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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BOAZ SHAPIRA

Appeal 2019-001036
Application 14/700,205
Technology Center 2800

Before JOHN A. EVANS, JAMES W. DEJMEK, and RUSSELL E. CASS, *Administrative Patent Judges*.

DEJMEK, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant[1] appeals under 35 U.S.C. § 134(a) from a Non-Final Rejection of claims 1–3, 6–9, and 11. Appellant has canceled claims 4, 5, 10, and 12. *See* Appeal Br. 8–11. An oral hearing was scheduled for August 11, 2020, but Appellant waived the hearing. *See* Resp. to Notice of Hearing (filed July 31, 2020). We have jurisdiction over the remaining pending claims under 35 U.S.C. § 6(b). *See Ex parte Lemoine*, 46 USPQ2d 1420, 1423 (BPAI 1994) (precedential).

We reverse.

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[1] Throughout this Decision, we use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42 (2018). Appellant identifies Aspect Imaging Ltd. as the real party in interest. Appeal Br. 1.

STATEMENT OF THE CASE

Introduction

Appellant's disclosed and claimed invention generally relates to "detecting cyclic electromagnetic perturbations that penetrate into the field of view of a magnetic resonance imaging system." Spec. ¶ 1. According to the Specification, cyclic electromagnetic perturbations are a source of artifacts in MRI measurements, which inherently have a low signal-to-noise ratio. Spec. ¶¶ 2–3. The Specification describes the perturbations as having an amplitude α and a frequency v. Spec. ¶ 2. In a disclosed embodiment, the frequency and amplitude of the perturbing signal are determined during the acquisition of a spin-echo spectrum in a magnetic resonance device. Spec. ¶ 7. According to the Specification, once the frequency of the perturbing signal is determined, it may be extracted from the resulting magnetic resonance image. *See* Spec. ¶ 59.

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

> 1. A method for a magnetic resonance device to remove a perturbing cyclic electromagnetic signal included within a spin-echo spectrum measurement taken by the magnetic resonance device, the method comprising:
>
> acquiring, by the magnetic resonance device, a plurality of n 2D NMR spectra, each of said 2D NMR spectra having a Ω_{TR} axis, a Ω_{τ}, and a different value of T_R;
>
> selecting, by the magnetic resonance device, a peak in each of said n 2D NMR spectra, said peak having a peak value along said Ω_{τ} axis, a peak value along said Ω_{TR} axis, and an area $A(\Omega_{\tau}, \Omega_{TR})$;
>
> calculating, by the magnetic resonance device, for each n, possible frequencies of said peak along said Ω_{TR} axis;

eliminating, by the magnetic resonance device, results that do not match the peak value of said peak along said Ω_{TR} axis, thereby obtaining *v*;

determining the amplitude α of said perturbing electromagnetic signal, comprising:

calculating $\emptyset_{\alpha=1}(t_\tau,\ t_{TR})$ from $\emptyset(t_\tau,\ t_{TR}) = -\frac{4\pi}{\omega}\Big(sin(\emptyset_0 + \omega_x t_\tau + \omega t_{TR})\big(1 - cos(\omega t_\tau)\big)\Big)$, [sic] where $\omega_x = \omega(1 + N_{TR}\Delta t_{TR} / \Delta t_\tau)$;

determining said amplitude α from $\emptyset_{\alpha=1}(t_\tau, t_{TR})$;

removing, by the magnetic resonance device, said perturbing electromagnetic signal from the spin-echo measurement to obtain a spin-echo signal without the unwanted electromagnetic signal; and

producing, by the magnetic resonance device, at least one magnetic resonance image based on the obtained spin-echo signal.

The Examiner's Rejection

Claims 1–3, 6–9, and 11 stand rejected under 35 U.S.C. § 101 as being directed to patent-ineligible subject matter. Non-Final Act. 3–7.

ANALYSIS[2]

Appellant disputes the Examiner's conclusion that the pending claims are directed to patent-ineligible subject matter. Appeal Br. 3–6; Reply Br. 1–2. In particular, Appellant argues that when properly considered as a whole, the claims provide an improvement in the operation of an MRI

[2] Throughout this Decision, we have considered the Appeal Brief, filed August 28, 2018 ("Appeal Br."); the Reply Brief, filed November 16, 2018 ("Reply Br."); the Examiner's Answer, mailed November 1, 2018 ("Ans."); and the Final Office Action, mailed May 14, 2018 ("Final Act."), from which this Appeal is taken.

device. Appeal Br. 3–6; Reply Br. 1–2. Appellant asserts the claims are necessarily rooted in computer technology and amount to significantly more than a mental process or mathematical relationship, as determined by the Examiner. Appeal Br. 3–6.

The Supreme Court's two-step framework guides our analysis of patent eligibility under 35 U.S.C. § 101. *Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208, 217 (2014). In addition, the Office has published revised guidance for evaluating subject matter eligibility under 35 U.S.C. § 101, specifically with respect to applying the *Alice* framework. USPTO, 2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50 (Jan. 7, 2019) ("Office Guidance"). If a claim falls within one of the statutory categories of patent eligibility (i.e., a process, machine, manufacture, or composition of matter) then the first inquiry is whether the claim is directed to one of the judicially recognized exceptions (i.e., a law of nature, a natural phenomenon, or an abstract idea). *Alice*, 573 U.S. at 217. As part of this inquiry, we must "look at the 'focus of the claimed advance over the prior art' to determine if the claim's 'character as a whole' is directed to excluded subject matter." *Affinity Labs of Tex., LLC v. DIRECTV, LLC*, 838 F.3d 1253, 1257–58 (Fed. Cir. 2016). Per the Office Guidance, this first inquiry has two prongs of analysis: (i) does the claim recite a judicial exception (e.g., an abstract idea), and (ii) if so, is the judicial exception integrated into a practical application. Office Guidance, 84 Fed. Reg. at 54. Under the Office Guidance, if the judicial exception is integrated into a practical application, *see infra*, the claim passes muster under § 101. Office Guidance, 84 Fed. Reg. at 54–55. If the claims are not directed to an abstract idea, the inquiry ends. *See McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1312 (Fed.

Cir. 2016). However, if the claim *is* directed to a judicial exception (i.e., recites a judicial exception and does not integrate the exception into a practical application), the next step is to determine whether any element, or combination of elements, amounts to significantly more than the judicial exception. *Alice*, 573 U.S. at 217; Office Guidance, 84 Fed. Reg. at 56.

The Examiner concludes the claims are directed to an abstract idea because it organizes information through mathematical correlations, or could be carried out as a mental process, "at least in principle." Non-Final Act. 3–6 (citing *Parker*,[3] *Classen*,[4] and *Electric Power*[5]). Moreover, the Examiner finds the claims do not recite significantly more than the abstract idea, and that the claims merely recite generic functions that are well-understood, routine, and conventional. Non-Final Act. 6–7; *see also* Ans. 4–5 (finding the claimed magnetic resonance device is well-understood, routine, and conventional).

We disagree that the instant claims recite a scenario analogous to that in *Electric Power*. Rather, in *Electric Power*, the court determined the focus of the pending claims was "on collecting information, analyzing it, and displaying certain results of the collection and analysis." *Elec. Pwr.*, 830 F.3d at 1353. Further, the court explained that "[i]nformation as such is an intangible" and that the collection of information falls within the realm of abstract ideas. *Elec. Pwr.*, 830 F.3d at 1353. In addition, "analyzing information by steps people go through in their minds, or by mathematical

[3] *Parker v. Flook*, 437 U.S. 584 (1978).

[4] *Classen Immunotherapies, Inc. v. Biogen IDEC*, 659 F.3d 1057 (Fed. Cir. 2015).

[5] *Electric Power Group, LLC v. Alstom S.A.*, 830 F.3d 1350 (Fed. Cir. 2016).

algorithms, without more [are treated] as essentially mental processes within the abstract-idea category." *Elec. Pwr.*, 830 F.3d at 1354.

As an initial matter, we disagree that the claims recite a method that can, as a practical matter, be carried out within one's mind. *See Research Corp. Techs. v. Microsoft Corp.*, 627 F.3d 859, 868 (Fed. Cir. 2010) (a method for rendering a halftone image of a digital image by comparing, pixel by pixel, the digital image against a blue noise mask was found to recite patent-eligible subject matter because the method could not, as a practical matter, be performed entirely in a human's mind); *SiRF Tech., Inc. v. Int'l Trade Comm'n.*, 601 F.3d 1319, 1331–33 (Fed. Cir. 2010) (a method for calculating an absolute position of a GPS receiver and an absolute time of reception of satellite signals was found to recite patent-eligible subject matter because there was "no evidence . . . that the calculations here [could] be performed entirely in the human mind"). Specifically, the human mind alone cannot perform the steps of "acquiring, by the magnetic resonance device, a plurality of *n* 2D NMR spectra," "selecting, by the magnetic resonance device, a peak in each of said *n* 2D NMR spectra," "removing, by the magnetic resonance device, said perturbing signal from the spin-echo measurement to obtain a spin-echo signal without the unwanted electromagnetic signal," and "producing, by the magnetic resonance device, at least one magnetic resonance image based on the obtained spin-echo signal," as recited in claim 1. Rather, those steps require use of the magnetic resonance device to acquire the spectra, remove perturbing signals, and produce an image. Accordingly, the instant claims are not directed to a mental process (a category of abstract ideas).

Although we agree that the claims involve mathematical calculations (i.e., mathematical correlations), we are mindful that "an invention is not rendered ineligible for patent simply because it involves an abstract concept." *Alice*, 573 U.S. at 271. As set forth in the claims, cyclic electromagnetic perturbations that occur during spin echo measurements are detected and removed from a produced magnetic resonance image based on the obtained spin echo signal. *See, e.g.*, claim 1; *see also* Spec. ¶¶ 2–7.

Here, we conclude that the focus of the claims (i.e., the character of the claims as a whole) is more than merely organizing information through mathematical correlations or mental processes. Instead, we conclude the claims are directed to providing an improved magnetic resonance image based on a spin-echo measurement by detecting and removing a perturbing electromagnetic signal from the originally acquired spin-echo measurement data. *See* Spec. ¶¶ 3–4 (identifying an issue in the field of magnetic resonance imaging and a proposed solution); *see also Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1337 (Fed. Cir. 2016) (explaining the conclusion that the claims are directed to an improvement of an existing technology is bolstered by the specification's teachings).

As the court discussed in *Enfish*, claims that improve an existing technology might not succumb to the abstract idea exception of patent eligibility. *Enfish*, 822 F.3d at 1335. In *Enfish*, the court framed the first step of the *Alice* inquiry as whether the focus of the claims is on a specific asserted improvement in computer capabilities or, instead on an abstract idea that merely uses a computer as a tool for carrying out the abstract idea. *Enfish*, 822 F.3d at 1335–36.

In addition, our reviewing court has also recently concluded that claims directed to an improvement to cardiac monitoring technology were not directed to an abstract idea. *CardioNet, LLC v. InfoBionic, Inc.*, 955 F.3d 1358, 1368 (Fed. Cir. 2020). More particularly, the court concluded that the claims were patent eligible because they focus on a specific method that improves cardiac monitoring rather than being directed to a result or effect that is the abstract idea itself. *CardioNet*, 955 F.3d at 1368. Similarly, in *Thales Visionix, Inc. v. United States*, 850 F.3d 1343, 1348 (Fed. Cir. 2017), the court concluded that although the claims utilized mathematical equations to determine the orientation of an object relative to a reference frame, the claims were patent eligible because they "result in a system that reduces errors in an inertial system that tracks an object on a moving platform." As discussed above, we find that the instant claims are directed to improving magnetic resonance images based on a spin-echo measurement by detecting and removing a perturbing electromagnetic signal from the originally acquired spin-echo measurement data.

Accordingly, we conclude the claims are patent eligible under 35 U.S.C. § 101.

Moreover, analysis under the Office Guidance does not alter our conclusion. The Examiner concludes the claims are directed to an abstract idea. *See* Non-Final Act. 3–7. In particular, the Examiner concludes the claims are directed to "organizing information through mathematical correlations." Non-Final Act. 6. The Examiner explains the "claimed invention focuses on the calculation of amplitude from acquiring a plurality of spectra by mathematical formula is just acquiring data." Non-Final Act. 6.

Claim 1 is reproduced below and includes those limitations identified by the Examiner (*see* Non-Final Act. 3–7) as reciting organizing information through mathematical correlations emphasized in *italics*:

> 1. A method for a magnetic resonance device to remove a perturbing cyclic electromagnetic signal included within a spin-echo spectrum measurement taken by the magnetic resonance device, the method comprising:
>
> acquiring, by the magnetic resonance device, a plurality of *n* 2D NMR spectra, each of said 2D NMR spectra having a Ω_{TR} axis, a Ω_τ, and a different value of T_R;
>
> selecting, by the magnetic resonance device, a peak in each of said *n* 2D NMR spectra, said peak having a peak value along said Ω_τ axis, a peak value along said Ω_{TR} axis, and an area $A(\Omega_\tau, \Omega_{TR})$;
>
> calculating, by the magnetic resonance device, for each *n*, possible frequencies of said peak along said Ω_{TR} axis;
>
> eliminating, by the magnetic resonance device, results that do not match the peak value of said peak along said Ω_{TR} axis, thereby obtaining *v*;
>
> *determining the amplitude α of said perturbing electromagnetic signal, comprising:*
>
> *calculating* $\emptyset_{\alpha=1}(t_\tau, t_{TR})$ *from* $\emptyset(t_\tau, t_{TR}) = -\frac{4\pi}{\omega}\left(sin(\emptyset_0 + \omega_x t_\tau + \omega t_{TR})\left(1 - cos(\omega t_\tau)\right)\right)$*, [sic] where* $\omega_x = \omega(1 + N_{TR}\Delta t_{TR} / \Delta t_\tau)$*;*
>
> *determining said amplitude α from* $\emptyset_{\alpha=1}(t_\tau, t_{TR})$*;*
>
> removing, by the magnetic resonance device, said perturbing electromagnetic signal from the spin-echo measurement to obtain a spin-echo signal without the unwanted electromagnetic signal; and
>
> producing, by the magnetic resonance device, at least one magnetic resonance image based on the obtained spin-echo signal.

Because the claim *recites* an abstract idea (i.e., a mathematical concept such as a mathematical relationship, formula or equation),[6] we next determine whether the claim integrates the abstract idea into a practical application. Office Guidance, 84 Fed. Reg. at 54. To determine whether the judicial exception is integrated into a practical application, we identify whether there are "*any additional elements recited in the claim beyond the judicial exception(s)*" and evaluate those elements to determine whether they integrate the judicial exception into a recognized practical application. Office Guidance, 84 Fed. Reg. at 54–55 (emphasis added); *see also* Manual of Patent Examining Procedure ("MPEP") § 2106.05(a)–(c), (e)–(h) (9th ed., Rev. 08.2017, Jan. 2018).

As discussed above, we find the additional limitations integrate the abstract idea (as identified by the Examiner) into a practical application—specifically improving magnetic resonance images based on a spin-echo measurement by detecting and removing a perturbing electromagnetic signal from the originally acquired spin-echo measurement data. *See* MPEP § 2106.05(a).

For the reasons discussed *supra*, we are persuaded of Examiner error. Accordingly, we do not sustain the Examiner's rejection under 35 U.S.C. § 101 of claims 1–3, 6–9, and 11.

CONCLUSION

We reverse the Examiner's decision rejecting claims 1–3, 6–9, and 11 under 35 U.S.C. § 101.

[6] *See* Office Guidance, 84 Fed. Reg. at 52.

DECISION SUMMARY

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–3, 6–9, 11	101	Eligibility	1–3, 6–9, 11	

REVERSED