



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/549,670	11/21/2014	Hongxuan Zhang	2014P18411US	2983
28524	7590	08/21/2020	EXAMINER	
SIEMENS CORPORATION IP Dept - Mail Code INT-244 3850 Quadrangle Blvd Orlando, FL 32817			KINGSLEY, SARAH R	
			ART UNIT	PAPER NUMBER
			3791	
			NOTIFICATION DATE	DELIVERY MODE
			08/21/2020	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ipdadmin.us@siemens.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte HONGXUAN ZHANG

Appeal 2020-001171
Application 14/549,670
Technology Center 3700

Before CHARLES N. GREENHUT, MICHAEL L. HOELTER, and
ANNETTE R. REIMERS, *Administrative Patent Judges*.

HOELTER, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner's decision to reject claims 1–8 and 11–19 (i.e., all the claims on appeal).² We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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 “Siemens Healthcare GMBH.” Appeal Br. 4.

² Claims 9 and 10 have been canceled and claim 20 has been withdrawn from consideration. Final Act. 1 (Office Action Summary); Appeal Br. 4–5.

CLAIMED SUBJECT MATTER

The disclosed subject matter “relates to systems and methods for filtering patient signals.” Spec. ¶ 1. Computer-readable medium claim 1 and method claim 6 are independent. Claim 1 is illustrative of the claims on appeal and is reproduced below.

1. A non-transitory computer readable medium having embodied thereon computer-executable instructions which, when executed, cause a computer to perform steps for signal filtering, the steps comprising:

receiving an electrocardiogram signal, wherein the electrocardiogram signal includes an electrocardiogram signal component, noise, a respiration signal component and a blood pressure signal component;

removing the electrocardiogram signal component from the electrocardiogram signal to generate a first output signal by performing an electrocardiogram signature cycle matching pursuit method;

eliminating the noise from the first output signal to generate a second output signal by performing sub-bandwidth filtering of the first output signal;

removing the respiration signal component from the second output signal to generate a third output signal; and

reconstructing a time-domain blood pressure signal based on the third output signal by performing inverse fast Fourier transform (IFFT) on integrated frequency components of the third output signal.

ISSUES ON APPEAL

Claims 1–8 and 11–19³ are rejected under 35 U.S.C. § 112(a) as failing to comply with the enablement requirement. Final Act. 2.

³ In the header of paragraph 3 of the Final Office Action, the Examiner lists claims 1–5 and 8 for this rejection; however, in the body of the rejection, independent claim 6 is discussed (Final Act 2), as is claim 7 (Final Act. 4). Appellant states, “Appellant is treating claim 6 as being rejected under 35

Claims 1–8 and 11–19 are rejected under 35 U.S.C. § 101 because they recite “organiz[ing] information through mathematical correlations and/or are representative of mathematical relationships or formulas” and hence, “recite [an] abstract idea.” Final Act. 5. Alternatively, claims 1–8 and 11–19 are rejected under 35 U.S.C. § 101 because they recite steps that “could be practically performed in the mind,” and hence, also an abstract idea. Ans. 14.

ANALYSIS

*The rejection of claims 1–8 and 11–19
as failing to comply with the enablement requirement*

Both independent claims on appeal recite *an electrocardiogram (ECG) signal* that includes a blood pressure signal component.^{4,5} Appeal Br. 20, 22 (Claims App). The Examiner finds that “the disclosure does not describe how a blood pressure signal could be acquired from *an electrophysiological (EP) signal*, as these two signals [i.e., EP and blood

U.S.C. § 112(a).” Appeal Br. 9. To be clear, claim 6 is the parent (either directly or indirectly) of claims 11–19. *See* Appeal Br. 23–26 (Claims App.). In the Answer, the Examiner correctly lists claims 1–8 and 11–19 as being rejected. *See* Ans. 3. It is thus understood that claims 1–8 and 11–19 are rejected as failing to comply with the enablement requirement.

⁴ Claim 6 does not specifically recite a “blood pressure signal component”; however, claim 8, which depends from claim 6, recites “wherein the signal of interest is a blood pressure signal component.” Appeal Br. 22–23 (Claims App.). Hence, a blood pressure signal component is encompassed by the parent’s (claim 6) recitation to “a signal component of interest.”

⁵ Appellant’s Specification distinguishes between a (genus) electrophysiological (EP) signal and a (species) electrocardiogram (ECG) signal stating that an EP signal can include a “respiration signal, noise, *ECG signal*, etc.” Spec. ¶ 22 (emphasis added).

pressure] appear to be different types of signals (e.g. electrical vs. mechanical signals).” Final Act. 2 (emphasis added); *see also* Ans. 10, 11.

Further, according to the Examiner:

[W]hile the prior art does describe several examples of acquiring blood pressure from an ECG and PPG sensor using a pulse transit time, and from a PCG and ECG signal . . . , the prior art does not appear to describe methods of determining a blood pressure from an *electrophysiological signal* solely by filtering the signal. The disclosure does not provide direction on how to acquire a blood pressure waveform other than the idea that other waveforms can be filtered out, and that the blood pressure waveform can be reconstructed.

Final Act. 2–3 (emphasis added). *See also* Ans. 13.

Appellant points out that “independent claims 1 and 6 recite filtering signal components specifically from an *electrocardiogram* signal, not an *electrophysiological* signal.” Reply Br. 4. On this point, the Examiner acknowledges that “[t]he *[S]pecification* provides an example in which an ECG signal may be used to acquire a blood pressure signal, but does not limit the signal to an ECG signal.” Ans. 12–13 (emphasis added). We note, however, that the *claims* are limited to a received ECG signal which includes a blood pressure signal component. Thus, this statement by the Examiner regarding the Specification’s example would seem to buttress Appellant’s position that Appellant’s Specification is at least enabling of the recited *claims*.

Additionally, as regarding “how to acquire a blood pressure waveform,” the claims on appeal recite the steps of undertaking a first filtering operation via a “signature cycle matching pursuit method;” a second filtering operation “by performing sub-bandwidth filtering;” and reconstructing the desired blood pressure signal “by performing [an] inverse

fast Fourier transform” operation. Thus, certain methodologies are recited and as such, Appellant states that “no experimentation is required to make and use the invention of claims 1 and 6.” Appeal Br. 10.

There is merit to Appellant’s contentions. First, the Examiner’s premise is based upon the filtering of an “electrophysiological signal,” but claims 1 and 6 instead recite an “electrocardiogram signal” as noted above. The Examiner’s rejection is additionally premised on the filtering of what appears to be a generic electrocardiogram signal that may or may not contain a blood pressure signal component. *See* Final Act. 2–4; *see also* Ans. 13 (“the [S]pecification describes a method and system for extracting a blood pressure signal from a generic electrophysiological signal”). However, as indicated above, both claims 1 and 6 recite that the received and to-be-filtered ECG signal *includes* a blood pressure signal component, which is to be extracted. Appellant’s Specification also includes flowcharts and graphs, which depict how such extraction is to occur. *See also* Reply Br. 4. Paragraph 24 of Appellant’s Specification (and those that follow) begins a more detailed description of these figures and the filtering operation recited. Paragraph 25 of Appellant’s Specification states, “[t]he combination patient signal may be acquired via, for example, a single surface ECG lead.” The Examiner does not explain how these figures and associated text fail to enable the limitations of claims 1 and 6, but instead, as indicated above, the Examiner relies on faulty premises to reject these claims.

The Examiner additionally applies the various *Wands* factors to assist in the analysis. *See* Final Act. 3–4; Ans. 9. For example, the Examiner states, “[i]t is not predictable to acquire a blood pressure waveform after filtering components from an electrophysiological signal such as an ECG

signal.” Final Act. 3; *see also* Ans. 11. However, since the claims recite that the received ECG signal already contains a blood pressure signal component, the Examiner does not explain why it is not predictable to acquire a blood pressure waveform by filtering the received ECG signal.⁶

The Examiner also acknowledges that “the [S]pecification provides a method of reconstructing a blood pressure waveform after filtering several components from the ECG (see pages 19–21).” Final Act. 3. The Examiner further states, “the [S]pecification merely provides an example of filtering a signal containing various components, and does not provide specificity about what the signal being filtered is.” Final Act. 4. We disagree because claims 1 and 6 are clear that it is an ECG signal that is being filtered, and that it is the included blood pressure component that is being filtered out.

Accordingly, we conclude that the Specification provides an enabling disclosure with respect to the claimed subject matter. For these reasons, the Examiner’s rejection of claims 1–8 and 11–19, for failing to comply with the enablement requirement, is not sustained.

THE REJECTION OF CLAIMS 1–8 and 11–19
UNDER 35 U.S.C. § 101

Background

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

⁶ This is especially the case when the Examiner acknowledges that a blood pressure signal is a “distinct” signal. Ans. 11; *see also* Final Act. 2 (a “different type[]”).

ideas” are not patentable. *See, 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 Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 75–77 (2012) and in *Alice*. *See Alice*, 573 U.S. at 217–18. 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, 69 (1972)). Concepts determined to be patent eligible include physical and chemical processes, such as “molding rubber products” (*Diamond v. Diehr*, 450 U.S. 175, 192 (1981)); “tanning, dyeing, making waterproof cloth, vulcanizing India rubber, smelting ores” (*id.* at 184 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))).

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].’”⁷ *Id.* (quoting *Mayo*, 566 U.S. at 77).

Analysis

As stated above, claims 1–8 and 11–19 are rejected under 35 U.S.C. § 101 because they either recite “organiz[ing] information through mathematical correlations and/or are representative of mathematical relationships or formulas” (Final Act. 5) or because they recite steps that “could be practically performed in the mind” (Ans. 14). We proceed as

⁷ The USPTO has published revised guidance on the application of § 101. See USPTO’s January 7, 2019, Memorandum, *2019 Revised Patent Subject Matter Eligibility Guidance*, 84 Fed. Reg. 50 (Jan. 7, 2019), and supplemented at 84 Fed. Reg. 55942 (Oct. 18, 2019) (“Office Guidance”). Regarding this Office Guidance, our reviewing court stated, “the Office Guidance is not, itself, the law of patent eligibility, does not carry the force of law, and is not binding in our patent eligibility analysis.” *In re Rudy*, 956 F.3d 1379, 1383 (Fed. Cir. 2020). “To the extent the Office Guidance contradicts or does not fully accord with our caselaw, it is our caselaw, and the Supreme Court precedent it is based upon, that must control.” *Rudy*, 956 F.3d at 1383 (referencing *Cleveland Clinic Found. v. True Health Diagnostics LLC*, 760 F. App’x. 1013, 1021 (Fed. Cir. 2019) (holding claims ineligible, despite Office Guidance suggesting otherwise, where statements and examples in the Guidance were inconsistent with *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371 (Fed. Cir. 2015)): see also *In re Zach Zunshine*, No. 2020-1254, 2020 WL 3816803, at *2 (Fed. Cir. July 8, 2020) (addressing “the Office Guidance, which we recently reiterated does not modify or supplant controlling case law”).

instructed by our reviewing courts:

1. Do the claims fall within a Statutory Category of § 101?

As an initial matter, we must first ascertain whether independent claims 1 and 6 recite one of the enumerated statutory classes of subject matter that is eligible under 35 U.S.C. § 101, namely, a process, machine, manufacture, or composition of matter. Claim 1 recites “[a] non-transitory computer readable medium” and claim 6 recites “[a] method.” Appeal Br. 20, 22 (Claims App.). We thus conclude that claims 1 and 6 recite an enumerated statutory class of subject matter under 35 U.S.C. § 101. The Examiner does not indicate otherwise. *See* Final Act. 5–6.

2. Are Claims 1 and 6 Directed to a Mathematical Concept or a Mental Process?

In the Final Office Action, the Examiner determines that claims 1 and 6 recite “recite [an] abstract idea” for the reasons expressed above. Final Act. 5; *see also* Ans. 14. Regarding the “mathematical concept” analysis employed by the Examiner, the Examiner states that these claims are abstract because the filtering technique is performed via “an inverse Fast Fourier Transform” operation. Final Act. 5. In other words, “they merely organize information through mathematical correlations and/or are representative of mathematical relationships or formulas.” Final Act. 5.

Appellant contends, “[t]he claims do not recite a mathematical relationship, formula, or calculation. While some of the claim features may be based on mathematical concepts, the mathematical concepts are not recited in the claims.” Appeal Br. 17. For example, “claims 1 and 6 recite various steps for signal filtering and a signal reconstruction step that is

merely based on or involves inverse fast Fourier transform (IFFT).” Reply Br. 6.

Indeed, the reconstructing step recited in claims 1 and 6 states “performing inverse fast Fourier transform (IFFT) on integrated frequency components of the third output signal.” Appeal Br. 20, 23 (Claims App.). However, we do not find that claims 1 and 6 are directed to a mathematical concept by virtue of one step thereof merely reciting a particular methodology (IFFT) by which to reconstruct a signal. The Examiner, on the other hand, bases the “mathematical concept” rationale on this particular recitation to an IFFT operation while also contending that the remaining limitations “do not include additional elements that are sufficient to amount to significantly more.” Final Act. 5.

We also disagree with the Examiner’s latter analysis (“[t]he claim(s) . . . do not include additional elements [that] amount to significantly more” (Final Act. 5)) as well, because claims 1 and 6 specify discrete steps by which the desired blood pressure signal is to be obtained. For example, claim 1⁸ recites removing the ECG signal component from the received signal so as to generate a first output signal by a “cycle matching pursuit method.” Noise is then eliminated to generate a second output signal by performing sub-bandwidth filtering of the first output signal. Afterwards, the respiration signal component is removed from the second output signal so as to generate a third output signal. From this third signal, a blood pressure signal is reconstructed using an IFFT operation on this third output signal. *See also* Appeal Br. 18.

⁸ Claim 6 includes similar language.

Thus, in the matter before us, “[t]he asserted [] claims are analogous to the claims at issue in *Diehr* and *Thales*⁹. Like the claims in *Diehr*, the asserted claims ‘describe in detail a step-by-step method’ for accomplishing a physical process” (*XY, LLC v. Trans Ova Genetics, LC*, 2020 WL 4378028, *5 (Fed. Cir. 2020)), and thus integrate the recited mathematical concept into a practical application.

In view of the above, we are not in agreement with the Examiner’s analysis that the remaining limitations (i.e., all but the IFFT operation) “do not include additional elements that are sufficient to amount to significantly more.” Final Act. 5. Consequently, we disagree with the Examiner’s analysis that claims 1 and 6 recite “organiz[ing] information through mathematical correlations and/or are representative of mathematical relationships or formulas” and as such are directed to an abstract idea of a “mathematical concept.” Final Act. 5.

Regarding the Examiner’s alternate rejection based on “mental process,” the Examiner states that “the steps of eliminating noise from the first output signal, and removing the respiration signal component *could be practically* performed in the mind, as ‘sub-bandwidth filtering’ could be defined as simple thresholding through observationally evaluating sections of data.” Ans. 14; emphasis added. The Examiner reasons that “if a claim limitation, under its broadest reasonable interpretation, covers performance of the limitation in the mind but for the recitation of generic computer components, then it is recognized as an abstract idea because it recites a mental process.” Ans. 14.

⁹ *Thales Visionix Inc. v. United States*, 850 F.3d 1343 (Fed Cir. 2017).

Appellant references the “October 2019 Update at pages 7-8” as clarifying “that *a claim with limitations that cannot practically be performed in the human mind does not recite a mental process.*” Reply Br. 5.

Appellant contends that, “[f]or example, claim 1 requires a several-step manipulation of signals that **cannot be practically applied in the human mind.**” Reply Br. 6. In short, Appellant contends that the claimed steps cannot be “practically performed in the human mind, at least because **they require a processor to manipulate the signal and reconstruct the blood pressure signal.**” Reply Br. 6–7.

There is merit to Appellant’s contentions. This is, in part, because the Examiner appears to recognize that the recited steps cannot necessarily be performed in the human mind when stating that they can “practically” be performed in the human mind. In other words, the Examiner is speculating that the above filtering steps “could be practically performed in the mind.” Ans. 14. The Examiner provides no support for the concept that a human mind can practically perform (a) a “cycle matching pursuit method” to generate a first output signal; (b) a “sub-bandwidth filtering” of the first output signal to generate a second output signal; (c) removal of the respiration signal component from the second output signal to generate a third output signal; and, (d) inverse fast Fourier transformation on the third output signal to reconstruct the desired blood pressure signal. *See also* Reply Br. 8.

It is also not self-evident that such steps “could be practically performed in the mind” as stated. Ans. 14. We thus fail to see how the recited steps, including the different signals that are generated, eliminated, and reconstructed, can be said by the Examiner to be “an abstract idea

because it recites a mental process.” Ans. 14. As noted above, “the asserted claims ‘describe in detail a step-by-step method.’” *XY*, 2020 WL at *5. As such, we also do not agree with the Examiner that claims 1 and 6 are directed to a mental process.

For these reasons, we conclude that claims 1 and 6 are not directed to an abstract idea, and are, instead, directed to patent-eligible subject matter. Accordingly, the rejection of claims 1–8 and 11–19 under 35 U.S.C. § 101 as being directed to patent-ineligible subject matter is not sustained.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–8, 11–19	112(a)	Enablement		1–8, 11–19
1–8, 11–19	101	Eligibility		1–8, 11–19
Overall Outcome				1–8, 11–19

REVERSED