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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte EDWARD K. McINTYRE,
EDWARD J. LADNY, NATHANIEL ROBINSON,
and WILLIAM DAVIS LEE

Appeal 2018-001004
Application 13/729,524¹
Technology Center 2800

Before BRADLEY R. GARRIS, ADRIENE LEPIANE HANLON, and
SHELDON M. McGEE, *Administrative Patent Judges*.

HANLON, *Administrative Patent Judge*.

DECISION ON APPEAL

A. STATEMENT OF THE CASE

The Appellants filed an appeal under 35 U.S.C. § 134(a) from an Examiner's decision finally rejecting claims 2–9, 12, 13, and 15–17 under 35 U.S.C. § 101.² We have jurisdiction under 35 U.S.C. § 6(b).

¹ The real party in interest, and the Applicant, is said to be Axcelis Technologies, Inc. Appeal Brief dated June 19, 2017 (“App. Br.”), at 1.

² The obviousness rejections of claims 2–9, 12, 13, and 15–17 were withdrawn in the Examiner's Answer. Examiner's Answer dated September 8, 2017 (“Ans.”), at 2.

The claims on appeal are directed to an electrostatic clamp monitoring system and a method for monitoring a clamping capability of an electrostatic clamp.

The Appellants disclose that in semiconductor manufacturing, electrostatic clamps are often used to hold a workpiece, such as a semiconductor wafer, in position while the workpiece undergoes various semiconductor processing, such as ion implantation. Spec. 1, ll. 10–13. The Appellants disclose that during such semiconductor processing, it is desirable to accurately maintain the position of the workpiece with respect to the electrostatic clamp and/or maintain a temperature of the workpiece, which often requires the workpiece to maintain a predetermined contact pressure with a surface of the electrostatic clamp. Spec. 1, ll. 13–19.

In order to maintain the position and/or predetermined contact pressure of the workpiece with respect to the electrostatic clamp, the Appellants disclose that tests are often performed to ensure proper clamping forces are maintained throughout clamping and processing of the workpiece. Spec. 1, ll. 20–23. The Appellants disclose that the present invention provides a system and method for assessing a clamping capability associated with an electrostatic clamp independent of conventional mechanical testing. Spec. 2, ll. 17–19.

Independent claims 4 and 15 are reproduced below from the Claims Appendix to the Appeal Brief.

4. An electrostatic clamp monitoring system, comprising:
 - an electrostatic clamp configured to selectively electrostatically clamp a workpiece to a clamping surface associated therewith *via* one or more electrodes;
 - a power supply electrically coupled to the electrostatic clamp, wherein the power supply is configured to selectively supply a clamping voltage to the one or more electrodes of the electrostatic clamp;

a data acquisition system operably coupled to the power supply and configured to measure a current supplied to the one or more electrodes, therein defining a measured current;

a controller configured to integrate the measured current over time, therein determining a charge value associated with a clamping force between the workpiece and electrostatic clamp; and

a memory configured to store the charge value associated with the clamping force between the workpiece and electrostatic clamp over a plurality of clamping cycles, therein defining a plurality of charge values, wherein the controller is further configured to determine a clamping capability of the electrostatic clamp based on a comparison of a currently determined charge value to the plurality of charge values, and wherein the controller is configured to predict a future status of the clamping capability of the electrostatic clamp based on the currently determined charge value and the plurality of charge values.

App. Br. 13–14.

15. A method for monitoring a clamping capability of an electrostatic clamp, the method comprising:

applying a clamping voltage to one or more electrodes of an electrostatic clamp, therein electrostatically attracting a workpiece to a clamping surface of the electrostatic clamp;

measuring a current associated with the clamping voltage applied to the one or more electrodes at a plurality of times, therein defining a plurality of measured currents;

integrating the plurality of measured currents over time, therein defining respective charge values associated with a respective plurality of clamping forces between the workpiece and electrostatic clamp;

storing the plurality of charge values in a memory; and

determining a clamping capability of the electrostatic clamp *via* a controller, wherein determining the clamping capability of the electrostatic clamp comprises determining a current status of the clamping capability of the electrostatic clamp based on a charge value that is currently determined and a plurality of charge values that are

previously stored, and wherein determining the clamping capability of the electrostatic clamp comprises predicting a future status of the clamping capability of the electrostatic clamp based on a charge value that is currently determined and a plurality of charge values that are previously stored, and wherein predicting the future status [of] the clamping capability of the electrostatic clamp comprises forming a model of the plurality of charge values that are previously stored and the charge value that is currently determined.

App. Br. 15–16.

The 35 U.S.C. § 101 rejection of claims 2–9, 12, 13, and 15–17 is sustained for the reasons set forth in the Final Office Action dated December 22, 2016 (“Final Act.”) and the Examiner’s Answer. We add the following for emphasis.

B. DISCUSSION

The Examiner determines that the claimed invention is directed to a judicial exception (i.e., an abstract idea) without significantly more. Final Act. 8.

More specifically, referring to the three-step analysis under the guidance provided in the 2014 Interim Guidance on Patent Subject Matter Eligibility, 79 Fed. Reg. 74618–74633 (Dec. 16, 2014), the Examiner determines that claims 2–9 belong to the statutory class of a machine and claims 12, 13, and 15–17 belong to the statutory class of a process under step one of the analysis. Final Act. 8. Under step two of the analysis, the Examiner determines that the claims recite an abstract idea that is subject to a judicial exception.³ Final Act. 8. According to the Examiner:

The method steps recited in Claim 15 for **integrating the plurality of measured currents over time, therein defining respective charge values associated with a respective plurality of clamping forces**

³ Step two of the analysis corresponds to “determin[ing] whether the claims at issue are directed to a patent-ineligible concept” discussed in *Alice Corp. Pty. Ltd v. CLS Bank Int’l*, 134 S. Ct. 2347, 2355 (2014). That is, are the claims drawn to an abstract idea? *Id.*

between the workpiece and electrostatic clamp describe the abstract mathematical calculation of force and charge. The integration of charge is further an abstract mathematical calculation. The step of **determining a clamping capability of the electrostatic clamp** relies on the abstract physical relationship of electrical charge and electrostatic force that provides the clamping capability. The recitation of **wherein determining the clamping capability of the electrostatic clamp comprises determining a current status of the clamping capability of the electrostatic clamp based on a charge value that is currently determined and a plurality of charge values that are previously stored** describes the abstract concept of comparing information regarding a sample or test subject to a control or target data. Claim 15 further describes the abstract idea of mathematically predicting a future status of clamping capability based upon the physical values of electrical charge that were conventionally stored and by way of mathematical models.

Final Act. 8.

The Examiner explains that step three of the analysis “looks to determine if there is ‘substantially more’ than just the abstract ideas.”⁴ Final Act. 9. In this case, the Examiner finds that the electrostatic clamp recited in independent claim 15 “describes conventional equipment, and thus does not provide significantly more than the abstract ideas identified above.” Final Act. 9.

The Examiner determines that system claims 2–6 implement the method steps of claims 12–14, 16, and 17, and claim 4, like claim 15, recites an abstract

⁴ Step three of the analysis corresponds to “examin[ing] 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” discussed in *Alice*, 134 S. Ct. at 2357. “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.* (quoting *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 566 U.S. 66, 77 (2012)).

idea. *See* Final Act. 9 (determining that claims 15 and 4 are analogous).

Moreover, the Examiner finds that:

The claimed structure [recited in claim 4] including the recitation of **An electrostatic clamp monitoring system, comprising: an electrostatic clamp [...] one or more electrodes; a power supply electrically coupled to the electrostatic clamp, wherein the power supply is configured to selectively supply a clamping voltage to the one or more electrodes of the electrostatic clamp; a data acquisition system operably coupled to the power supply and configured to measure a current supplied to the one or more electrodes, therein defining a measured current; a controller ; and a memory** describe conventional and well-known equipment.

Final Act. 9.

In the Appeal Brief, the Appellants do not direct us to any error in the Examiner's determination that claims 4 and 15 are directed to an abstract idea.⁵ Rather, the Appellants focus their arguments on step three of the analysis discussed above (i.e., whether there is "significantly more" than just the abstract idea). App. Br. 4.

First, the Appellants argue that claim 4 recites an electrostatic clamp, a power supply, a data acquisition system, a controller, and a memory that are configured to perform specific functions in an electrostatic clamp monitoring system. App. Br. 4–5. Similarly, the Appellants argue that claim 15 recites specific steps for monitoring a clamping capability of an electrostatic clamp, i.e.,

⁵ In the Reply Brief, for the first time on appeal, the Appellants argue that "all pending claims are not directed toward abstract ideas." Reply Brief dated November 8, 2017 ("Reply Br."), at 8. The Appellants' argument is not responsive to an argument raised for the first time in the Examiner's Answer, and the Appellants do not show good cause why the argument could not have been raised in the Appeal Brief. Therefore, the Appellants' argument will not be considered on appeal. 37 C.F.R. § 41.41(b)(2) (2016).

applying a clamping voltage to one or more electrodes, measuring a current at a plurality of times, integrating the measured currents over time, and storing the generated charge values in a memory. App. Br. 5. The Appellants argue that the Examiner has not provided any evidence showing that the claimed elements are either well-known or conventional. App. Br. 5.

Referring to McAnn,⁶ the Examiner explains that the Appellants were “provided evidence that the asserted structure is conventional to the technological environment recited in the claim.” Ans. 8; *see also* Ans. 9 (mapping the system illustrated in McAnn Figure 1 to Appellants’ claim 4); Ans. 11 (finding that “the collection by computerized means of voltage and current measurements to the electrodes of an electrostatic claim [sic, clamp] was entirely conventional” (citing McAnn ¶ 38, McAnn Fig. 1)). The Appellants do not offer a response. *See, generally*, Reply Br. 2–8.

Second, the Appellants argue that if the claimed controller and/or operation thereof is considered to be a judicial exception, the electrostatic clamp monitoring system of claim 4 and the method of claim 15 recite additional elements that “add ‘significantly more’ to the judicial exception by improving the technology or technical field, and applying the elements and providing meaningful limitations to a particular machine.” App. Br. 6 (emphasis omitted). More specifically, the Appellants argue that the system of claim 4 and the method of claim 15 “improve[] the operation of the electrostatic clamp over conventional clamping systems”⁷ by

⁶ US 2011/0032654 A1, published February 10, 2011. McAnn was applied in the withdrawn obviousness rejection of claims 2–9, 12, 13, and 15–17. *See* Final Act. 10–17; Ans. 2.

⁷ In the Reply Brief, for the first time on appeal, the Appellants argue that the claimed invention improves previously-known systems and methods by “predicting a future status of the clamping ability *while minimizing production time*

“improv[ing] a clamping capability of the electrostatic clamp.” App. Br. 6–7 (emphasis omitted). According to the Appellants, “the controller may determine a trending of a ‘health’ or ‘clamping capability’ of the electrostatic clamp over numerous clamping cycles by comparing the currently determined charge value to historical determined charge values.” App. Br. 6. The Appellants also argue that the controller of claim 4 predicts a future status of the clamping capability based on determined charge values and the method of claim 15 predicts a future status of the clamping capability by forming a model of the previously stored charge values and the currently determined charge value. App. Br. 7–8. According to the Appellants, the claimed model “solves a previously-unsolved technological problem of predicting the ability of an electrostatic clamp, at any given time, to adequately clamp a workpiece thereto.” App. Br. 8 (emphasis omitted).

The Examiner explains that “the prediction of a future status of clamping capability is a mathematical algorithm ineligible by judicial exception.” Final Act. 3. According to the Examiner, there is no recitation in claim 4 or claim 15 reasonably suggesting that the claimed invention improves “the operation of the electrostatic clamp over conventional clamping systems.” Ans. 16. To the extent that the claimed electrostatic clamp is tested through electrical rather than mechanical, i.e., conventional, means, the Examiner explains that electrical monitoring of electrostatic clamps is conventionally done, as evidenced by the computerized electrical testing system taught in McAnn. Ans. 17.

losses.” Reply Br. 7 (original emphasis omitted). The Appellants’ argument is not responsive to an argument raised for the first time in the Examiner’s Answer, and the Appellants do not show good cause why the argument could not have been raised in the Appeal Brief. Therefore, the Appellants’ argument will not be considered on appeal. 37 C.F.R. § 41.41(b)(2) (2016).

The Examiner finds that the improvement alleged by the Appellants “is found entirely in the mathematical processing, which is enabled by an entirely conventional combination of hardware.” Ans. 7. More specifically, the Examiner finds that “[t]he putative improvement offered by the present invention to this entirely conventional system is found in the application of mathematics to produce mathematical answers (clamping capability and predicted future status) from conventionally obtained information (in particular, an electrical current).” Ans. 19.

Based on the foregoing, we find that the evidence of record establishes that all of the elements recited in claim 4 are conventional elements configured to enable the controller to be programmed to (1) determine a clamping capability of the electrostatic clamp and (2) predict a future status of the clamping capability of the electrostatic clamp. No elements recited in claim 4 are configured to perform functions other than those functions necessary to enable the controller to be programmed as claimed. Similarly, the applying, measuring, integrating, and storing steps recited in claim 15 are performed using conventional elements to program the controller to (1) determine a clamping capability of the electrostatic clamp and (2) form a model to predict a future status of the clamping capability of the electrostatic clamp. Once a clamping capability is determined or a future status is predicted, no further action is recited in claim 15. Thus, on this record, we agree with the Examiner that the mathematical answers provided by the claimed invention do not “improve the conventional machine—the answers are produced and their use is left unspecified.” Ans. 19.

The rejection of claims 2–9, 12, 13, and 15–17 under 35 U.S.C. § 101 is sustained.

C. DECISION

The Examiner’s decision is affirmed.

Appeal 2018-001004
Application 13/729,524

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).

AFFIRMED