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Paper 58
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FACEBOOK, INC., LINKEDIN CORP., and TWITTER, INC.,
Petitioner,

v.

SOFTWARE RIGHTS ARCHIVE, LLC,
Patent Owner.

Case IPR2013-00478
Patent 5,544,352

Before SALLY C. MEDLEY, CHRISTOPHER L. CRUMBLEY, and BARBARA A. PARVIS, *Administrative Patent Judges.*

CRUMBLEY, *Administrative Patent Judge.*

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. BACKGROUND

A. Introduction

On July 30, 2013, Facebook, Inc., LinkedIn Corp., and Twitter, Inc. (collectively "Petitioner") filed a Petition requesting an *inter partes* review of claims 26, 28–30, 32, 34, and 39 of U.S. Patent No. 5,544,352 (Ex. 1001, "the '352 patent"). Paper 1 ("Pet."). On February 3, 2014, we instituted

trial on all challenged claims, on certain of the grounds of unpatentability alleged in the Petition. Paper 17 ("Decision to Institute" or "Inst. Dec.").

After institution of trial, Software Rights Archive, LLC ("Patent Owner"), filed a Patent Owner Response ("PO Resp."). Paper 34. Petitioner also filed a Reply. Paper 43 ("Reply").

A consolidated oral hearing for IPR2013-00478, IPR2013-00479, IPR2013-00480, and IPR2013-00481, each involving the same Petitioner and the same Patent Owner, was held on October 30, 2014. The transcript of the consolidated hearing has been entered into the record. Paper 57, "Tr."

We have jurisdiction under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

Petitioner has shown by a preponderance of the evidence that claims 26, 28–30, 32, 34, and 39 of the '352 patent are unpatentable.

B. Related Proceedings

Petitioner and Patent Owner both indicate that the '352 patent is involved in the following co-pending district court proceedings: *Software Rights Archive, LLC v. Facebook, Inc.*, Case No. 12-cv-3970; *Software Rights Archive, LLC v. LinkedIn Corp.*, Case No. 12-cv-3971; and *Software Rights Archive, LLC v. Twitter, Inc.*, Case No. 12-cv-3972, each pending in the United States District Court for the Northern District of California. Pet. 1; Paper 8, Patent Owner's Mandatory Notice, 2.

In addition, we instituted trial on Petitioner's petitions on related patents including: (1) IPR2013-00479 and IPR2013-00480, *inter partes* reviews of U.S. Patent No. 5,832,494 (the "'494 patent"); and (2) IPR2013-00481, an *inter partes* review of U.S. Patent No. 6,233,571 (the "'571 patent"). The '352 patent issued from the parent of the application that

issued as the ’494 patent. The ’571 patent issued from an application that was a divisional of the application that issued as the ’494 patent. The ’352 patent was the subject of Reexamination No. 90/011,010.

C. The ’352 patent

The ’352 patent relates to computerized research on databases. Ex. 1001, 1:7–11. The ’352 patent discloses that it improves search methods by indexing data using proximity indexing techniques. *Id*. at 3:42–55. According to the ’352 patent, proximity indexing techniques generate a quick-reference of the relations, patterns, and similarity found among the data in the database. *Id*. at 3:53–55.

Figure 2 of the ’352 patent illustrates the high-level processing of software for computerized searching (*Id.* at 8:7–8) and is reproduced below:

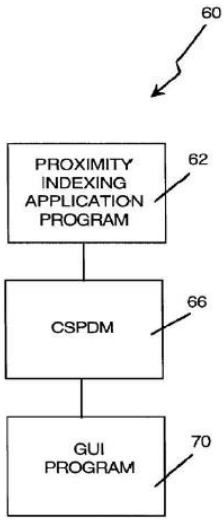

Fig. 2

Figure 2 depicts software system 60 comprising Proximity Indexing Application Program 62, Computer Search Program for Data Represented by Matrices (“CSPDM”) 66, and Graphical User Interface (“GUI”) program 70.

Id. at 10:53–60.

Processing of software system 60 begins with Proximity Indexing Application Program 62 indexing a database. *Id.* at 11:4–5. Then, CSPDM 66 searches the indexed database and retrieves requested objects. *Id.* at 11:6–10. CSPDM 66 relays the retrieved objects to GUI program 70 to display on a display. *Id*. at 11:10–13.

Software system 60 runs on a computer system comprising, for example, a processor of a personal computer. *Id.* at 9:39–44. The system comprises a display, which displays information to the user. *Id.* at 10:4–7. Exemplary displays include computer monitors, televisions, LCDs, or LEDs. *Id*.

The processor is connected to a database to be searched. *Id*. at 9:46–47. The database contains cases—also called full textual objects—that contain citations to other objects within the database. *Id*. at 12:1–10. Each full textual object is assigned a number corresponding to its chronological order in the database. *Id*.

The ’352 patent discloses that any two textual objects in the database may be related through a number of “patterns.” *Id*. at 12:31–32. For example, object A may cite B, or the two objects may cite the same object C. *Id*. at 12:46–61. The Proximity Indexing Application (discussed above) applies algorithms to these relationships to create a matrix of pattern vectors that represent the relationships between the various objects in the database. *Id*. at 12:62–13:3, 14:18–20. The CSPDM is used to search the indexed database. *Id*. at 14:20–21.

D. Illustrative Claim

Of the challenged claims, only claim 26 is independent, whereas claims 28–30, 32, 34, and 39 depend, directly or indirectly, from claim 26. Claim 26 is illustrative of the claimed subject matter and is reproduced below:

> 26. A non-semantical method for numerically representing objects in a computer database and for computerized searching of the numerically represented objects in the database, wherein direct and indirect relationships exist between objects in the database, comprising:
>
> marking objects in the database so that each marked object may be individually identified by a computerized search;
>
> creating a first numerical representation for each identified object in the database based upon the object's direct relationship with other objects in the database;
>
> storing the first numerical representations for use in computerized searching;
>
> analyzing the first numerical representations for indirect relationships existing between or among objects in the database;
>
> generating a second numerical representation of each object based on the analysis of the first numerical representation;
>
> storing the second numerical representation for use in computerized searching; and
>
> searching the objects in the database using a computer and the stored second numerical representations, wherein the search identifies one or more of the objects in the database.

Ex. 1001, 35:28–54.

E. The Prior Art References Upon Which Trial Was Instituted

Yahiko Kambayashi et al., *Dynamic Clustering Procedures for Bibliographic Data*, Kyoto Univ., Dep't of Inf. Sci., 90–99 (1981) ("Kambayashi") (Ex. 1004).

Colin F.H. Tapper, *Citation Patterns in Legal Information Retrieval*, 3 DATENVERARBEITUNG IM RECHT 249–75 (1976) ("Tapper 1976") (Ex. 1005).

Colin Tapper, *The Use of Citation Vectors for Legal Information Retrieval*, 1 J. OF LAW AND INFO. SCI. 131–61 (1982) ("Tapper 1982") (Ex. 1006).

Edward A. Fox, *Characterization of Two New Experimental Collections in Computer and Information Science Containing Textual and Bibliographic Concepts* (Sept. 1983) (Ph.D. dissertation, Cornell Univ. Dep't of Comp. Sci.) ("Fox Collection") (Ex. 1007).

Edward A. Fox, *Some Considerations for Implementing the SMART Information Retrieval System under UNIX* (Sept. 1983) (Ph.D. dissertation, Cornell Univ. Dep't of Comp. Sci.) ("Fox SMART") (Ex. 1008).

Edward A. Fox, *Extending the Boolean and Vector Space Models of Information Retrieval with P-Norm Queries and Multiple Concept Types* (Aug. 1983) (Ph.D. dissertation, Cornell Univ. Dept. of Comp. Sci.) ("Fox Thesis") (Ex. 1009).

The parties do not dispute the prior art status of the references.

F. The Pending Grounds of Unpatentability

Reference(s)	Basis	Claims instituted
Kambayashi	§ 102	26, 28–30, 32, 39
Fox Thesis, Fox SMART, and Fox Collection	§ 103	26, 28–30, 32, 34, 39
Tapper 1976 and Tapper 1982	§ 103	26, 28–30, 32, 34, 39

II. ANALYSIS

A. Claim Construction

1. Principles of Law

Petitioner asserts, and Patent Owner does not dispute, that the '352 patent expired on August 6, 2013. Pet. 6. The Board's interpretation of the claims of an expired patent is similar to that of a district court's review. *See In re Rambus, Inc.*, 694 F.3d 42, 46 (Fed. Cir. 2012). We, therefore, are guided by the principle that the words of a claim "are generally given their ordinary and customary meaning," as understood by a person of ordinary skill in the art in question at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc) (citation omitted). "In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17). There is a "heavy presumption," however, that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002) (citation omitted).

2. Overview of the Parties' Positions

In the Decision to Institute, we found it instructive to construe the claim terms *direct relationships*, *indirect relationships*, *pool-similarity searching*, and *pool-importance searching*. Inst. Dec. 10–14. Our constructions are set forth in the table below.

Claim Term or Phrase	Construction
direct relationships	"relationships where one object cites to another object" Inst. Dec. 13.
indirect relationships	"relationships where at least one intermediate object exists between two objects and where the intermediate object(s) connect the two objects through a chain of citations" Inst. Dec. 13.
pool-similarity searching	"identifying at least one object based on degree of similarity to a selected pool of objects" Inst. Dec. 14.
pool-importance searching	"identifying at least one object based on the importance of the object to a selected pool of objects" Inst. Dec. 14.

Petitioner does not challenge any of our constructions. Reply 1–2. Patent Owner appears to agree with many of our constructions, and states that it uses our constructions for the purpose of evaluating patentability of the challenged claims of the '352 patent. PO Resp. 12–14. Based on the complete record now before us, we discern no reason to change our prior constructions.

Additionally, Patent Owner addresses the following phrases or terms: 1) *objects in a computer database*; 2) *computerized searching*; 3) *non-semantical method*; 4) *some indirect relationships are weighed more heavily than other indirect relationships*; and 5) *relationships exist between or among subsets of objects*, which are discussed below. *Id*. at 9–14.

Petitioner's Reply further addresses *database* and *numerical representation*, but otherwise does not contest Patent Owner's proposed constructions of these terms. Reply 2.

3. numerical representation

Patent Owner's Response does not proffer an explicit construction of *numerical representation*, but appears to interpret the term to exclude strings that may include letters. PO Resp. 21 (distinguishing prior art as having "non-numerical character strings). At oral argument, Patent Owner confirmed that its construction of *numerical representation* is something "represented only by digits," or in other words "expressed by numbers, not by letters." Tr. 85.

Petitioner responds that *numerical* includes "any representation of binary or digital data that can be processed and analyzed by a computer," and means simply "of or relating to numbers." Reply 1; Tr. 13. Petitioner's construction is, therefore, not limited to representations consisting only of numbers. At oral argument, Petitioner argued that the inclusion of a single number into a string is sufficient to make that string a *numerical representation*. Tr. 25.

Petitioner's proffered construction is overly broad and unsupported by the specification. While one dictionary definition of *numerical* is "of or relating to a number or series of numbers," it may also refer to "expressed in or counted by numbers." THE AMERICAN HERITAGE DICTIONARY OF THE ENGLISH LANGUAGE (2000) (Ex. 3001); *see also* COLLINS ENGLISH DICTIONARY (2000) (Ex. 3002) ("measured or expressed in numbers").

The specification of the '352 patent uses *numerical* consistent with this latter interpretation. In the Initial Extractor Subroutine, the "full textual

objects" of the database are numbered "with Arabic numbers from 1 through n." Ex. 1001, 14:49–50. These numbers are used to create vectors and matrices, which are then run through various algorithms such as the Opinion Patterner Subroutine. *Id*. at 14:55–15:22. "Numerical factors" are then "calculated" to determine "values." *Id*. at 15:19–22; 18:63–67. This emphasis on calculation, values, and on processing by computer algorithms, leads us to conclude that *numerical representation*, as used in the '352 specification, must refer to solely numbers, so that a computer can process the representations using mathematical algorithms.

Petitioner's attempt to link the *numerical representation* of the specification to the West "key number" system is unpersuasive. Reply 2. While the specification of the '352 patent does discuss the key number system, and such "key numbers" include letters, there is no indication that the patentee intended to link the *numerical representation* of the claims to the West key number system discussed—and distinguished—in the background portion of the specification. Ex. 1001, 2:38–43 ("such a numbering process is subjective and is prone to error").

Nor do we find persuasive Petitioner's argument that *numerical* is somehow distinct from "numeric," in that the latter term means only numbers but the former may encompass letters. Tr. 13. Not only was this argument advanced for the first time at oral hearing,[1] but it is unsupported by any evidence of record. Indeed, the two terms are used interchangeably in dictionary definitions. *See* Ex. 3001 (entry for "numerical also numeric"); Ex. 3002 (entry for "numerical or numeric").

[1] Our Rules do not permit arguments to be raised for the first time at oral hearing. 37 C.F.R. § 42.70(a) (permitting oral argument only on "an issue raised in a paper.").

For these reasons, we construe *numerical representation* as "representation consisting exclusively of numbers or a set of numbers."

4. objects in a computer database and computerized searching

Patent Owner addresses the terms *objects in a computer database* and *computerized searching*, both of which appear in claim 26. PO Resp. 9–11. Rather than proffer a construction for either term, however, Patent Owner discusses the general concept of computerized searching in the '352 patent. *Id*. It is not clear what construction Patent Owner wishes us to adopt, and we are not persuaded that either term requires an explicit construction.

5. non-semantical method

Patent Owner asks that we interpret *non-semantical method* to mean "a method that uses the direct relationships between one database object and another and does not otherwise account for words and phrases in a textual object." PO Resp. 11. We note that Petitioner raised a similar construction in the Petition, but the Board declined to construe the term expressly in the Decision to Institute. Pet. 6–7; Inst. Dec. 11. We also note that we adopted a similar construction for "non-semantically" in the related case IPR2013-00481. We consider the proffered construction to be reasonable and consistent with the specification of the '352 patent, and adopt it herein.

6. some indirect relationships are weighed more heavily than other indirect relationships

Patent Owner asks that we construe this phrase as "some *types* of indirect relationships are weighed more heavily than others." PO Resp. 13 (emphasis in original). To support this interpretation, Patent Owner cites the specification of the '352 patent, which discloses that the different "patterns," which include direct and indirect relationships, are assigned various weights.

Ex. 1001, 13:34–38. Petitioner does not dispute this construction. We consider the proffered construction to be reasonable and consistent with the specification of the '352 patent, and adopt it herein.

7. relationships exist between or among subsets

Patent Owner does not set forth an express construction for this phrase which appears in claim 34, but instead states that the "relationships" are the direct and indirect relationships of claim 26, and that subsets are a portion of a textual object. PO Resp. 13–14. Patent Owner has not persuaded us that an express construction of this phrase is necessary.

B. Anticipation of Claims 26, 28–30, 32, and 39 by Kambayashi

We instituted trial to determine whether claims 26, 28–30, 32, and 39 are unpatentable under 35 U.S.C. § 102 as anticipated by Kambayashi. Dec. Inst. 19–20. To establish anticipation, Petitioner must prove that each and every element in a claim, arranged as is recited in the claim, may be found in a single prior art reference. *Net MoneyIN, Inc. v. VeriSign, Inc*., 545 F.3d 1359, 1369 (Fed. Cir. 2008); *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). We determine that Petitioner has not shown by a preponderance of the evidence that claims 26, 28–30, 32, and 39 are unpatentable as anticipated by Kambayashi.

1. Kambayashi

Kambayashi describes a method for clustering, which is said to be "an important tool for efficient retrieval of documents in bibliographic database systems." Ex. 1004, Abstract. The reference discloses the creation of "Direct Reference Matrix R," defining direct reference as "when a paper A refers to a paper B." *Id*. at 91–92. Kambayashi also discloses a set of pairs

(ID, IDF) where ID and IDF are the identification codes of the papers and (ID, IDF) means that paper ID cites paper IDF. *Id*. at 93.

Kambayashi also discloses the creation of two secondary matrices, "Bibliographic Coupling Matrix B" (papers with one or more citation in common) and "Co-citation Matrix C" (citations frequently cited together). *Id*. at 92. These secondary matrices consist of vectors derived from the (ID, IDF) pairs noted above. *Id*. at 93–34. A "Similarity Matrix S" may then be created via weighted summation of matrices R, B, and C. *Id*. at 92.

2. Claim 26

We focus our analysis herein on two steps required by the method of claim 26: "creating a first numerical representation for each identified object in the database based upon the object's direct relationship with other objects in the database," and "analyzing the first numerical representations for indirect relationships existing between or among objects in the database." Petitioner contends that Kambayashi discloses both of these steps in two alternative embodiments.

First, Petitioner directs us to Kambayashi's disclosure of (ID, IDF) pairs, and their use in creating the B and C matrices. Petitioner asserts that deriving the (ID, IDF) pairs may be considered to be creating a first numerical representation, and that they represent direct relationships between documents ID and IDF. Pet. 24–25; Tr. 22. The (ID, IDF) pairs are then analyzed for indirect relationships, leading to B and C matrices which Petitioner contends are second numerical representations. Pet. 25–26.

Second, Petitioner identifies Kambayashi's Direct Reference Matrix R as a first numerical representation that represents direct relationships. Pet. 24–25; Tr. 22. As noted above, Matrix R is used—along with matrices B

and C—to generate a Similarity Matrix S. Petitioner contends that if Matrix R is considered to be the first numerical representation, then Matrix S would be a second numerical representation within the scope of claim 26. Tr. 22.

Upon review of the disclosure of Kambayashi, we find neither of these arguments persuasive. First, in the case of the (ID, IDF) pairs that are used to derive the B and C matrices, Patent Owner argues that ID and IDF are *strings* that contain letters. PO Resp. 21. This is supported by the disclosure of Kambayashi, which discloses identification codes such as EVER7404 and GARDL7710. Ex. 1004, 96. The testimony of Dr. Jacobs, Patent Owner's declarant, explains how Kambayashi's source database shows that identification codes begin with the first four letters of the first author's name. Ex. 2113 ¶¶ 100–103 (citing Ex. 2023). Because, as discussed above, the proper construction of *numerical representation* is a representation that contains only numbers, Kambayashi's (ID, IDF) pairs cannot be the first numerical representation of claim 26.

Nor do we find that the Direct Reference Matrix R / Similarity Matrix S system of Kambayashi meets the limitations of claim 26. Petitioners assert, and we agree, that Matrix R is an array of numbers that represents direct relationships between the objects in the Kambayashi database. Pet. 24–25; Ex. 1004, 92 (values r_{ij} of matrix R are either 0 or 1). This conclusion is supported by the fact that, in order to derive Matrix S, Matrix R is multiplied by a constant w_R. Ex. 1004, 92. It would not make sense to multiply a matrix containing strings of letters by a constant.

Matrix S, however, cannot be the second numerical representation of claim 26. The claim requires that the representation be created by "analyzing the first numerical representations for indirect relationships

existing between or among objects in the database." Matrix S, however, is generated according to the following formula:

$S = w_R*R+w_B*B'+w_C*C'$ (*Id.*)

Patent Owner argues that multiplying matrix R by a constant is not *analyzing*, as that term is used in claim 26. PO Resp. 21. We agree. While Matrix S does take into account indirect relationships between objects, those relationships are not derived from an analysis of Matrix R (the first numerical relationship). Rather, the indirect relationships are accounted for in Matrix S by the inclusion of Matrices B (which tracks bibliographic coupling) and C (which tracks co-citation). *Id*. The indirect relationships reflected in the B and C matrices, in turn, are not derived from Matrix R, but rather from the (ID, IDF) pairs, which we have determined above cannot be the first numerical relationship. For these reasons, Matrix S of Kambayashi does not meet the second numerical representation limitation of claim 26, because it is not generated by analyzing the first numerical representation.

We, therefore, conclude that Kambayashi fails to disclose an embodiment having all elements of claim 26, as arranged in the claim. Kambayashi does not anticipate claim 26.

3. Dependent Claims

The remaining instituted claims all depend, directly or indirectly, from claim 26, and incorporate claim 26's requirements of a first numerical representation, and second numerical representation. We, therefore, find that Kambayashi does not anticipate the dependent claims, for the same reasons discussed above with respect to claim 26.

C. Obviousness of Claims 26, 28–30, 32, 34, and 39 Over Fox Papers

We instituted trial to determine whether claims 26, 28–30, 32, 34, and 39 are unpatentable under 35 U.S.C. § 103 as having been obvious over the combined disclosures of Fox Thesis, Fox SMART, and Fox Collection (collectively, "the Fox Papers"). Inst. Dec. 14–19. In support of the asserted ground of unpatentability, Petitioner sets forth the teachings of the cited prior art, provides detailed claim charts, and cites to the declaration of Dr. Fox (Ex. 1016 ¶¶ 68–145), explaining how each limitation is taught in the cited prior art combination. Pet. 9–23.

The claim chart persuasively reads all elements of each of claims 26, 28–30, 32, 34, and 39 onto the teachings of the Fox Papers, taken together. Despite the counter-arguments in Patent Owner's Response, and the evidence cited therein, which we have also considered, Petitioner has shown by a preponderance of the evidence that each of claims 26, 28–30, 32, 34, and 39 of the '352 patent are unpatentable, under 35 U.S.C. § 103, as they would have been obvious over the combination of Fox Thesis, Fox Collection, and Fox SMART.

1. Fox Thesis

Fox Thesis describes improving query and document representation schemes for information retrieval. Ex. 1009, 261. In particular, useful types of bibliographic data are incorporated into a model to test clustering and retrieval functions. *Id*. at 164. Bibliographic connections between articles are illustrated for an exemplary set "O" of documents, which are represented by letters A through G. *Id*. at 165–66, Fig. 6.2. This exemplary set "O" includes direct and indirect citation references. *Id*. at 166–67, Table 6.2.

Based on the reference pattern for a set of documents, Fox Thesis describes deriving various measures of the interconnection between the documents. *Id.* at 166. For example, weights are assigned "based upon integer counts" for bibliographically coupled documents. *Id*. at 167. Citation submatrices represent reference or citation information. *Id*. at 169. For example, submatrix *bc* represents bibliographically coupled reference information and submatrix *cc* represents co-citation reference information. *Id*. at 169–72, Figs. 6.3–6.5.

2. Fox SMART

Fox SMART describes the System for Mechanical Analysis and Retrieval of Text ("SMART") as a project for designing a fully automatic document retrieval system and for testing new ideas in information science. Ex. 1008, 3. Fox SMART describes the computer system used to implement the experiments described in the Fox Thesis. Ex. 1016, ¶ 27. The software components of SMART are implemented in the C Programming Language and run under the UNIX™ operating system on a VAX™ 11/780 computer. Ex. 1008, 1, 4.

In SMART, an automatic indexing component constructs stored representations of documents. *Id*. at 3. Bibliographic information is used to enhance document representations. *Id*. at 29. The SMART system may process basic raw data, such as an exemplary N collection of articles and citation data describing which articles are cited by others. *Id*. at 29–30. Data is entered into the SMART system as a set of tuples $\{(d_i, d_j)|d_i \rightarrow d_j\}$ which describe the cited and citing documents, as well as the direction of citation. *Id*. at 29. The exemplary input data also includes indirect citation relationships, such as bibliographic coupled and co-citation relationships.

Id. at 30–32. These relationships are used to create extended vectors which can then be clustered and searched to aid document retrieval. *Id*. at 29.

3. Fox Collection

Fox Collection describes collections of data which are said to be useful for investigating the interaction of textual and bibliographic data in retrieval of documents. Ex. 1007, 1. According to the testimony of Dr. Edward Fox, Fox Collection was originally part of the same work as Fox Thesis and Fox SMART, and describes the manner in which the data sets were obtained and processed prior to their use in the Fox SMART experiments. Ex. 1016 ¶ 27.

According to Fox Collection, the experiments were performed on a collection of bibliographic records (title, abstract, author, keywords, etc.) from the *Communications of the ACM*, termed the "CACM collection." Ex. 1007, 14.[2] Two individuals then examined printed copies of the articles referenced by the CACM bibliographic records, and citation data was obtained from the articles and entered into a set Raw_data. *Id*. The citation data contained pairs of identifiers (citing, cited) which were the document id numbers ("dids") of the citing record and record it cites. *Id*. From this Raw_data matrix, secondary matrices such as bc (bibliographic coupling) and cc (co-citation) were derived computationally. *Id*. at 14–16.

[2] Fox Collection also discusses an ISI Collection, but in his Reply Declaration Dr. Fox explains that he cites the ISI collection to "emphasize findings in the prior art about the value of using co-citation data (a non-semantic indirect relationship) in information retrieval, not to fully address all the elements of claims. . . . For the sake of simplicity, the Board should focus on the methodology given in Fox Papers, and the examples of their use with the CACM Collection." Ex. 1030, ¶ 6.

4. Claim 26

Petitioner's claim chart persuasively reads all elements of claim 26 onto the combined teachings of Fox Thesis, Fox SMART, and Fox Collection. Pet. 9–23 (citing Ex. 1007, 14–15, 43, 48; Ex. 1008, 3, 12–13, 16, 18, 25–27, 29–33, 36, 38–39, 41–43, 53; Ex. 1009, 17, 19, 179, 181–82, 195, 199, 203, 211; 1016 ¶¶ 71–108, 122–131). For instance, the combination of Fox Thesis, Fox SMART, and Fox Collection teaches "marking objects in the database" and "creating a first numerical representation for each identified object in the database based upon the object's direct relationship with other objects in the database," as recited in claim 26. In particular, Fox Collection teaches assigning document identification numbers ("dids") to the articles in the CACM collection, which is "marking objects in the database." Ex. 1007, 14. Printed copies of each article with a bibliographic entry in the CACM collection then are reviewed manually, to obtain bibliographic subvectors in the form "Raw_data (cited, citing)." *Id*. This is a first numerical representation created based on the direct relationship between the "cited, citing" pair of bibliographic records.

The combination of Fox Thesis, Fox SMART, and Fox Collection also teaches "analyzing the first numerical representations for indirect relationships existing between or among objects in the database" and "generating a second numerical representation of each object based on the analysis of the first numerical representation," as recited in claim 26. Fox SMART teaches that direct relationships may be represented by tuples called "CITED," which contain a citing document, a cited document, and the direction of the citation. Ex. 1008, 29. These tuples are then processed to

construct submatrices such as *bc* and *cc*, which contain numbers representing indirect relationships. *Id*. at 30–32 ("construct BC by counting the number of identical tuples of C"). Dr. Fox testifies that the CITED tuples of Fox SMART refer to the Raw_data derived from the CACM collection. Ex. 1016 ¶ 124. Because these *bc* and *cc* submatrices are numerical representations, and are generated from the first numerical representations CITED which are based on direct relationships, we find that the Fox Papers together teach "generating a second numerical representation of each object based on the analysis of the first numerical representation."

a. Combination of References

As to whether Petitioner has satisfied the requirements for combining the teachings of Fox Thesis, Fox SMART, and Fox Collection, we determine that Petitioner has articulated sufficient reasoning with a rational underpinning as to why one of ordinary skill in the art would have combined the retrieval systems taught in Fox Thesis, Fox SMART, and Fox Collection. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Dr. Fox states that the three publications arose from the same thesis project, and were originally one document. Ex. 1016 ¶ 70. Furthermore, Dr. Fox notes that Fox Thesis "explain[s] the method and experimental results of [his] information retrieval work," Fox SMART "detail[s] the updated SMART computer system used to execute the experiments," and Fox Collection "describes how the data sets were obtained and processed prior to being used in the experiments." *Id*. We give Dr. Fox's statement that one of skill in the art would have been motivated to combine the references because they "describe a complete project with its underlying system and data" (*id*.)

substantial weight, because it is consistent with the considerable overlap in the disclosures of the Fox Papers and their internal references to one another. *See, e.g.*, Ex. 1009, 343 (Fox Thesis cites to Fox SMART); Ex. 1008, 84 (Fox SMART cites to Fox Thesis).

b. Patent Owner's Counterarguments

We have considered Patent Owner's counterarguments but do not find them persuasive. Patent Owner contends that various elements of claim 26 are not taught or suggested by the Fox Papers in combination. First, Patent Owner argues that the Fox Papers do not teach a computer database in which direct and indirect relationships exist between objects in the database. PO Resp. 17. Because the databases of the Fox Papers are bibliographic databases, they contain certain information about documents such as title, abstract, author, and publication date. *See, e.g.*, Ex. 1007, 14 (describing CACM database). The Fox databases do not contain the full documents, meaning that the databases do not contain the portions of the documents that cite to other documents. As such, Patent Owner argues, the databases cannot have objects having direct and indirect relationships, as required by claim 26. PO Resp. 17–18.

We have construed *direct relationships* to mean "relationships where one object cites to another object." Based on this construction, the bibliographic records of Fox Collection's CACM database do not have direct relationships, because they do not contain cites to one another. It is only after the full documents—which are not in the database—are manually reviewed, and the first numerical representation (Raw_data) is entered, that the database contains objects that have direct relationships. Claim 26, however, requires that direct and indirect relationships exist between objects

in the database first, prior to creating a first numerical representation. In other words, the Raw_data of the Fox Collection CACM database cannot be both the objects that have relationships, as well as the first numerical representation of those relationships.

Petitioner contends, however, that it would have been "trivial and obvious" to modify the databases of the Fox Papers to contain full text documents. Reply 10. Dr. Fox's testimony supports this argument, noting that if storage resources allowed storage of the full text of documents, this would have been understood as preferable. Ex. 1016 ¶¶ 76, 89. We credit Dr. Fox's testimony on this point, as it is consistent with the disclosure of Fox Thesis that "some [information retrieval] systems store the full text of the various documents." Ex. 1009, 6. Fox Thesis adds that full text permits users to "locate documents of interest," as well as "retrieve and/or examine paragraphs, passages, sentences, or single word occurrences (in context)." *Id*. These extra capabilities are described as "straightforward generalizations of document retrieval methods." *Id*.

We, therefore, conclude that the Fox Papers suggested to one of ordinary skill in the art at the time of the invention the modification of the Fox databases to include full text documents. With such a modification, the databases would contain, as objects, the full text documents. Therefore, even prior to generation of the Raw_data, the database would contain objects that have direct and indirect relationships due to their citation of one another. Patent Owner's argument to the contrary is unpersuasive.

In the same vein, Patent Owner argues that the Fox Papers do not teach "creating a first numerical representation for each identified object in the database based upon the object's direct relationship with other objects in

the database." PO Resp. 31. Because, for example, the Raw_data disclosed in the Fox Collection is derived from documents that are not in the CACM database, but rather compiled from full text printed versions of the documents, Patent Owner argues that Raw_data is not *based on* the object's direct relationship with other objects. *Id*. at 32.

We find this argument unpersuasive for the same reasons outlined above for the objects limitation. The Fox Papers suggest inclusion of full text documents in the databases. With such a modification, the databases would have—even prior to creation of Raw_data—objects with direct relationships. The subsequently-created Raw_data relation would be based on those objects, thus satisfying the first numerical representation element of claim 26.

Patent Owner's remaining contentions relate to whether the Petitioner has satisfied the requirements for combining the teachings of Fox Thesis, Fox SMART, and Fox Collection. For example, Patent Owner contends that the systems disclosed in the individual Fox Papers are "narrowly tailored" and would not have been combined merely because of their common authorship. PO Resp. 26.

As indicated above, we determine that Petitioner has articulated sufficient reasoning with a rational underpinning as to why one of ordinary skill in the art would have combined the retrieval systems taught in Fox Thesis, Fox SMART, and Fox Collection. *See KSR*, 550 U.S. at 398. For instance, Dr. Fox wrote each of Fox Thesis, Fox SMART, and Fox Collection. See Ex. 1009, i; Ex. 1008, 1; Ex. 1007, 1.

Patent Owner also contends that the Raw_data relation of Fox Collection could not be combined with the CITED tuples of Fox SMART,

because they are "fundamentally incompatible." PO Resp. 27. In support of this argument, Dr. Jacobs testifies, for example, that CITED does not describe using document ids ("dids") while Raw_data does. Ex. 2113 ¶¶ 170–171. Dr. Fox testifies to the contrary, stating that the CITED tuples of Fox SMART specifically refer to the Raw_data derived from the CACM collection. Ex. 1016 ¶ 124. We give Dr. Fox's testimony on this point substantial weight. Our determination is not only due to Dr. Fox's personal knowledge of the Fox Papers, but also supported by the descriptions of Raw_data and CITED in the references. The references indicate that both Raw_data and CITED contain pairs of document identifiers, with the sole difference being that CITED also contains a third data element that signifies the direction of the citation. Furthermore, while the description of CITED in Fox SMART is silent as to document ids, other portions of the document discuss dids which are an "index in range 1 . . . N." Ex. 1008, 36. We do not consider the combination of Raw_data with CITED, or the combination of the systems of Fox Collection, Fox SMART, and Fox Thesis, to be beyond the level of ordinary skill in the art.

Patent Owner further contends that using indirect relationships in a computerized search system would not have been predictable at the time of the invention of the '352 patent. PO Resp. 50. Patent Owner's contention is based on its view that the combined teachings of Fox Thesis, Fox SMART, and Fox Collection are not sufficient because they do not teach computerized searching of an electronic database. PO Resp. 54; *see also* Tr. 49 ("[T]he Fox papers by themselves don't get you there . . . every one . . . is directed to printed articles, not an electronic database."). According to Patent Owner, the prior art cited by Petitioner teaches experiments that are

not directed to a computer database, "but rather are directed toward limited experimentation with bibliographic relationships existing among paper documents." PO Resp. 1.

We disagree with Patent Owner. For example, Fox SMART teaches an implementation in which software components of SMART are implemented in the C Programming Language and run under the UNIX™ operating system on a VAX™ 11/780 computer. Ex. 1008, 1, 4. In SMART, an automatic indexing component constructs stored representations of documents. *Id*. at 3. In light of the various teachings of Fox Thesis, Fox SMART, and Fox Collection discussed herein, we determine that Fox Thesis, Fox SMART, and Fox Collection, taken together, teach or suggest computerized searching of an electronic database.

Patent Owner also contends that the inclusion of indirect relationships into search "degrades results," and therefore provides a teaching away from the invention. PO Resp. 50. As Patent Owner acknowledges, its evidence of degraded results does not teach away from the *combination* of the Fox Papers, but rather from the *modification* of the teachings of the Fox Papers to incorporate "an electronic database that has references to the objects in the database." Tr. 49–50. We found above, however, that the Fox Papers teach this feature. In addition, to the extent modification of the Fox Papers is necessary to meet claim 26, we have found that modification is expressly suggested by the Fox Papers themselves. The record is insufficient to establish a teaching away.

Patent Owner also asserts objective indicia of non-obviousness, focusing on Google's search engine using its PageRank algorithm. PO Resp. 56–60. As an initial matter, Patent Owner's contentions again appear

to be based on its view that the combined teachings of Fox Thesis, Fox SMART, and Fox Collection are not sufficient because they do not teach computerized searching of an electronic database. *Id*. at 58 ("Link analysis technology applied to the Web, as claimed in the '352 patent and embodied in PageRank, satisfied a long felt need for improved computerized search." (citation omitted)); Tr. 60–61 ("[I]t certainly wouldn't have been obvious to one of ordinary skill based on Fox's work to extend these ideas from this paper collection to electronic databases."). For the reasons discussed above, we disagree with Patent Owner's view and determine that Fox Thesis, Fox SMART, and Fox Collection, taken together, teach or suggest computerized searching of an electronic database.

Furthermore, we note that Patent Owner has not shown that the asserted success of a commercial embodiment of the '352 patent actually resulted from features recited in the claims of the '352 patent. Patent Owner has not provided sufficient evidence to support a nexus between claim 26 and the Google PageRank algorithm. Because Patent Owner has failed to provide the source code of PageRank, or any other detailed information beyond publicly-available, generalized hearsay statements about Google's search (Ex. 2050), the record is insufficient to prove that PageRank uses the method of claim 26.

Even if PageRank's algorithm incorporates the method of claim 26, we cannot determine that Google's success is due to the method of claim 26, as opposed to other elements of the algorithm. Patent Owner's declarant Dr. Amy N. Langville conceded that the Google search technology involves a combination of link analysis (non-semantic) and semantic searching, whereas claim 26 recites a non-semantical method. Ex. 1034, 76:19–21.

Even if we were to conclude that the PageRank algorithm utilized the non-semantical method of claim 26, we could not determine whether the alleged success of PageRank is due to its non-semantical aspects, its semantical aspects, or some combination of both.

Patent Owner also points to Google's license of the '352 patent as evidence of nexus. PO Resp. 59–60. Patent Owner, however, admits that this license resulted in the settlement of a lawsuit (*id*.), which without additional contextual evidence, weighs against finding a nexus.

Additionally, we determine that in light of the weak showing of secondary considerations, the evidence of obviousness with respect to Fox Thesis, Fox SMART, and Fox Collection, is sufficient to support the conclusion that claim 26 would have been obvious. *See Leapfrog Enterprises, Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007). As discussed above, Petitioner has provided a strong case of obviousness.

Accordingly, even after considering the counter-arguments in Patent Owner's Response, and the evidence cited therein, we find that Petitioner has shown by a preponderance of the evidence that claim 26 is unpatentable as it would have been obvious over the combination of Fox Thesis, Fox SMART, and Fox Collection.

5. Dependent Claims

Petitioner's claim chart persuasively reads all elements of dependent claims 28, 29, 30, 32, 34, and 39 onto the teachings of Fox Thesis, Fox SMART, and Fox Collection, taken together. Pet. 16–23 (citing Ex. 1007, 12, 14–15, 43, 48–49; Ex. 1008, 14, 16, 24–25, 29, 30–33, 36–38, 41, 43–52; Ex. 1009, 1, 15, 17, 23, 126, 151, 173–74, 177–79, 181–82, 191–92, 194, 202, 213–18, 224, 232, 234, 238–43, 257; Ex. 1016 ¶¶ 71–108, 110–

121, 124–125, 127–128, 132–135, 137–145). For instance, we determine that Petitioner has shown by a preponderance of the evidence that the combination of Fox Thesis, Fox SMART, and Fox Collection teaches that the first and second numerical representations are vectors that are arranged in first and second matrices, as required by claim 28. Fox SMART teaches CITED, which is a set of tuples indicating a pair of documents linked by a direct relationship, as well as the direction of citation. Ex. 1008, 29. These tuples are vectors, as are the components of the *bc* and *cc* submatrices, which represent indirect relationships. *Id*. at 30–32. Furthermore, the objects in the CACM database are bibliographic records which include publication date (Ex. 1007, 14), and therefore are assigned chronological data as required by claim 28.

We also determine that Petitioner has shown by a preponderance of the evidence that the combination of Fox Thesis, Fox SMART, and Fox Collection teaches weighing, wherein some indirect relationships are weighed more heavily than other indirect relationships, as recited in claim 32. Fox Thesis, for example, discloses assigning weights to subvectors such as *bc* and *cc*, which are different types of indirect relationships. Ex. 1009, 257 (Table 8.13). In one weighting scheme disclosed in Fox Thesis, bibliographic coupling indirect relationships (*bc*) are weighted at .009, more heavily than co-citation indirect relationships (*cc*), weighted at 0. *Id*.

Claim 39 requires both pool-similarity searching and pool-importance searching. As noted above, we construed *pool-similarity searching* as "identifying at least one object based on degree of similarity to a selected pool of objects" and *pool-importance searching* as "identifying at least one object based on the importance of the object to a selected pool of objects."

We determine that the Fox Papers have been shown by a preponderance of the evidence to teach these elements. Fox Thesis and Fox SMART disclose a feedback search in which results are presented to a user, ranked according to importance, and then used to construct a new search. Ex. 1008, 24, Fig. 6; Ex. 1009, 151, Fig. 5.1. This teaches pool-importance searching as required by claim 39. Similarly, Fox SMART discloses a search that "perform[s] exact matches as well as general similarity computations" (Ex. 1008, 37–38), which meets the pool-similarity searching limitation of claim 39.

Additionally, for the reasons discussed above with respect to claim 26, we determine that Petitioner has satisfied the requirements for combining the teachings of Fox Thesis, Fox SMART, and Fox Collection.

Patent Owner argues that Petitioner has not proven by a preponderance of the evidence that all elements of the dependent claims are taught or suggested by the Fox Papers. PO Resp. 35–39. Some of these arguments, for example those made with respect to claims 28, 29, 30, and 34, are based on the fact that the databases of the Fox Papers do not include objects because the bibliographic records do not cite to one another. *Id.* Just as we found such arguments unpersuasive with respect to claim 26, we are not persuaded by them here. The Fox Papers suggest the inclusion of full text documents into the databases, and that such a modification could be beneficial.

Patent Owner also argues that claim 28's limitation that the step of searching comprises the steps of matrix searching of the second matrices and examining the chronological data is not met by the Fox Papers. *Id*. at 35–36. According to Patent Owner, the Fox Thesis discloses a "preliminary clustering experiment" in which chronological data is "summarily dismissed

because of poor results." *Id.* We do not consider this reading of the Fox Thesis accurate. The quotation from the reference provided by Patent Owner, "the clustering result does not seem as good as that of the other methods" (Ex. 1009, 217), is partial and misleading. The full sentence reads: "*If the* clustering result does not seem as good as that of other methods *then a likely explanation is that improper coefficients were chosen and used in computing the combined similarity value*." *Id.* (omitted portion emphasized). Not only does Patent Owner omit the qualifier "if," but also the explanation that the result likely is due to improper weighting coefficients. This is far from the "summary dismissal" of chronological data asserted by Patent Owner.

Indeed, as Petitioner notes, other portions of the Fox Papers expressly disclose searching using indirect relationship matrices in combination with chronological data. Ex. 1008, 41 (p-norm queries include date, as well as bibliographically coupled or co-cited articles). We are not persuaded by Patent Owner's arguments regarding claim 28.

Patent Owner also contends that the Fox Papers do not teach or suggest marking subsets of objects in the database, as required by claim 34. PO Resp. 38. Fox SMART discloses "separate indexing of paragraphs or even sentences." Ex. 1008, 25; *id.* at 80 ("vectors could be computed for smaller items than just documents"). According to Patent Owner, however, the markings "must be usable by a computerized search to individually identify a specific subset of an object in a computer database as a search result." PO Resp. 38. This alleged requirement is drawn from the *marking* limitation of claim 26. *Id.* Claim 26, however, only requires that the "marked object . . . be individually identified by a computerized search."

The subsets of claim 34 are marked, but this marking does not transform the subsets into objects as recited in claim 26. Patent Owner's argument that computerized searching of the marked subsets is required by claim 34 lacks merit.

Finally, Patent Owner argues that the Fox Papers do not teach or suggest pool-importance searching, as required by claim 39. PO Resp. 39. Patent Owner correctly notes that "importance is distinct from similarity," and therefore pool-importance searching is different than pool-similarity searching. *Id*. The Petition, Patent Owner argues, only identifies disclosures of pool-similarity searching in the Fox Papers, and, therefore, fails to establish that all elements are taught or suggested by the prior art. *Id*.

We disagree with Patent Owner's argument. In its claim chart, Petitioner set forth distinct disclosures from the Fox Papers to meet the pool-importance searching and pool-similarity searching elements. Pet. 22–23. For instance, Fox SMART teaches using "general similarity computations," (Ex. 1008, 37–38) which Petitioner contends is pool-similarity searching, as well as a "feedback" search loop in which results are ranked according to importance to a user, and then further results are retrieved (*id*. at 24, Fig. 6), which Petitioner contends is pool-importance searching. As we concluded above, the feedback search function disclosed in the Fox Papers teaches pool-importance searching, as required by claim 39.

For the foregoing reasons, Petitioner has shown by a preponderance of the evidence that claims 28, 29, 30, 32, 34, and 39 of the '352 patent are unpatentable under 35 U.S.C. § 103(a) as they would have been obvious over Fox Thesis, Fox SMART, and Fox Collection.

D. Obviousness of Claims 26, 28–30, 32, 34, and 39 Over the Tapper Papers

We instituted trial to determine whether claims 26, 28–30, 32, 34, and 39 are unpatentable under 35 U.S.C. § 103 as having been obvious over the combined disclosures of Tapper 1976 and Tapper 1982 (collectively, "the Tapper Papers"). Inst. Dec. 21–24.

We have considered Petitioner's arguments and evidence, as well as the counter-arguments in Patent Owner's Response, and the evidence cited therein, and conclude that Petitioner has not shown by a preponderance of the evidence that each of claims 26, 28–30, 32, 34, and 39 of the '352 patent are unpatentable, under 35 U.S.C. § 103, as having been obvious over the Tapper Papers.

1. Tapper 1976

Tapper 1976 discloses a "citation vector technique" for retrieving legal information that seeks to overcome perceived deficiencies in Boolean search strings. Ex. 1005, 270–71. Rather than characterizing a legal document by the words it contains, vector matching focuses on the citations the document contains. *Id*. at 263. Tapper 1976 also notes that the technique may be used as an adjunct to a full-text retrieval system. *Id*. at 272.

By repeating the vector characterization of the documents, Tapper 1976 discloses that a matrix may be created that shows the similarities between the documents. *Id*. By re-ordering the matrix, the documents may be clustered according to their similarity. *Id*. The reference also discloses that "second generation citations" may be used: "if a case cites cases A', B' and C', and case A' cites a1', a2' and a3', case B' b1', b2' and b3' and case C'

c1', c2' and c3' the original case would be represented by a combination of its own vector, and those of cases A', B' and C'." *Id*. at 266.

2. Tapper 1982

Tapper 1982 similarly focuses on the drawbacks of full-text searching of legal documents and the alternative use of citation vectors for legal research. Ex. 1006, 135–36. The reference discusses weighting certain citation vectors more heavily than others, for example by the difference in the ages of the citing and cited case. *Id*. at 138.

A pilot project implementing such a citation vector-based system is also described by Tapper 1982. *Id*. at 139. The reference discloses a correlation algorithm used in the pilot project to cluster together vectors with a high degree of association. *Id*. at 143–44. Such clustering is said to permit a document to be retrieved "not only because it is itself closely associated with another target document, but also because both it and the target document are closely associated with a third." *Id*.

3. Claim 26

As discussed above, claim 26 requires steps of "creating a first numerical representation for each identified object in the database based upon the object's direct relationship with other objects in the database." We find that this limitation is neither taught nor suggested by the combined Tapper Papers.

Petitioner's claim chart identifies several portions which allegedly teach a first numerical representation. Pet. 47–48. For example, Tapper 1976 is cited as disclosing "quantifiable representation in the form of numerical weighting" *Id*. (citing Ex. 1005, 263). These "quantifiable representations" are of "other characteristics" of the citations, such as age or

the importance of the court or jurisdiction deciding the case, not the citations (relationships) themselves. Ex. 1005, 263.

Similarly, Tapper 1982 is cited as disclosing "[a]scription of numerical values to vector elements." Pet. 48 (citing Ex. 1006, 141). But Tapper 1982 explicitly defines "vectors" as "the strings [a document] contains and the frequency of their occurrence." Ex. 1006, 134. In other words, the "numerical values" of Tapper 1982 are the *frequency* of the appearance of citation *strings*, which as we discussed above, connotes the inclusion of letters. The Petition provides no citation to either Tapper Paper that teaches representing direct relationships with a first numerical representation.

In its Reply Brief, Petitioner identifies two other disclosures by the Tapper Paper it contends satisfy the *first numerical representation* limitation. First, Petitioner argues that "the legal citations in Tapper clearly qualify as numerical representations." Reply 4–5. The legal citations Petitioner identifies, however, are in the exemplary form of "500 F.2d 411," which includes letters. As we have construed the term, this is not a numerical representation, but rather the "strings" of the vectors discussed above.

Second, Petitioner notes that the Tapper Papers describe assigning cases in the database a unique ID number. *Id*. (citing Ex. 1006, 148). At oral argument, Petitioner's counsel directed our attention to Table 2 of Tapper 1982, which includes in the leftmost column pairs of numbers which signify pairs of documents. Tr. 14; Ex. 1006, 147. At most, the assignment of these numbers could satisfy the marking step of claim 26 (Ex. 1006, 148 ("[t]he first column gives the numbers allocated to the cases.")); they are not

generating a first numerical representation. The document numbers indicated by Petitioner are numerical representations of *documents*, not of the *relationships* between those documents. Claim 26 requires that the first numerical representations are based on direct relationships in the database. The numbers allocated to the cases of Tapper 1982 cannot satisfy this limitation.

Nor can the document number *pairs* of Table 2 be a first numerical representation, as Tapper 1982 does not disclose that they represent a direct relationship (i.e., one of the documents in the pair citing the second). Rather, the pairs of documents appear to be listed together in the table because of their high "correlation values." Ex. 1006, 148. As Petitioner acknowledges, these correlation values represent indirect relationships between the documents (Reply 6 ("correlation values of cases' indirect relationships")), therefore they cannot be a first numerical representation that represents a direct relationship.

Petitioner argues in the alternative that "there is nothing non-obvious about creating citation vectors consisting solely of numbers." Reply 4–5. At the outset, we note that this argument was presented for the first time in the Reply; the sole modification to the Tapper Papers addressed in the Petition is the combination of the disclosures of the two references. Pet. 45–46. Nor did Petitioner present any testimony with the Petition regarding the Tapper Papers, or how a person of ordinary skill in the art would have modified the references. It would be a proper exercise of our discretion, therefore, to not consider this argument and the Reply Declaration of Dr. Fox (Ex. 1016), which presents testimony on the Tapper Papers for the first

time.[3] *See* Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,767 (Aug. 14, 2012) ("a reply that raises a new issue or belatedly presents evidence will not be considered.")

Even if we were to consider Petitioner's Reply and Dr. Fox's Reply Declaration, however, we are not persuaded. Petitioner cites to various portions of the Tapper Papers (Reply 4–5), but none of these citations sufficiently establish a reason to substitute numerical representations for those disclosed in Tapper. For example, Petitioner argues—using pieced-together quotations—that "Tapper [1982] also makes clear that one could 'very easily' use a 'simple conversion table' to map 'extracted' citations to any 'chosen style.'" *Id*. at 5 (citing Ex. 1006, 136). Upon reading the full context from which these quotes are drawn, however, it is clear that Tapper 1982 is discussing "parallel reports of the same decision." Ex. 1006, 136. In other words, Tapper 1982 does not contemplate converting letter-containing case citations into numbers, but rather converting one letter-containing citation into another.

Dr. Fox's Reply Declaration (Ex. 1030 ¶¶ 107–115) relies on the same arguments as Petitioner's Reply, and we find them unpersuasive for the same reasons. Nor are we persuaded by the portions of Dr. Jacobs's cross-examination Petitioner cites (Reply 5 (citing Ex. 1033, 313:7–316:23, 339:3–342:6)), as Dr. Jacobs's testimony was to what a person of ordinary skill would have understood from the '352 patent specification, not the Tapper Papers. *See In re Vaeck*, 947 F.2d 488, 493 (Fed. Cir. 1991) (suggestion to make invention cannot "be founded . . . in the applicant's

[3] We address Patent Owner's Motion to Exclude portions of the Reply Declaration below.

disclosure"). The record before us does not support the conclusion that a person of ordinary skill in the art would have modified the combined disclosures of the Tapper Papers to include a first numerical representation.

4. Dependent Claims

The remaining instituted claims all depend, directly or indirectly, from claim 26, and thus incorporate claim 26's requirement of a first numerical representation. We, therefore, find that the Tapper Papers do not teach or suggest all elements of these dependent claims.

E. Motion to Exclude

Patent Owner filed a Motion to Exclude (Paper 47) in which Patent Owner seeks to exclude portions of the Reply Declaration of Dr. Edward A. Fox (Ex. 1030) ("Reply Declaration") submitted with Petitioner's Reply. In particular, Patent Owner identifies three issues with the Declaration, each of which is based on the argument that portions of the Declaration are improper reply evidence.

In its Reply, a Petitioner may only respond to arguments raised in the Patent Owner's Response. 37 C.F.R. § 42.23(a). "A reply that raises a new issue or belatedly presents evidence will not be considered." Office Patent Trial Practice Guide, 77 Fed. Reg. at 48,767 (Aug. 14, 2012). The Practice Guide provides, as indications of improper reply evidence, "new evidence necessary to make out a *prima facie* case for . . . patentability or unpatentability . . ., and new evidence that could have been presented in a prior filing." *Id.*

A motion to exclude evidence under 37 C.F.R. § 42.64(c), however, "normally is not the proper vehicle for resolution of a dispute regarding reply arguments and evidence exceeding the proper scope of a reply." *ABB,*

Inc. v. Roy-G-Biv Corp., Case IPR2013-00063, slip op. 13–14 (PTAB May 16, 2014) (Paper 71); *Corning Inc. v. DSM IP Assets B.V.*, Case IPR2013-00047, slip op 7 n.3 (PTAB May 1, 2014) (Paper 84) (characterizing such motions as "now disfavored"). Rather, when evaluating the record after oral argument, the Board is capable of determining what, if any, evidence exceeds the proper scope of rely, and accordingly disregarding that evidence.

While we, therefore, *deny* Patent Owner's Motion, we also note that even if it were proper, we would dismiss it as moot. With respect to the objected-to portions of the Reply Declaration which discuss the Tapper Papers, we have considered them above, found Dr. Fox's testimony unpersuasive, and found in favor of Patent Owner on the Tapper Papers ground. With respect to the Fox Papers ground, we have found in favor of Petitioner, but did not rely on any of the objected-to portions of the Reply Declaration in so doing. A decision to exclude the Reply Declaration would, therefore, not affect our determinations in this case.

F. Motions to Seal

Patent Owner filed a Motion to Seal (Paper 35) the Declaration of Dr. Amy N. Langville ("Langville Declaration") filed as Exhibit 2114. Petitioner filed a Motion to Seal (Paper 42) the Transcript of the Deposition of Amy N. Langville, Ph.D. ("Langville Transcript") filed as Exhibit 1034. Both of these motions are unopposed.

Regarding Patent Owner's Motion to Seal, according to Patent Owner paragraphs 25, 112, and 113 of the Langville Declaration makes reference to certain facts about confidential licenses to the patents under review. Paper

35, 3. Additionally, Patent Owner contends that this information has not been made, and will not be made, public. *Id*.

Regarding Petitioner's Motion to Seal, according to Petitioner, Patent Owner has designated the transcript as confidential. Paper 42, 3. To avoid public disclosure, therefore, Petitioner submits sealing the Langville Transcript is appropriate. *Id*.

There is a strong public policy in favor of making information filed in *inter partes* review proceedings open to the public. *See Garmin Int'l v. Cuozzo Speed Techs., LLC*, Case IPR2012-00001 (PTAB Mar. 14, 2013) (Paper 34). Under 35 U.S.C. § 316(a)(1), the default rule is that all papers filed in an *inter partes* review are open and available for access by the public.[4] The standard for granting a motion to seal is "good cause." 37 C.F.R. § 42.54. A moving party bears the burden of showing that the relief requested should be granted. 37 C.F.R. § 42.20(c).

Regarding Patent Owner's Motion to Seal, Patent Owner, as the moving party, has failed to carry its burden. Patent Owner identifies only three paragraphs in the Langville Declaration that purportedly contain confidential information. However, Patent Owner has not pointed to proof in the record that any information contained in these paragraphs is confidential. Additionally, although Patent Owner contends that this information has not been made, and will not be made, public, Patent Owner presented this information during the hearing on October 30, 2014, which

[4] Additionally, we note that confidential information subject to a protective order ordinarily would become public 45 days after final judgment in a trial. Office Patent Trial Practice Guide, 77 Fed. Reg. at 48,761. However, after denial of a petition to institute a trial or after final judgment in a trial, a party may file a motion to expunge confidential information from the record. 37 C.F.R. § 42.56.

was open to the public. *See* Tr. 54:12–25. We, therefore, determine that Patent Owner has not met its burden of proof.

Regarding Petitioner's Motion to Seal, Patent Owner's designation of the transcript as confidential is not sufficient to show that the transcript contains confidential information. We, therefore, determine that Petitioner has not met its burden of proof.

We recognize a denial of the motions to seal would unseal immediately the material that Patent Owner desires to remain confidential and the effect would be irreversible. Therefore, rather than denying the motions at this time, we will provide Patent Owner and Petitioner one week to (1) withdraw the motions to seal and request that we expunge Exhibits 2114 and 1034, or (2) withdraw the motions to seal, request that we expunge Exhibits 2114 and 1034, and replace them with redacted versions that leave out the confidential information. We note that we have not relied on the three paragraphs of the Langville Declaration that Patent Owner identifies as containing allegedly confidential information.

III. CONCLUSION

We conclude that Petitioner has shown by a preponderance of the evidence that claims 26, 28–30, 32, 34, and 39 of the '352 patent are unpatentable under 35 U.S.C. § 103, as they would have been obvious over Fox Thesis, Fox SMART, and Fox Collection, taken together.

IV. ORDER

For the reasons given, it is

ORDERED that claims 26, 28–30, 32, 34, and 39 of U.S. Patent No. 5,544,352 are determined by a preponderance of the evidence to be unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Exclude the Reply Declaration of Dr. Edward A. Fox (Exhibit 1030) is denied;

FURTHER ORDERED that Exhibit 2114 and Exhibit 1034 will be made available to the public after 5 PM Eastern five business days after the entry date of this decision, unless prior to that time, each of Patent Owner and Petitioner (1) withdraws the motions to seal and requests that we expunge Exhibits 2114 and 1034, or (2) withdraws the motions to seal, requests that we expunge Exhibits 2114 and 1034, and replaces them with redacted versions that leave out the confidential information; and

FURTHER ORDERED that, because this is a final written decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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