sample. Spec. 4, l. 5–8. This information is often referred to as the substance's spectral "fingerprint." *Id.* at ll. 8–9. An ICE structure is an optical filter that extracts the information of the spectral fingerprint of multiple characteristics or analytes within a substance, and using regression techniques, converts that information into a detectable output regarding the overall properties of a sample. *Id.* at ll. 9–12. For example, if the sample is a gasoline sample, and if the regression embodied by the ICE structure (filter) is an octane regression vector for that particular

gasoline type, the intensity of the light output from the filter is directly
related to the octane of the sample. *See* US 6,198,531 ("US '531"), issued
March 6, 2001, 7:40–44; *see also* Spec. 5, l. 23 (citing US '531). Although
Werner describes an optical element, for example a multi-band optical
element, and teaches that the function of its optical element may be
optimized using a genetic algorithm to obtain desired optical properties
(Werner ¶¶ 3–7, 19), on this record the Examiner fails to identify sufficient
factual evidence that Werner's optical element is an ICE structure—an
optical element that extracts spectral data of multiple characteristics within a
sample and uses regression techniques to transform that information into a
detectable output regarding the overall properties of the sample.

The Examiner bears the initial burden of presenting a prima facie case
of unpatentability. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). To
serve as an anticipatory reference, "the reference must disclose each and
every element of the claimed invention." *In re Gleave*, 560 F.3d 1331, 1334
(Fed. Cir. 2009). For the reason discussed above, on this record before us,
we are persuaded that the Examiner has failed to meet the burden to
establish that claims 1, 2, 4–8, and 10–15 are anticipated by Werner.
Accordingly, we do not sustain the rejection of claims 1, 2, 4–8, and 10–15.

DECISION

The rejection of claims 1–7 and 9–15 under 35 U.S.C. § 101 is
affirmed.

The rejection of claims 1, 2, 4–8, and 10–15 under 35 U.S.C. § 102(b)
as anticipated Werner is reversed.

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

AFFIRMED-IN-PART