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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 RADOMIR MECH, NATHAN A. CARR,
and ONDREJ STAVA

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Appeal 2019-003126
Application 13/408,890
Technology Center 2100

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Before RICHARD M. LEBOVITZ, JASON V. MORGAN, and
JOHN A. EVANS, *Administrative Patent Judges*.

MORGAN, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Introduction

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the

Examiner's decision to reject claims 1–20. We have jurisdiction under 35

U.S.C. § 6(b).

We AFFIRM.

Summary Of The Disclosure

Appellant's claimed subject matter relates to "improving printability of a three-dimensional model" by applying a point "at which stresses . . . exceed the structural tolerances of a material to be used by the three-dimensional printing system for a fabrication of the model" and calculating a correction "to the model designed to decrease the stresses" on the point. Abstract.

Exemplary Claim (Key Limitations Emphasized)

1. A computer-implemented method, the method comprising:

performing, by a computing device, a three-dimensional printability analysis of a computer-based three-dimensional model to be generated by a three-dimensional printing system, the three-dimensional printability analysis occurring prior to printing by the three-dimensional printing system and comprising:

applying, by the computing device, at least one test case representing an application of at least one force to the computer-based three-dimensional model; and

performing, by the computing device, for the at least one test case, operations comprising:

generating, by the computing device, at least one point at which stresses associated with the respective test case exceed the structural tolerances of a material to be used by the three-dimensional printing system for a fabrication of the computer-based three-dimensional model;

calculating, by the computing device, *for the at least one point, at least one correction to the computer-based three-dimensional model, the at least one correction specifying a change in how the computer-based three-dimensional model is to be printed in order to decrease the stresses associated with the respective test case*; and

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> selecting, by the computing device, a correction of the at least one correction based on at least one criterion.

The Examiner's Rejections And Cited References

The Examiner rejects claims 1–20 under 35 U.S.C. § 101 as being directed to patent-ineligible subject matter. Non-Final Act. 3–5.

The Examiner rejects claims 1–3, 6, 8, 11, 14, 16, and 19 under 35 U.S.C. § 103(a) as being unpatentable over J. Hiller et al., *Design and analysis of digital materials for physical 3D voxel printing*, Rapid Prototyping Journal, Vol. 15 No. 2, pp. 137–49 (2009) ("Hiller"), Martin (US 2012/0326356 A1; published Dec. 27, 2012), Amakai et al. (US 2003/0055612 A1; published Mar. 20, 2003) ("Amakai"), and Langer et al. (US 5,460,758; issued Oct. 24, 1995). Non-Final Act. 6–14.

The Examiner rejects claims 4, 5, and 20 under 35 U.S.C. § 103(a) as being unpatentable over Hiller, Martin, Amakai, Langer, and Napadensky et al. (US 2004/0187714 A1; published Sept. 30, 2004) ("Napadensky"). Non-Final Act. 13–16.

The Examiner rejects claims 7, 12, and 13 under 35 U.S.C. § 103(a) as being unpatentable over Hiller, Martin, Amakai, Langer, and Fogel et al. (US 2011/0087350 A1; published Apr. 14, 2011) ("Fogel"). Non-Final Act. 16–19.

The Examiner rejects claims 9 and 10 under 35 U.S.C. § 103(a) as being unpatentable over Hiller, Martin, Amakai, Langer, and Stipek (US 2004/0032156 A1; published Feb. 19, 2004). Non-Final Act. 19–21.

The Examiner rejects claims 15, 17, and 18 under 35 U.S.C. § 103(a) as being unpatentable over Hiller, Martin, Amakai, Langer, and Bickel et al.

(US 2012/0053716 A1; published Mar. 1, 2012) ("Bickel"). Non-Final Act. 21–25.

PRINCIPLES OF LAW

To constitute patent-eligible subject matter, an invention must be a "new and useful process, machine, manufacture, or composition of matter, or [a] new and useful improvement thereof." 35 U.S.C. § 101. There are implicit exceptions to the categories of patentable subject matter identified in 35 U.S.C. § 101, including: (1) laws of nature; (2) natural phenomena; and (3) abstract ideas. *Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208, 216 (2014). The U.S. Supreme Court has set forth a framework for distinguishing patents with claims directed to these implicit exceptions "from those that claim patent-eligible applications of those concepts." *Id.* at 217 (citing *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66 (2012)). The evaluation follows a two-part framework: (1) determine whether the claim is *directed to* a patent-ineligible concept, e.g., an abstract idea; and (2) if so, then determine whether any element, or combination of elements, in the claim is sufficient to ensure that the claim amounts to *significantly more* than the patent-ineligible concept itself. *See id.* at 217–18.

The U.S. Patent and Trademark Office (USPTO) published guidance on the application of the two-part analysis in 2019. USPTO, 2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50 (January 7, 2019) ("2019 Revised Guidance"); *see also* USPTO, October 2019 Update: Subject Matter Eligibility, available at https://www.uspto.gov/sites/default/files/documents/peg_oct_2019_update.pdf (Oct. 17, 2019) ("Oct. 2019 Update"). 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) (*see* 2019 Revised Guidance, 84

Fed. Reg. at 54 (step 2A, prong one)); and

(2) additional elements that integrate the judicial

exception into a practical application (*see id.* at 54–55 (step 2A,

prong two); 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 is 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 2019 Revised Guidance, 84 Fed. Reg. at 56.

ANALYSIS—35 U.S.C. § 101

Step 2A, Prong One

In rejecting claim 1 as being directed to patent-ineligible subject

matter, the Examiner determines the claim recites the "abstract idea of

customizing information and presenting it [to] users based on particular

characteristics to improve the printability of a three-dimensional model."

Non-Final Act. 3; *see also* Ans. 25. "Appellant maintains that the claims do

not recite an abstract idea" (Reply Br. 4), but Appellant's arguments are best addressed under Step 2A, Prong Two, and Step 2B (*see* Appeal Br. 10–16; Reply Br. 3–7; 2019 Revised Guidance, 84 Fed. Reg. at 54–55).

Furthermore, we agree with the Examiner that claim 1 recites an abstract idea. In particular, claim 1 recites "performing . . . a three-dimensional [fabrication] analysis of a . . . three-dimensional model" by "applying . . . at least one test case representing an application of at least one force to the . . . three-dimensional model," "generating . . . at least one point at which stresses associated with [a] test case exceed the structural tolerances of a material to be used . . . for a fabrication of the . . . three-dimensional model," "calculating . . . for the at least one point, at least one correction to the . . . model, the at least one correction specifying a change in how the . . . is to be [fabricated] in order to decrease the stresses associated with the respective test case," and "selecting . . . a correction of the at least one correction based on at least one criterion." The Specification illustrates these steps in Figure 2, which shows performing structural analysis (step 230) for detected test cases (step 220) to determine if stress is too high (step 240) and selecting a correction (step 260) such as adding a part (step 290), thickening a part (step 280), or lightening a part (step 270). These recitations, and the supporting disclosures, exemplify the process of engineering structures such as bridges or cantilevers that are load-bearing, allow movement or manipulation, or merely withstand the effects of gravity. *See* Spec. ¶¶ 4, 25, 27–29, 46, 52–54; Appeal Br. 14–15; Reply Br. 7. That is, before creating a physical structure, engineers typically model the structure, predict how expected forces are likely to affect the structure, and modify or correct the model to handle predicted forced. Moreover, with the

exception of generic computing device recitations, there is nothing in claim 1 that forecloses the recited steps "from being performed by a human, mentally or with pen and paper." *Intellectual Ventures I LLC v. Symantec Corp.*, 838 F.3d 1307, 1318 (Fed. Cir. 2016).

Accordingly, claim 1 recites mental processes—concepts performed in the human mind (including an observation, evaluation, judgment or opinion)—and, therefore, claim 1 recites an abstract idea. 2019 Revised Guidance, 84 Fed. Reg. at 52.

Step 2A, Prong One

Appellant contends the Examiner erred because "the claimed subject matter is an improvement to a computing technology, e.g., three-dimensional model printing." Appeal Br. 11; Reply Br. 4. Appellant argues the features of claim 1 are similar to a patent-eligible solution that "is necessarily rooted in computer technology in order to overcome a problem specifically arising in the realm of computer networks." Appeal Br. 12 (quoting *DDR Holdings, LLC v. Hotels.com, L.P.*, 773 F.3d 1245, 1257 (Fed. Cir. 2014)); *see also id.* at 13–15; Reply Br. 5–6. Specifically, Appellant argues claim 1 "involves detecting problems with printing a three-dimensional model and calculating corrections in relation to how a three-dimensional printing system prints the three-dimensional model." Appeal Br. 13 (citing Spec. ¶ 25).

Appellant's arguments are not persuasive because the additional elements of claim 1 generally link the use of the underlying mental processes to the field of three-dimensional model printing without providing an improvement to the printing process which is separate from the recited mental steps. This is not enough to integrate the underlying mental processes into a patent-eligible practical application. *See* 2019 Revised Guidance, 84

Fed. Reg. at 55. Moreover, processes for modelling a structure, predicting how expected forces are likely to affect the structure, and modifying or correcting the model before physically building the modeled structure are not necessarily rooted in a computing technology because, as explained above, they can be performed in the human mind with the aid of pen and paper. *Compare with DDR Holdings, LLC v. Hotels.com, L.P.*, 773 F.3d 1245, 1257–58 (Fed. Cir. 2014) (a system to enable a visitor to "click o[n] an advertisement for a third-party product displayed on a host's website [without being] transported to the third party's website" was necessarily rooted in a computer technology because with pre-Internet practices there was "no possibility that by walking up to this kiosk, [a] customer [would] be suddenly and completely transported outside the warehouse store and relocated to a separate physical venue associated with the third-party").

The additional elements of claim 1 also fail:

> (1) to reflect "an improvement in the functioning of a computer, or an improvement to other technology or technical field" (e.g., a three-dimensional printing system is not improved by the process— instead, an improved three-dimensional model may be provided to an unimproved three-dimensional printing system);

> (2) to apply or use the underlying "judicial exception to effect a particular treatment or prophylaxis for a disease or medical condition";

> (3) to implement the underlying "judicial exception with, or [use the] judicial exception in conjunction with, a particular machine or manufacture that is integral to the claim" (e.g., a particular computing device is not recited);

(4) to effect "a transformation or reduction of a particular article to a different state or thing" (*compare with Diamond v. Diehr*, 450 U.S. 175, 101 S. Ct. 1048 (1981) (a method of operating a rubber-molding press by monitoring the mold's temperature to determine when to automatically opening the press was patent-eligible)); and

(5) to apply or use the underlying "the judicial exception in some other meaningful way beyond generally linking the use of the judicial exception to a particular technological environment, such that the claim as a whole is more than a drafting effort designed to monopolize the exception."

See 2019 Revised Guidance, 84 Fed. Reg. at 55.

Accordingly, we determine that claim 1 does not include additional recitations that integrate the recited mental processes—concepts performed in the human mind (including an observation, evaluation, judgment or opinion)—into a patent-eligible practical application.

Step 2B

The Examiner further determines that claim 1 "does not include additional elements that are sufficient to amount to significantly more than the judicial exception because the additional elements when considered both individually and as an ordered combination do not amount to significantly more than the abstract idea." Non-Final Act. 4; *see also* Reply Br. 30–31. Appellant contends the Examiner erred by failing "***to provide any facts*** showing that the [additional] elements of [claim 1] were widely prevalent or in common use in the relevant industry at the time the patent application was filed." Appeal Br. 16.

Appellant's argument is not persuasive because the additional recitations were well-understood, routine, and conventional. *See* 2019 Revised Guidance, 84 Fed. Reg. at 56. For example, the Specification's support for the claimed "computing device" is provided at a high-level of generality that evinces computing devices were sufficiently well-known such that disclosure of particulars (e.g., which of the many different computing devices enumerated are best suited for performing the claimed steps) were not needed to meet the requirements of providing both an enabling disclosure and sufficient written description support. *See* Spec. ¶¶ 24, 35–36, 56–68, Fig. 10; USPTO, Changes in Examination Procedure Pertaining to Subject Matter Eligibility, Recent Subject Matter Eligibility Decision (*Berkheimer v. HP, Inc.*), *3–4, available at https://www.uspto. gov/sites/default/files/documents/memo-berkheimer-20180419.PDF (Apr. 19, 2018).

For these reasons, we determine that claim 1 does not add a specific limitation or combination of limitations that provide an inventive concept such that transforms the underlying mental processes into a patent-eligible invention. *See* 2019 Revised Guidance, 84 Fed. Reg. at 56. Accordingly, we sustain the Examiner's 35 U.S.C. § 101 rejection of claim 1, and claims 2–20, which Appellant does not argue separately. Appeal Br. 16.

ANALYSIS—35 U.S.C. § 103(A)

Langer teaches analysis of the surface of a three-dimensional object—modelled by solidifying superposed layers—to ascertain deviations of the object from the CAD data for the object, thus enabling the CAD data to be corrected for subsequent productions of the object. *See* Langer Abstract,

3:30–56. The Examiner "considers the changing of the layer thickness to be the calculation of at least one correction, since one or more corrections form[ing] the correction calculation module include adjusting a thickness of a component of a . . . model." Non-Final Act. 9 (citing Spec. ¶ 40). Thus, the Examiner finds that Langer teaches or suggests "calculating for the at least one point, at least one correction to the computer-based three-dimensional model, the at least one correction specifying a change in how the computer-based three-dimensional model is to be printed in order to decrease the stresses associated with the respective test case," as recited in claim 1. *Id.* (citing Langer 3:30–56); *see also* Ans. 34 (further citing Langer 4:7–15).

Appellant contends the Examiner erred because Langer teaches "that Moire-technology is used to perform surface measurements of an object, which determines inaccuracies of a solidified surface of the object." Appeal Br. 18 (citing Langer 1:26–32). Appellant argues that "measurements of ***a printed object*** are not force representations applied to a three-dimensional model that is not transferred to the real world, e.g., via three-dimensional printing." *Id.* at 19. That is, "Langer's correction calculation does not correspond to the claimed 'calculating . . . at least one correction,' which is calculated in relation to stresses associated with a test case—***a representation of at least one force*** applied to the claimed ***computer-based three-dimensional model***." Reply Br. 9.

We agree with Appellant that the Examiner erred. The thickening of a surface, or a portion of a surface, in Langer merely corrects for discrepancies between uncorrected CAD data for an object and the object as produced. In particular, Langer discloses that its

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> correction takes not only the primary causes of deformation into account, i.e.[,] the stresses and deformations due to the volume change or shrinkage occurring during the solidification and/or post curing, but also all other inaccuracies such as errors in adjusting the illuminating apparatus, inhomogeneities of the resin, variations in the level adjustment of the support platform[,] etc.

Langer 4:9–14.

Producing corrected CAD data to minimize discrepancies (i.e., deformations) in subsequent productions of the object does not represent making a correction to decrease the stresses associated with a test case. That is, the subsequent objects produced in Langer more accurately embody the original CAD data, but correcting the CAD data to enable more accurate object production does not correct the design of the original CAD data so that the modeled object can withstand particular forces applied to a point in a computer-based three-dimensional model. Therefore, we agree with Appellant that the Examiner does not show Langer teaches or suggests "calculating . . . for the at least one point, at least one correction to the computer-based three-dimensional model, the at least one correction specifying a change in how the computer-based three-dimensional model is to be printed in order to decrease the stresses associated with the respective test case," as recited in claim 1.

The Examiner does not show that Hiller, Martin, Amakai, Napadensky, Fogel, Stipek, or Bickel cure the noted deficiency of Langer. Non-Final Act. 10, 14, 16–17, 20–22. Therefore, we do not sustain the Examiner's 35 U.S.C. § 103(a) rejection of claim 1, and claims 2–20, which contain the same or similar recitations.

CONCLUSION

Claims Rejected	35 U.S.C. §	References/Basis	Affirmed	Reversed
1–20	101	Eligibility	1–20	
1–3, 6, 8, 11, 14, 16, 19	103(a)	Hiller, Martin Amakai, Langer		1–3, 6, 8, 11, 14, 16, 19
4, 5, 20	103(a)	Hiller, Martin, Amakai, Langer, Napandesky		4, 5, 20
7, 12, 13	103(a)	Hiller, Martin, Amakai, Langer, Fogel		7, 12, 13
9, 10	103(a)	Hiller, Martin, Amakai, Langer, Stipek		9, 10
5, 17, 18	103(a)	Hiller, Martin, Amakai, Langer, Bickel		5, 17, 18
Overall Outcome			**1–20**	

TIME PERIOD FOR RESPONSE

No time period for taking 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