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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Ex parte ANDREY M. ILINICH and S. GEORGE LUCKEY JR.

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Appeal 2018-008924
Application 14/305,021
Technology Center 2100

_____

Before DENISE M. POTHIER, LINZY T. McCARTNEY, and
STEVEN M. AMUNDSON, *Administrative Patent Judges.*

McCARTNEY, *Administrative Patent Judge.*

DECISION ON APPEAL

Appellant[1] seeks review under 35 U.S.C. § 134(a) from the
Examiner's final rejection of claims 1–7, 9–13, and 15–19. We have
jurisdiction under 35 U.S.C. § 6(b).

We affirm.

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[1] Appellant identifies the real party in interest as Ford Global Technologies,
LLC. Appeal Brief 1, filed May 1, 2018 ("Appeal Br.").

BACKGROUND

This patent application concerns "improved finite element analysis simulation accounting for relief of bending stress in simulated objects." Specification ¶ 1, filed June 16, 2014 ("Spec."). Claim 1 illustrates the claimed subject matter:

1.   A system comprising:

a display;

a memory storing a finite-element-analysis simulator; and

a processor configured to execute the finite-element-analysis simulator to

simulate a pre-bend operation of an object design, performed to a raw material in forming an object, to produce simulated pre-bend results,

reset stress tensor components of the simulated pre-bend results to eliminate residual elastic deformation from the simulated pre-bend results,

complete object simulation of the raw material using the reset simulated pre-bend results, and

send the results to the display for visualization.

Appeal Brief, Claims Appendix A-1 ("Claims App.").

REJECTIONS

Claims	35 U.S.C. §	References
1–7, 9–13, 15–19	101	
1–7, 9–13, 15–19	103	Trana,[2] Mendizabal,[3] Koç,[4] Kubli[5]

DISCUSSION

We have reviewed the Examiner's rejections and Appellant's arguments, and we disagree with Appellant that the Examiner erred. As consistent with the discussion below, we adopt the Examiner's reasoning, findings, and conclusions on pages 2–23 of the Final Office Action mailed December 1, 2017 ("Final Act.") and pages 3–22 of the Examiner's Answer mailed July 18, 2018 ("Ans."). We address the Examiner's rejections in turn.

Section 101 Rejection

Section 101 of the Patent Act provides that "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof" is patent eligible. 35 U.S.C. § 101. But the Supreme Court has long recognized an implicit exception to this section: "Laws of nature, natural phenomena, and abstract ideas are not patentable." *Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208, 216 (2014) (quoting *Ass'n for*

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[2] Kristoffer Trana, *Finite Element Simulation of the Tube Hydroforming Process–Bending, Preforming and Hydroforming*, 127 J. of Materials Processing Tech. 401 (2002).
[3] Artiz Mendizabal et al*., Refining Welding Modelling for Prediction of Distortion Incorporating Mechanical Effects of Annealing*, Proc. of the 9th Int'l Conf. on Trends in Welding Res. (2012).
[4] Muammer Koç & Taylan Altan, *An Overall Review of the Tube Hydroforming (THF) Technology*, 108 J. of Materials Processing Tech. 384 (2001).
[5] Kubli et al. (US 2012/0123579 A1; May 17, 2012).

Molecular Pathology v. Myriad Genetics, Inc., 569 U.S. 576, 589 (2013)).

To determine whether a claim falls within one of these excluded categories,

the Court has set out a two-part framework. That framework requires us first

to consider whether the claim is "directed to one of those patent-ineligible

concepts." *Alice*, 573 U.S. at 217. If so, we then examine "the elements of

[the] claim both individually and 'as an ordered combination' to determine

whether the additional elements 'transform the nature of the claim' into a

patent-eligible application." *Alice*, 573 U.S. at 217 (quoting *Mayo

Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 78, 79 (2012)).

That is, we examine the claim for an "inventive concept," "an element or

combination of elements that is 'sufficient to ensure that the patent in

practice amounts to significantly more than a patent upon the [ineligible

concept] itself.'" *Alice*, 573 U.S. at 217–18 (alteration in original) (quoting

Mayo, 566 U.S. at 72–73).

The Patent Office has revised its guidance about this framework. *See*

2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50

(Jan. 7, 2019) ("Revised Guidance"). Under the Revised Guidance, to decide

whether a claim is directed to an abstract idea, we evaluate whether the

claim (1) recites subject matter that falls within one of the abstract idea

groupings listed in the Revised Guidance and (2) fails to integrate the recited

abstract idea into a practical application. *See* Revised Guidance, 84 Fed.

Reg. at 51, 54. If the claim is directed to an abstract idea, as noted above, we

then determine whether the claim has an inventive concept. The Revised

Guidance explains that when making this determination, we should consider

whether the additional claim elements add "a specific limitation or

combination of limitations that are not well-understood, routine,

conventional activity in the field" or "simply append[] well-understood, routine, conventional activities previously known to the industry, specified at a high level of generality." Revised Guidance, 84 Fed. Reg. at 56.

With these principles in mind, we turn to the § 101 rejection. Appellant argues claims 1–7, 9–13, and 15–19 together, so as permitted by 37 C.F.R. § 41.37(c)(1)(iv), we decide the appeal for this ground of rejection based on claim 1.

Abstract Idea

The Revised Guidance explains that the abstract idea exception includes "mental processes" and "mathematical concepts." Revised Guidance, 84 Fed. Reg. at 52. The Examiner determined that claim 1 recites subject matter that falls within these abstract idea groups. *See, e.g.*, Final Act. 2–3 (determining that claim 1 is similar to the patent-ineligible claims in *Electric Power Group, LLC v. Alstom S.A.*, 830 F.3d 1350 (Fed. Cir. 2016) and recites steps involving "mathematical relationships in a simulation to produce intangible results"); *see also* USPTO, October 2019 Update: Subject Matter Eligibility at 7, https://www.uspto.gov/sites/default/files/ documents/peg_oct_2019_update.pdf ("October SME Update") (explaining that the patent-ineligible claims in *Electric Power Group* are examples of claims that recite mental processes).

We agree that claim 1 recites an abstract idea. Claim 1 recites (1) "simulate a pre-bend operation of an object design, performed to a raw material in forming an object, to produce simulated pre-bend results"; (2) "reset stress tensor components of the simulated pre-bend results to eliminate residual elastic deformation from the simulated pre-bend results"; and (3) "complete object simulation of the raw material using the reset

simulated pre-bend results." Claims App. A-1. Given their broadest reasonable interpretation, these limitations encompass using mathematical computations to analyze information. *See, e.g.*, Spec. ¶¶ 15 ("[F]inite element analysis (FEA) may be utilized to establish product feasibility. FEA is a technique by which numerical solutions to boundary value problems for differential equations are mathematically computed to estimate a response of a physical object or objects subjected to external loads."), 22–23 (disclosing that a FEA simulator "may be configured to model the pre-bend operation," "reset components of the stress tensor for every integration point of every element of the discretized part (*e.g.*, set to zero)," and "perform[] the remainder of the hydroforming FEA using the adjusted results of the simulation of the pre-bend operation").

Because these limitations encompass using mathematical computations to analyze information, claim 1 recites mental processes. *See, e.g., Elec. Power Grp.*, 830 F.3d at 1354 ("In a similar vein, we have treated analyzing information by steps people go through in their minds, or by mathematical algorithms, without more, as essentially mental processes within the abstract-idea category."). For the same reason, claim 1 also recites mathematical concepts. *See, e.g., Bancorp Servs., L.L.C. v. Sun Life Assur. Co. of Canada (U.S.)*, 687 F.3d 1266, 1280–81 (Fed. Cir. 2012) (determining that, in light of the written description, the claims at issue involved "mere mathematical computation" and were directed to an abstract idea); October SME Update 3–4 (explaining that a claim recites a mathematical calculation—and thus a mathematical concept—"when the broadest reasonable interpretation of the claim in light of the specification encompasses a mathematical calculation"). Claim 1 thus recites an abstract

idea. *See* Revised Guidance, 84 Fed. Reg. at 52 (explaining that the abstract idea exception includes mental processes and mathematical concepts).

Appellant has not persuaded us otherwise. Appellant argues that cases such as *Electric Power Group* are irrelevant to claim 1 because those cases do not involve "hydroforming" or "simulation of hydroforming," much less "reset[ting] stress tensor components of the simulated pre-bend results to eliminate residual elastic deformation from the simulated pre-bend results" or "complet[ing] object simulation of the raw material using the reset simulated pre-bend results." Appeal Br. 7. We disagree. Cases such as *Electric Power Group* are relevant because they make clear that claims that encompass using mathematical computations to analyze information recite mental processes. *See, e.g.*, *Elec. Power Grp.*, 830 F.3d at 1354 ("In a similar vein, we have treated analyzing information by steps people go through in their minds, or by mathematical algorithms, without more, as essentially mental processes within the abstract-idea category."). For the reasons discussed above, claim 1 encompasses using mathematical computations to analyze information and therefore recites mental processes.

Appellant also contends that claim 1 is not patent ineligible simply because it "includes some operations that may be performed mathematically." Appeal Br. 7. According to Appellant, claim 1 does not "recite a mathematical relationship or formula" but rather "steps that are used to produce significantly more accurate results and correspondingly shorter simulation turnaround time as compared to other currently used hydroforming FEA simulation approaches." Appeal Br. 7. But "[a] claim that recites a mathematical calculation will be considered as falling within the 'mathematical concepts' grouping" of abstract ideas. October SME

Update 4. A claim "does not have to recite the word 'calculating' in order to be considered a mathematical calculation"; rather, a claim recites a mathematical calculation "when the broadest reasonable interpretation of the claim in light of the specification encompasses a mathematical calculation." October SME Update 4. As explained above, the written description indicates that the broadest reasonable interpretation of the "simulate a pre-bend operation," "reset stress tensor components," and "complete object simulation" limitations includes mathematical computations. *See* Spec. ¶¶ 15, 22–23. Claim 1 therefore recites mathematical concepts.

Because we determine that claim 1 recites an abstract idea, we next consider whether claim 1 integrates the abstract idea into a practical application. *See* Revised Guidance, 84 Fed. Reg. at 51. In doing so, we evaluate the claim as a whole to determine whether the claim "integrate[s] the [abstract idea] into a practical application, using one or more of the considerations laid out by the Supreme Court and the Federal Circuit." Revised Guidance, 84 Fed. Reg. at 55; *see also* October SME Update 12 (discussing the practical application analysis). That is, we consider any additional elements recited in the claim along with the limitations that recite an abstract idea to determine whether the claim integrates the abstract idea into a practical application. *See* October SME Update 12.

The additional elements recited in claim 1 include "a display," "a memory storing a finite-element-analysis simulator," "a processor configured to execute the finite-element-analysis simulator," and the step of "send[ing] the results to the display for visualization." *See* Claims App. A-1. The written description describes the display, memory, and processor in a manner that indicates that these components are generic. *See, e.g.*, Spec.

¶¶ 16 (explaining that "[t]he simulated results 214 may then be stored or displayed to an operator via a display 216"), 17 ("The processing device 202 may include various types of computing apparatus, such as a computer workstation, a server, a desktop, notebook, laptop, or handheld computer, or some other computing system and/or device. Computing devices, such as processing device 202, generally include a memory 206 on which computer-executable instructions may be maintained, where the instructions may be executable by one or more processors 208 of the processing device 202."); *see also Intellectual Ventures I LLC v. Erie Indem. Co.*, 850 F.3d 1315, 1331 (Fed. Cir. 2017) ("The claimed mobile interface is so lacking in implementation details that it amounts to merely a generic component (software, hardware, or firmware) that permits the performance of the abstract idea, i.e., to retrieve the user-specific resources."). As for the step of "send[ing] the results to the display for visualization," this step does not impose meaningful limits on the recited simulation process and thus recites insignificant post-solution activity. *Cf. Apple, Inc. v. Ameranth, Inc.*, 842 F.3d 1229, 1242 (Fed. Cir. 2016) (agreeing with the Board that downloading and printing menus are insignificant post-solution activities).

Considering these additional elements along with the limitations that recite an abstract idea, both individually and as an ordered combination, we determine that claim 1 does not integrate the recited abstract idea into a practical application. Claim 1 uses generic computer components to implement the abstract idea. *See* Claims App. A-1. Using generic computer components in this way does not integrate an abstract idea into a practical application. *See, e.g.*, *Alice*, 573 U.S. at 223–24 ("[W]holly generic computer implementation is not generally the sort of 'additional featur[e]'

that provides any 'practical assurance that the process is more than a drafting effort designed to monopolize the [abstract idea] itself.'" (quoting *Mayo*, 566 U.S. at 77) (second and third alterations in original)). Claim 1 also adds insignificant post-solution activity to the abstract idea, but this too fails to integrate the abstract idea into a practical application. *See Bilski v. Kappos*, 561 U.S. 593, 612 (2010) ("*Flook* established that limiting an abstract idea to one field of use or adding token postsolution components did not make the concept patentable."). Claim 1 is therefore directed to an abstract idea.

Appellant's arguments to the contrary are unpersuasive. Appellant argues that claim 1 is not directed to an abstract but instead is directed to the following advantages and steps mentioned in the written description:

> produc[ing] significantly more accurate results and correspondingly shorter simulation turnaround time as compared to other currently used hydroforming FEA simulation approaches by [resetting] components of the stress tensor for every integration point of every element of the discretized part (*e.g.*, set to zero), effectively eliminating any associated residual elastic deformation in the FEA simulation of the pre-bend operation, while [preserving] other element variables of the FEA pre-bend simulation, such as strain tensor and accumulated effective plastic strain components.

Appeal Br. 6–7 (quoting Spec. ¶¶ 20–23) (internal quotation marks omitted) (second and third alterations in original).

We disagree. The parts of the written description cited by Appellant confirm that claim 1 is directed to an abstract idea. These parts of the written description make clear that the focus of the claimed invention is using mathematical computations to analyze information and that the invention's alleged benefits flow from performing those computations. *See, e.g.*, Spec. ¶¶ 20–23. As discussed above, using mathematical computations to analyze

information falls in the mental processes and mathematical concepts categories of abstract ideas. *See, e.g.*, *Elec. Power Grp.*, 830 F.3d at 1354; *Bancorp*, 687 F.3d at 1280–81; October SME Update 3–4. Even if the disclosed mathematical computations represent an improvement over prior art computations, claims focused on using improved mathematical computations to analyze data are still directed to an abstract idea. *See, e.g.*, *SAP Am., Inc. v. InvestPic, LLC*, 898 F.3d 1161, 1168 (Fed. Cir. 2018) (determining that claims focused on "improved mathematical analysis" are directed to an abstract idea); *In re Gitlin*, 775 F. App'x 689, 691 (Fed. Cir. 2019) ("[M]erely calling for a mathematical concept to be performed more efficiently or with a particular input does not amount to an application of the mathematical concept that is patent-eligible.").

Inventive Concept

Finally, we consider whether claim 1 has an inventive concept, that is, whether the claim has additional elements that "'transform the nature of the claim' into a patent-eligible application." *Alice*, 573 U.S. at 217 (quoting *Mayo*, 566 U.S. at 78, 79). As discussed above, this requires us to evaluate whether the additional claim elements add "a specific limitation or combination of limitations that are not well-understood, routine, conventional activity in the field" or "simply append[] well-understood, routine, conventional activities previously known to the industry, specified at a high level of generality." Revised Guidance, 84 Fed. Reg. at 56.

As noted above, the additional elements recited in claim 1 include "a display," "a memory storing a finite-element-analysis simulator," "a processor configured to execute the finite-element-analysis simulator," and the step of "send[ing] the results to the display for visualization." *See* Claims

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App. A-1. The written description indicates that the display, memory, and processor are conventional. *See, e.g.*, Spec. ¶¶ 16–17. As for the step of sending the results to the display for visualization, this is a well-understood, routine, and conventional computer activity. *Cf. Intellectual Ventures I*, 850 F.3d at 1331 ("But receiving transmitted data over a network and displaying it to a user merely implicates purely conventional activities that are the 'most basic functions of a computer.'").

Whether we consider these additional elements individually or as an ordered combination, these elements do not transform the nature of claim 1 into a patent-eligible application. These elements are largely recited at a high level of generality, and there is no indication that these elements override the conventional use of known features or involve an unconventional arrangement or combination of elements. At bottom, claim 1 recites conventional computer components employed in a customary manner, which is not enough to provide an inventive concept. *Alice*, 573 U.S. at 223 ("[T]he mere recitation of a generic computer cannot transform a patent-ineligible abstract idea into a patent-eligible invention.").

Appellant contends that the Examiner erred because the Examiner considered only whether the recited computer components are conventional and did not address the "inventive concept," that is, the other limitations recited in claim 1. *See* Appeal Br. 9–10; Reply Brief 3, filed September 18, 2018 ("Reply Br.). But the other limitations recited in claim 1 form part of the identified abstract idea, and the Examiner was not required to show that the abstract idea was well understood, routine, and conventional. *See, e.g.*, *Bridge & Post, Inc. v. Verizon Commc'ns, Inc.*, 778 F. App'x 882, 892 (Fed. Cir. 2019) ("At *Alice* step two we assess 'whether the claim limitations *other*

than the invention's use of the ineligible concept to which it was directed were well-understood, routine, and conventional.'" (quoting *BSG Tech LLC v. BuySeasons, Inc.*, 899 F.3d 1281, 1290 (Fed. Cir. 2018)); *BSG Tech*, 899 F.3d at 1290 ("[T]he relevant inquiry is *not* whether the claimed invention as a whole is unconventional or non-routine. . . . It has been clear since *Alice* that a claimed invention's use of the ineligible concept to which it is directed cannot supply the inventive concept that renders the invention 'significantly more' than that ineligible concept." (first emphasis added)).

In any event, the other limitations recited in claim 1 involve well-understood, routine, and conventional activities. The "simulate a pre-bend operation," "reset stress tensor components," and "complete object simulation" limitations encompass performing mathematical computations. *See, e.g.*, Spec. ¶¶ 15, 22–23. Performing mathematical computations is a well-understood, routine, and conventional computer activity. *See, e.g.*, *Bancorp*, 687 F.3d at 1278 ("The computer required by some of Bancorp's claims is employed only for its most basic function, the performance of repetitive calculations, and as such does not impose meaningful limits on the scope of those claims."). Whether we consider these limitations individually or as an ordered combination, these limitations do not transform the nature of claim 1 into a patent-eligible application.

Summary

We have reviewed the other arguments presented by Appellant and find them unpersuasive. For at least the above reasons, we sustain the Examiner's rejection of claim 1 under § 101.

Section 103 Rejection

Claim 1 recites "reset stress tensor components of the simulated pre-bend results to eliminate residual elastic deformation from the simulated pre-bend results." Claims App. A-1. Appellant contends that the Examiner's combination of Trana, Mendizabal, Koç, and Kubli fails to teach or suggest this limitation. *See* Appeal Br. 10–12. According to Appellant, Mendizabal does not teach this limitation because Mendizabal "makes no mention of pre-bending or hydroforming and bears no relation to pre-bending or hydroforming below an annealing temperature" and its disclosures are "irrelevant to modeling of a pre-bend where annealing is not required or even mentioned." Appeal Br. 11. Appellant argues that Koç does not fill this gap because Koç "actually teaches against" the "reset stress tensor components" limitation. Appeal Br. 12. As for Trana and Kubli, Appellant contends that the Examiner did not rely on either reference for this limitation. *See* Appeal Br. 11, 12.

We find these arguments unpersuasive. First, Appellant's arguments about Mendizabal are either not commensurate with the scope of claim 1 or do not address the Examiner's combination of the cited art. Claim 1 does not limit the recited pre-bending to pre-bending below an annealing temperature and makes no mention of hydroforming, *see* Claims App. A-1, so even if Mendizabal does not disclose these features, that does not show that the Examiner erred or that Mendizabal is irrelevant. Although claim 1 recites "simulate a pre-bend operation . . . to produce simulated pre-bend results" and "reset stress tensor components of the simulated pre-bend results," the Examiner relied on Trana for the simulated pre-bend operation and pre-bend results, not Mendizabal. *See* Final Act. 7–9. The Examiner found

Mendizabal teaches resetting stress tensor components to eliminate residual elastic deformation because Mendizabal teaches resetting all stresses to zero above an annealing temperature to model the effects of annealing. *See* Final 8–9. The Examiner concluded that, given the additional teachings of Koç, it would have been obvious to combine Trana's and Mendizabal's teaching to arrive at the disputed claim limitation. *See* Final Action 7–9. Appellant's arguments against Mendizabal alone have not persuaded us that the Examiner erred. *See In re Keller*, 642 F.2d 413, 426 (CCPA 1981) ("[O]ne cannot show non-obviousness by attacking references individually where, as here, the rejections are based on combinations of references.").

Second, Appellant's arguments about Koç do not persuasively address its teachings. Appellant argues that Koç discloses the "exact opposite" of the "reset stress tensor components" limitation because Koç discloses "carry[ing] the *strain history* gained during pre-forming directly into the hydroforming stage just as in the actual forming of complex parts." Appeal Br. 12 (emphasis added) (quoting Koç 391). But as found by the Examiner, Koç discloses that pre-forming tubes for hydroforming "usually includes bending and crushing operations," that "annealing may be necessary after bending or crushing *to remove residual stresses*," and that "it is necessary to carry the results of bending and crushing analysis into hydroforming stage." Koç 391 (emphasis added), *cited in* Final Act. 9. As also found by the Examiner, Koç discloses that "[c]onsequent and seamless simulation of bending, preforming and hydroforming, *and sometimes annealing*, results in accurate predictions in terms of producibility, formability and thinning of the desired part as well as points out necessary changes in tool design." Koç 386 (emphasis added), *cited in* Ans. 20. These disclosures teach that, in at least

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some circumstances, Koç's simulation involves annealing before hydroforming, and that annealing removes residual stresses. Appellant's assertion that Koç teaches carrying a different property—a strain history—into the hydroforming stage does not persuasively address Koç's teachings about removing residual stresses.

For at least the above reasons, we sustain the Examiner's obviousness rejection of claim 1. Because Appellant does not present separate, persuasive arguments for obviousness rejection of claims 2–7, 9–13, and 15–19, we also sustain the Examiner's obviousness rejection of these claims.

CONCLUSION

Claims Rejected	35 U.S.C. §	References	Affirmed	Reversed
1–7, 9–13, 15–19	101		1–7, 9–13, 15–19	
1–7, 9–13, 15–19	103	Trana, Mendizabal, Koç, Kubli	1–7, 9–13, 15–19	
Overall Outcome			1–7, 9–13, 15–19	

No period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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