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EXAMINER

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* MIHAIL PETROV

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Appeal 2018-003684  
Application 15/176,351<sup>1</sup>  
Technology Center 2100

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Before ERIC S. FRAHM, CARL L. SILVERMAN, and  
MATTHEW J. McNEILL, *Administrative Patent Judges*.

McNEILL, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1–4, which are all the claims pending in this application.

We have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

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<sup>1</sup> According to Appellant, the real party in interest is the Applicant, Panasonic Corporation. App. Br. 2.

## STATEMENT OF THE CASE

### *Introduction*

Appellant's application relates to a bit interleaver for a bit-interleaved coding and modulation system with quasi-cyclic low density parity-check codes. Spec. ¶ 1. Claim 1 illustrates the appealed subject matter and reads as follows:

1. A transmitting method performed by a bit interleaver for transmitting a transmission signal generated from bits of a codeword, the codeword being generated by using a repeat-accumulate quasi-cyclic low-density parity check coding scheme, the bit interleaver including a non-transitory memory storing information indicating a permutation rule and circuitry that reorders parity portions of the codeword by parity interleaving performed in accordance with the information indicating the permutation rule, the bit interleaving method comprising:

a cyclic block permutation step of applying, using the bit interleaver, a cyclic block permutation process to a codeword made up of N cyclic blocks each consisting of Q bits, to reorder the cyclic blocks in accordance with a cyclic block permutation rule defining a reordering of the cyclic blocks;

a bit permutation step of applying, using the bit interleaver, a bit permutation process to the codeword after the cyclic block permutation process, to reorder the bits of the codeword in accordance with a bit permutation rule defining a reordering of the bits;

a dividing step of dividing, using the bit interleaver, the codeword after the bit permutation process into a plurality of constellation words, each of the constellation words being made up of M bits;

a modulating step of mapping, using the bit interleaver, each constellation word to a modulated signal; and

a transmitting step of transmitting, using the bit interleaver, the transmission signal including the modulated signal, wherein

N is not a multiple of M,

the bit permutation rule defines the reordering of the bits of the codeword after the cyclic block permutation process, such that the Q bits in each of  $N'=N-X$  cyclic blocks of the N cyclic blocks are each allocated to a bit of an identical bit index in Q constellation words and the Q constellation words are each made up of one bit in each of M cyclic blocks and such that one or more of the N cyclic blocks are excluded and interleaving is performed only to cyclic blocks remaining, the M cyclic blocks being common to the Q constellation words, where X is a remainder of N divided by M, and

a bit index of the bit in each of the Q constellation words to which the bits in each of the  $N'=N-X$  cyclic blocks are each allocated is determined in accordance with the cyclic block permutation rule.

### *The Examiner's Rejection*

Claims 1–4 stand rejected under 35 U.S.C. § 101 as being directed to patent-ineligible subject matter. Final Act. 2–3.

### ANALYSIS

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 ideas” are not patentable. *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* and *Alice*. *Id.* at 217–18 (citing *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 75–77 (2012)). 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 182 n.7 (quoting *Corning v. Burden*, 56 U.S. 252, 267–68 (1854))); and manufacturing flour (*Benson*, 409 U.S. at 69 (citing *Cochrane v. Deener*, 94 U.S. 780, 785 (1876))).

In *Diehr*, the claim at issue recited a mathematical formula, but the Supreme Court held that “[a] claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula.” *Diehr*, 450 U.S. at 187; *see also id.* at 191 (“We view respondents’ claims as nothing more than a process for molding rubber

products and not as an attempt to patent a mathematical formula.”). Having said that, the Supreme Court also indicated that a claim “seeking patent protection for that formula in the abstract . . . is not accorded the protection of our patent laws, and this principle cannot be circumvented by attempting to limit the use of the formula to a particular technological environment.” *Id.* (internal citation omitted) (citing *Benson* and *Flook*); *see, e.g., id.* at 187 (“It is now commonplace that an *application* of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection.”).

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 (citation omitted). “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].’” *Id.* (alterations in original) (quoting *Mayo*, 566 U.S. at 77). “[M]erely requir[ing] generic computer implementation[] fail[s] to transform that abstract idea into a patent-eligible invention.” *Id.*

The PTO recently published revised guidance on the application of § 101. *2019 Revised Patent Subject Matter Eligibility Guidance*, 84 Fed. Reg. 50 (Jan. 7, 2019) (“Revised Guidance”). Under that guidance, we first look to whether the claim recites:

- (1) any judicial exceptions, including certain groupings of abstract ideas (i.e., mathematical concepts, certain methods of organizing

human activity such as a fundamental economic practice, or mental processes); and

(2) additional elements that integrate the judicial exception into a practical application (*see* MPEP § 2106.05(a)–(c), (e)–(h)).

Only if a claim (1) recites a judicial exception and (2) does not integrate that exception into a practical application, do we then look to whether the claim:

(3) adds a specific limitation beyond the judicial exception that are not “well-understood, routine, conventional” in the field (*see* MPEP § 2106.05(d)); or

(4) simply appends well-understood, routine, conventional activities previously known to the industry, specified at a high level of generality, to the judicial exception.

*See* Revised Guidance.

*Revised Guidance Step 1*

Step 1 of the Revised Guidance asks whether the claimed subject matter falls within the four statutory categories of patentable subject matter identified by 35 U.S.C. § 101: process, machine, manufacture, or composition of matter. Claim 1 recites a “transmitting method.” Appellants do not argue the Examiner erred in concluding claim 1 falls within the four statutory categories of patentable subject matter. We agree with the Examiner’s conclusion because claim 1 falls within the process category.

*Revised Guidance Step 2A, Prong 1*

Under Step 2A, Prong 1 of the Revised Guidance, we determine whether the claims recite any judicial exceptions, including certain groupings of abstract ideas (i.e., mathematical concepts, certain methods of

organizing human activity such as a fundamental economic practice, or mental processes). *See Revised Guidance.*

Claim 1 recites the following limitations, among others: (1) “a codeword made up of  $N$  cyclic blocks each consisting of  $Q$  bits,” (2) “a cyclic block permutation rule defining a reordering of the cyclic blocks,” (3) “a dividing step of dividing . . . the codeword after the bit permutation process into a plurality of constellation words, each of the constellation words made up of  $M$  bits,” (4) “wherein  $N$  is not a multiple of  $M$ ,” and (5) “such that the  $Q$  bits in each of  $N' = N - X$  cyclic blocks of the  $N$  cyclic blocks are each allocated to a bit of an identical bit index in  $Q$  constellation words.”

These limitations, under their broadest reasonable interpretation, recite an algorithm for converting a data structure into another data structure because each of the limitations defines a procedure for converting the data in an initial data structure to a new data structure according to a set of defined rules, or an algorithm. For example, “a codeword made up of  $N$  cyclic blocks each consisting of  $Q$  bits,” as recited in limitation (1) defines a codeword that is operated upon by the algorithm. “A cyclic block permutation rule defining a reordering of the cyclic blocks” and “a dividing step of dividing . . . the codeword after the bit permutation process into a plurality of constellation words, each of the constellation words made up of  $M$  bits” as recited in limitations (2) and (3) define operations performed by the algorithm to reorder the data in the data structure. “Wherein  $N$  is not a multiple of  $M$ ,” and “such that the  $Q$  bits in each of  $N' = N - X$  cyclic blocks of the  $N$  cyclic blocks are each allocated to a bit of an identical bit index in  $Q$  constellation words” as recited in limitations (4) and (5) define properties of the data structures before and after the algorithm is performed. The recited

algorithm involves mathematical concepts including mathematical relationships (e.g., “wherein N is not a multiple of M” and mathematical formulas (e.g., “dividing . . . the codeword after the bit permutation process into a plurality of constellation words” and “such that the Q bits in each of N’=N-X cyclic blocks of the N cyclic blocks are each allocated to a bit of an identical bit index in Q constellation words.” The claims are similar to the “series of mathematical calculations based on selected information” in *SAP America* and the concept of hedging that can be reduced to a mathematical formula in *Bilski*. *Bilski v. Kappos*, 561 U.S. 593, 611 (2010); *SAP America, Inc. v. InvestPic, LLC*, 898 F.3d 1161, 1163 (Fed. Cir. 2018). Accordingly, we conclude the claims recite mathematical relationships and mathematical formulas, which are mathematical concepts identified in the Revised Guidance and, thus, an abstract idea.

*Revised Guidance Step 2A, Prong 2*

Under the Step 2A, Prong 2 of the Revised Guidance, we next determine whether the claims recite additional elements that integrate the judicial exception into a practical application (*see* MPEP § 2106.05(a)–(c), (e)–(h)).

The Examiner finds the claimed algorithm is not recited as an improvement or an enhancement to any hardware or system. *Id.* The Examiner further finds any nonconventional and non-generic arrangement of the claimed codewords are related solely to the algorithm itself. *Id.*

Appellant argues the claims improve the relevant technology, namely, bit-interleaved coding and modulation used in transmission/reception systems for digital communications. App. Br. 10. In particular, Appellant argues the claims recite the use of cyclic block permutation and bit

permutation rules “for interleaving bits of a codeword generated by using a repeat-accumulate quasi-cyclic low-density parity check coding scheme, which enables more efficient interleaving to be applied to codewords of quasi-cyclic low-density parity-check codes and improves bit-interleaved coding and modulation used in transmission/reception systems for digital communications.” *Id.* at 9–10 (citing Spec. ¶¶ 9–11, 49–55).

Appellant has persuaded us of Examiner error. We agree with Appellant that the claims improve the relevant technology, namely, bit-interleaved coding and modulation used in transmission/reception systems for digital communications. We, therefore, conclude the claims integrate the judicial exception into a practical application. *See* MPEP § 2106.05(a). We are guided by our reviewing court’s decision in *McRO*, where the court held that claims that recite rules allowing automation of animation tasks that could only be performed manually were not directed to an abstract idea because the claims improved animation technology. *See McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1313–14 (Fed. Cir. 2016). Like *McRO*, the claims here improve an existing technology and are, therefore, not directed to an abstract idea.

For these reasons, we do not sustain the Examiner’s rejection of independent claim 1 as directed to patent-ineligible subject matter. We also do not sustain the rejection of independent claims 2, 3, and 4, which recite commensurate subject matter.

#### DECISION

We reverse the decision of the Examiner rejecting claims 1–4.

REVERSED