

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ELECTION SYSTEMS & SOFTWARE, LLC,
Petitioner,

v.

HART INTERCIVIC, INC.,
Patent Owner.

PGR2020-00031
Patent 10,445,966 B1

Before CHARLES J. BOUDREAU, AMANDA F. WIEKER, and
JASON M. REPKO, *Administrative Patent Judges*.

REPKO, *Administrative Patent Judge*.

DECISION
Granting Institution of Post-Grant Review
35 U.S.C. § 324, 37 C.F.R. § 42.4

I. INTRODUCTION

Election Systems & Software, LLC (“Petitioner”) filed a petition to institute a post-grant review of claims 1–30 of U.S. Patent No. 10,445,966 (Ex. 1001, “the ’966 patent”). Paper 2 (“Pet.”). Hart InterCivic, Inc. (“Patent Owner”) did not file a Preliminary Response.

Institution of post-grant review requires that the information presented in the Petition, if not rebutted, demonstrate that it is more likely than not that at least one challenged claim is unpatentable. 35 U.S.C. § 324(a). Applying that standard, we institute a post-grant review.

A. Related Matters

Neither party identifies any related matters. Pet. 1; Paper 4, 2 (Mandatory Notice).

B. The ’966 Patent

The ’966 patent describes an electronic voting system that uses printed vote records (PVRs). Ex. 1001, 1:54–57. PVRs create an official record for later auditing. *Id.* at 1:29–31, 36. Electronic voting systems that create a paper record are called “hybrid voting” systems because they are a cross between hand-marked paper ballots and electronic systems. *Id.* at 1:31–34. In these hybrid systems, PVRs typically contain a bar code that encodes the voter’s selections. *Id.* at 1:40–42. The hybrid voting system then digitally scans the PVR’s bar code to create an electronic cast vote record. *Id.* at 1:42–43. But, according to the patent, voters find that this system lacks transparency because they cannot read the bar code to confirm that their votes match the printed record and their intended vote selections. *Id.* at 1:43–47.

To improve transparency, the ’966 patent’s PVRs record the voter’s selections using voter-readable characters. *See id.* at 1:48–57. For example,

the top of a PVR generated by a ballot-marking device is shown below. *See id.*, Fig. 3.

320

300

310

340

OFFICIAL VOTE RECORD

Additional custom header text

PVR Title

Joint General and Special Election

Sample County, USA

November 7, 2006

81234567

Precinct: Anderson 1001-A

PERSONAL

844498-12-00000

20

81234567

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To cast your ballot, you must take this record to the separate scanning station and scan it.

	CHOICE	ORDER
President and Vice President	QUINLAN PHILLIPS	3 DEM
Senator	CAJ KLEMENTS	1 DEM
House of Representative District 6	NITIN STEVENS	5 DEM
Secretary of State	VIMAL ORIOL	22 DEM
Railroad Commissioner	KELEEN ANGIOLI	2 DEM
State Senator	SALLIE UTKIN	4 DEM
State Legislator, District 124	SEBASTIJAN KAMAU	6 DEM
Governor	TEKLA ALFARSI	1 DEM

Figure 3 shows the PVR's header region 310 with instructions to the voter, voter selection section 340, which is readable by the voter, and bar code 320. *Id.* at 6:25–40.

The system scans the PVR using optical character recognition (OCR) to record the votes. *Id.* at 1:57–59. That is, the voter can read the same data from which the system generates the cast vote record. *Id.* at 1:60–65. This allows the voter to confirm that the PVR matches the selections entered into the ballot-marking device. *Id.* at 6:40–43.

The system uses a bar code to detect counterfeit or altered PVRs. *Id.* at 2:31–32. The bar code includes a digitally signed hash. *Id.* at 2:33–36. During scanning, the system generates the OCR results and verifies them with another hash. *Id.* at 2:36–38. In particular, the system produces a hash from the OCR-generated characters and compares them to the hash provided in the bar code. *Id.* at 2:38–40. According to the patent, this technique confirms that a known source printed the PVR and detects post-printing alterations. *Id.* at 2:40–44.

The system's OCR process uses several techniques to improve recognition accuracy. *See id.* at 1:66–2:30. In one embodiment, the OCR process uses a dictionary of potential vote choices (such as candidate names) for pattern matching. *Id.* at 1:67–2:4. The OCR process may also use a Levenshtein distance algorithm for error detection. *Id.* at 2:20–22. This algorithm calculates a distance between the OCR data and each key in the dictionary. *Id.* at 2:22–24. If the distance is below a threshold, the data is matched to the dictionary entry. *Id.* at 2:24–26.

C. Claims

Claims 1, 6, 11, 15, 20, 23, 28, and 29 are independent. Claim 1 is reproduced below.

1. A method for electronic voting using printed vote records, comprising:
 - recording a voter's vote selections;
 - generating a printed vote record of the voter's vote selections, the printed vote record containing voter readable text indicating the voter's vote selections;
 - scanning the printed vote record, the scanning including scanning the voter readable text;
 - utilizing optical character recognition (OCR) on the scanned voter readable text to create a data set which identifies the voter's vote selections; and
 - generating a cast vote record from the data set so that voter selections in the cast vote record are based on the voter readable text,
- wherein identifying the voter's vote selection includes comparing the data set to an election dictionary, the election dictionary containing potential vote choices,

wherein the comparing the data set to the election dictionary is utilized to confirm an accuracy of the OCR to limit potential OCR errors.

Ex. 1001, 8:43–62.

D. Evidence

Name	Reference	Exhibit No.
Brockhouse	US 2014/0231513 A1, published Aug. 21, 2014	1004
Heilper	US 7,406,201 B2, issued July 29, 2008	1005
Nadaf	BR 10 2013 018558-2 A2, published Sept. 2, 2014	1006 (original), 1007 (translation)
Backert	US 9,401,059 B2, issued July 26, 2016	1008
Herskowitz	US 6,971,574 B1, issued Dec. 6, 2005	1009

E. Asserted Grounds

Petitioner asserts that claims 1–30 are unpatentable on the following grounds. Pet. 3.

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–30	101	Eligibility
1–5, 15–19	103	Brockhouse, Heilper
6–10, 23, 24, 29, 30	102 or 103	Nadaf
25	103	Nadaf, Heilper
11–14, 28	103	Nadaf, Backert, Herskowitz
20–22	103	Nadaf, Heilper, Backert, Herskowitz
4, 5, 26, 27	112(b)	Indefiniteness

II. ANALYSIS

A. Eligibility for Post-Grant Review

Post-grant review is available only for patents that, at one point, contained at least one claim with an effective filing date, as defined by 35

U.S.C. § 100(i), on or after March 16, 2013. Petitioner asserts that the '966 patent is available for post-grant review. Pet. 2. We agree. The filing date for the '966 patent is January 4, 2019, and the patent claims benefit only to a provisional application filed on July 27, 2018. Ex. 1001, codes (22), (60).

B. Level of Ordinary Skill in the Art

According to Petitioner,

A person of ordinary skill in the art at the time the '966 patent was filed ("POSITA") would have had at least a Bachelor's degree in electrical engineering or computer science or an equivalent field, or equivalent work experience and, in addition, at least two years' experience with electronic voting machines, including familiarity with ballot marking devices ("BMDs"), optical character recognition, bar codes and hash functions.

Pet. 24 (citing Ex. 1003 ¶¶ 50–51).

For the purpose of this decision, we apply Petitioner's proposed definition, which is consistent with the level of skill reflected in the asserted references. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that the prior art itself can reflect an appropriate level of skill in the art). If Patent Owner proposes a different level of ordinary skill in the art in its Response, the parties are encouraged to explain how any differences affect the unpatentability grounds.

C. Claim Construction

In Petitioner's view, the '966 patent defines the term "cast vote record" both as (1) "an electronic record that indicates the determined voter's choice or selection in a manner determined in accordance with the voting system" and (2) "an electronic record of a voter's cast voting selections and *may be* used in the vote tabulation process." Pet. 23 (quoting Ex. 1001, 1:23–28) (emphasis added).

We understand Petitioner to assert that the patent's use of the word "may," in the second definition, means that the record is not required to be used in tabulation. *See id.* According to Petitioner, "while the cast vote record may be used in the vote tabulation process, one of ordinary skill in the art would recognize that such use is not required." *Id.* (citing Ex. 1045) (emphasis in original). To support this position, Petitioner cites a definition for "cast vote record" from the *Electronic Voting Glossary*: "permanent record of all votes produced by a single voter whether in electronic, paper or other form. Also referred to as BALLOT IMAGE when used to refer to electronic ballots. ... An 'archival record of all votes produced by a single voter.'" *Id.* at 23–24 (quoting Ex. 1045, 7). On this issue, Petitioner sufficiently supports the assertion that the '966 patent uses the term "may" to indicate an optional use. *Id.* at 23. Thus, we preliminarily find that the cast vote record need not be used in tabulation.

For the purposes of this decision, we preliminarily construe "cast vote record" as a "record that indicates the determined voter's choice or selection in a manner determined in accordance with the voting system," consistent with Petitioner's first identified definition. *See* Ex. 1001, 1:23–28; Pet. 23. We note that the definition that Petitioner quotes from the '966 patent is for an "*electronic* cast vote record." Pet. 23 (quoting Ex. 1001, 1:23–28) (emphasis added). But the claims recite only a "cast vote record," without specifying that it be "electronic." *See, e.g.,* Ex. 1001, 8:43–62 (claim 1). So our preliminary construction of "cast vote record" follows Petitioner's quoted definition but omits the word "electronic." *See* Pet. 23. Because the term "cast vote record" is not required to be electronic or tabulated, we do not include the second part of the quoted definition: "an electronic record of

a voter's cast voting selections and may be used in the vote tabulation process." *See* Ex. 1001, 1:23–28.

We need only construe terms that are in controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). On the current record, no terms are in controversy. So, apart from the "cast vote record," we do not construe any additional claim terms in this decision.

D. Obviousness over Brockhouse and Heilper

1. Claims 1 and 15

Petitioner asserts that the subject matter of independent claims 1 and 15 would have been obvious over Brockhouse and Heilper. Pet. 49–56. As discussed in the following sections, Petitioner asserts that Brockhouse teaches all limitations of claims 1 and 15, except for using a dictionary to improve the accuracy of the OCR process. *Id.* Petitioner asserts that one of ordinary skill in the art would have used a dictionary, as taught by Heilper, for error correction. *Id.* at 56.

a) Brockhouse

Brockhouse describes a voting system that prints a voter's selections on a card. *See generally* Ex. 1004, Abstract, Fig. 6. In one embodiment, the voter selects candidates on a touch-screen device. *Id.* ¶¶ 41–42. After the voter finishes selecting the candidates, the voting system prints those selections on an activation card. *Id.* ¶ 53. The activation card includes other information, such as a bar code. *Id.* In one mode, the tabulation device decodes voter selections on the activation card using OCR and generates the cast vote record from the resulting data set. *Id.* ¶¶ 130, 134.

b) Heilper

Heilper generally relates to OCR error correction. Ex. 1005, 1:6–9. Heilper explains that an OCR process is typically followed by an error-correction step. *Id.* at 1:20–21. For example, Heilper describes an algorithm for dictionary-based OCR error correction. *Id.* at 1:26–41.

c) Preamble

Claim 1 recites, in part, “A method for electronic voting using printed vote records, comprising.” Ex. 1001, 8:43–44. Claim 15 recites the same preamble. *Id.* at 9:64–65.

On this record, Petitioner has made a sufficient showing that Brockhouse teaches the subject matter recited in the preamble. Pet. 49 (citing Ex. 1004, Abstract; Ex. 1003 ¶¶ 208–209). In particular, the cited evidence shows that Brockhouse’s electronic voting station uses a printed activation card. Ex. 1004, Abstract. Brockhouse’s printed activation card shows the voter’s selections. *Id.* Thus, without determining whether the preamble is limiting, we determine that Petitioner sufficiently shows, at this stage and on this record, that Brockhouse teaches a method for electronic voting using printed vote records, as recited in claims 1 and 15.

d) Recording Vote Selections

Claim 1 recites, in part, “recording a voter’s vote selections.” Ex. 1001, 8:45. Claim 15 recites a similar step but adds that the selection is “with a ballot marking device.” *Id.* at 9:66–67. The ’966 patent discloses that a “wide range” of BMDs may be used. *Id.* at 4:27–30. In one example, the voter enters selections via the BMD’s touch screen, and the BMD prints a PVR with an internal printer. *Id.* at 4:39–45.

Petitioner asserts that Brockhouse’s voting apparatus performs the recited recording. *See* Pet. 50 (citing Ex. 1004 ¶¶ 16, 41–42, 53, 104–106,

117, 134). Like the BMD disclosed in the '966 patent, Brockhouse's voting apparatus records a voter's selections via a touch-screen display or a keypad. Ex. 1004 ¶¶ 41–42, *cited in* Pet. 50. After these selections, Brockhouse's voting apparatus prints a PVR, i.e., an activation card, to create the cast vote record. *Id.* ¶ 53, *cited in* Pet. 50. In at least this way, Petitioner sufficiently shows at this stage that Brockhouse records a voter's vote selections with a BMD.

e) Generating a Printed Vote Record

Claim 1 recites, in part, “generating a printed vote record of the voter's vote selections, the printed vote record containing voter readable text indicating the voter's vote selections.” Ex. 1001, 8:46–48. Claim 15 recites a similar limitation but adds “a candidate name of a voter's vote selection.” *Id.* at 10:1–4.

Petitioner asserts that Brockhouse prints the recited PVR. Pet. 52. Brockhouse states that “after a voter has made his/her voting selections with universal voting station 12, printer 72 prints a master bar code 110, vote selection bar codes 112, and vote selections 114 on activation card 20.” Ex. 1004 ¶ 53, *quoted in* Pet. 52. One embodiment of Brockhouse's activation card is shown below with Petitioner's annotations. Pet. 52.

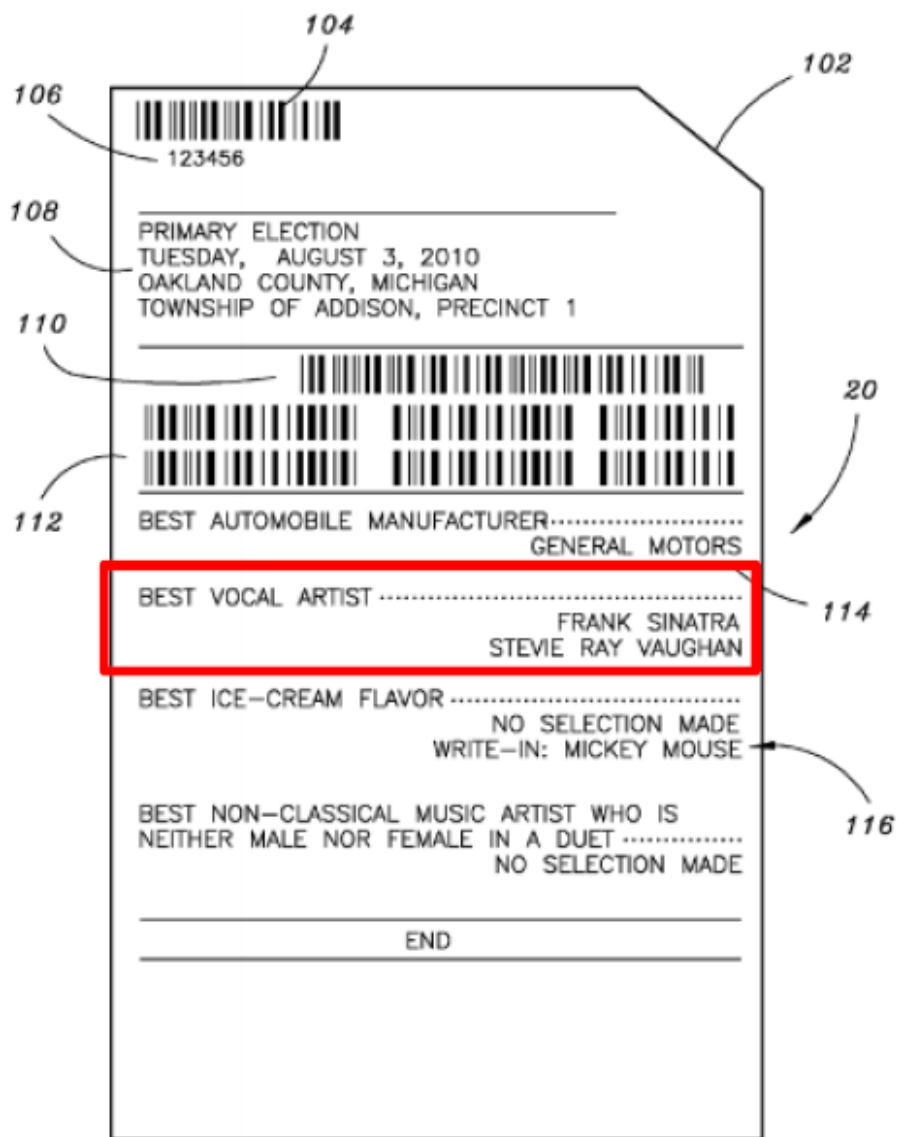


FIG. 6

The figure above shows Brockhouse’s activation card with Petitioner’s annotations. Pet. 52 (citing Ex. 1004, Fig. 6, ¶ 16)

Figure 6 shows, among other things, the names “FRANK SINATRA” and “STEVIE RAY VAUGHAN.” Ex. 1004, Fig. 6. Brockhouse explains that the voter chose these candidates for the “BEST VOCAL ARTIST” contest. *Id.* ¶ 56. On this record, Petitioner sufficiently shows for the purpose

of institution that Brockhouse teaches a PVR containing voter-readable text indicating the voter's vote selections: candidates Frank Sinatra and Stevie Ray Vaughn, among others. Pet. 52 (citing Ex. 1004, Fig. 6, ¶¶ 16, 53, 106; Ex. 1003 ¶¶ 216–218).

f) Scanning the Printed Vote Record

Claim 1 recites, in part, “scanning the printed vote record, the scanning including scanning the voter readable text.” Ex. 1001, 8:49–50. Claim 15 recites in part, “electronically scanning the printed vote record, the scanning including scanning the candidate name.” *Id.* at 10:5–6.

Petitioner asserts that Brockhouse teaches these limitations. Pet. 53 (citing Ex. 1004 ¶¶ 106, 130, 134, 219–221). In one of the cited paragraphs, Brockhouse teaches that, after tabulation device 14 receives an activation card, ballot-scanner assembly 194 scans the card and sends the result to a processor. Ex. 1004 ¶ 130. Considering Brockhouse's description of ballot-scanner assembly 194 here, Petitioner sufficiently shows at this stage that Brockhouse teaches the limitations about scanning the PVR.

g) Optical Character Recognition

Claim 1 recites, in part, “utilizing optical character recognition (OCR) on the scanned voter readable text to create a data set which identifies the voter's vote selections.” Ex. 1001, 8:51–53. Claim 15 has a similar limitation but recites candidate name instead of voter-readable text: “utilizing optical character recognition (OCR) on the scanned *candidate name to create a first data set.*” *Id.* at 10:7–8 (emphasis added).

Petitioner asserts that Brockhouse teaches these limitations. Pet. 54 (citing Ex. 1004 ¶ 134; Ex. 1003 ¶¶ 222–224). In the paragraph cited by Petitioner, Brockhouse discloses that devices 12 or 14 use OCR to “decode the voter selections 114 on the printed activation cards.” Ex. 1004 ¶ 134. As

discussed above, Petitioner sufficiently shows that Brockhouse’s activation card has candidate names. *Supra* § II.D.1.e). On this record, Petitioner sufficiently shows at this stage that Brockhouse teaches using the OCR process recited in claims 1 and 15.

h) Generating a Cast Vote Record

Claim 1 recites, in part, “generating a cast vote record from the data set so that voter selections in the cast vote record are based on the voter readable text.” Ex. 1001, 8:54–56. Claim 15 recites, in part, “generating a cast vote record based on the comparing of the first data set with the election dictionary so that voter selections in the cast vote record are based on the scanned candidate name.” *Id.* at 10:15–18.

For the purposes of this decision, we construe “cast vote record” as “a record that indicates the determined voter’s choice or selection in a manner determined in accordance with the voting system.” *See supra* § II.C.

Petitioner asserts that Brockhouse teaches generating the cast vote record, as recited. Pet. 54 (citing Ex. 1004 ¶¶ 117, 130, 134). In the cited paragraphs, Brockhouse teaches that the tabulation device uses OCR to decode voter selections on the card and generates the cast vote record from the resulting data set. Ex. 1004 ¶¶ 130, 134. Because the OCR data comes from the voter’s selections, Petitioner sufficiently shows that Brockhouse’s record indicates the determined voter’s choice—as required by the construction of cast vote record above. *See supra* § II.C. Also, Brockhouse expressly states that the tabulation device “permanently stores the cast vote record” for the cards. Ex. 1004 ¶ 117. On this record, Petitioner sufficiently shows that Brockhouse generates the cast vote record, as recited in claims 1 and 15.

i) The Election Dictionary

Claim 1 recites, in part,

wherein identifying the voter's vote selection includes
comparing the data set to an election dictionary, the
election dictionary containing potential vote
choices,

wherein the comparing the data set to the election
dictionary is utilized to confirm an accuracy of the
OCR to limit potential OCR errors.

Ex. 1001, 8:57–62. Claim 15 recites a similar limitation. *See id.* at 10:9–14.

Petitioner asserts that it would have been obvious “to incorporate the known error correction safeguards disclosed in Heilper, such as the use of a dictionary, with the common OCR procedures utilized in Brockhouse.”

Pet. 56 (citing Ex. 1003 ¶¶ 231–235). Petitioner asserts that OCR processes are error prone. *Id.* (citing Ex. 1005, 1:13–41). According to Petitioner, “One of ordinary skill in the art would have further known that the cast vote record should be based on the error-corrected OCR data set—a data set that as established above includes candidate name(s).” *Id.* (citing Ex. 1003 ¶ 234).

On the current record at this preliminary stage, Petitioner's obviousness rationale is sufficiently supported. *See id.* In particular, Heilper teaches that OCR processes typically segment the scanned document into individual characters and then apply a pattern-recognition algorithm to each character to find a match. Ex. 1005, 1:15–20. Heilper teaches that this is typically followed by an error-correction step because OCR processes are error prone. *Id.* at 1:20–21. According to the quoted paragraph from Heilper, error correction includes finding each OCR-generated word in a dictionary and substituting the nearest match from the dictionary. *Id.* at 1:21–25. At this

stage, these parts of Heilper sufficiently support Petitioner’s conclusion that using Heilper’s dictionary would have been obvious because it would have provided “error correction” for Brockhouse’s method. Pet. 56.

j) Conclusion

We conclude that the unrebutted information presented in the Petition demonstrates that it is more likely than not that claims 1 and 15 would have been obvious over the combination of Brockhouse and Heilper.

2. Claims 2, 3, and 16

Claim 2 recites, “The method of claim 1, wherein the comparing the data set to an election dictionary includes using a long string matching algorithm.” Ex. 1001, 8:43–62. Claim 16 depends from claim 15 and recites a similar limitation. *Id.* at 9:64–10:18. Claim 3 further limits the matching algorithm by reciting that it “uses a Levenshtein distance value.” *Id.* at 8:66–67.

Petitioner asserts that Heilper teaches the recited matching algorithm. Pet. 57 (quoting Ex. 1005, 1:13–41). According to the quoted paragraph, dictionary-based error correction typically uses a string-matching algorithm, and these algorithms are based on the Levenshtein distance. Ex. 1005, 1:26–41. On this record and at this stage, Petitioner sufficiently shows that Heilper teaches the recited long-string matching algorithm and Levenshtein-distance value.

3. Claims 4, 5, 18, and 19

Claim 4 depends from claim 1 and recites, in part, “wherein the data set includes a candidate’s name, the data set combined with additional information related to the voter’s vote selection to assist in identifying the voter’s vote selection.” Ex. 1001, 9:1–4. Claim 18 recites a similar limitation

and “scanning additional information related to the voter’s vote selection to assist in identifying the voter’s vote selection.” *Id.* at 10:24–28.

Petitioner asserts that claim 4 is indefinite because it is “ungrammatical and meaningless as written.” Pet. 85–86. For purpose of the obviousness ground, Petitioner interprets claim 4 to require that the data set combined additional information is used to assist in identifying the voter’s vote selection. *See id.* at 60. For example, Petitioner explains, “A POSITA would have also recognized that this additional information—contest name(s)—could be used to assist in identifying the voter’s vote selection.” *Id.*

Petitioner’s interpretation is supported by the embodiments disclosed in the patent. *See id.* For instance, the ’966 patent discloses that the additional data can be information other than the candidate’s name, such as “sequence number data,” “line number data affiliated with a contest,” “the contest name itself,” or “data related to the candidate.” Ex. 1001, 5:14–22. In one embodiment, the OCRed name and the additional data are used together as a key into the election dictionary. *Id.* at 5:14–16.

As for the prior art, Petitioner asserts that Brockhouse’s PVR has additional information, including the contest name. Pet. 59. To show this, Petitioner annotates Brockhouse’s Figure 6, below. *Id.*

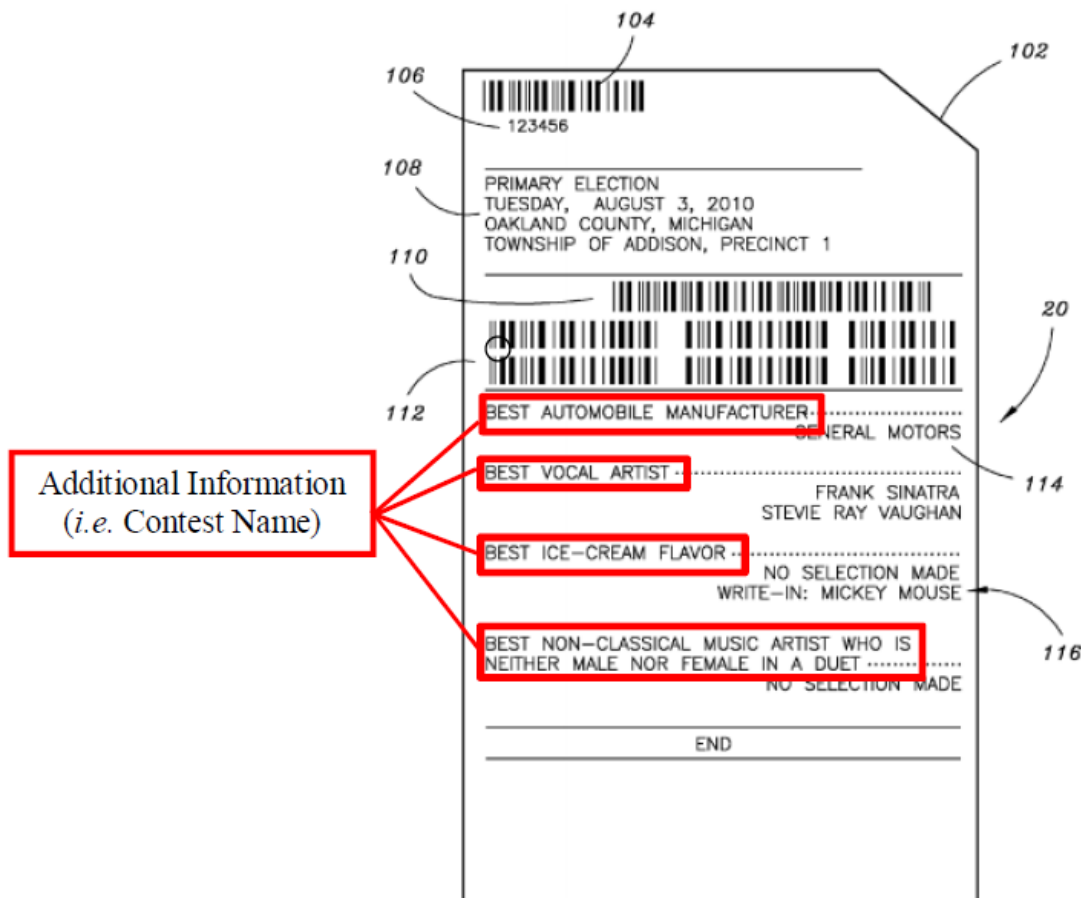


FIG. 6

Figure 6, above, shows Brockhouse’s PVR with Petitioner’s annotation on the contest name. Pet. 59.

Figure 6 shows a PVR with “BEST VOCAL ARTIST,” among other contests. Ex. 1004, Fig. 6. Brockhouse uses OCR to decode the vote selections. *Id.* ¶ 134. Petitioner asserts that it would have been obvious to use the contest name to help identify the vote selection. Pet. 59–60 (citing Ex. 1003 ¶¶ 241–250). Dr. Shamos’s declaration repeats Petitioner’s assertion without further citing the record. Ex. 1003 ¶¶ 249–250.

Claim 5 depends from claim 4 and recites, “wherein the additional information includes information affiliated with a candidate and/or information affiliated with a contest.” Ex. 1001, 9:5–7. Claim 19 depends

from claim 18 and recites a similar limitation. *Id.* at 10:29–31. Here, Petitioner identifies the contest name “BEST VOCAL ARTIST,” which is at least affiliated with the candidate “FRANK SINATRA.” Ex. 1004, Fig. 6.

4. Claim 17

Claim 17 recites, in part, “providing a bar code on the printed vote record.” Ex. 1001, 10:22–23. Petitioner asserts that Brockhouse teaches this limitation. Pet 60 (citing Ex. 1004 ¶ 134, Fig. 6). Because the PVR in Figure 6 of Brockhouse has a bar code printed on it, Petitioner sufficiently shows that Brockhouse teaches the recited bar code at this stage and on this record. *See* Ex. 1004 ¶ 134 (discussing bar codes).

E. Anticipation or Obviousness over Nadaf

1. Independent Claims 6, 23, and 29

Petitioner asserts that the subject matter of independent claims 6, 23, and 29 is unpatentable as anticipated “and/or” obvious over Nadaf. Pet. 60–69.

a) Nadaf

Nadaf describes an electronic voting device that prints a “verification ballot.” Ex. 1007, 14:7–14. The verification ballot has the voter’s selections “stated in sufficiently legible text.” *Id.* at 14:11–12. The ballot also contains a bar code that encodes “the complete vote by the voter.” *Id.* at 14:12–14. Nadaf’s optical reader compares the text to the bar-code information. *Id.* at 19:7–9. According to Nadaf, the voting device allows “the voter to leave the polling station after comparing the two printed records of their vote, one in text and the other in a two-dimensional bar code.” *Id.* at 13:6–9.

b) Preamble

Claims 6, 23, and 29 recite, in part, “A method for electronic voting using printed vote records.” Ex. 1001, 9:8–9 (claim 6), 10:62–63 (claim 23), 12:13–14 (claim 29).

Petitioner asserts that Nadaf’s electronic voting machine generates printed records. Pet. 61 (quoting Ex. 1007, 10:13–11:1). In the quoted paragraph, Nadaf explains that the printed vote assures the voter about the vote’s integrity and prevents digital tampering. *See* Ex. 1007, 10:13–11:1. On this record, without determining whether the preamble is limiting, we determine that Petitioner sufficiently shows at this stage that Nadaf’s method is for electronic voting using PVRs, as recited in the preamble.

c) Recording Vote Selections

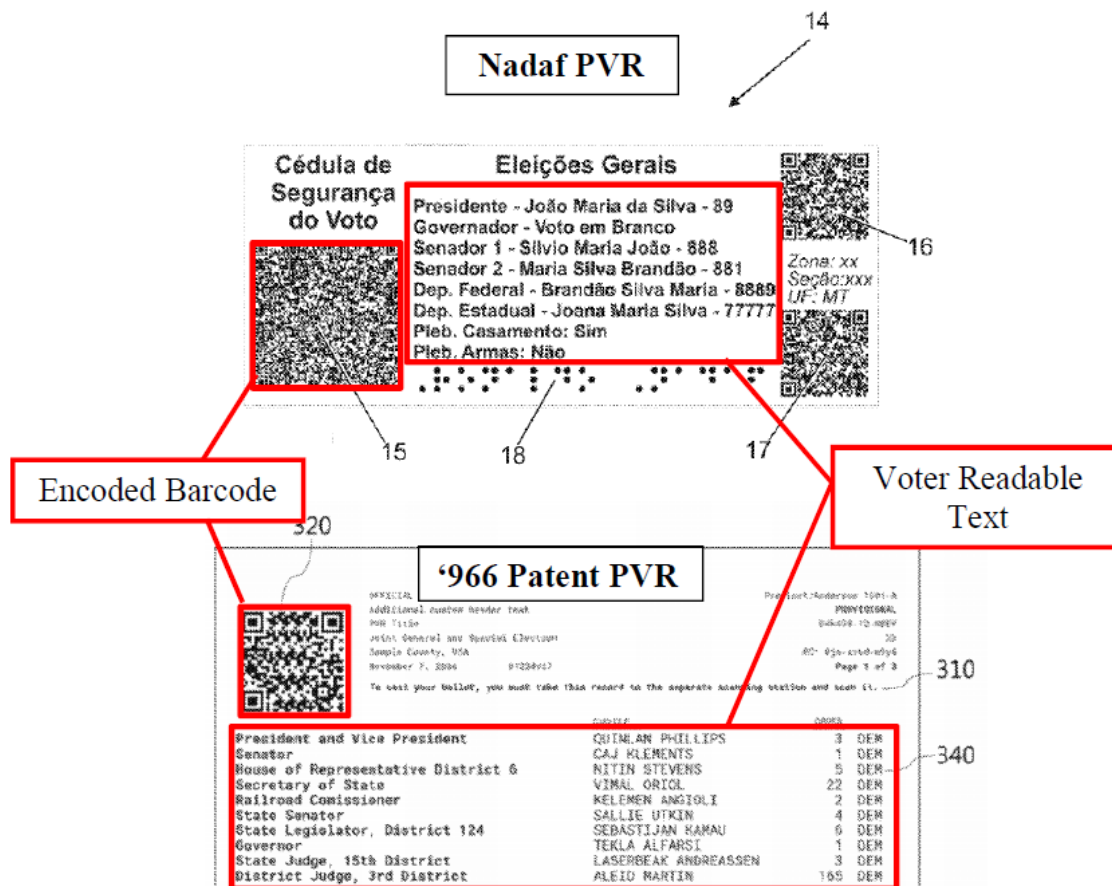
Claims 6, 23, and 29 recite, in part, “recording a voter’s vote selections.” Ex. 1001, 9:10 (claim 9); 10:64 (claim 23); 12:15 (claim 29).

Petitioner asserts that, in Nadaf, the voter uses the voting machine to record selections. Pet. 62 (citing Ex. 1007, 14:3–9; Ex.1003 ¶¶ 261–262). In the cited paragraph, Nadaf describes that, using a keyboard or touchscreen, the voter chooses the candidates then authorizes the ballot to be printed. Ex. 1007, 14:3–9, *quoted in* Pet. 62. On this record, Petitioner sufficiently shows at this stage that Nadaf teaches the recited recording.

d) Generating a PVR

Claims 6, 23, and 29 recite, in part, “generating a printed vote record of the voter’s vote selections, the printed vote record containing voter readable text indicating the voter’s vote selections.” Ex. 1001, 9:11–14 (claim 6), 10:65–67 (claim 23), 12:16–18 (claim 29).

Petitioner reproduces the PVRs of Nadaf and the ’966 patent, with its annotations. Pet. 64. We show Petitioner’s illustration below. *See id.*



The Figure above is Nadaf’s Figure 4 and the top part of the ’966 patent’s Figure 3 with Petitioner’s annotations on the encoded bar code and voter-readable text. *Id.*

In the paragraph quoted by Petitioner, Nadaf discloses that the “verification ballot (14)” shows the voter’s choices for each office being contested in the election. Ex. 1007, 14:7–14, *quoted in* Pet. 63. Nadaf adds that the choices are “stated in sufficiently legible text.” Ex. 1007, 14:11–12. On this record and at this preliminary stage, Petitioner sufficiently shows that Nadaf’s PVR contains voter-readable text “indicating the voter’s vote selections,” as recited.

e) Scanning the PVR

Claims 6 and 29 recite, in part, “scanning the printed vote record, the scanning including scanning the voter readable text.” Ex. 1001, 9:15–16 (claim 6), 12:19–20 (claim 29). Claim 23 recites a similar limitation but adds electronic bar-code scanning: “*electronically* scanning the printed vote record, the *electronical* scanning including scanning the voter readable text and scanning the bar code.” *Id.* at 11:4–6 (emphasis added).

Petitioner asserts that Nadaf discloses an optical reader that performs these operations. Pet. 64–65 (citing Ex. 1007, 13:6–9, 19:7–9). In particular, Petitioner asserts that, after voting, the voter submits the printed ballot to optical reader 25 for scanning. *Id.* at 64 (citing Ex. 1007, 19:7–9). In the cited paragraph, Nadaf describes that optical reader 25 compares the text-vote information to the vote information encoded by the bar code. Ex. 1007, 19:7–9, *quoted in* Pet 65. Nadaf’s Figure 6 shows that optical reader 25 is part of the electronic voting equipment. *Id.* Fig. 6, 11:14–15. And as discussed above, Petitioner sufficiently shows that Nadaf’s text-vote information contains voter-readable text. *Supra* § II.D.1.d). So at this stage and on the evidence of record, Petitioner sufficiently shows that Nadaf’s optical reader is electronic and scans the voter-readable text and bar code.

f) Optical Character Recognition

Claims 6, 23, and 29 recite, in part, “utilizing optical character recognition (OCR) on the scanned voter readable text to create a data set which identifies the voter’s vote selections.” Ex. 1001, 9:16–18 (claim 6) 11:7–9 (claim 23), 12:21–23 (claim 29).

Petitioner asserts that Nadaf’s optical reader 25 applies OCR to the scanned image to create a data set identifying the voter’s selections. Pet. 65 (citing Ex. 1007, 18:9, 19:7–13; Ex. 1003 ¶¶ 270–273). In particular,

Petitioner asserts that Nadaf's optical reader 25 is an optical OCR and QR-code reader. *Id.* (citing Ex. 1007, 18:9). According to the cited paragraphs, Nadaf's reader 25 reads the bar codes and compares the "text vote information" to the vote information from the bar code. Ex. 1007, 19:7–9, *cited in* Pet. 65. Because Nadaf scans voter-readable text to perform this comparison, Petitioner sufficiently shows at this stage that Nadaf uses OCR in the way that is recited in claims 6, 23, and 29.

g) Generating a Cast Vote Record

Claims 6, 23, and 29 recite, in part, "generating a cast vote record from the data set so that voter selections in the cast vote record are based on the voter readable text." Ex. 1001, 9:20–22 (claim 6), 11:10–12 (claim 23), 12:24–26 (claim 29).

Petitioner asserts that Nadaf generates the cast vote record from the recited data set. Pet. 66 (citing Ex. 1007, 6:7–10, 17:13–18:9, 19:10–13; Ex. 1003 ¶¶ 274–276). As discussed above, Petitioner sufficiently shows that Nadaf's printed vote contains voter-readable text. *Supra* § II.D.1.d). In the cited paragraph, Nadaf discloses that, after an audit, the printed vote is recorded electronically and stored. Ex. 1007, 19:10–13. Because Nadaf processes the printed vote in this way, Petitioner sufficiently shows at this stage that (1) Nadaf generates the cast vote record from the data set that identifies the voter's vote selections and (2) Nadaf's voter selections in the cast vote record are based on the voter-readable text.

h) Bar code / Encoded Data

Claim 6 recites, in part,

providing a bar code on the printed vote record, the bar code including information indicative of the voter's vote selections,

wherein the bar code is utilized to confirm that results of the OCR match the voter's original selections by comparing data in the bar code to the data set created by the OCR.

Ex. 1001, 9:23–29. Claim 29 contains a similar limitation but recites “encoded data” instead of “bar code.”¹ *See id.* at 2:27–33.

Petitioner asserts that Nadaf's PVR has a bar code encoding the voter's selections. Pet. 68 (citing Ex. 1007, 14:10–13, Fig. 4). According to Nadaf, the bar code encodes the voter's “complete vote.” Ex. 1007, 14:10–13. On this record and for the purpose of institution, Petitioner sufficiently shows that Nadaf discloses the recited bar code.

Petitioner also asserts that Nadaf uses the bar code to confirm that the OCR results match the voter's original selections. Pet. 68–69 (citing Ex. 1007, 13:6–9, 19:7–9). For example, Nadaf's optical reader 25 compares the text vote information to the vote information from the bar code. Ex. 1007, 19:7–9. Also, Nadaf discloses that the system uses the bar code to verify the printed vote. *See id.* at 13:6–9. Thus, Petitioner sufficiently shows that Nadaf compares the bar code to the OCR data set, as recited in claims 6 and 29.

Similarly, claim 23 recites, in part, “the printed vote record further including a bar code, the bar code including information indicative of the voter's vote selections” (Ex. 1001, 11:1–3) and recites the same wherein clause as claim 6 about how the bar code is used (*see* Ex. 1001, 11:14–17).

¹ Petitioner asserts that “the bar code” lacks antecedent basis in claim 29. Pet. 67. Claim 29 recited, as originally issued, “by comparing data in *the bar code* to the data set created by the OCR.” Ex. 1001, 12:32–34. But a Certificate of Correction dated October 15, 2019, deleted “the bar code” and inserted “a bar code.” Ex. 1002, 2.

So for same reasons as discussed for claims 6 and 29, Petitioner sufficiently shows at this stage that Nadaf also discloses this limitation. Pet. 68–69.

i) Conclusion

We conclude that the information presented in the Petition demonstrates that it is more likely than not that claim 6, 23, and 29 are anticipated by Nadaf.

2. Claims 7–10, 24, and 30

Claims 7 and 24 depend from claims 6 and 23, respectively. Both claims 7 and 24 add “wherein the bar code is utilized to confirm the printed vote record is valid.” Ex. 1001, 9:30–31 (claim 7), 11:18–19 (claim 24). Claims 8–10 further limit the bar code. *Id.* at 9:32–38.

As for claims 7 and 24, Petitioner asserts that Nadaf counts the vote only after confirming that the PVR is valid. Pet. 70 (citing Ex. 1007, 6:2–10). In the cited passages, Nadaf refers to the process as “confirming the institutional provenance and integrity of the content of the printed vote.” Ex. 1007, 6:2–6. According to Nadaf, “Only after being audited will the printed vote be validated for counting.” *Id.* at 6:7–10. On this record, Petitioner sufficiently supports the assertion that Nadaf confirms the printed vote’s validity with the bar code, as recited. *See* Pet. 69–70.

As for claims 8–10 and 30, Petitioner asserts that Nadaf’s PVR contains both voter-readable text and a bar code encoded with voter selections. Pet. 71 (citing Ex. 1006, Fig. 4). Petitioner asserts that (1) Nadaf’s Figure 4 shows an example QR code and (2) a QR code is a two-dimensional bar code. *Id.* (citing Ex. 1007, 18:9; Ex. 1003 ¶ 296). Thus, Petitioner sufficiently shows that Nadaf discloses the two-dimensional bar code that is a QR code, as recited in claims 9 and 10.

Claim 8, though, recites that the bar code is a “one dimensional bar code.” Ex. 1001, 9:33–34. The Petition does not further discuss one-dimensional bar codes with respect to claim 8. *See* Pet. 70–71. In the declaration, Dr. Shamos appears to rely on both anticipation and obviousness as the basis for claim 8’s unpatentability:

In my opinion, Claims 8-10 and 30 are thus *anticipated by, or*, based on the disclosure of Nadaf and the knowledge of a POSITA at the time of the purported invention of the ‘966 Patent, *would have been obvious* in light of, Nadaf.

Ex. 1003 ¶ 297 (emphasis added), *cited in* Pet. 71. The Petition explains that the claimed bar codes serve a known purpose, and “their inclusion in the claims is *not novel nor non-obvious*.” Pet. 71 (emphasis added).

In a table summarizing the grounds, the Petition states that the statutory basis for challenging claims 6–10, 23–24, 29, and 30 is “35 U.S.C. §§ 102 and/or 103.” *Id.* at 3. But, apart from that table, Petitioner does not expressly state whether the basis for challenging claim 8 is § 102 or § 103, unlike the statements in other grounds. *Compare id.* at 71 (“Claims 8–10 and 30 are also invalid *under Nadaf*.”) (emphasis added), *with id.* at 69 (“Because all of the limitations are disclosed in Nadaf, claims 6, 23, and 29 are invalid *under § 102*.”) (emphasis added), 72 (“Dependent claim 25 thus would have been obvious to a POSITA and is invalid *under §103*.”) (emphasis added).

F. Obviousness over Nadaf and Heilper

Claim 25 recites, in part, “The method of claim 23, wherein identifying the voter’s vote selection includes comparing the data set to an election dictionary.” Ex. 1001, 11:20–22.

Petitioner asserts that the subject matter of claim 25 would have been unpatentable as having been obvious over “Nadaf alone or in combination with Heilper.” Pet. 71.

As for Petitioner's explanation of how Nadaf alone teaches the recited dictionary, Petitioner only refers to sections X(C)(1) and (2) of the Petition. *Id.* at 72. Those sections address claims 6, 23, and 29. *See id.* at 60–69. Yet, unlike claim 25, claims 6, 23, and 29 do not expressly recite a dictionary.

Nevertheless, Petitioner alternatively relies on Heilper to teach the recited dictionary. *Id.* at 72. As discussed above, Petitioner sufficiently shows—at this stage and on this record—that (1) Nadaf teaches the recited OCR process and (2) Heilper teaches a dictionary for OCR error correction. *Supra* §§ II.E.1.f), II.D.1.i). Thus, for similar reasons to those discussed above with respect Brockhouse and Heilper, Petitioner sufficiently explains why one of ordinary skill in the art would have used a dictionary to ensure OCR accuracy in Nadaf. *Supra* §§ II.D.1.i).

G. Obviousness over Nadaf, Backert, and Herskowitz

Petitioner asserts that the subject matter of claims 11–14 and 28 would have been obvious over Nadaf and Backert or Nadaf and Herskowitz. Pet. 72–79.

1. Independent Claims 11 and 28

Petitioner asserts that Nadaf teaches all limitations of claims 11 and 28 except for the limitations to the hash-value procedures. Pet. 79. Petitioner asserts that it would have been obvious to use the hash-value procedures taught by Herskowitz or Backert to further increase security in Nadaf. *Id.*

a) Limitations Shared with Claims 6 and 23

Claim 11 recites the same method as claim 6 up to and including generating a cast vote. *Compare* Ex. 1001, 9:39–52 (claim 11), *with* Ex. 1001, 9:8–22 (claim 6). For the reasons discussed in connection with claim 6 (*supra* § II.E.1), Petitioner sufficiently shows that Nadaf teaches the limitations in claim 11 that are also recited in claim 6.

Claim 28 recites the same method as claim 23 up to and including generating a cast vote, except that claim 23 adds “the bar code including information indicative of the voter's vote selections.” *Compare* Ex. 1001, 11:30–12:9 (claim 28), *with* Ex. 1001, 10:62–11:12 (claim 23). For the reasons discussed in connection with claim 23 (*supra* § II.E.1), Petitioner sufficiently shows that Nadaf teaches the limitations in claim 28 that are also recited in claim 23.

b) Confirming an Integrity of the Printed Vote Record

Claim 11 recites, in part, “wherein a first hash produced from the data set is compared to a second hash provided on the printed vote record, a comparison of the first hash and the second hash confirming an integrity of the printed vote record.” Ex. 1001, 9:53–57. Claim 23 recites a similar limitation except that it requires “a second hash provided *in the bar code*,” rather than “on the printed vote record,” as in claim 11. *Compare id.* at 12:9–12 (emphasis added), *with id.* at 9:54–55.

Petitioner asserts that Nadaf uses digital signatures to ensure the PVR’s integrity. Pet. 78 (quoting Ex. 1007, 5:7–15, 6:2–10). In the quoted passages, Nadaf teaches that the ballot’s bar codes store the digital signatures of the elections judge and other auditing institutions. Ex. 1007, 5:6–9. Nadaf uses asymmetric cryptography to generate these signatures. *Id.* at 5:10–12. Nadaf’s audit process compares the text record to the bar code. *Id.* at 6:2–6.

As discussed in the sections that follow, Petitioner asserts that it would have been obvious “to incorporate the additional hash value procedures” from Herskowitz or Backert to “further increase the security” of Nadaf’s voting method. Pet. 79.

(1) *Herskowitz*

For claim 11, Petitioner asserts that Herskowitz teaches using hash functions to verify the integrity of ballots. Pet. 75–77 (citing Ex. 1009, Abstract, 1:44–58, 2:10–39; Ex. 1003 ¶¶ 318–321).

As for the first and second hash values recited in claim 11, Herskowitz’s electronic voting system assigns confidential hash numbers to the ballot choices. Ex. 1009, 1:44–48. After the voter makes the selections, the system totals the corresponding hash numbers to produce a hash value for the voter. *Id.* at 1:48–50. The system then encrypts that hash value to produce an “encrypted hash total (EHT).” *Id.* at 1:52–58. Herskowitz stores the EHT in memory and prints it on the voter’s receipt. *Id.* Herskowitz compares the stored EHT to the printed one. *Id.* at 2:10–31, *cited in* Pet. 76. Thus, Petitioner sufficiently shows at this stage that Herskowitz teaches a first hash (recorded hash) and a second hash (the printed EHT) provided on the printed vote record, as recited in claim 11. Pet. 76.

The method of claim 11 uses the comparison to verify the integrity of the printed vote record. *See* Ex. 1001, 9:53–57. In Herskowitz, matching EHTs indicate that the voter’s receipt is “correct.” Ex. 1009, 2:12–14. Unmatched EHTs are “strong evidence” that the receipt “is a forgery.” *Id.* at 2:15–17. Here, Petitioner sufficiently shows at this stage that whether a receipt is correct or a forgery corresponds to the “integrity of the printed vote record,” as recited in claim 11. Pet. 76–77.

Claim 28 recites “a second hash provided *in the bar code*,” rather than “on the printed vote record,” as recited in claim 11. *Compare* Ex. 1001, 12:9–12 (emphasis added), *with id.* at 9:54. As for this limitation, Petitioner asserts that Nadaf’s bar code stores the digital signatures of the elections judge and other auditing institutions. Pet. 78 (quoting Ex. 1007, 5:7–15, 6:2–

10). And Petitioner shows that Herskowitz uses hash functions to verify the integrity of ballots. *Id.* at 75–77 (citing Ex. 1009, Abstract, 1:44–58, 2:10–39; Ex. 1003 ¶¶ 318–321). On this record, Petitioner sufficiently shows that the combination of Herskowitz and Nadaf collectively teach a second hash provided in the bar code, as recited in claim 28. *Id.*

As for the obviousness rationale, Petitioner sufficiently shows that Herskowitz would only further bolster Nadaf’s security by providing an additional way to verify the vote. *See id.* at 79. That is, at this stage and on this preliminary record, Petitioner sufficiently shows that a person of ordinary skill in the art would have added Herskowitz’s hash-value process to Nadaf’s voting method to arrive at the method recited in claims 11 and 28. *Id.*

(2) *Backert*

Petitioner also asserts that Backert teaches the hash-value procedures recited in claims 11 and 28. Pet. 77–78 (citing Ex. 1008, Abstract, 11:8–13, 12:21–36; Ex. 1003 ¶ 327). The cited passages from Backert describe verifying digitally signed ballots using a cryptographic hash. *See, e.g.,* Ex. 1008, 12:21–30, *quoted in* Pet. 77–78.

As for the recited first hash value in claims 11 and 28, Backert creates a message digest for a ballot’s contents using a hashing algorithm. *Id.* at 11:5–7. The message digest is a cryptographic hash that serves as a unique identifier. *See id.* at 10:65–11:9. According to Backert, “it is computationally infeasible to generate a different electronic ballot that will hash to the same message digest.” *Id.* at 11:8–13. On this record, Petitioner sufficiently shows that Backert teaches a first hash produced from the data set representing the ballot’s contents, as recited in claims 11 and 28. Pet. 77–78.

As for the recited second hash in claims 11 and 28, Backert's digitally signed electronic ballots are stored in a holding area until the voter verifies them. Ex. 1008, 11:41–46. When the ballots are later retrieved from storage, Backert verifies the digital signature. *Id.* at 12:21–30. In particular, Backert calculates a cryptographic hash for the ballot and compares this hash to the ballot's message digest. *Id.* at 12:21–30, 34–36. A non-match indicates that the ballot was improperly stored or altered. *Id.* at 12:33–36. Considering these teachings, Petitioner sufficiently shows that Backert teaches a first and second hash value—i.e., the cryptographic hash and the message digest—that confirm the ballot's integrity when compared. Pet. 78 (citing Ex. 1008, 12:31–36).

As discussed above, Petitioner asserts that Nadaf's bar code stores the digital signatures of the elections judge and other auditing institutions. *Id.* (quoting Ex. 1007, 5:7–15, 6:2–10). Although Nadaf uses digital signatures in this way, Petitioner sufficiently shows that adding Backert would only further bolster security by providing an additional way to verify the vote. *See id.* at 79. At this stage and on this preliminary record, Petitioner sufficiently shows that a person of ordinary skill in the art would have added Backert's hash-value process to Nadaf's voting method. *Id.*

Thus, Petitioner sufficiently shows at this stage that Nadaf and Backert collectively teach or suggest “wherein a first hash produced from the data set is compared to a second hash provided on the printed vote record, a comparison of the first hash and the second hash confirming an integrity of the printed vote record,” as recited in claim 11, and the similar limitations in claim 28, which require “a second hash provided in the bar code.” *Id.* at 74–79.

c) Conclusion

We conclude that the information presented in the Petition demonstrates more likely than not that claims 11 and 28 would have been obvious over Nadaf and Herskowitz or Nadaf and Backert.

2. Claims 12–14

Claims 12–14 directly or indirectly depend from claim 11. *See* Ex. 1001, 9:58–63. Claim 12 recites, “The method of claim 11, wherein the second hash is provided in a bar code on the printed vote record.” *Id.* at 9:58–59. A similar limitation is also found in claim 28, which is discussed in § II.G.1. Claims 13 and 14 recite limitations about a bar code similar to those of claims 8 and 9, which are discussed in § II.E.2.

H. Obviousness over Nadaf, Heilper, Backert, and Herskowitz

Petitioner asserts that the subject matter of claims 20–22 is unpatentable as having been obvious over Nadaf, Heilper, and Backert or Nadaf, Heilper, and Herskowitz. Pet. 80–83.

1. Claim 20

Claim 20 recites limitations similar to those recited in claims 11 and 28 except that (1) the voter selection is with a ballot-marking device (BMD), (2) the voter-readable text includes a candidate name, and (3) an election dictionary is used. *Compare* Ex. 1001, 10:33–54, *with id.* at 9:39–57 (claim 11), 11:30–12:12 (claim 28).

As discussed above, Petitioner sufficiently shows that Nadaf teaches or suggests the subject matter recited in claims 11 and 28. *Supra* § II.G.1. Also, Petitioner sufficiently explains why one of ordinary skill in the art would have used Heilper’s dictionary to ensure OCR accuracy in Nadaf, as discussed in connection with claim 25. *Supra* § II.F.

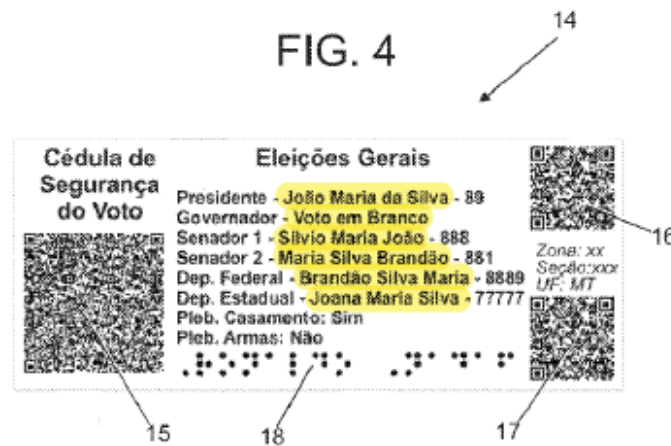
As for the remaining limitations, Petitioner asserts that (1) Nadaf records votes with a BMD and (2) Nadaf's voter-readable text includes a candidate name. In particular, Petitioner asserts that Nadaf contrasts direct-recording electronic voting machines with the invention:

This set of equipment will bring the vote printed on paper ballots to the electoral process, however, with another level of security, where the ballot printed with the citizen's vote will be handled only by the voter casting the vote.

Ex. 1007, 4:7–9, *quoted in* Pet. 81.

According to Petitioner, “A POSITA would have understood Nadaf to be a BMD.” Pet. 81 (citing Ex. 1007, 4:5–9; Ex. 1003 ¶ 337). In the '966 patent, a “wide range” of BMDs may be used. Ex. 1001, 4:27–30. Like Nadaf's BMD, in one example, the voter enters selections, and the BMD prints a PVR with its internal printer. *Id.* at 4:39–45. On this record and at this stage, Petitioner sufficiently shows that Nadaf teaches the recited BMD. *See* Pet. 81.

As for the candidate's name, Petitioner asserts that Nadaf shows the candidate name “Joana Maria Silva,” among others, on the PVR. *Id.* at 81–82. Nadaf's Figure 4 is reproduced below with Petitioner's annotations. *Id.* at 82.



Nadaf's Figure 4 above shows a PVR with the candidate names highlighted by Petitioner in yellow. Pet. 82.

According to the passages cited in the Petition, ballot 14 shows the voter's choices for each office being contested in the election. Ex. 1007, 14:10–12. That is, Nadaf's Figure 4 shows the candidate name "Joana Maria Silva" next to the office "Dep. Estadual," among the other choices. *Id.* Fig. 4, *discussed in* Pet. 81–82. On this record and at this stage, Petitioner sufficiently shows that Nadaf teaches or suggests the candidate name recited in claim 20.

On this record, the information presented in the Petition demonstrates more likely than not that claim 20 would have been obvious over Nadaf, Heilper, and Backert or Nadaf, Heilper, and Herskowitz. Pet. 80–83.

2. Claim 21

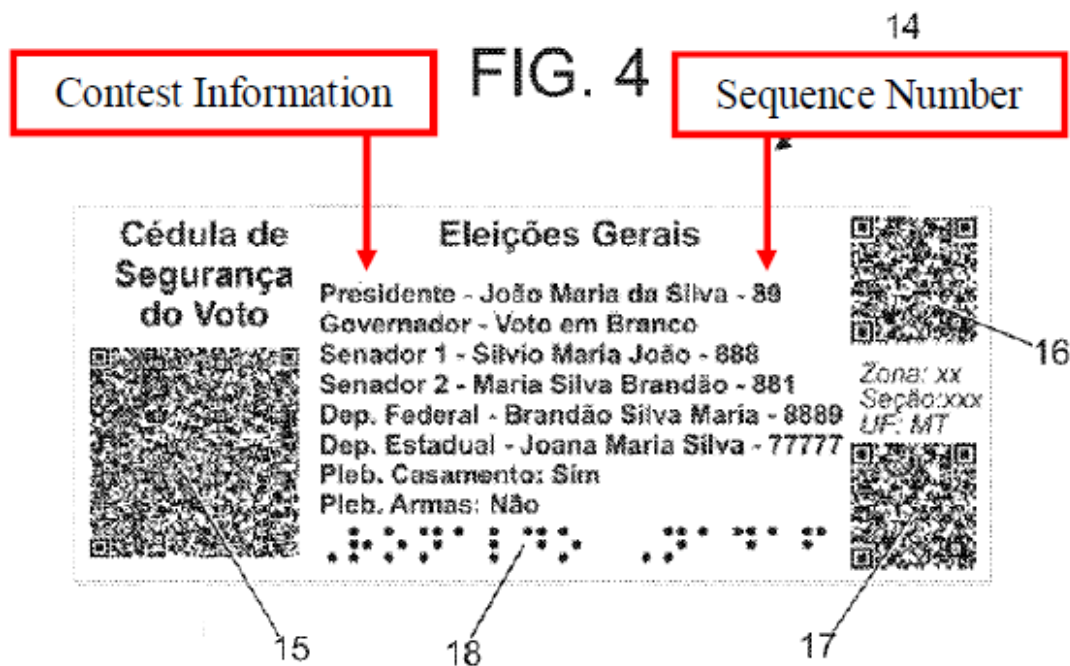
Claim 21 recites,

The method of claim 20, further comprising: providing *additional data* in the first data set, the additional data set obtained by scanning additional information related to the voter's vote selection to assist in identifying the voter's vote selection.

Ex. 1001, 10:55–59 (emphasis added).

The '966 patent discloses that the additional data can be information other than the candidates name, such as “sequence number data,” “line number data affiliated with the contest,” “the contest name itself,” or “data related to the candidate.” *Id.* at 5:14–22.

Here, Petitioner asserts that Nadaf’s PVR has the contest name (e.g., “Presidente”) and a sequence number. Pet. 83–84. Nadaf’s Figure 4 is reproduced below with Petitioner’s annotations. *Id.* at 84.



Nadaf’s Figure 4 with Petitioner’s text boxes pointing to the “contest information” and “sequence number.” Pet. 84.

Because the fields identified above are at least data related to the candidate, Petitioner sufficiently shows that Nadaf at least provides additional data in the first data set. *See id.* Petitioner further asserts that this information could help identify the vote, and that claim 21’s step requires using known OCR techniques for their intended purpose. *Id.* So, at this stage, the information presented in the Petition demonstrates more likely than not that the subject matter of claim 21 would have been obvious over

Nadaf and the other references used in the grounds challenging independent claim 21.

3. *Claim 22*

Claim 22 depends from claim 20 and further recites a second hash. Ex. 1001, 10:60–61. A similar limitation is also found in claim 12 (*id.* at 10:58–59), which is discussed in § II.G.2.

I. Indefiniteness

Petitioner asserts that claims 4, 5, 26, and 27 are indefinite. Pet. 85–86. Petitioner asserts that claim 4 is indefinite because it is “ungrammatical and meaningless as written.” *Id.* Because claim 5 depends from claim 4, Petitioner asserts that claim 5 is also indefinite. *Id.* at 86.

One interpretation of claim 4 is that the phrase “the data set combined with additional information” requires the act of combining the data set with additional information. Ex. 1001, 9:2–3. For example, one embodiment uses information other than the candidate’s name, such as “sequence number data,” “line number data affiliated with a contest,” “the contest name itself,” or “data related to a candidate.” *Id.* at 5:14–22. The embodiment combines the OCR’d name and the additional data together as a key into the election dictionary. *Id.* at 5:14–16. Similarly, claim 4’s data set created from the OCR process is recited in claim 1. *See id.* at 8:51–53. So claim 4 can be interpreted as requiring some combination of this data set with the additional information about the selection.

This understanding of the claim aligns with Petitioner’s interpretation in the obviousness ground. Pet. 59–60. In particular, Petitioner appears to interpret claim 4 to require that the data set is combined with additional information to identify the voter’s selection. *See id.* (citing Ex. 1003 ¶¶ 241–

250). Apart from objecting to the grammar, Petitioner does not provide another reason why claim 4 is indefinite. *See id.* at 85–86.

As for claims 26 and 27, Petitioner asserts that claim 26 includes the following indefinite limitation: “wherein the data set wherein a candidate’s name, the data combined with additional information related to the voter’s vote selection to assist in identifying the voter’s vote selection.” *Id.* at 86. Because claim 26 depends from claim 27, Petitioner asserts that claim 27 is also indefinite. *Id.* According to Petitioner, “The meaning of this limitation, as written, is indiscernible.” *Id.* (citing Ex. 1003 ¶¶ 362–364). For example, we agree that at least the phrase “wherein a candidate’s name” is meaningless as recited because it is unclear what the phrase modifies. On this record and at this stage, Petitioner sufficiently shows that it is more likely than not that claims 26 and 27 are indefinite.

J. Subject-Matter Eligibility

Petitioner asserts that the subject matter of claims 1–30 is ineligible for patent protection under 35 U.S.C. § 101. Pet. 24–46.

1. Principles of Law

Under § 101, patent-eligible subject matter is defined as “any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof.” 35 U.S.C. § 101. But courts have long held that laws of nature, natural phenomena, and abstract ideas are not patentable. *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 70–71 (2012) (citing *Diamond v. Diehr*, 450 U.S. 175, 185 (1981)). These ineligible concepts are implicit exceptions to the statutory categories. *Id.* at 71.

The Supreme Court articulated a two-part subject-matter eligibility test in *Mayo* and *Alice Corp. v. CLS Bank International*, 573 U.S. 208

(2014). The first part of the *Alice/Mayo* test asks whether a claim is “directed to” a judicial exception. *Alice*, 573 U.S. at 217. In the second part of the *Alice/Mayo* test, we consider “the elements of each 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.” *Id.* (quoting *Mayo*, 566 U.S. at 79, 78). This part is described as a search for an “inventive concept.” *Id.*

Step 1 of the USPTO’s eligibility analysis asks whether the claimed subject matter falls within one of the four statutory categories of invention. MPEP § 2106.03 (9th ed. Rev. 10.2019, June 2020). Under Step 2A, Prong One of the Guidance, we determine if the claim recites a judicial exception. MPEP § 2106.04 II.A.1. “Step 2A of the Office’s eligibility analysis is the first part of the *Alice/Mayo* test.” *Id.* If the claim recites an abstract idea, we then analyze the claim to determine whether the recited judicial exception is integrated into a practical application under Step 2A, Prong Two. MPEP § 2106.04 II.A.2.

“Step 2B of the Office’s eligibility analysis is the second part of the *Alice/Mayo* test.” MPEP § 2106 II. Thus, “Step 2B asks: Does the claim recite additional elements that amount to significantly more than the judicial exception?” *Id.*

2. Step 1

All challenged claims recite a method. As defined in 35 U.S.C. § 100(b), the term “process” is synonymous with “method.” Thus, all claims fall within the “process” category of § 101.

3. *Step 2A, Prong One*

We next ask whether the claims recite a judicial exception. MPEP § 2106.04 II.A.1. A claim recites a judicial exception when the judicial exception is “set forth” or “described” in the claim. *Id.*

The USPTO’s Guidance synthesizes key concepts identified by the courts as abstract ideas into three primary subject-matter groupings: mathematical concepts, certain methods of organizing human activity, and mental processes. MPEP § 2106.04(a). Certain methods of organizing human activity include “managing personal behavior or relationships or interactions between people,” such as “social activities.” MPEP § 2106.04(a)(2) II.C.

According to Petitioner’s analysis, each independent claim recites the activity of voting. Pet. 31. Voting is a social activity, which falls within the subject-matter grouping of “certain methods of organizing human activity.” *See* MPEP § 2106.04(a)(2) II.C (citing *Voter Verified, Inc. v. Election Sys. & Software, LLC*, 887 F.3d 1376 (Fed. Cir. 2018)).

In *Voter Verified*, the claimed method comprised the steps of presenting an election ballot, accepting the votes, storing the votes, printing the votes, comparing the printed votes to those in computer storage, and determining whether the printed ballot is acceptable. 887 F.3d at 1384–85. Table 1 of the Petition, below, shows Petitioner’s correspondence between claim 85 in *Voter Verified* and claim 1 of the ’966 patent. Pet. 32–33.

Ineligible <i>Voter Verified</i> Claim 85	Claim 1 of the ‘966 Patent
A method for voting providing for self-verification of a ballot comprising the steps of:	A method for electronic voting using printed vote records, comprising:

voting by a voter using a computer voting station programmed to present an election ballot;	
accept input of votes from the voter according to the election ballot, temporarily store the votes of the voter;	recording a voter's vote selections;
printing of the votes of the voter from the votes temporarily stored in the computer for the voting station;	generating a printed vote record of the voter's selection,
comparison by the voter of the printed votes with the votes temporarily stored in the computer for the voting station;	the printed vote record containing voter readable text indicating the voter's vote selections
decision by the voter as to whether a printed ballot is acceptable or unacceptable;	scanning the printed vote record, the scanning including scanning the voter readable text;
	utilizing optical character recognition (OCR) on the scanned voter readable text to create a data set which identifies the voter's vote selections; <i>wherein identifying the voter's vote selection includes comparing the data set to an election dictionary, the election dictionary containing potential vote choices;</i> <i>wherein the comparing the first data set to the election dictionary is utilized to confirm an accuracy of the</i>

	<i>OCR to limit potential OCR errors[]</i>
submission of an acceptable ballot for tabulation.	and generating a cast vote record from the data set so that the voter selections in the cast vote record are based on the voter readable text

Petitioner notes that the claim in *Voter Verified* expressly required that the voter verify the ballot’s accuracy. *Id.* at 34. Petitioner explains that the claimed PVR has voter-readable characters for the same reason: “the voter may visually confirm their voting selections, thus providing voting transparency to the voter.” *Id.* (quoting Ex. 1001, 4:1–4).

At this stage and on this record, Petitioner sufficiently shows that the recited “recording a voter’s vote selections” is part of the activity of voting. *See id.* at 30–37. Recording a vote here is similar to accepting the vote in *Voter Verified*. *Id.* at 32, Table 1. Other claimed steps determine whether the ballot is acceptable, similar to the voting process recited in the *Voter Verified* claims. *Id.* Specifically, the claims recite “identifying the voter’s vote selection”² and “generating a cast vote record,” which are steps in the voting process.

Petitioner asserts that the rest of the claim limitations recite a generic computer implementation that executes the abstract idea: creating and comparing data sets, printing, scanning, using OCR, correcting errors, and verifying the PVR. *Id.* at 37–38. These are the “additional elements” to be

² The phrase “identifying the voter’s vote selection” is used in claim 1. Ex. 1001, 8:57–59. Claims 6, 11, 23, 28, and 29 recite a similar phrase in the “utilizing” step. *Id.* at 8:17–19 (claim 6), 10:8–9 (claim 11), 11:2–3 (claim 23), 12:5–6 (claim 28), 12:23 (claim 29).

evaluated under Step 2A, Prong Two of the USPTO’s eligibility analysis. *See* MPEP § 2106.04(d). In our analysis, we use the term “additional elements” for claim features, limitations, or steps that the claim recites beyond the identified judicial exception.

On this record and at this stage, Petitioner sufficiently shows that the claim recites an abstract idea that falls within the grouping of certain methods of organizing human activity.

4. *Step 2A, Prong Two*

Mere recitation of a judicial exception does not mean that the claim is “directed to” that judicial exception. Under Step 2A, Prong Two, “a claim that recites a judicial exception is not directed to that judicial exception, if the claim as a whole integrates the recited judicial exception into a practical application of that exception.” MPEP § 2106.04 II.A.2. In this way, Prong Two distinguishes between claims that are “directed to” the recited judicial exception from those that are not. *Id.*

Here, Petitioner asserts that the recited abstract idea is not integrated into a practical application. Pet. 37. According to Petitioner, the claims merely use a generic computer to create and verify the PVR. *Id.* at 37–39. Petitioner identifies the “additional elements” as creating and comparing data sets, printing, scanning, using OCR, correcting errors, and verifying the PVR. *Id.* at 37–38.

An improvement in the functioning of a computer, or an improvement to other technologies or technical fields is one way that an additional element—or combination of elements—may integrate the exception into a practical application. MPEP § 2106.04(d) I.

Petitioner relies on *Solutran, Inc. v. Elavon, Inc.*, 931 F.3d 1161³ (Fed. Cir. 2019), among other cases, to support its argument that the claim merely recites a generic computer, which does not indicate a technical improvement. *See* Pet. 37–39. In *Solutran*, the Federal Circuit found that the claims at issue recited “basic steps of electronic check processing.” *Solutran*, 931 F.3d at 1167. Notably, “Solutran’s counsel acknowledged at oral argument that the ’945 patent’s invention *did not improve the technical capture* of information from a check to create a digital file or the technical step of electronically crediting a bank account.” *Id.* (emphasis added). The Federal Circuit also found that the invention did not “improve how a check is scanned.” *Id.*

Like *Solutran*, one of the issues here is whether the claimed subject matter improves “the technical capture of information” from a paper ballot or how that ballot is scanned. *See id.* For example, independent claims 1 and 15 recite using an “election dictionary” with information that allows the method to “confirm an accuracy of the OCR to limit potential OCR errors.” Ex. 1001, 8:57–62 (claim 1), 10:9–14 (claim 15). Independent claims 6, 23, and 29 recite using a bar code to confirm the OCR results. *Id.* at 9:23–29 (claim 6), 11:14–17 (claim 23), 12:27–33 (claim 29). Independent claims 11 and 28 recite using a hash to confirm “an integrity of the printed vote record.” *Id.* at 9:53–57 (claim 11), 12:9–12 (claim 28).

The patent’s disclosure may also be helpful to determine whether the purported improvement is to a computer’s functioning or to the abstract idea itself. In the background, the ’966 patent explains that the invention uses a

³ Petitioner cites page 1151 of the Federal Reporter, but *Solutran* appears on page 1161.

PVR that provides “better transparency to the voter.” *Id.* at 1:48–50. This statement suggests that the PVR improves the voter’s experience and is not a technical improvement to ballot scanning, for example. On the other hand, in *Solutran*, it was undisputed that “the steps of the claim are conventional processes for processing checks electronically.” 931 F.3d at 1168. Yet the patent here states that additional processing goes “beyond traditional OCR processes” to ensure accuracy. Ex. 1001, 2:47–50.

Petitioner asserts that the recited OCR and error-correction processes are generic, which do not integrate the exception into a practical application. Pet. 37–38. Patent Owner has not yet provided a response. The parties are invited to address, during trial, whether the Petition shows that the recited OCR and error correction improves the way the voting device operates or whether the claims are more like those in *Solutran*, for example, which did not “purport to improve any technology.” 931 F.3d at 1169.

5. Step 2B

A claim directed to an abstract idea may be patent eligible if it provides an inventive concept such that the additional elements amount to significantly more than the exception itself. MPEP § 2106.05. “For the role of a computer in a computer-implemented invention to be deemed meaningful in the context of this analysis, it must involve more than performance of ‘well-understood, routine, [and] conventional activities previously known to the industry.’” *Content Extraction & Transmission LLC v. Wells Fargo Bank*, 776 F.3d 1343, 1347–48 (Fed. Cir. 2014) (citing *Alice*, 573 U.S. at 2359). Here, Petitioner asserts that “the elements of the Challenged Claims simply use well-understood, routine, conventional activities to automate the abstract idea.” Pet. 41.

a) Scanning

Petitioner asserts that the additional elements include limitations to scanning.⁴ *Id.* at 43. In *Solutran*, the Federal Circuit stated, “Merely using a general-purpose computer and scanner to perform conventional activities in the way they always have . . . does not amount to an inventive concept.” 931 F.3d at 1169. Likewise, in *Content Extraction*, the Federal Circuit stated, “There is no ‘inventive concept’ in CET’s use of a generic scanner and computer to perform well-understood, routine, and conventional activities commonly used in industry.” 776 F.3d at 1348, *quoted in* Pet. 44; *see also Voter Verified*, 887 F.3d at 1386 (determining that the claimed scanner was well-known), *cited in* Pet. 46. Similarly, the *Background of the Invention* section in the ’966 patent discloses that known systems scan PVRs on a digital scanner to create the cast vote record. Ex. 1001, 1:29–47.

b) Bar Codes

As for the recited limitations to bar codes,⁵ Petitioner also asserts that the use of bar codes is well-known, routine and conventional. Pet. 42–43.

⁴ Claim 1 recites, in part, “scanning the printed vote record, the scanning including scanning the voter readable text.” Ex. 1001, 8:49–50. Claim 15 recites in part, “electronically scanning the printed vote record, the scanning including scanning the candidate name.” *Id.* at 10:5–6. Claims 6 and 29 recite, in part, “scanning the printed vote record, the scanning including scanning the voter readable text.” *Id.* at 9:15–16 (claim 6), 12:19–20 (claim 29). Claim 11 recites a similar scanning step as claim 6. *Id.* at 9:39–52. Claim 23 recites, in part, “electronically scanning the printed vote record, the electronical scanning including scanning the voter readable text and scanning the bar code.” *Id.* at 11:4–6. Claim 20 recites limitations similar to those recited in claims 11 and 28. *Id.* at 10:33–54.

⁵ Claim 6 recites, in part, “providing a bar code on the printed vote record, the bar code including information indicative of the voter’s vote selections, wherein the bar code is utilized to confirm that results of the OCR match the voter’s original selections by comparing data in the bar code to the data set

Indeed, the *Background of the Invention* discloses, “Traditionally, the PVR contains a bar code that is encoded with the voter’s vote selections.”

Ex. 1001, 1:40–44. The parties are invited to address, during trial, whether the Petition shows that the recited bar-code processing involves more than performance of well-understood, routine, and conventional activity previously known to the industry.

c) *OCR, Election Dictionary, Error Correction, and Hash*

As for the recited OCR, election dictionary, error correction, and hash, Petitioner asserts that these features are generic. Pet. 43. For example, independent claims 1 and 15 recites using an election dictionary to limit OCR errors. Ex. 1001, 8:60–62 (claim 1), 10:15–18 (claim 15). Independent claims 11 and 28 recite using a hash to confirm the integrity of the printed vote record. *Id.* at 9:53–57 (claim 11), 12:10–13 (claim 28).

In *Content Extraction*, the claim required scanning and extracting data from a physical document:

defining a set of symbols which designate fields of information required by an application program; and detecting the presence of a particular one of said defined set of symbols on a hard copy document and extracting a field of information required by an application program based on said detecting.

Content Extraction, 776 F.3d at 1348–49, discussed in Pet. 44. According to the Federal Circuit, “This limitation merely describes generic optical character recognition technology, which CET conceded was a routine

created by the OCR.” Ex. 1001, 9:23–29. Claim 29 contains a similar limitation but recites “encoded data” instead of “bar code.” *See id.* at 12:27–33. Similarly, claim 23 recites, in part, “the printed vote record further including a bar code, the bar code including information indicative of the voter’s vote selections” (*id.* at 11:1–3) and the same wherein clause as claim 6 about how the bar code is used (*see id.* at 11:14–17).

function of scanning technology at the time the claims were filed.”

Id. at 1349.

Likewise, the *TLI* claims recited a “method for recording and administering digital images.” *In re TLI Commc’ns LLC Patent Litig.*, 823 F.3d 607, 610 (Fed. Cir. 2016), *cited in* Pet 38. Those claims involved “recording images using a digital pick up unit in a telephone unit” and digitally storing the images, among other features. *Id.* The Federal Circuit held that the *TLI* claims used only conventional computer components to implement the abstract idea. *Id.* at 613.

But here the ’966 patent states that the subject matter goes “beyond traditional OCR processes” to ensure accuracy. Ex. 1001, 2:47–50. And the claimed methods use more than OCR alone to process the data. For example, the claims recite an “election dictionary” (*id.* at 8:57–62 (claim 1), 10:9–14 (claim 15)) and using a hash (*id.* at 9:53–57 (claim 11), 12:9–12 (claim 28)). To be sure, Petitioner sufficiently shows—on this record and at this preliminary stage—that the recited OCR and the additional processes were disclosed in the prior art. *Supra* §§ II.D–II.H. Even so, “[w]hether a particular technology is well-understood, routine, and conventional goes beyond what was simply known in the prior art.” *Berkheimer v. HP Inc.*, 881 F.3d 1360, 1369 (Fed. Cir. 2018). “The mere fact that something is disclosed in a piece of prior art, for example, does not mean it was well-understood, routine, and conventional.” *Id.*

d) The Combination

Even if one or more elements were well-understood, routine, and conventional activity when considered individually, the combination of additional elements may amount to an inventive concept. For example, *BASCOM* found that all additional elements in the claims at issue in that

case recited generic components. *BASCOM Glob. Internet Servs., Inc. v. AT&T Mobility LLC*, 827 F.3d 1341, 1350-51 (Fed. Cir. 2016). Yet the elements in combination amounted to significantly more because their arrangement was non-conventional and non-generic, which improved the relevant technology. *Id.*

Patent Owner has not yet provided a response. The parties are invited to address, during trial, whether the Petition shows that the additional elements—individually or in combination—amount to an inventive concept.

III. CONCLUSION

We determine that the information presented in the Petition demonstrates more likely than not that at least one of claims 1–30 is unpatentable. Thus, we institute a post-grant review of claims 1–30 on all grounds. 35 U.S.C. § 324(a).

IV. ORDER

It is

ORDERED that, under 35 U.S.C. § 324(a), a post-grant review of claims 1–30 of the '966 patent is instituted for all grounds in the Petition; and

FURTHER ORDERED that, under 35 U.S.C. § 324(d) and 37 C.F.R. § 42.4, notice is given of the institution of a trial that commences on this decision's entry date.

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