UNITED STATES PATENT AND TRADEMARK OFFICE

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P.O. Box 14329
Research Triangle Park, NC 27709

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ANTHONY A. RENSHAW[1]

Appeal 2017-003375
Application 14/025,127
Technology Center 3600

Before BRADLEY W. BAUMEISTER, STACEY G. WHITE, and
ADAM J. PYONIN, *Administrative Patent Judges*.

BAUMEISTER, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134(a) from the Examiner's
Final Rejection of claims 1–13, which claims constitute all the claims
pending in this application. App. Br. 2.[2] We have jurisdiction under
35 U.S.C. § 6(b).

We affirm.

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[1] Appellant lists Axioma, Inc. as the real party in interest. Appeal Brief filed
May 6, 2016 ("App. Br.") 1.
[2] Rather than repeat the Examiner's positions and Appellant's arguments in
their entirety, we refer to the above-mentioned Appeal Brief, as well as the
following documents, for their respective details: the Final Action mailed
December 8, 2015 ("Final Act."); the Examiner's Answer mailed November
1, 2016 ("Ans."); and the Reply Brief filed December 28, 2016 ("Reply
Br.").

STATEMENT OF THE CASE

The Invention

Appellant describes the present invention as follows:

> The quantitative construction of investment portfolios of securities such as stocks, bonds, or the like using optimization is addressed. More specifically, during optimization[,] constraints on non-target factor exposures are automatically converted to constraints on the exposure of the projections of the non-target factors that are orthogonal to a specified target factor. Such constraints may be utilized to produce portfolios with superior performance to those produced with traditional factor exposure constraints.

Abstract.

Independent claim 1 illustrates the appealed claims. Claim 1 is reproduced below with emphasis added to indicate which part of the claim is directed to the fundamental economic practice of gathering financial data and analyzing the data to calculate a result:

> 1.   A computer-implemented method of *constructing a portfolio comprising*:
>
> electronically *receiving* by a programmed computer *a set of N potential investments*;
>
> electronically *receiving* by the programmed computer *an N-dimensional vector of target factor scores for each of the potential investments*;
>
> electronically *receiving and storing* by the programmed computer *at least one N-dimensional non-target factor score vector*;
>
> electronically *receiving and storing* by the programmed computer *data defining an [sic] requirements that must be satisfied by an N-dimensional vector of investment allocations that includes upper and lower bound exposure constraints limiting the largest and smallest values of each vector inner*

product of a non-target factor score vector and the investment allocation vector;

determining a projection of each non-target factor score vector that is orthogonal to the target factor score vector;

computing by the programmed computer *an investment allocation vector for said requirements where the upper and lower bound exposure constraints are computed as vector inner products of the projection of each non-target factor score vector that is orthogonal to the target factor score vector and the investment allocation vector;* and

electronically *outputting the optimal investment allocation vector* using an output device.

Rejections on Appeal[3]

Claims 1–13 stand rejected under 35 U.S.C. § 101 as being directed to patent-ineligible subject matter. Final Act. 12–13.

Claims 1, 3, and 4 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Almgren (US 2006/0190371 A1; published Aug. 24, 2006). Final Act. 16–22.

Claims 2 and 5 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Almgren and Stubbs (US 7,698,202 B2; issued Apr. 13, 2010). Final Act. 22–25.

Claims 6–8 and 10–12 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Almgren and Hsu (US 2012/0246094 A1; published Sept. 27, 2012). Final Act. 25–33.

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[3] Claims 1–5 previously were rejected respectively under 35 U.S.C. § 112, ¶ 1, and claims 10–13 previously were rejected under 35 U.S.C. § 112, ¶ 2 (Final Act. 13–14), but the Examiner withdrew those rejections in the Advisory Action mailed March 21, 2016. *See also* App. Br. 2 (reconfirming that these rejections have been withdrawn).

Claims 9 and 13 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Almgren, Hsu, and Stubbs. Final Act. 33–35.

Standard of Review

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).

THE § 101 REJECTION

The Rejection and Contentions

The Examiner determines that the claims are directed to an abstract idea—"a series of steps instructing how to optimize an investment portfolio[,] which is a fundamental economic practice." Final Act. 12. The Examiner further determines that the claims do not include additional elements that are sufficient to amount to significantly more than the judicial exception. *Id.* at 12–13; *see also, e.g., id.* at 4 ("multiplication by a computer of data is using computers to do what computers do") (emphasis omitted). According to the Examiner, the claims, instead, generically recite computer elements that would have been routine in any computer implementation. *Id.* at 13. Accordingly, the Examiner concludes that the claims are directed to patent-ineligible subject matter. *Id.*

Appellant asserts that the claims are not directed to an abstract idea. App. Br. 12–16. Appellant further asserts that to the extent an abstract concept is employed, the concept is employed to a patent-eligible "new and useful end" and that the claims, considered as a whole, amount to significantly more than the abstract idea. *Id.* at 16.

We address the specifics of these arguments in the Analysis section below.

Principles of Law

A. SECTION 101

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 Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66 (2012), and *Alice. Alice*, 573 U.S. at 217–18 (citing *Mayo*, 566 U.S. at 75–77). 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,

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such as "molding rubber products" (*Diamond v. Diehr*, 450 U.S. 175, 191 (1981)); "tanning, dyeing, making water-proof 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 176; *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.*

B. USPTO SECTION 101 GUIDANCE

The United States Patent and Trademark Office ("USPTO" or "the Office") recently published revised guidance on the application of § 101. USPTO's January 7, 2019 Memorandum, *2019 Revised Patent Subject Matter Eligibility Guidance*, 84. Fed. Reg. 50 (Jan. 7, 2019) ("2019 Memorandum" or "Office Guidance"). Under that guidance, we first look to whether the claim recites the following:

> (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)).[4]

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 is not "well-understood, routine, conventional" in the field (*see* MPEP § 2106.05(d)); or

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[4] We acknowledge that some of these considerations may be evaluated properly under Step 2 of *Alice* (Step 2B of the Office Guidance). Solely for purposes of maintaining consistent treatment within the Office, we evaluate this inquiry under Step 1 of *Alice* (Step 2A of the Office Guidance).

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

Analysis

THE CLAIMS ARE DIRECTED TO AN ABSTRACT IDEA

Appellant argues that the present claims generally are related to improved computer-implemented methods of constructing a financial portfolio. App. Br. 12. More specifically, Appellant argues that the claims are directed to "new and useful processes or machines" "for reducing exposure to non-target factors, commonly referred to as unintended bets." *Id.* Appellant argues that "the claims do not constitute simply 'the abstract idea of a series of steps of instructing how to optimize an investment portfolio[,] which is a fundamental economic practice,'" as stated by the Examiner. *Id.* at 13 (citing Final Act. 12).

According to Appellant, "[a]ll of the [disclosed] approaches are very specific in how they seek to optimize portfolios, and to differentiate themselves from one another in the marketplace." *Id.* at 13–14. Appellant urges that "[t]hese approaches are not abstract at all as they are implemented in systems employed around the world which are advantageously employed in the management of billions of dollars of investments." *Id.* at 14. Appellant then recites the limitations of claim 1 to support these assertions. *Id.* at 14–15. Appellant argues that the claims are similar to those of *DDR Holdings, LLC v Hotels.com, L.P.*, 773 F.3d 1245 (Fed. Cir. 2014) because the "unconventional steps[,] when considered as a whole[,] confine the invention to a particular useful application." *Id.* at 15.

These arguments are unpersuasive. The fact that Appellant's claims may recite very specific approaches for optimizing portfolios does not mean the claims recite improvements to the functioning of a computer or to any other technology or technical field. *See, e.g., Flook,* 437 U.S. at 593 ("respondent incorrectly assumes that if a process application implements a principle in some specific fashion, it automatically falls within the patentable subject matter of § 101."). In the present case, Appellant does not point sufficiently to any *technical* problem that is being overcome. Appellant's claims merely recite very specific improvements to business practices that are carried out on a computer. In particular, Appellant improves upon known portfolio optimization software by providing software that will automatically adjust any exposure constraint based on the degree of overlap between the exposure constraint and one or more target factors. Spec. 8; *see DDR,* 773 F.3d at 1257 (distinguishing a claimed solution necessarily rooted in computer technology in order to overcome a problem specifically arising in the realm of computer networks from claims that "merely recite the performance of some business practice known from the pre-Internet world along with the requirement to perform it on the Internet"). "[I]n *Mayo,* the Supreme Court emphasized that satisfying the machine-or-transformation test, by itself, is not sufficient to render a claim patent-eligible, as not all transformations or machine implementations infuse an otherwise ineligible claim with an 'inventive concept.'" *Id.* at 1256.

As noted above, the 2019 Memorandum instructs us first to determine whether any judicial exception to patent eligibility is recited in the claim. The guidance identifies three judicially-excepted groupings: (1) mathematical concepts, (2) certain methods of organizing human

behavior such as fundamental economic practices, and (3) mental processes. We focus here on the second grouping—certain methods of organizing human behavior such as fundamental economic practices.

Claim 1 merely recites the steps of using a computer to carry out the fundamental economic practice that entails the following steps:

(i)   gathering financial data:

> *receiving . . . a set of N potential investments*;
>
> *receiving . . . an N-dimensional vector of target factor scores for each of the potential investments*;
>
> *receiving and storing . . . at least one N-dimensional non-target factor score vector*;
>
> *receiving and storing . . . data defining an [sic] requirements that must be satisfied by an N-dimensional vector of investment allocations that includes upper and lower bound exposure constraints limiting the largest and smallest values of each vector inner product of a non-target factor score vector and the investment allocation vector*;

(ii)   analyzing the data to calculate a result (an investment allocation vector):

> *determining a projection of each non-target factor score vector that is orthogonal to the target factor score vector*;
>
> *computing* by the programmed computer *an investment allocation vector for said requirements where the upper and lower bound exposure constraints are computed as vector inner products of the projection of each non-target factor score vector that is orthogonal to the target factor score vector and the investment allocation vector*; and

(iii)   displaying or otherwise outputting that result:

> *outputting the optimal investment allocation vector.*

Thus, like the concept of intermediated settlement in *Alice*, and the concept of hedging in *Bilski*, the series of steps instructing how to optimize an investment portfolio, as recited in Appellant's claims, 'is a fundamental economic practice long prevalent in our system of commerce.' *Alice*, 573 U.S. 216 (citations and internal quotation marks omitted). Accordingly, we agree with the Examiner that claim 1 is directed to a fundamental economic practice, and as such, directed to an abstract idea. Final Act. 12–13.

Regarding the dependent claims, Appellant nominally addresses claims 2–13. App. Br. 15–16. However, Appellant's treatment of these claims merely constitutes reciting the language of each claim. *Id.* As such, Appellant's treatment of these claims does not constitute an argument on the merits. "A statement [that] merely points out what a claim recites will not be considered an argument for separate patentability of the claim." 37 C.F.R. § 41.37(c)(1)(iv).

THE CLAIMS DO NOT INTEGRATE THE ABSTRACT IDEA INTO A PRACTICAL APPLICATION

Appellant next argues that to the extent an abstract concept is employed, the claims are patent eligible because they recite a specific context and approach to the usage of the abstract concept and "the claim is not attempting to tie up the entire abstract idea." App. Br. 16. This argument is unpersuasive.

We recognize that the Supreme Court has described "the concern that drives this exclusionary principle [i.e., the exclusion of abstract ideas from patent eligible subject matter] as one of pre-emption." *Alice*, 573 U.S. at 216. However, characterizing preemption as a driving concern for patent eligibility is not the same as characterizing preemption as the sole test for

patent eligibility. As our reviewing court has explained: "The Supreme Court has made clear that the principle of preemption is the basis for the judicial exceptions to patentability" and "[f]or this reason, questions on preemption are inherent in and resolved by the § 101 analysis." *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1379 (Fed. Cir. 2015) (citing *Alice*, 573 U.S. at 216). Although "preemption may signal patent ineligible subject matter, the absence of complete preemption does not demonstrate patent eligibility." *Id.*

In further regard to the question of whether the claims add other meaningful limitations or integrate the abstract idea into a practical application, Appellant returns to the argument that "the present invention is necessarily rooted in computer technology." App. Br. 17. This argument still is unpersuasive because Appellant again describes the purported technical problems as being "problems in existing portfolio determination strategies, as addressed at length in the Background of the Invention, as noted above. More particularly, among its several aspects, the present invention identifies the problem presented by unintended bets in such previous strategies." *Id.* Appellant then again recites the steps of claim 1 and alleges that the claimed "problem solution is similar to the way in which Internet-centric problems were solved in DDR Holdings." *Id.* at 18.

Just as these arguments do not dissuade us that the claims are directed to an abstract idea under the first step of the *Alice* framework, these arguments likewise do not persuade us that the claims recite limitations that are transformative, solve a problem rooted in computer technology, or otherwise add meaningful limitations that integrate the abstract idea into a practical application, as required by the 2019 Memorandum. Appellant's

arguments improperly conflate purported improvements to the underlying abstract idea with improvements to elements that are additional to the abstract idea. We determine there are no such improvements to elements that are additional to the abstract idea in the present case.

THE RECITED COMPUTER ELEMENTS ARE USED FOR WELL-UNDERSTOOD, ROUTINE, AND CONVENTIONAL ACTIVITIES

We likewise agree with the Examiner's further determination that the additionally claimed elements, when viewed individually and as an ordered combination, merely recite known computer elements specified at a high level of generality and being used for well-understood, routine, and conventional activities. Specifically, the Examiner cites to passages of Appellant's Specification that provide prima facie evidence supporting the Examiner's conclusion. *See* Ans. 8 (citing Spec. 11:11–18). Appellant does not provide persuasive rebuttal evidence that any technology is improved. *See* App. Br. 16–19; Reply Br. 1–4. Appellant, instead, only provides arguments that conflate the additional elements with the underlying abstract idea. Furthermore, Appellant acknowledges that commercial portfolio optimization software was known. *See, e.g.*, Spec. 5:9–15; *see also* Reply Br. 4 ("commercial optimization software has, for over 30 years, allowed portfolio managers to form optimized portfolios with constraints on the exposures").

For the foregoing reasons, Appellant has not persuaded us of error in the Examiner's determination that the claims are directed to patent-ineligible subject matter. Accordingly, we sustain the Examiner's rejection of claims 1–13 under 35 U.S.C. § 101.

The § 103 REJECTIONS

The Rejections and Contentions

The Examiner finds that "Almgren et al. teaches *maximizing* inner product for optimizing portfolio return using return and risk[, but does] not teach *minimizing* the inner product." Final Act. 20 (emphasis added and omitted). The Examiner finds that Almgren teaches that (1) various minimax techniques can be used to generate optimal portfolios (*id.* (citing Almgren ¶ 6)); (2) allowable weight vectors are determined based on one or more constraints, including a risk limit constraint (*id.* (citing Almgren ¶ 15)); (3) the goal of finding preferred portfolio vectors subject to constraints is equivalent to maximizing the scalar quantity for a given level of variance (*id.* (citing Almgren ¶ 35)); and (4) risk constraints can be determined based on maximum permissible volatility (*id.* (citing Almgren ¶ 67)).

The Examiner concludes

> It would have been obvious . . . to include in the maximizing inner product method and system of Almgren et al.[,] the ability to use various minimax techniques also taught by Almgren et al. [because] the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable. Further motivation is provided by the need to limit (minimize) risk and volatility as taught by Almgren. One of ordinary skill in the art would recognize that a minimum inner product would result in reduced risk for an expected return.

Final Act. 20–21 (emphasis omitted).

Appellant argues, *inter alia*, that Almgren does not teach or suggest modifying linear constraints, as presently claimed. App. Br. 22. According

to Appellant, "[t]he orthogonalized constraints have not been suggested in the prior art." *Id.* We understand Appellant to be arguing that Almgren does not teach or suggest computing an investment allocation vector where both the upper and lower bounds (i.e., the maximum and minimum) exposure constraints are computed as vector inner products of the claimed projection.

Analysis

Almgren teaches generally that various minimax techniques can be used to generate optimal portfolios. Almgren ¶ 6, *cited in* Final Act. 20. However, Examiner has not provided a sufficient factual basis to support the conclusion that one of ordinary skill would have recognized that the *minimum* exposure constraints—not merely the *maximum* exposure constraints—could be calculated, more specifically, by computing vector inner products of the projection of each non-target factor score vector and the investment allocation vector, as recited in claim 1.

For the foregoing reasons, Appellant has persuaded us of error in the Examiner's obviousness rejection of independent claim 1. Accordingly, we do not sustain the Examiner's obviousness rejection of that claim or of claims 3 and 4, which depend from claim 1.

With respect to the rejection of dependent claims 2 and 5, the Examiner does not rely on Stubbs to cure the deficiency of the obviousness rejection explained above. *See* Final Act. 22–24. Accordingly, we do not sustain the obviousness rejection of these claims for the reasons set forth in relation to independent claim 1.

Claims 6–13

Turning to claims 6–13, independent claim 6 reads as follows:

6.   A computer-based method of constructing a purified factor portfolio comprising:

electronically receiving and storing by a programmed computer a set of N potential investments;

electronically receiving and storing by a programmed computer an N-dimensional vector representing a relative market capitalization of each potential investment;

electronically receiving and storing by the programmed computer an N-dimensional target factor score vector for each of the potential investments;

determining a reference portfolio for the target factor score vector by defining the reference portfolio investment allocation using the target factor score vector and market capitalization of each potential investment;

electronically receiving and storing by the programmed computer at least one N-dimensional non-target factors score vector;

determining a projection of each non-target factor score vector that is orthogonal to the target factor score vector;

electronically receiving and storing by the programmed computer data defining a factor risk model that predicts future volatility for the N potential investments;

computing an optimal investment allocation vector that simultaneously minimizes the predicted tracking error between the optimal allocation and the reference portfolio while minimizing the absolute value of the vector inner product of each orthogonal projection and the difference of the investment allocation vector and the reference portfolio; and

electronically outputting the optimal investment allocation vector using an output device.

The Examiner finds, *inter alia*, that Almgren teaches claim 6's limitation, "electronically receiving and storing by the programmed computer data defining a factor risk model that predicts future volatility for

the N potential investments." Final Act. 28–29 (citing Almgren ¶ 67); Ans. 22 (citing Almgren ¶¶ 34, 35, 67). Appellant argues that "while Almgren considers risk and risk constraints, Almgren does not mention and does not consider factor risk models anywhere." App. Br. 24. Appellant more broadly contends that Almgren does not receive and store data defining a factor risk model that predicts future volatility. *Id.*

Appellant's arguments are persuasive. The passages of Almgren upon which the Examiner relies reasonably teach using a maximum permissible volatility as a factor in determining risk. Almgren ¶ 67. However, the cited passages do not reasonably teach or suggest defining a risk model that predicts future volatility. Furthermore, the Examiner does not rely on Hsu to teach this limitation. *See, e.g.*, Ans. 30 (stating that Hsu is being relied upon to teach minimizing tracking error).

Accordingly, we do not sustain the Examiner's obviousness rejection of independent claim 6, of independent claim 10, which recites a similar limitation, or of claims 7, 8, 11, and 12, which depend from claims 6 and 10. With respect to the remaining rejection of dependent claims 9 and 13, the Examiner does not rely on Stubbs to cure the deficiency of the obviousness rejection explained above. *See* Final Act. 33–35.

CONCLUSIONS

We sustain the Examiner's rejection of claims 1–13 as being directed to patent-ineligible subject matter under 35 U.S.C. § 101.

We do not sustain the Examiner's rejections of claims 1–13 as being unpatentable under 35 U.S.C. § 103.

DECISION

The Examiner's decision rejecting claims 1–13 is affirmed.

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). *See* 37 C.F.R. § 1.136(a)(1)(iv).

<u>AFFIRMED</u>