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EXAMINER

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MARTIN TRUMP and STEFFEN BOHNE¹

Appeal 2018-005043
Application 13/891,616
Technology Center 3700

Before CHARLES N. GREENHUT, JAMES P. CALVE, and
LISA M. GUIJT, *Administrative Patent Judges*.

CALVE, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant appeals under 35 U.S.C. § 134(a) from the Office Action finally rejecting claims 1–16. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ BorgWarner BERU Systems GmbH is identified as the real party in interest (Br. 1) and also is the Applicant pursuant to 37 C.F.R. § 1.46.

CLAIMED SUBJECT MATTER

Claims 1, 15, and 16 are independent. Claim 1 is reproduced below.

1. A method for knock detection in an internal combustion engine in which a fuel/air mixture is ignited by means of a corona discharge, the method comprising:

exciting an electrical resonant circuit, in which an ignition electrode that is electrically insulated with respect to combustion chamber walls constitutes a capacitor together with the combustion chamber walls, to generate the corona discharge; and

measuring and evaluating the course of an electrical variable of the resonant circuit for knock detection, comprising:

identifying the start of fuel combustion by detecting a first extremum in the electrical variable;

after the start of fuel combustion, checking for an increase followed by a decrease or vice versa, in the electrical variable to identify a local extremum;

checking whether the increase and the decrease exceed threshold amounts;

not associating extrema falling below the threshold amounts with knocking; and

associating extrema exceeding the threshold amounts with knocking.

Br. 25 (Claims App.).

REJECTIONS

Claims 1–16 are rejected as being directed to patent-ineligible subject matter under the judicial exception to 35 U.S.C. § 101. Final Act. 11; Ans. 2–4.

Claims 1, 2, and 10–15 are rejected under 35 U.S.C. § 103(a) as unpatentable over Toedter (US 2011/0305998 A1, pub. Dec. 15, 2011) and Aoki (US 6,151,954, iss. Nov. 28, 2000). Ans. 5–12, 18.

Claims 3–7 and 16 are rejected under 35 U.S.C. § 103(a) as unpatentable over Toedter, Aoki, and Kiess (US 2003/0164025 A1, pub. Sept. 4, 2003). Ans. 12–15, 18.

Claims 8 and 9 are rejected under 35 U.S.C. § 103(a) as unpatentable over Toedter, Aoki, Kiess, and Sho (JP 2011-12671A, pub. Jan. 20, 2011). Ans. 15–17, 18.

ANALYSIS

Claims 1–16 Rejected Under 35 U.S.C. § 101

Appellant argues claims 1–16 as a group. Br. 7–13. We select claim 1 as representative with claims 2–16 standing or falling with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner finds that claim 1 is directed to an abstract idea of measuring, evaluating, identifying, checking, and associating an electrical variable and does not include any additional elements sufficient to amount to significantly more than the judicial exception. Final Act. 11. In particular, the Examiner determines that the claimed steps of measuring and evaluating, identifying, checking, and associating involve abstract ideas of collecting information, analyzing the collected information, and determining results from the analysis of the collected information. *Id.* at 12–13. The Examiner also determines that the process steps and corresponding structural features are recited at a high level of generality for performing generic actions with generic structures associated with corona discharge applications as taught by Toedter. *Id.* at 13; Ans. 21 (citing Toedter ¶¶ 2–5). Therefore, the Examiner determines that the limitations of claim 1, considered individually or as an ordered combination, do not improve a computer or other technology but recite what is already known to be conventional in the art. Final Act. 13.

We analyze patent-eligibility under *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2355 (2014) and *Mayo Collaborative Services v. Prometheus Labs., Inc.*, 566 U.S. 66 (2012). First, we consider whether the claims are directed to a patent-ineligible concept such as a law of nature, natural phenomena, or abstract idea. *Alice*, 134 S. Ct. at 2355. If so, we consider the claim elements individually and as an ordered combination to determine whether additional elements transform the claims into a patent-eligible application. *Id.* This search for an inventive concept in the second step seeks an element, or a combination of elements “sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself.” *Id.* We also consider initially whether the claims fall within a statutory category of section 101. *See Aatrix Software, Inc. v. Green Shades Software, Inc.*, 882 F.3d 1121, 1125 (Fed. Cir. 2018).²

Alice Step One: Are the Claims Directed to an Abstract Idea?

We agree with the Examiner’s determination that claim 1 is directed to an abstract idea of information processing. *See Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353–54 (Fed. Cir. 2016) (method of detecting events on an interconnected electric power grid in real time by receiving data streams from a grid and power systems, detecting and analyzing events in real-time, and displaying analysis results, diagnoses, and measurements involved abstract idea of collecting and analyzing information by steps people go through in their minds or by mathematical algorithms).

² Reciting a “*method* for knock detection in an internal combustion engine” (emphasis added) does not, by itself, make claim 1 patent eligible. *See CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1374 (Fed. Cir. 2011) (regardless of the statutory category a claim invokes, the underlying invention is considered for patent-eligibility).

Reciting a method for detecting knocks in an internal combustion engine by exciting an electrical resonant circuit does not resolve whether claim 1 is directed to an abstract idea. *See* Br. 8–9. Nor does measuring physical phenomena associated with fuel combustion. *See id.* at 9–10.

Unlike the situation in *Thales Visionix Inc. v. United States*, claim 1 recites nothing that is innovative or nonconventional regarding how the internal combustion engine, electrical resonant circuit, combustion chamber walls, or electrode are arranged or function. There is nothing unique in the way that the claimed method measures or evaluates data surrounding the combustion process. *Thales Visionix Inc. v. United States*, 850 F.3d 1343, 1348–49 (Fed. Cir. 2017) (holding that the “claims are directed to systems and methods that use inertial sensors in a non-conventional manner to reduce errors in measuring the relative position and orientation of a moving object on a moving reference frame.”).

Similarly, in *Enfish, LLC v. Microsoft Corporation*, the claims were directed to a non-conventional, self-referential table for a computer database that functioned differently than conventional databases structures. *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1337 (Fed. Cir. 2016) (the claimed invention achieves benefits over conventional databases, such as increased flexibility, faster search times, and smaller memory requirements)

Claim 1 recites a method of collecting data in a particular physical environment that is conventional and then analyzing the data to predict if a particular event (knocking) has occurred. Merely presenting the results of an abstract process of collecting and analyzing information without more is abstract as an ancillary part of the collection and analysis. *Elec. Power*, 830 F.3d at 1354.

Essentially, Appellant recognized a physical phenomenon. With an ideal fuel combustion, “the rise in the resonance frequency is continuous monotonously until the end of the corona discharge.” Spec. ¶ 13. However, “[w]ith a knocking combustion, this rise in resonance frequency is interrupted by an explosion-like partial combustion, which leads to a fall in the frequency.” *Id.* The claimed method looks for these interruptions as “extremum,” which present themselves as an increase followed by a decrease or vice versa. *See id.* ¶¶ 5, 29, Figs. 1c, 2c; Br. 25 (Claims App.).

The claimed method thus measures and evaluates electrical variables to identify a local extremum. Appellant has not identified anything about the electrical resonant circuit, combustion chamber walls, or the ignition electrode that is unconventional or innovative, either in their configuration or their use in the claimed method that would elevate the method out of the realm of the abstract under step one of *Alice*. *See* Br. 8–13.

Unlike the situation in *Thales* and *Enfish*, claim 1 does not require anything other than conventional elements that gather and analyze data. *See Elec. Power*, 830 F.3d at 1355; *Automated Tracking Solutions, LLC v. Coca-Cola Co.*, 723 F. App’x 989, 994 (Fed. Cir. 2018) (non-precedential) (claims to a system for locating, identifying and/or tracking an object with a first transponder, a reader, a processor, and a storage device “simply do not require a particular configuration or arrangement of RFID system components. Nor do the representative claims require multiple antenna coverage areas.”); *TDE Petroleum Data Solutions, Inc. v. AKM Enterprise, Inc.*, 657 F. App’x 991, 993 (Fed. Cir. 2016) (non-precedential) (claims to method for determining the state of well operations by receiving data from plural systems and comparing them to threshold limits was an abstract idea).

Alice Step Two: Do the Claims Contain an “Inventive Concept”?

We also agree with the Examiner that claim 1 does not recite any additional elements that are sufficient to elevate the abstract idea of data collection and analysis to a patent-eligible application. Final Act. 2–3; Ans. 7–8. Instead, the claimed method merely detects/collects/measures data relating to an internal engine combustion and analyzes that information.

Appellant admits that knock detection for internal combustion engines that ignite a fuel/air mixture by a corona discharge is known as is a corona ignition device. Spec. ¶¶ 2, 3. Appellant does not describe their claimed electrical resonant circuit, ignition electrode, or combustion chamber walls as innovations in internal combustion engines. Nor does claim 1 recite any innovative ways to detect, measure, or evaluate electrical variables in an internal combustion engine. Br. 2 (Summary of Claimed Subject Matter for claim 1) (citing Spec. ¶¶ 2, 3, 7, 35, 36, 38 as support for claim 1). The Examiner correctly finds that Appellant and prior art such as Toedter teach such internal combustion engines and systems as conventional. *See* Ans. 21.

We also agree with the Examiner that claim 1 is distinguishable from claims found to be patent eligible in *Diamond v. Diehr*, 450 U.S. 175 (1981) because claim 1 does not recite a process that effects any transformation or reduction of a particular article to a different state or thing. Ans. 21–22; *see Diamond*, 450 U.S. at 192 (“when a claim containing a mathematical formula implements or applies that formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect (*e. g.*, transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101.”).

[M]ere recitation of concrete, tangible components is insufficient to confer patent eligibility to an otherwise abstract idea. Rather, the components must involve more than performance of well-understood, routine, conventional activit[ies] previously known to the industry.

In re TLI Commc'ns LLC Patent Litig., 823 F.3d 607, 613 (Fed. Cir. 2016) (citing *Alice*, 134 S. Ct. at 2359 (internal quotations omitted)).

Whether considered individually, or as an ordered combination, the limitations of claim 1 do not recite an inventive concept. Instead, they use conventional components in a conventional combination or arrangement to collect and analyze data, which is an abstract idea. *See Elec. Power*, 830 F.3d at 1356 (“The claims in this case specify what information in the power-grid field it is desirable to gather, analyze, and display, including in “real time”; but they do not include any requirement for performing the claimed functions of gathering, analyzing, and displaying in real time by use of anything but entirely conventional, generic technology.”); *TLI Commc'ns*, 823 F.3d at 611–13 (“the focus of the patentee and of the claims was not on an improved telephone unit or an improved server” but rather recite physical components that merely provide a generic environment in which to carry out an abstract idea); *Automated Tracking*, 723 F. App'x at 995 (The claims do not use conventional RFID components in a non-conventional combination or arrangement. “Instead, the claims merely disclose collecting data from a particular source—RFID transponders—and analyzing that data.”).

Thus, we are not persuaded by Appellant's arguments that claim 1 represents an inventive concept simply because the method is practiced in a specific field. Br. 13–14. Nor does claim 1 represent a specific solution to a specific problem of knock detection. *Id.* at 13.

Unlike the mathematical formula used to improve a process for curing of rubber in *Diehr*, claim 1 recites a method that gathers, processes, and analyzes data, which is an abstract idea. At most, the claimed method may identify knocking based on the claimed data gathering and analysis. There is no evidence that claim 1 recites a method that *solves* the problem of knock detection as Appellant argues. Br. 13. Nor is there evidence that claim 1 recites a better method of detecting knocks in an internal combustion engine.

This is particularly true given the generality that claim 1 recites its method. Extrema are identified for an electrical variable, which can be a resonance frequency or impedance of the resonant circuit or the phase position between current and voltage. Spec. ¶ 6. Appellant discloses that knocking combustion leads specifically to vibrations of the combustion chamber contents in the acoustic frequency range and these oscillations are found in the electrical variables of the resonant circuit. *Id.* ¶ 7. There is no indication that identifying a single local extremum improves knock detection over combustion chamber vibrations. Appellant discloses that knocking is detected by third and fourth local extrema, and the differences between two or more extrema must be calculated to determine the extent of the knocking. *Id.* ¶¶ 13, 17. Even if inventive, these features are not recited in claim 1.

Appellant's arguments regarding preemption (Br. 14) are resolved by our § 101 analysis. *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1379 (Fed. Cir. 2015); *see also Two-Way Media Ltd. v. Comcast Cable Comm'ns, LLC*, 874 F.3d 1329, 1339 (Fed. Cir. 2017) (where patent claims are deemed patent ineligible, "preemption concerns are fully addressed and made moot").

For all the foregoing reasons, we sustain the rejection of claims 1–16.

*Claims 1, 2, and 10–15
Rejected As Unpatentable over Toedter and Aoki*

Appellant argues claims 1, 2, and 10–15 as a group. Br. 15–21. We select claim 1 as representative with claims 2 and 10–15 standing or falling with claim 1. 37 C.F.R. § 41.37(c)(1)(iv).

The main issue in dispute is whether Toedter and/or Aoki teach or suggest “checking for an increase followed by a decrease or vice versa, in the electrical variable to identify a local extremum” and “associating extrema exceeding the threshold amounts with knocking.” *See* Br. 15–21.

We agree with Appellant that Toedter’s disclosure of measuring an electrical variable and comparing the measured values to limit values to identify values exceeding or falling below the limit values to determine the impact on combustion chamber performance does not necessarily disclose the claimed local extremum, which requires an increase followed by a decrease and vice versa. *See id.* at 15–17.

We agree with the Examiner that Aoki cures Toedter’s deficiencies in this regard by measuring electrical variable signals using a *peak* holding unit to determine whether a knocking signal exceeds a threshold. *See* Ans. 8–9. Appellant does not dispute this finding; instead, Appellant argues that a peak holding unit merely records a peak value of the measured signal rather than determining whether a local extremum is present because an integrating unit accumulates an input quantity. Br. 19–20.

In response, the Examiner cites Figure 4B of Aoki as evidence of the measurement and recognition of local extremum. Ans. 34. Figure 4B shows the output of a band-pass filter BFP with knocking vibrations as a series of extremum, i.e., increases followed by decreases and vice versa similar to Figures 1c and 2c of Appellant’s disclosure. Spec. ¶ 29.

Appellant’s arguments do not address these findings of the Examiner and, therefore, do not apprise us of Examiner error in this regard. *See* Br. 18–20. Aoki also illustrates the prior art understanding that a “peak” is given its ordinary, customary meaning of a maximum point, i.e., an increase followed by a decrease, which corresponds to the claimed extrema. Aoki measures ionic current as an electrical variable to detect knocking.³ Aoki, 5:26–45. Like Appellant (Spec. ¶ 8), Aoki filters measured signals. Aoki, 5:28–45. Like Appellant (Spec. ¶ 9), Aoki also integrates the signals. Aoki, 5:28–45. Aoki compares measured signal peaks to threshold amounts to determine whether knocking has occurred as claimed.⁴ *Id.* at 6:19–58; Br. 20 (peak value is compared to a threshold).

Accordingly, we sustain the rejection of claims 1, 2, and 10–15.

Claims 3–7 and 16

Rejected As Unpatentable over Toedter, Aoki, and Kiess

Appellant argues the patentability of dependent claims 3–7 and independent claim 16 for the same reasons discussed for claim 1. Br. 21–22. Because we sustain the rejection of claim 1, these arguments are not persuasive and we also sustain the rejection of claims 3–7 and 16.

Claims 8 and 9

Rejected As Unpatentable Over Toedter, Aoki, Kiess, and Sho

Appellant argues patentability of claims 8 and 9 because they depend from claim 1. Br. 22. Because we sustain the rejection of claim 1, this argument is not persuasive and we sustain the rejection of claims 8 and 9.

³ Appellant discloses current as an exemplary electrical variable. Spec. ¶ 6.

⁴ Although claim 1 recites checking whether an increase or decrease exceeds threshold amounts, the Specification discloses the use of thresholds only for filtering. Spec. ¶¶ 32, 34. The Specification also discloses that detection of knocking generally involves the detection of multiple extrema. *Id.* ¶¶ 35–39.

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DECISION

We affirm the rejection of claims 1–16 as directed to patent-ineligible subject matter under the judicial exception to 35 U.S.C. § 101.

We affirm the prior art rejections of claims 1–16.

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