

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,
Petitioner,

v.

UNILOC 2017 LLC,
Patent Owner.

IPR2020-00755
Patent 6,366,908 B1

Before SALLY C. MEDLEY, KRISTEN L. DROESCH, and
SHEILA F. McSHANE, *Administrative Patent Judges*.

MEDLEY, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

Google LLC (“Petitioner”) filed a Petition for *inter partes* review of claims 6–12 of U.S. Patent No. 6,366,908 B1 (Ex. 1001, “the ’908 patent”). Paper 1 (“Pet.”). Uniloc 2017 LLC (“Patent Owner”) filed a Preliminary Response. Paper 8 (“Prelim. Resp.”). In accordance with Board authorization, Petitioner filed a Reply to the Preliminary Response (Paper 9) and Patent Owner filed a Sur-reply (Paper 11). Upon review of the papers, we instituted *inter partes* review, pursuant to 35 U.S.C. § 314, as to claims 6–12 based on the challenges set forth in the Petition. Paper 14 (“Decision to Institute” or “Dec.”).

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 17, “PO Resp.”), Petitioner filed a Reply to Patent Owner’s Response (Paper 19, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 20, “Sur-reply”). On July 15, 2021, we held an oral hearing. A transcript of the hearing is of record. Paper 27 (“Tr.”).

For the reasons that follow, we conclude that Petitioner has proven by a preponderance of the evidence that claims 6–12 of the ’908 patent are unpatentable.

A. Related Matters

Petitioner and Patent Owner indicate that the ’908 patent is the subject of court proceeding, *Uniloc 2017 LLC v. Google LLC*, No. 2:18-cv-00553 (E.D. Tex.). Pet. 93; Prelim. Resp. 3. Petitioner’s motion to transfer the district court case to the Northern District of California was granted. Ex. 1046. According to Petitioner, “the Northern District of California found that at least Fortress Credit Co. LLC held sufficient rights in the challenged patent that Uniloc lacked standing to sue. The court then

dismissed the litigation for lack of subject matter jurisdiction.” Paper 18, 1 (citing *Uniloc 2017 LLC v. Google LLC*, No. 4:20-cv-05345-YGR (N.D. Cal. Entered Dec. 22, 2020 (single order addressing eleven cases))).
Petitioner states “Uniloc filed a notice of appeal on December 31, 2020.” *Id.*

B. The '908 Patent¹

The '908 patent describes a keyfact-based text retrieval method and a keyfact-based text index method. Ex. 1001, 1:6–7. The '908 patent states that a keyfact is “an important fact contained in sentences which constitute a document,” where the keyfact is “represented by an object and property information through syntactic analysis of a sentence.” *Id.* at 1:15–18. As described in the '908 patent, a keyword-based text retrieval method was the mainstream in conventional text retrieval methods, but the precision of a keyword-based text retrieval method was less than ideal for several reasons. *Id.* at 1:19–22. First, the meaning of the document was not precisely represented because the document was represented by keywords, which are nouns. *Id.* at 1:22–25. Second, when a query included a natural language phrase, sentence, or keywords, the intention of the user’s query was not reflected precisely in a keyword-based text retrieval method. *Id.* at 1:27–32. Therefore, the keyword-based text retrieval method had a fundamental limitation in retrieval precision because it performed document retrieval by keywords. *Id.* at 1:32–34. Phrase-based text retrieval methods perform more precise text retrieval than the keyword-based text retrieval method, but performs less precise text retrieval than a concept-based text retrieval method, which expresses text by concept units. *Id.* at 1:45–49.

¹ The '908 patent appears to be expired.

The '908 patent further describes a new approach to keyfact-based text retrieval that overcomes the shortcomings of the keyword-based text retrieval method and generalized phrase-based text retrieval methods. *Id.* at 1:50–53. In a keyfact-based text retrieval method, parts of text that represent the same meaning are described as a keyfact, where the phrases or words having the same meaning are indexed as the same indexing terms. *Id.* at 1:53–55, 1:60–62. According to the '908 patent, since the keyfact-based retrieval method is a concept-based retrieval method, indexing and retrieval of the keyfact-based retrieval method are performed with the unit of the keyfact, and precision of the retrieval is greatly improved. *Id.* at 1:55–59.

A block diagram of a keyfact-based text retrieval system is illustrated in Figure 1, reproduced below.

FIG. 1

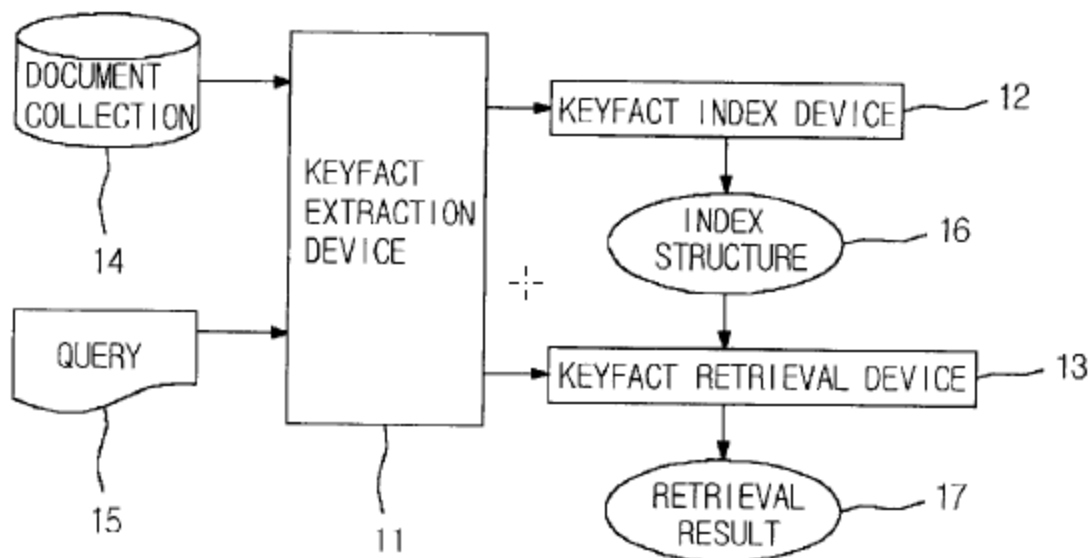


Figure 1 is a block diagram illustrating a keyfact-based text retrieval system. *Id.* at 4:22–23. The keyfact-based text retrieval system comprises

keyfact extraction device 11, keyfact index device 12, and keyfact retrieval device 13. *Id.* at 4:23–26. The '908 patent describes that once a document collection 14 or a query 15 is given, the keyfact extraction device 11 extracts words without ambiguity by performing morphological analysis and tagging. *Id.* at 4:42–45. The keyfact generation rule is applied to the words and then the keyfacts are extracted. *Id.* at 4:45–46. The keyfact index device 12 indexes the document collection 14 or the query 15 with the unit of keyfact and calculates the frequencies of the keyfacts. *Id.* at 4:47–49. The frequencies of the keyfacts are stored into the index structure 16 with the document ID information. *Id.* at 4:49–51. The keyfact retrieval device 13 orders documents using a similarity calculation method and shows retrieval results. *Id.* at 4:51–53.

A block diagram of a keyfact extraction device of a keyfact-based text retrieval system is illustrated in Figure 3, reproduced below.

FIG. 3

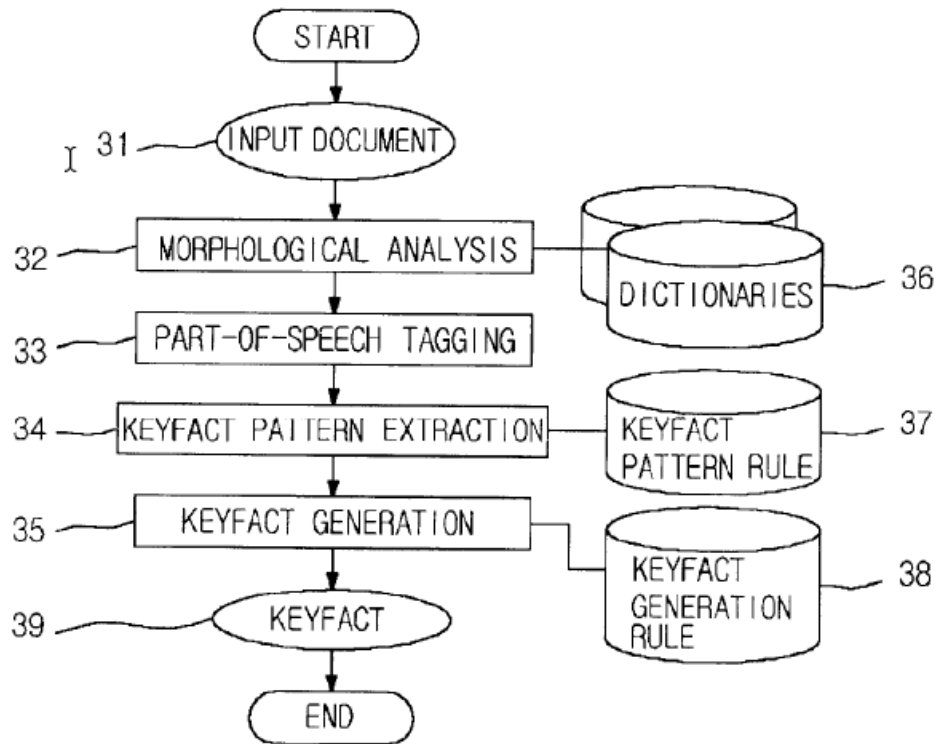


Figure 3 illustrates a block diagram of keyfact extraction device 11 that analyzes a document and generates keyfacts through the processes of morphological analysis, part-of-speech tagging, keyfact pattern extraction, and keyfact generation. *Id.* at 5:15–18. The '908 patent describes that a document is supplied at stage 31 and morphological analysis is performed at stage 32. *Id.* at 5:19–20. More specifically, a sentence in the document is divided into words, the morphological analysis is performed with dictionaries 36 at stage 32, and various results are obtained. *Id.* at 5:20–22, 5:59–60. At stage 33, part-of-speech tagging is performed, where a precise sequence of tags is chosen among the various results of the morphological analysis. *Id.* at 5:61–63. Once the final sequence of tags is obtained, the

stage of keyfact pattern extraction 34 searches the keyfact pattern rule 37 and extracts meaningful keyfact patterns necessary for keyfact generation. *Id.* at 6:5–8. “Keyfact terms that have forms of [object, property] are generated as to the input keyfact pattern at the stage of the keyfact generation 35 by searching the keyfact generation rule 38,” resulting in a keyfact list 39. *Id.* at 6:38–41, 51.

A block diagram of a keyfact index device of a keyfact-based text retrieval system is illustrated in Figure 4, reproduced below.

FIG. 4

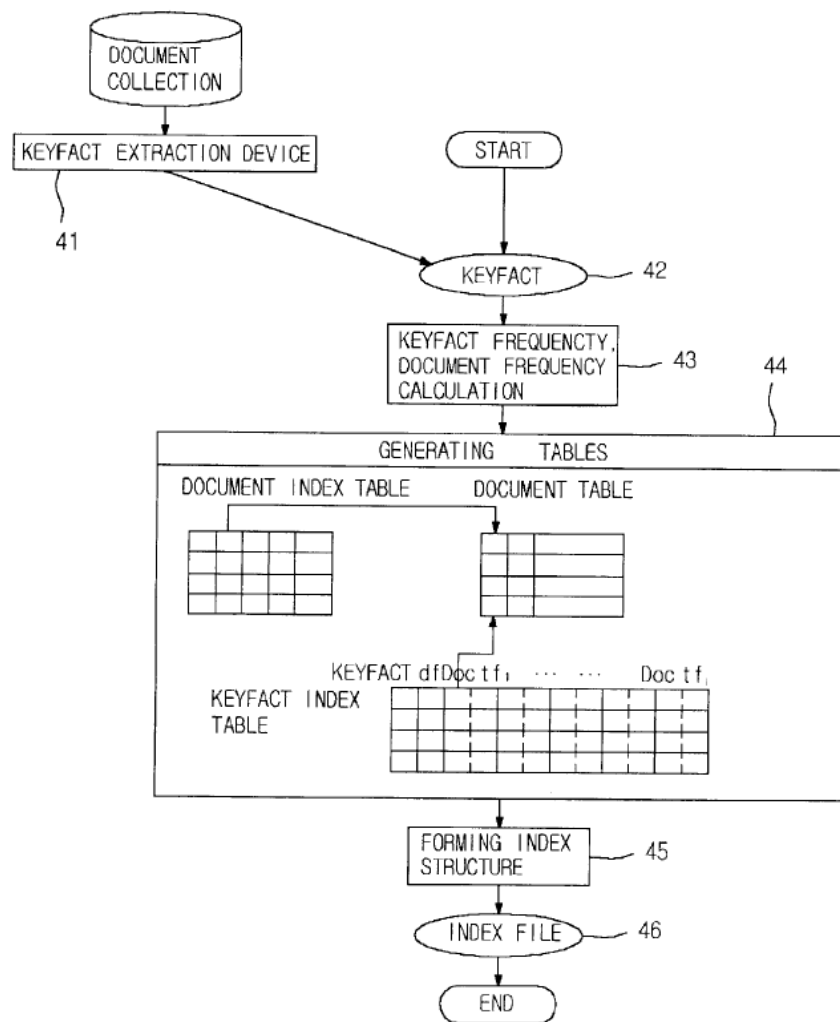


Figure 4 illustrates a block diagram of keyfact index device 12 that calculates statistical frequencies of keyfacts in a document obtained from the keyfact extraction device 11, and that forms an index structure. *Id.* at 6:58–60. The '908 patent describes that, for each document, a keyfact frequency and document frequency of a keyfact 42 are calculated at 43 in order to obtain the frequency information of the keyfacts. *Id.* at 6:65–67. Next, supplementary tables, such as a document index table, a document table, and a keyfact index table, are generated to form an efficient index structure 44. *Id.* at 7:1–3. Subsequently, an index structure is formed in a unit of the keyfact at 45, and an index file is stored at 46. *Id.* at 7:10–11.

A block diagram of keyfact retrieval device of a keyfact-based text retrieval system is illustrated in Figure 5, reproduced below.

FIG. 5

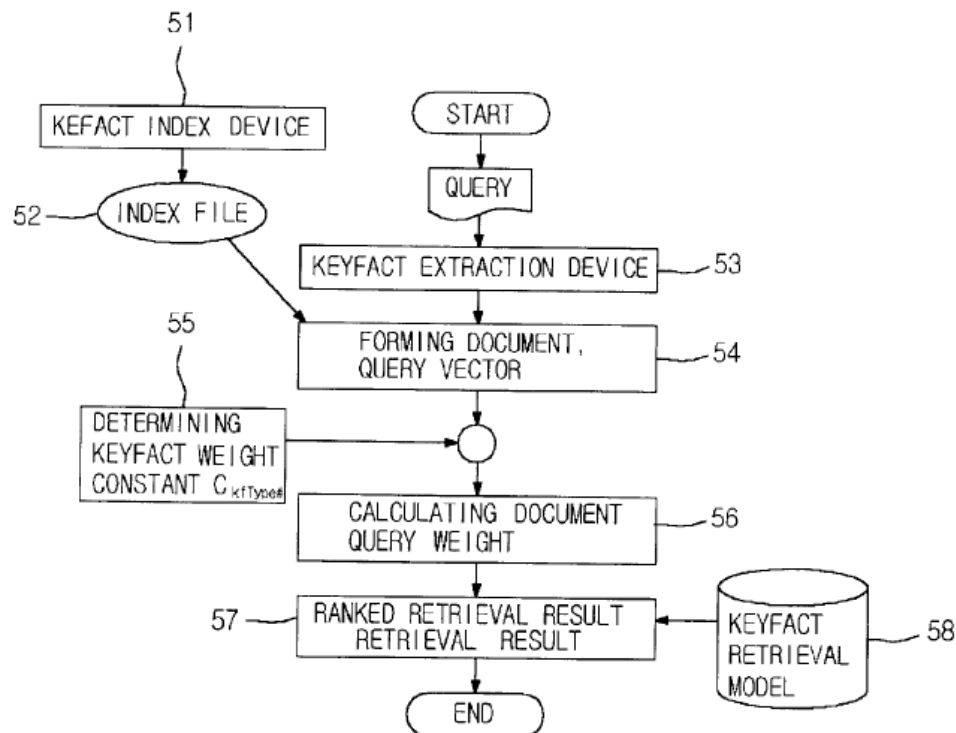


Figure 5 illustrates a block diagram of keyfact retrieval device 13 that, at 54, forms a document vector and query vector with a keyfact supplied from a keyfact extraction device 53 and an index file 52 generated by a keyfact index device 51. *Id.* at 7:35–39. At 55, the keyfact weight constants ($C_{KfType\#}$), which are fit for the attribute of a document collection, are determined. *Id.* at 7:40–41. Subsequently, at 56, the keyfact weights are calculated from the document and query vector. *Id.* at 7:42–43. Further, at 57, the similarity of each document appropriate for the query is calculated by employing a keyfact retrieval model 58, where the result of a similarity calculation determines an order of appropriate documents. *Id.* at 8:20–24.

C. Illustrative Claim

Petitioner challenges claims 6–12 of the '908 patent. Pet. 1. Claim 6 is an independent claim, and claims 7–12 depend therefrom. Claim 6 is reproduced below.

6. A keyfact-based text retrieving method comprising:
 - keyfact extracting step for analyzing a document collection and a user query, and extracting keywords without part-of-speech ambiguity from said document collection and said user query, and respectively extracting keyfacts of said document collection and said user query from said keywords;
 - keyfact indexing step for calculating the frequency of said keyfacts of said document collection and generating a keyfact list of said document collection for a keyfact index structure; and
 - keyfact retrieving step for receiving said keyfact of said user query and said keyfacts of said document collection and defining a keyfact retrieval model in consideration of weigh factors according to a keyfact pattern and generating a retrieval result.

Ex. 1001, 9:54–10:7.

D. Instituted Grounds of Unpatentability

We instituted *inter partes* review based on the following grounds of unpatentability under 35 U.S.C. § 103(a)² as follows (Dec. 9–10, 38):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
6–12	103(a)	Braden-Harder ³ , Grossman ⁴
6–12	103(a)	Braden-Harder, Heidorn ⁵ , Messerly ⁶ , Grossman
7–9	103(a)	Braden-Harder, Grossman, Kucera ⁷
7–9	103(a)	Braden-Harder, Heidorn, Messerly, Grossman, Kucera
9	103(a)	Braden-Harder, Grossman, Miller ⁸
9	103(a)	Braden-Harder, Heidorn, Messerly, Grossman, Miller
9	103(a)	Braden-Harder, Grossman, Kucera, Miller

² The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended several provisions of 35 U.S.C., including § 103. Because the ’908 patent has an effective filing date before the effective date of the applicable AIA amendments, we refer to the pre-AIA version of 35 U.S.C. § 103. Petitioner asserts, and Patent Owner does not dispute, that each relied upon reference is prior art under the pre-AIA version. Pet. 2, 7, 9, 12, 15–16; *see generally* PO Resp.

³ US 5,933,822, issued Aug. 3, 1999 (Ex. 1020, “Braden-Harder”).

⁴ David A. Grossman and Ophir Frieder, *Information Retrieval: Algorithms and Heuristics*, Kluwer International Series in Engineering and Computer Science (Kluwer Academic Publishers, Springer Science + Business Media New York prtg.) (1st. ed. 1998) (Ex. 1010, “Grossman”).

⁵ US 5,966,686, issued Oct. 12, 1999 (Ex. 1022, “Heidorn”).

⁶ US 6,076,051, issued June 13, 2000 (Ex. 1025, “Messerly”).

⁷ US 4,868,750, issued Sept. 19, 1989 (Ex. 1011, “Kucera”).

⁸ George A. Miller et al., *Introduction to WordNet: An Online Lexical Database*, International Journal of Lexicography, Vol. 3, No. 4, 235–244 (1990) (Ex. 1027, “Miller”).

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
9	103(a)	Braden-Harder, Heidorn, Messerly, Grossman, Kucera, Miller

II. DISCUSSION

A. Principles of Law

To prevail in its challenges to Patent Owner’s claims, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d) (2019). A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness.⁹ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill

In determining the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active

⁹ Patent Owner does not present any objective evidence of nonobviousness as to the challenged claims.

workers in the field.” *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citation omitted). Petitioner relies on the declaration testimony of Dr. Bernard J. Jansen, who testifies that a person having ordinary skill in the art “would have had a Bachelor’s degree in computer science, information technology, or the equivalent, and one to two years of experience working with at least one of information retrieval systems, the structure and organization of databases, and natural language processing.” Pet. 22 (citing Ex. 1003 ¶ 142). According to Dr. Jansen, “significant work experience in any of these areas could substitute for formal education, and vice versa.” Ex. 1003 ¶ 142.

Patent Owner indicates Petitioner’s proposed assessment is improper because it does not define thresholds for “significant work experience” or “formal education.” PO Resp. 4. Patent Owner, however, does not offer its own assessment of the level of skill in the art, or indicate that the resolution of any issue depends on a specific type of work experience or a specific level of education. *See id.* Patent Owner additionally states that even if Petitioner’s proposed level of qualifications were applied, the Petition does not establish unpatentability. *Id.* at 5.

We adopt the assessment offered by Petitioner as it is consistent with the ’908 patent and the asserted prior art. We further note that the prior art of record in the instant proceeding reflects the appropriate level of ordinary skill in the art. *Cf. Okajima v. Bourdeau*, 261 F.3d 1350, 1354–55 (Fed. Cir. 2001) (holding the Board may omit specific findings as to the level of ordinary skill in the art “where the prior art itself reflects an appropriate level and a need for testimony is not shown”).

C. Claim Construction

In an *inter partes* review for a petition filed on or after November 13, 2018, “[claims] of a patent . . . shall be construed using the same claim construction standard that would be used to construe the [claims] in a civil action under 35 U.S.C. § 282(b), including construing the [claims] in accordance with the ordinary and customary meaning of such claims as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *See* 37 C.F.R. § 42.100(b) (2019); *see also Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc).

“step for” limitations

Petitioner argues that the claim 6 “keyfact extracting step for,” “keyfact indexing step for,” and “keyfact retrieving step for” (collectively, “keyfact steps”) should each be construed as “step-for” limitations in accordance with 35 U.S.C. § 112, ¶ 6. Pet. 25–31. For the same reasons presented in its Preliminary Response, Patent Owner argues that these claim 6 terms should not be construed in accordance with 35 U.S.C. § 112, ¶ 6. *Compare* PO Resp. 10–14, *with* Prelim. Resp. 15–19. Although we preliminarily agreed that the claims should not be construed in accordance with 35 U.S.C. § 112, ¶ 6, we also determined that whether the claim 6 terms invoke 35 U.S.C. § 112, ¶ 6 “is not material to resolving the issues currently before us, because Petitioner has shown a reasonable likelihood of prevailing under either construction.” Dec. 17 (explaining how Petitioner’s proposed construction is narrow, whereas Patent Owner’s proposed construction is broad, and that Petitioner contends that the prior art renders the claims obvious “regardless of whether § 112, ¶ 6 applies”). Petitioner agrees with

our initial determination that we need not “address the issue because the claims are unpatentable even under Uniloc’s argument.” Pet. Reply 5.

Patent Owner, however, presents numerous arguments why the claims should not be construed in accordance with 35 U.S.C. § 112, ¶ 6 without clearly explaining why it is necessary to address § 112, ¶ 6 in order to resolve the controversies on the merits that are before us. PO Resp. 9–19; Sur-reply 7–9. As discussed below, beside the arguments directed to the sufficiency of the prior art teaching the “keyfact steps” limitations based on Patent Owner’s construction of the term “keyfact,” Patent Owner fails to explain sufficiently what is lacking from Petitioner’s challenges and related analyses provided that assert that claims 6–12 would have been obvious based on the cited prior art *under either construction*. For example, Patent Owner argues that “Petitioner fails to recognize that the claim language recites various *acts*” and that Petitioner construes each recited act as a function. PO Resp. 9. In applying a § 112, ¶ 6 analysis to claim 6, however, Petitioner looks to the ’908 patent for the *corresponding acts* associated with the recited function. *See, e.g.*, Pet. 26–31. Thus, Patent Owner’s arguments appear to us to be a matter of form over substance because Petitioner addresses the corresponding acts by looking to the Specification of the ’908 patent. Tr. 8:12–25. Patent Owner does not persuade us otherwise. For example, Patent Owner argues that the claim 6 “keyfact extracting step” requires “a respective set of acts” such as “‘analyzing ...,’ ‘extracting ...,’ and ‘respectively extracting’” PO Resp. 12–13 (alterations in original). Patent Owner argues that “Petitioner fails to comprehend the logical interrelationship between groups of *acts* and the underlying respective result, expressed as a ‘step,’ that each group of *acts* operated to collectively achieve.” *Id.* at 14. Patent Owner, however, fails to identify or explain how

Petitioner’s analysis of the claim language and prior art fails to address the claimed acts. As explained in detail below, we determine that Petitioner shows, by a preponderance of the evidence, how Braden-Harder and Grossman teach or suggest each of the claimed steps, such as the “keyfact extracting step.” Pet. 33–47. As further explained below, Patent Owner does not present meaningful arguments to the contrary.

Patent Owner further argues that Petitioner’s proposed constructions “violate[] both the doctrine of claim differentiation and the ‘all elements’ rule.” PO Resp. 14–19. In particular, Patent Owner argues that dependent claim 7 recites additional acts required for the “keyfact extracting step” of claim 6 that are distinct from what claim 6 recites. *Id.* at 15–16. Patent Owner argues that “the ‘analyzing’ act of claim 6 (expressly directed to *both* ‘a document collection *and* a user query’ together) must require something more than the distinct ‘analyzing’ of dependent claim 7 (which is directed, instead, to ‘morphology of an input sentence’).” *Id.* at 15. Patent Owner contends that Petitioner erroneously conflates the acts of claim 6 with the acts of the dependent claims “thereby failing to give meaningful effect to those *acts* affirmatively recited in claim 6.” *Id.* at 16–19.

Petitioner argues that the dependent claims “all identically recite ‘*wherein said step of ... comprises the steps of ...*’ language.” Pet. Reply 5 (alterations in original). As such, Petitioner argues that the dependent claims should be “construed as describing details required as part of performing the previously introduced steps” and that the dependent claims do “not add new ‘distinct and additional’ steps—contrary to Uniloc’s contentions.” *Id.* at 5–9 (citing *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019)), 24–25 (arguing that dependent claims 7, 10, and 11 do not add new distinct and additional steps, but “give details of the more general steps previously

claimed”). As such, Petitioner argues that “Uniloc’s arguments fall with its own erroneous interpretation of the dependent claims.” *Id.* at 24–25.

Petitioner further argues that whether 112, ¶ 6 applies “[t]he challenged claims are unpatentable either way.” *Id.* at 8–9. Petitioner contends that the “all elements” rule is not applicable here, because that “rule relates to the doctrine of equivalents for infringement.” *Id.* at 9 (citing *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 29 (1997)).

We agree with Petitioner that the dependent claims do not add new distinct steps or acts, but “give details of the more general steps previously claimed.” *Id.* at 5–9, 24–25. That is, we agree with Petitioner that claim 7 recites “wherein said step of keyfact extracting comprises the steps of,” which should be construed as describing details required as part of performing the previously introduced step. *Id.* at 5. On the other hand, Patent Owner fails to explain sufficiently why we should construe the dependent claims as reciting additional acts to the steps recited in claim 6. Accordingly, we agree with Petitioner that Patent Owner’s arguments regarding claim differentiation necessarily fail because the arguments are based on an erroneous interpretation of the dependent claims to include additional steps or acts untethered from the steps recited in claim 6. Additionally, we agree with Petitioner that whether § 112, ¶ 6 applies “[t]he challenged claims are unpatentable either way.” *Id.* at 8–9.¹⁰

¹⁰ Patent Owner’s arguments that Petitioner fails to address or rebut our preliminary determination that “claim 6 does not invoke 35 U.S.C. § 112, ¶ 6” (Sur-reply 7) are misplaced because, as discussed, whether the claim 6 terms invoke 35 U.S.C. § 112, ¶ 6 is not material to resolving the issues here.

Accordingly, consistent with the Decision to Institute, we determine that it is not necessary to construe the claim 6 “step for” terms because whether the claim 6 keyfact steps invoke 35 U.S.C. § 112, ¶ 6 is not material to resolving the issues currently before us because Petitioner has shown that the challenged claims are unpatentable under either construction. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that “only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Matal*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs.* in the context of an *inter partes* review).

“keyfact”

Claim 6 recites the term “keyfact” several times. For example, claim 6 recites, “extracting keyfacts of said document collection and said user query from said keywords.” Patent Owner argues that the term “keyfact” means “a factual extraction of a sentence which expresses semantic relation between words in the sentence in the form of [object, property].” PO Resp. 9 (citing Ex. 1001, 4:58–60). Patent Owner further argues that “[t]his form represents a paired relationship between an ‘object’ that is the head and a ‘property’ that is the modifier.” *Id.* at 7 (citing Ex. 1001, 1:8–10). Petitioner argues that we need not construe the term “keyfact,” because the challenged claims are unpatentable over the asserted prior art even under Patent Owner’s construction. Pet. Reply 1–2.

For the reasons provided in this Decision discussed below, we agree with Petitioner that Braden-Harder’s “extracted logical forms are each ‘a factual extraction of a sentence which expresses semantic relation between words in the sentence in the form of [object, property].’” *See id.* at 10

(citing Pet. 47; Ex. 1003 ¶¶ 221–222). As explained below, we disagree, however, that a “keyfact” must be in the exact paired form “[object, property]” and nothing else. For purposes of this Decision, we need not otherwise expressly construe any claim terms.

D. Asserted Obviousness of Claims 6–12 over Braden-Harder, Heidorn, Messerly, and Grossman

1. Braden-Harder

Braden-Harder describes an information retrieval system that utilizes natural language processing to process results retrieved by an information retrieval search engine that ultimately yields a set of retrieved documents. Ex. 1020, code (57). Each document is subjected to natural language processing to produce a set of logical forms, where each logical form encodes, in a word-relation-word manner, semantic relationships between words in a phrase. *Id.* A user-supplied query is analyzed in the same manner to yield a set of corresponding logical forms, where documents are ranked as a predefined function of the logical forms from the documents and the query. *Id.*

A high-level block diagram of an information retrieval system is illustrated in Figure 1, reproduced below.

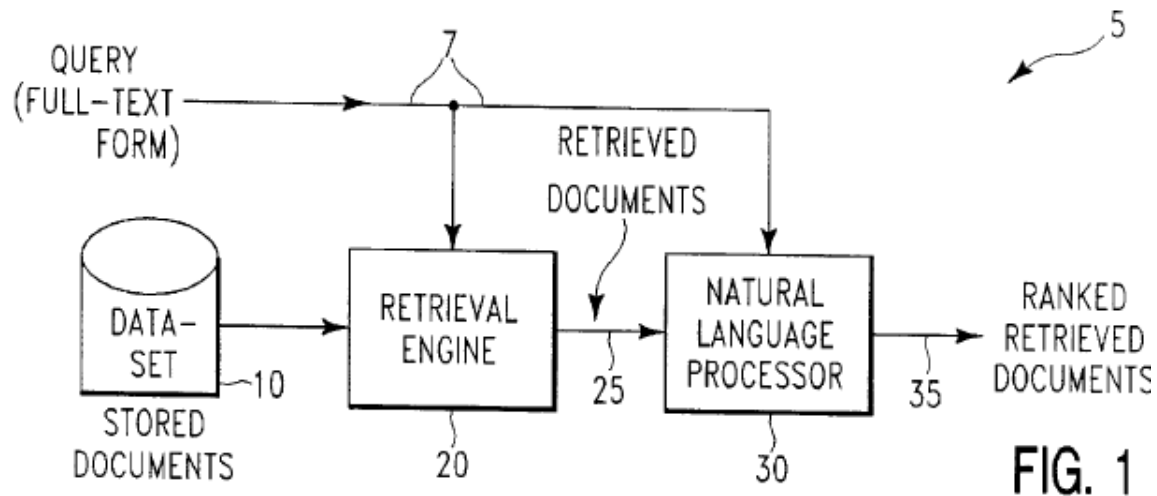


Figure 1 is a high-level block diagram of an information retrieval system 5. *Id.* at 7:25–27. In operation, a user supplies a search query to system 5. *Id.* at 7:35–36. System 5 applies this query both to information retrieval engine 20 and natural language processor 30. *Id.* at 7:40–41. In response to the query, engine 20 searches through a dataset 10 of stored documents to yield a set of retrieved documents. *Id.* at 7:41–43. The set of documents is then applied, as symbolized by line 25, as an input to processor 30. *Id.* at 7:43–46. Within processor 30, each of the documents in the set is subjected to natural language processing, specifically morphological, syntactic and logical form, to produce logical forms for each sentence in that document. *Id.* at 7:46–50. Each such logical form encodes semantic relationships between words in a linguistic phrase in that sentence. *Id.* at 7:50–53. Processor 30 analyzes the query in an identical fashion to yield a set of corresponding logical forms. *Id.* at 7:53–55. Processor 30 then compares the set of forms for the query against the sets of logical forms associated with each of the documents in the set in order to ascertain any match between logical forms in the query set and logical forms for each document. *Id.* at 7:55–59. Documents that produce no matches are

eliminated from further consideration, where each remaining document that contains at least one match is retained and heuristically scored by processor 30. *Id.* at 7:59–63. Finally, processor 30 presents the retained documents to the user rank-ordered based on their respective scores. *Id.* at 8:2–4.

2. *Heidorn*

Heidorn describes a method and system for performing semantic analysis of an input sentence within a natural language processing (“NLP”) system. Ex. 1022, 6:28–30. A semantic analysis subsystem receives a syntax parse tree generated by morphological and syntactic subsystems. *Id.* at 6:30–32. The semantic analysis subsystem applies two sets of semantic rules to make adjustments to the received syntax parse tree. *Id.* at 6:32–34. The semantic analysis subsystem then applies a third set of semantic rules to create a skeletal logical form graph from the syntax parse tree. *Id.* at 6:34–36. The semantic analysis subsystem finally applies two additional sets of semantic rules to the skeletal logical form graph to provide semantically meaningful labels for the links of the logical form graph, to create additional logical form graph nodes for missing nodes, and to unify redundant logical form graph nodes. *Id.* at 6:36–42. The final logical form graph generated by the semantic analysis subsystem represents the complete semantic analysis of an input sentence. *Id.* at 6:42–44.

An example semantic analysis subsystem is illustrated in Figure 43, reproduced below.

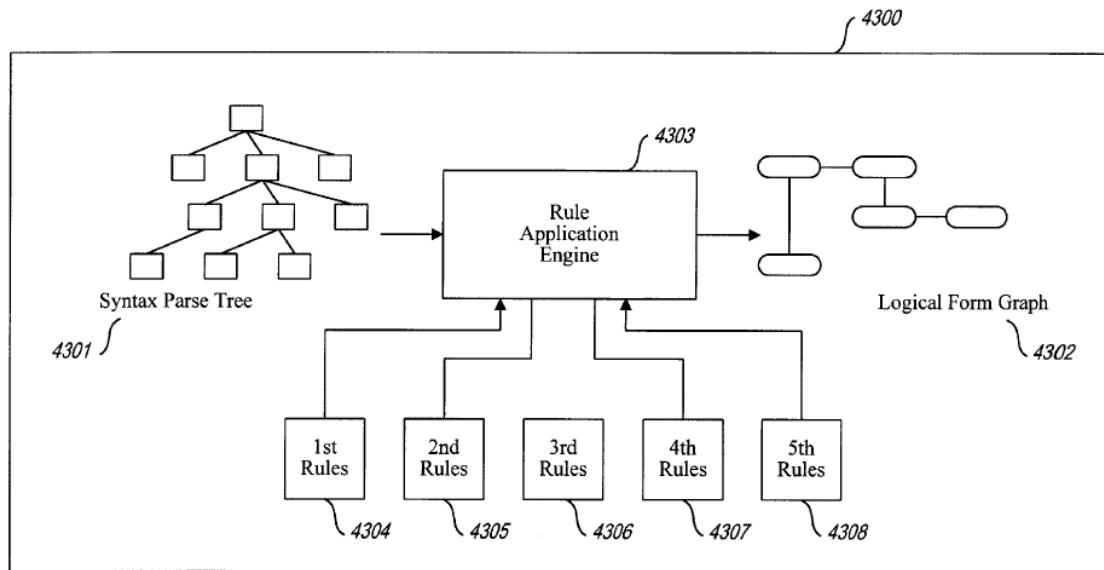


Fig. 43

Figure 43 is a block diagram of a computer system for a semantic analysis subsystem. *Id.* at 13:49–50. The computer 4300 contains a memory with semantic rules 4304–4308 and rule application engine 4303. *Id.* at 13:50–51. The rule application engine, under control of a central processing unit, applies the five sets of rules to a syntax parse tree 4301 to generate a corresponding logical form graph 4302. *Id.* at 13:51–54. The syntax parse tree is generated by the morphological and syntactic subsystems, which are not shown. *Id.* at 13:55–56.

3. Messerly

Messerly describes performing information retrieval using semantic representation of text. Ex. 1025, code (57). A tokenizer generates, from an input string information retrieval, tokens that characterize the semantic relationship expressed in the input string. *Id.* The tokenizer first creates,

from the input string, a primary logical form characterizing a semantic relationship between the selected words in the input string. *Id.* The tokenizer then identifies hypernyms that each have an “is a” relationship with one of the selected words in the input string. *Id.* The tokenizer then constructs one or more alternative logical forms from the primary logical form. *Id.* For each of one or more of the selected words in the input string, the tokenizer constructs each alternative logical form by replacing the selected word in the primary logical form with an identified hypernym of the selected word. *Id.* Finally, the tokenizer generates tokens representing both the primary logical form and the alternative logical forms. *Id.*

An example overview flow diagram showing steps performed in order to construct and access an index semantically representing target documents is illustrated in Figure 3, reproduced below.

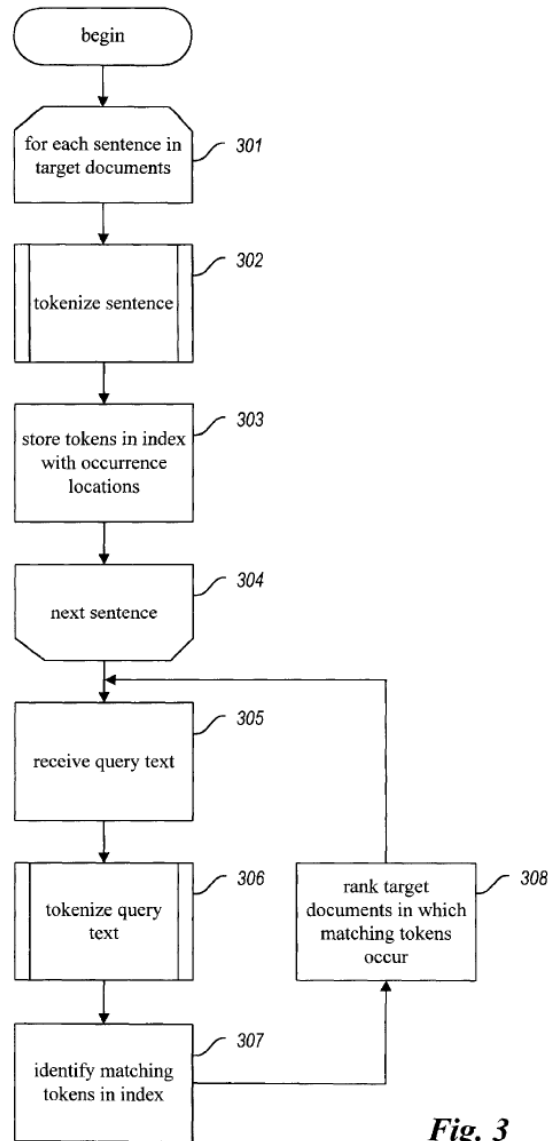


Fig. 3

Figure 3 is an overview flow diagram showing the steps performed by a facility in order to construct and access an index semantically representing target documents. *Id.* at 5:31–34. As represented in steps 301–304, the facility: converts each sentence of each target document into a number of tokens representing an expanded logical form portraying the relationship between the important words in the sentence (including hypernyms having similar meanings); and stores the semantic tokens in an index along with a location in the target documents where the sentence occurs. *Id.* at 5:34–41,

5:56–59. After all of the target documents have been indexed, the facility is able to process information retrieval queries against the index. *Id.* at 5:41–44. As represented in steps 305–308, for each received query, the facility: tokenizes the text of the query (i.e., converts the sentence into semantic tokens together representing an expanded logical form for the query text); compares these semantic tokens to the semantic tokens stored in the index to identify locations in the target documents for which these semantic tokens have been stored; and ranks the target documents containing these semantic tokens in the order of their relevance to the query. *Id.* at 5:44–53.

4. *Grossman*¹¹

Grossman describes the retrieval of information (e.g., finding relevant documents) in response to user queries. Ex. 1010, 1. More specifically, Grossman describes building an inverted index as part of an information retrieval system to find quickly terms in a document collection. *Id.* at 134. As described in Grossman, the inverted index includes a set of files, including: an index file that contains an actual posting list for each distinct term in the collection; a document file that contains information about each distinct document; and a weight file that contains the weight for each document. *Id.* at 136–137.

Grossman describes a preprocessor that reads an input file, outputs separate files, and bulk-loads the output files into a relational database. *Id.*

¹¹ Petitioner contends that Grossman (Exhibit 1010) is a textbook published in 1998, and that a copy of the textbook was cataloged and available at the UCB Library by November 17, 1998. Pet. 12 (citing Ex. 1009). Patent Owner does not challenge Petitioner’s contentions as to the prior art status of Grossman. *See generally* PO Resp. For the reasons provided in the Petition, we agree with Petitioner that Grossman is “prior art at least under §102(a).” *Id.*

at 169–170. Each output file corresponds to a relation. *Id.* at 170. The first relation, “DOC,” contains information about each document. *Id.* The second relation, “INDEX,” models the inverted index and indicates which term appears in which document and how often the term has appeared. *Id.* A third relation, “TERM,” tracks statistics for each term based on its number of occurrences across the document collection. *Id.*

Example DOC, INDEX, and TERM relations are illustrated in Tables 5.5, 5.6, and 5.8, reproduced below.

Table 5.5. DOC

DocId	DocName	PubDate	Dateline
1	WSJ870323-0180	3/23/87	TURIN, Italy
2	WSJ870323-0161	3/23/87	Du Pont Company, Wilmington, DE

Table 5.6. INDEX

DocId	Term	TermFrequency
1	commercial	1
1	vehicle	1
1	sales	1
1	italy	1
1	february	1
1	year	1
1	according	1
...
2	krol	2
2	president	2
2	diversified	1
2	company	1
2	succeeding	1
2	dale	1
2	products	2
...

Table 5.8. TERM

Term	Idf
according	0.9031
commercial	1.3802
company	0.6021
dale	2.3856
diversified	2.5798
february	1.4472
italy	1.9231
krol	4.2768
president	0.6990
products	0.9542
***	***
***	***
sales	1.0000
succeeding	2.6107
vehicle	1.8808
year	0.4771
***	***

Table 5.5 illustrates a DOC relation which models the documents in the document collection; Table 5.6 illustrates an INDEX relation which models an inverted index by storing the occurrences of a term in a document; and Table 5.8 illustrates a TERM relation which contains an inverse document frequency (“idf”) of a term, where $idf = \log (\text{number of documents} / \text{number of documents which contain the term})$. *Id.* at 16, 172–175.

5. Discussion

Petitioner contends that claims 6–12 are unpatentable under 35 U.S.C. § 103(a) as obvious over Braden-Harder and Grossman, or Braden-Harder, Heidorn, Messerly, and Grossman. Pet. 33–84. For the Braden-Harder and Grossman challenge, Petitioner contends that Braden-Harder “refers to and incorporates two co-pending U.S. patent applications assigned to Microsoft,” which are the Heidorn and Messerly patent applications. *Id.* at 5–6 (citing Ex. 1020, 14:53–61). Petitioner further explains that, because Braden-

Harder identifies the Heidorn and Messerly patent applications and where they can be found, “such broad and unequivocal language is plainly sufficient to incorporate both patent applications in their entirety.” *Id.* at 6 (citing *Paice LLC v. Ford Motor Co.*, 881 F.3d 894, 907 (Fed. Cir. 2018)). Petitioner further contends that “[e]verything disclosed in the Heidorn and Messerly patent applications is ‘effectively part of’ Braden-Harder as if these disclosures were ‘explicitly contained therein.’” *Id.* Petitioner explains that the Petition cites to the Messerly and Heidorn patents instead of the respective patent applications because the respective patents “disclose substantively the same subject matter and contain substantively identical disclosures.” *Id.* at 7 n.2, 9 n.3.

For the Braden-Harder, Heidorn, Messerly, and Grossman challenge, Petitioner argues that to the extent we decide that the disclosures in Heidorn and Messerly were not incorporated into Braden-Harder, it would have been obvious to combine these references. Pet. 33 (citing *Commonwealth Sci. & Indus. Research Org. v. Buffalo Tech. (USA), Inc.*, 542 F.3d 1363, 1372 (Fed. Cir. 2008)).

Patent Owner does not dispute Petitioner’s assertions that the Heidorn and Messerly applications are incorporated by reference into Braden-Harder, or that the respective Heidorn and Messerly patents “disclose substantively the same subject matter and contain substantively identical disclosures” as the incorporated Heidorn and Messerly applications. *See generally* PO Resp. Nor does Patent Owner contest Petitioner’s alternative theory, that it would have been obvious to combine Braden-Harder, Heidorn, Messerly, and Grossman. *Id.* For purposes of this Decision, we agree with Petitioner, for the reasons provided in the Petition, that Heidorn and Messerly were properly incorporated into Braden-Harder at the time of the Braden-Harder

invention and that the respective Heidorn and Messerly patents disclose substantively the same subject matter and contain substantively identical disclosures.

Accordingly, we focus on Petitioner’s challenge that claims 6–12 are unpatentable under 35 U.S.C. § 103(a) as obvious over Braden-Harder (incorporating Heidorn and Messerly) in view of Grossman.¹² In support of its showing, Petitioner relies upon the declaration of Dr. Bernard J. Jansen. *Id.* (citing Ex. 1003). Patent Owner contends that the combined teachings of Braden-Harder and Grossman do not teach the following limitations: (1) “keyfact”; (2) the acts for the “keyfact extracting step”; and (3) the “keyfact retrieving step.” PO Resp. 10–28; Sur-reply 10–22. Patent Owner does not introduce testimony from a declarant in support of its positions.

For the reasons that follow, we conclude that Petitioner has met its burden of proving by a preponderance of the evidence that each of the challenged claims would have been obvious in view of the asserted prior art.

a. Claim 6: “a keyfact-based text retrieving method comprising:” (preamble)¹³

For the above limitation, Petitioner contends, and we agree, that Braden-Harder’s information retrieval (IR) method describes subjecting documents and queries to natural language processing (NLP) to produce logical form triples, with each of the triples being of the form “word-relation-word.” Pet. 33–34 (citing Ex. 1020, 5:22–24, 5:29–35, 11:44–55). Petitioner further contends, and we agree, that the logical-form triples

¹² We refer to this challenge as Braden-Harder in view of Grossman or Braden-Harder (incorporating Heidorn and Messerly) in view of Grossman.

¹³ We need not determine whether the preamble is limiting because Petitioner shows that Braden-Harder meets the preamble.

express semantic relationships between important words in an input string or phrase. *Id.* at 34 (citing Ex. 1020, 5:18–20, 11:44–46; Ex. 1001, 1:53–59). Petitioner further contends that Braden-Harder’s logical-form triples are equivalent to the claimed keyfacts and provide a concept-based retrieval. *Id.* (citing Ex. 1003 ¶ 176). Although Patent Owner argues that Petitioner fails to show that Braden-Harder in combination with Grossman meets the “keyfact extracting step,” as explained below, Patent Owner does not dispute Petitioner’s showing with respect to the preamble. *See generally* PO Resp.

b. Claim 6: “keyfact extracting step for analyzing a document collection and a user query, and extracting keywords without part-of-speech ambiguity from said document collection and said user query, and respectively extracting keyfacts of said document collection and said user query from said keywords”

For the “analyzing a document collection and a user query” portion of the above limitation, Petitioner contends that Braden-Harder subjects documents and user queries to morphological analysis to parse text into constituent words using a stored lexicon. Pet. 37–38 (citing Ex. 1020, 5:33–35, 11:62–12:1, 12:12–16, 12:30–34; Ex. 1003 ¶¶ 184–187; Ex. 1022, 1:22–24; Ex. 1029, 112). Petitioner further contends, and we agree, that a POSITA¹⁴ would have understood that Braden-Harder’s lexicon is a machine-readable dictionary. *Id.* at 38 (citing Ex. 1003 ¶¶ 184–187; Ex. 1029, 112). As pointed out by Petitioner, Braden-Harder’s lexicon “includes various classes of words, such as e.g., prepositions, conjunctions, verbs, nouns, operators and quantifiers that define syntactic and semantic properties inherent in the words in an input string.” Ex. 1020, 12:12–16. Petitioner further contends that using its lexicon, Braden-Harder’s

¹⁴ A person of ordinary skill in the art.

morphological analysis normalizes differing word forms to a common morphological form for use by a parser. *Id.* at 38 (citing Ex. 1020, 12:34–37).

Petitioner contends that to accomplish the function of “extracting keywords without part-of-speech ambiguity from said document collection and said user query,” Braden-Harder teaches applying parts-of-speech tags to each extracted word. *Id.* at 39. Specifically, Petitioner asserts that Braden-Harder’s morphological analysis attributes each word, or phrase (noun phrase) in an input string, with a category of its corresponding grammatical function (part-of-speech tag for that word). *Id.* (citing Ex. 1020, 12:40–45). Petitioner contends that a noun extracted from a noun phrase in Braden-Harder is a keyword used to retrieve documents. *Id.* (citing Ex. 1003 ¶ 189; Ex. 1022, 3:36–40).

Petitioner further contends that Braden-Harder’s system syntactically analyzes stemmed words using grammatical rules and attributes to yield a syntactic parse tree with at least three levels (Table 1): top (root) node (e.g., declarative sentence), intermediate level nodes (e.g., verb, noun, or prepositional phrases), and a lower-level (leaf) nodes which represent the initial set of attribute/value records. *Id.* at 39–40 (citing Ex. 1020, 12:37–40, Table 1; Ex. 1022, 3:54–59). Petitioner asserts that Table 1 of Braden-Harder shows that the intermediate-level nodes and lower-level nodes represent part-of-speech tag sequences for the input string. *Id.* at 40 (citing Ex. 1020, Table 3). Petitioner asserts, and we agree, that in Braden-Harder’s syntactic-parse tree, the extracted words and phrases have no “part-of-speech ambiguity.” *Id.*

Petitioner contends that Heidorn describes the specific details of syntactic processing (extracting keywords without part-of-speech

ambiguity). *Id.* at 40–42 (citing Ex. 1022, 4:2–3, 4:44–51, Figs. 6, 22; Ex. 1003 ¶ 199). Petitioner argues that, to the extent the claim requires replacing a sequence of tags rather than selecting a final sequence of tags, like the '908 patent's "KEY," Braden-Harder similarly generates an intermediate-level tag sequence for an input sentence in which a sequence of lower-level-tagged noun phrases are replaced by a single tag "NP," resulting in a final sequence tag at the intermediate-level sequence (i.e., NP-VERB-NP). *Id.* at 42–43 (citing Ex. 1020, 12:40–45, 12:66–13:10, Table 1).

As further part of the "keyfact extracting step for" limitation, claim 6 recites, "respectively extracting keyfacts of said document collection and said user query from said keywords." Petitioner contends that Braden-Harder teaches processing the syntactic parse tree using a set of semantic rules ("keyfact pattern rules") to yield a logical form graph ("keyfact pattern") and incorporates Heidorn for the specific details of the logical form processing. *Id.* at 43 (citing Ex. 1020, 14:50–51, Figs. 5A–5D). Petitioner asserts that, like the '908 patent's disclosure, the final tag sequence is applied to a keyfact pattern rule to extract a keyfact pattern (Ex. 1001, 6:33–36), and Heidorn similarly applies semantic rules to the tag sequence to generate a logical form graph. *Id.* at 44–45 (citing Ex. 1022, 2:22–30, Fig. 43; Ex. 1003 ¶ 209). Petitioner further asserts that the extracted logical form graph captures the structure of arguments and adjuncts for each input string and provides a pattern representing the sentence in logical form. *Id.* at 45 (citing Ex. 1022, 13:56–58; Ex. 1003 ¶ 210). Petitioner contends, and we agree, that Braden-Harder applies rules to the logical form graph to generate a list of logical form triples, which are extracted based on semantic relationships of the nouns (keywords) with other words in the sentence. *Id.*

at 45–47 (citing Ex. 1020, 14:3–4, 14:18–24, 14:28–33, 14:37–41, Figs. 5B–5D; Ex. 1003 ¶¶ 211–219).

Important to this Decision, Petitioner argues, and we agree, that to the extent that “extracting keyfacts of said document collection and said user query from said keywords” requires generating keyfacts that have forms of [object, property], “a POSITA would have understood that Braden-Harder generates logical form triples for ‘the case of a constituent with noun modifiers’ (*see* Table 3), such as ‘Nadj’ and ‘Mods’ relations, which exhibit the semantic relationship of the form [object, modifier].” *Id.* at 47.¹⁵

Alternatively, Petitioner contends, and we agree, that it would have been obvious to generate other logic forms that do not include relations to enable structural paraphrasing. *Id.* (citing Ex. 1020, 11:51–55, 25:49–60).

Petitioner further contends, and we agree, that a POSITA would have been motivated “to generate logic forms that do not include the relations for ‘noun appositive’ or ‘relative clause’ constructions to increase matches with ‘sufficiently similar semantic content.’” *Id.* (citing Ex. 1020, 25:51–52; Ex. 1003 ¶¶ 221–222).

¹⁵ During the oral hearing, Petitioner stated, “[t]he difference between property and modifier is inconsequential. We can see from the ’908 patent at [column 1, lines 6–12] . . . that the property is the modifier, those are the same things so that is a distinction without a difference.” Tr. 17:14–18. We agree that the property described in the ’908 patent is the same as a modifier because the ’908 patent describes it as such. Ex. 1001, 1:7–12 (“In particular, the methods describe the formalized concept of a document as a pair comprising an object that is the head *and a property that is the modifier*, and uses the information described by the pair as index information for efficient document retrieval” (emphasis added)). Patent Owner does not contend otherwise. *See generally* PO Resp.

Patent Owner argues that the “Petition fails to prove obviousness of claim limitations reciting the ‘keyfact’ term, under a proper interpretation that accurately reflects the intrinsic evidence.” PO Resp. 20. Patent Owner further argues that Petitioner focuses on Braden-Harder in addressing “analyzing a document collection and a user query” by alleging that Braden-Harder discloses using a lexicon to recover various classes of words. *Id.* at 20–21. Patent Owner argues that “a mere distinction of ‘classes or words’ . . . is distinguishable on its face from the distinct concept of a ‘keyfact’ that is an extracted expression of fact, much less one that represents a semantic relation between words of a sentence in the form of [object, property], as disclosed and claimed in the ’908 patent.” *Id.* at 21. Patent Owner argues that in the ’908 patent, the class of noun determines the object or the property of the keyfacts and that the “Braden-Harder scheme makes no determination between a class of noun, much less one used to generate a ‘keyfact’ having the form [object, property].” *Id.* at 22. Patent Owner further contends that Braden-Harder’s triples are distinguishable from the keyfact extraction disclosed and claimed, because “the ’908 patent disparages the sort of phrase-based scheme Braden-Harder employs as being subject to certain technical disadvantages.” *Id.* (citing Ex. 1001, 1:19–28, 1:42–45).

Petitioner responds that Braden-Harder meets the claim limitation under Patent Owner’s construction for “keyfact” presented in its Response. Pet. Reply 10 (citing Pet. 47; Ex. 1003 ¶¶ 221–222). Petitioner argues, and we agree, that the Petition explains that Braden-Harder teaches various special graph walks, including one for the case of a constituent with noun modifiers. *Id.* (citing Pet. 45; Ex. 1020, 14:37–41, Fig. 5D; Ex. 1003

¶¶ 216–217). Petitioner points out that the Petition specifically explains that if keyfacts were construed to have the form [object, property], a person having ordinary skill in the art would have understood that Braden-Harder generates logical form triples for the case of a constituent with noun modifiers such as “Nadj” and “Mods” relations which exhibit the semantic relationship of the form [object, modifier]. *Id.* at 11 (citing Pet. 47; Ex. 1003 ¶ 221). In particular, Dr. Jansen testifies that:

[A] person of ordinary skill in the art would have understood that Braden-Harder generates logical form triple for “the case of a constituent with noun modifiers” (*see* Table 3), such as “Nadj” and “Mods” relations that exhibit the semantic relationship of the form [object, Mods, modifier]. Because Braden-Harder generates logical form triples for noun modifiers, Braden-Harder generates keyfacts having the forms of [object, modifier].

Ex. 1003 ¶ 221. Dr. Jansen further testifies, “each of Braden-Harder’s logical form triples ‘contains two node words ... linked by a semantic relationship there between.’” *Id.* ¶ 176 (alteration in original).¹⁶ We give substantial weight to Dr. Jansen’s un rebutted testimony because it is supported by the disclosures in Braden-Harder. In particular, Braden-Harder’s triples are in the form [object, property] because they are in the form, for example, [object, Mods, modifier¹⁷], where each triple contains

¹⁶ The Petition lists eight examples of Braden-Harder’s triples that meet the form [object, property]. Pet. 45–46; Ex. 1003 ¶¶ 216–221; *see also* Tr. 18:18–24 (explaining that in the example “BOWL – Mods – SHARK” from Figure 5D, “that ‘BOWL’ would be the object and ‘SHARK’ would be the modifier for the property”).

¹⁷ As explained above in footnote 15, the record supports that there is no distinction between modifier and property and we treat them the same, as do the parties.

two node words linked by a semantic relationship. *See* Ex. 1001, 1:7–12. We agree with Petitioner that “[i]n the case of noun modifier, Braden-Harder’s logical form triples represent ‘a paired relationship’ between an object that is the noun and a property that is the modifier, and are thus in the paired form of [object, property].” Pet. Reply 12, 18 (citing Ex. 1001, 1:7–12).

Patent Owner argues that the use of triples in Braden-Harder is distinguishable from claim language where keyfacts are extracted in a paired form, i.e. [object, property]. PO Resp. 22. We agree, however, with Petitioner’s assertion that there is nothing in the ’908 patent “specification or the prosecution history that would limit ‘keyfacts’ to at most two elements (e.g., object and property) and nothing more.” *Id.* at 18–19. Patent Owner directs us to no intrinsic or extrinsic evidence to support its contention that a “keyfact” must be in the exact paired form “[object, property]” and nothing else. Indeed, as pointed out by Petitioner, Table 1 of the ’908 patent includes, under the “keyfact term list” column “[KEY2 KEY1, NIL].” Ex. 1001, 6:18, Table 1.

In the Sur-reply, Patent Owner argues that “every single ‘keyfact’ example disclosed in the specification expresses semantic relation between words in the paired form of [object, property].” Sur-reply 2 (citing Ex. 1001, code (57), Table 1, 1:8–10, 1:16–18, 4:58–60, 6:15–30, 6:38–44) (emphasis omitted). Patent Owner argues that, in the example from Table 1 of [KEY2 KEY1, NIL], “the ‘property’ portion is ‘NIL’ or empty, such that KEY2 and KEY1 pair are the only two nonempty keyfact tags.” *Id.* at 13 (emphasis omitted). We are not persuaded by Patent Owner’s arguments that the ’908 patent includes a “disavowal expressed in the statement ‘All keyfacts express semantic relation between words in the form of [object,

property],” such that a keyfact must contain a pair and nothing else. *Id.* at 12–13. We agree with Petitioner that the description from the ’908 patent (all keyfacts express semantic relation between words in the form of [object, property]) does not preclude, for example, “more than the pair of node words,” such as Braden-Harder’s triples that include two node words in the form of [object, property] linked by a semantic relationship. Ex. 1003 ¶¶ 176, 221. Patent Owner responds that in every instance shown in Table 1, “the example keyfacts listed never consist of more than a pair of nonempty tags.” Sur-reply 13 (emphasis omitted). However, even the form [KEY2 KEY1, NIL], for example, contains an indicator “NIL” along with two other terms (KEY2 and KEY1), resulting in a representation that is more than just a pair of terms, like Braden-Harder. Moreover, Patent Owner’s argument that Braden-Harder’s triples are “the sort of phrase-based scheme” that the ’908 patent disparages is unavailing. PO Resp. 22 (citing Ex. 1001, 1:19–28, 1:42–45). As explained above, Braden-Harder applies rules to extract logical form triples, where each triple “is a factual extraction that represents the semantic relation between words of a sentence,” which is distinguishable from phrase-based methods that use “purely syntactic” approaches. Pet. Reply 21–22 (citing Pet. 1, 34; Ex. 1003 ¶¶ 175–176; Ex. 1020, 3:46–59, 4:18–20, 4:61–67) (emphasis omitted).

We also are not persuaded by Patent Owner’s arguments that claim 6 requires a “determination between a class of noun” used to generate a keyfact having the form [object, property]. PO Resp. 21–22 (citing Ex. 1001, 5:35–44). Claim 6 does not require making a determination between a class of noun. A class of noun is not in the claim language at all. Moreover, we agree with Petitioner that Braden-Harder nonetheless makes such a determination between a class of noun, and converts a sequence of nouns

into a single tag, like the '908 patent. Pet. Reply 16–18 (citing Pet. 42, 45–46; Ex. 1022, Fig. 22; Ex. 1020, 14:37–41; Ex. 1003 ¶¶ 199–200, 216–217).

Lastly, Patent Owner argues that for claim 6, Petitioner misconstrues acts as underlying functions and that “[i]t is significant here that claim 6 recites the ‘keyfact extracting step’ in the context of both a *document collection* (i.e., more than one document) *and* a ‘user query’ together, for each one of the corresponding acts.” PO Resp. 23–24. Patent Owner also argues that Petitioner makes no distinction between its challenge of claim 6 “and the distinct and additional requirement” recited in dependent claim 7. *Id.* (emphasis omitted). For the reasons explained above in the claim construction section of this Decision, we disagree with Patent Owner that the dependent claims, such as claim 7, include additional acts, and instead we agree with Petitioner that the dependent “claims should be properly construed as describing details required as part of performing the previously introduced steps.” Pet. Reply 5. Also, as explained above, Petitioner addresses the acts that Patent Owner argues are claimed in claim 6 by construing the claim under 35 U.S.C. § 112, ¶ 6.

To the extent Patent Owner contends that the Petition fails to show how Braden-Harder teaches or suggests the “keyfact extracting step” for *both a document collection* and a user query together, Patent Owner’s argument is without merit. PO Resp. 23–24. First, the claim “keyfact extracting step” does not recite that the analyzing of a document collection and a user query be performed “together” or at the same time, as Patent Owner appears to imply. There simply is no such temporal requirement and Patent Owner fails to explain why we should construe the claim to include one. Moreover, Patent Owner fails to identify what is missing from Petitioner’s showing. *Id.* at 23–24. For example, the Petition shows, and we

agree, that “the ‘keyfact extracting step’ is performed in the context of both a document collection and a user query.” Pet. Reply 25–27 (citing Pet. 35–37; Ex. 1003 ¶¶ 180–183; Ex. 1020, Figure 10A); Pet. 33–34 (citing Ex. 1020, 5:22–24, 5:29–35, 11:44–55, and arguing “Braden-Harder’s IR method subjects both documents and queries to NLP to produce ‘a list of logical form triples, with each of the triples being illustratively of a form ‘word-relation-word’”). Indeed, Braden-Harder describes that *each document* is “subjected to natural language processing, specifically morphological, syntactic and logical form, to ultimately produce appropriate logical forms for each sentence in each document. A user-supplied query is analyzed in the same manner to yield a set of corresponding logical form triples therefor.” Ex. 1020, 5:29–35; *see also id.* at 26:33–61 (claim 1 reciting the same). Petitioner explains, and we agree, that Braden-Harder teaches a document indexing engine that performs a triple-generation process to extract logical-form triples *for each document being indexed*. Pet. 35 (citing Ex. 1020, 6:55–57, 20:62–21:4, Figs. 10A, 10B, 11; Ex. 1003 ¶ 180). Petitioner further explains that Braden-Harder performs a similar retrieval process *for analyzing a user query to yield logical form triples*. *Id.* at 36 (citing Ex. 1020, 15:18–21, Fig. 12A). Patent Owner directs us to no supporting evidence that rebuts Petitioner’s showing, which we determine is sufficient. For all of the above reasons, we determine that Petitioner has shown sufficiently that Braden-Harder in view of Grossman teaches or suggests the disputed “keyfact” limitation.

As explained above, Petitioner alternatively contends, and we agree, that as to the claimed “keyfact” limitation, it would have been obvious to generate other logic forms that would not include relations to enable structural paraphrasing. Pet. 47 (citing Ex. 1020, 11:51–55, 25:49–60).

Petitioner further contends, and we agree, that a POSITA would have been motivated “to generate logic forms that do not include the relations for ‘noun appositive’ or ‘relative clause’ constructions to increase matches with ‘sufficiently similar semantic content.’” *Id.* (citing Ex. Ex. 1020, 25:51–52; Ex. 1003 ¶¶ 221–222).¹⁸ Braden-Harder describes that its “invention can readily utilize any other form, such as those noted above, that can portray a semantic relationship between words.” Ex. 1020, 11:51–55. Braden-Harder further describes that “the criteria for determining a match, for purposes of identifying sufficiently similar semantic content across triples, *can be relaxed* to encompass paraphrases as matching.” *Id.* at 25:50–53 (emphasis added). “A structural paraphrase is exemplified by use of either a noun appositive or a relative clause.” *Id.* at 25:53–57. Dr. Jansen testifies that Braden-Harder’s descriptions would have led a POSITA to “be motivated to generate logic forms that do not include the relations for ‘noun appositive’ or ‘relative clause’ constructions to increase matches with ‘sufficiently similar semantic content’” thereby ensuring “that all relevant documents are retrieved from the document collection.” Ex. 1003 ¶ 221. We give substantial weight to Dr. Jansen’s testimony and agree with Petitioner’s contentions that it would have been obvious to generate other logic forms that do not include relations to enable structural paraphrasing. Pet. 47.

In the Patent Owner Response, Patent Owner did not address Petitioner’s alternative theory of how the prior art renders obvious the disputed “keyfact” limitation, but only made arguments regarding the theory in the Sur-reply. *See generally* PO Resp.; Pet. Reply 19–20; Sur-reply 14–

¹⁸ During oral hearing, Petitioner stated that by not including the relation “it gets rid of that mod that’s in the middle of the tuple” resulting in “literally . . . this exact form of object and property.” Tr. 19:6–17.

16 (“Google also falsely suggests it is undisputed that it would have been obvious to modify Braden-Harder to *exclude* from its ‘triples’ the interposing relation label”). In other words, Patent Owner waited until the Sur-reply to address Petitioner’s alternative showing made in the Petition. We determine it is too late for Patent Owner to do so. In the Scheduling Order, we advised Patent Owner “that any arguments not raised in the [Patent Owner Response] may deemed waived.” Paper 15, 8; *see also In re NuVasive, Inc.*, 842 F.3d 1376, 1381 (Fed. Cir. 2016) (holding that patent owner’s failure to proffer argument at trial as instructed in the scheduling order constitutes waiver). A sur-reply that belatedly raises a new issue may not be considered. *See, e.g., Werner Co. v. Louisville Ladder, Inc.*, IPR2019-00336, Paper 34 at 39 (PTAB Aug. 24, 2020) (Final Written Decision) (“Patent Owner’s arguments made for the first time in its Sur-reply are waived because they were not made in the Patent Owner Response, and Petitioner relied on their absence to its detriment and was deprived of the chance to present arguments and evidence in its Reply to rebut Patent Owner’s assertions.”); *see also* Consolidated Trial Practice Guide, 74 (November, 2019)¹⁹. Additionally, Patent Owner provides no explanation for presenting its arguments late. *See* Sur-reply 14–16.²⁰ Thus, for the reasons provided in the Petition, we determine that Petitioner’s un rebutted

¹⁹ Available at <https://www.uspto.gov/sites/default/files/documents/tpgnov.pdf?MURL=>.

²⁰ Even if we considered Patent Owner’s untimely argument that Petitioner’s proposed modification would “render Braden-Harder inoperable for its intended purpose,” the underlying contentions are unsupported by evidence. Sur-reply 14–16. As stated above, Patent Owner does not introduce testimony from a declarant in support of its positions. Nor did Patent Owner cross-examine Dr. Jansen. Thus, Dr. Jansen’s testimony stands un rebutted.

alternative showing is sufficient to show that the disputed limitation with the “keyfact” term would have been obvious.

c. Claim 6: “keyfact indexing step for calculating the frequency of said keyfacts of said document collection and generating a keyfact list of said document collection for a keyfact index structure”

For the above limitation, Petitioner contends that Braden-Harder (incorporating Messerly) in combination with Grossman teach keyfact indexing by calculating keyfact frequencies (tf) and document frequencies (df) to generate tables used to construct a keyfact index structure. Pet. 47–48. In particular, Petitioner contends, and we agree, that Braden-Harder teaches scoring metrics to take into account the frequency of a logical form triple occurring in a document (tf) which corresponds to the claimed keyfact frequency. *Id.* at 48 (citing Ex. 1020, 17:60–18:7; Ex. 1003 ¶ 229). Petitioner further provides sufficient evidence that to the extent “frequency of said keyfacts” requires using df to calculate idf, Messerly teaches using df in combination with tf which was a “well-known approach[] to ranking documents by relevancy.” *Id.* at 48–49 (citing Ex. 1020, 2:42–46, 17:60–18:7; Ex. 1025, 12:33–36, 12:51–59, 13:8–10, 14:8–12; Ex. 1003 ¶¶ 232, 234, 235).

For the “generating a keyfact list of said document collection for a keyfact index structure” limitation, Petitioner further contends, and we agree, that, as an example, Braden-Harder describes an indexing engine that generates and stores a set of logical form triples for each indexed document in a Master Dataset 1030 (index structure). *Id.* at 50–51 (citing Ex. 1020, 7:12–16, 15:60–63, 16:61–62, 20:10–13, 20:50–61, 20:64–21:3, 21:7–25, Fig. 10A; Ex. 1003 ¶ 241). Petitioner further provides a detailed showing as to how the limitation is met if the claimed “keyfact index structure” requires

each of the specific tables in Figure 4 of the '908 patent. *Id.* at 52–54. Other than arguing that “Petitioner errs by conflating distinct claim requirements in a manner that impermissibly reads out limitations” (PO Resp. 14–19), which we address above, Patent Owner does not dispute Petitioner’s specific showing with respect to the above limitation. *See generally id.*

d. Claim 6: “keyfact retrieving step for receiving said keyfact of said user query and said keyfacts of said document collection and defining a keyfact retrieval model in consideration of weigh factors according to a keyfact pattern and generating a retrieval result”

For the above limitation, Petitioner contends, and we agree, that Braden-Harder teaches, during the retrieval process, obtaining a user’s full-text query and generating logical form triples from the user query block and receiving logical form triples associated with the retrieved document records. Pet. 55–56 (citing Ex. 1020, 11:19–25, 12:16–29, 15:9–21, Fig. 12A; Ex. 1003 ¶ 257).

Petitioner further contends that Braden-Harder teaches “defining a keyfact retrieval model in consideration of weigh factors according to a keyfact pattern,” as Braden-Harder teaches its retrieval model uses document weights calculated according to a logical-form-triple pattern. *Id.* at 57–58 (citing Ex. 1020, Fig. 8B). In particular, Petitioner contends, and we agree, that Braden-Harder teaches calculating a document weight by “weighting of matching logical forms . . . associated with a search query and each of the retrieved documents.” *Id.* at 58 (quoting Ex. 1020, 5:8–11) (alteration in original). Petitioner further contends that the weights are based on the semantic relationships in the logical form triples, such as the words’ functional roles, semantic roles, or semantic labels. *Id.* (citing Ex. 1020,

Tables 2–4, 5:41–44 (“different relation type, i.e., such as deep subject, deep object, operator and the like, that can occur in a logical form is assigned a predefined weight”), 16:21–25, 16:27–29 (“[t]he weight reflects a relative importance ascribed to that relation in indicating a correct semantic match between a query and a document”), Fig. 8A). Petitioner asserts, therefore, and we agree, that “Braden-Harder defines a retrieval model in consideration of weight constants according to logical form triples, like the ’908 patent.” *Id.* at 58–59 (citing Ex. 1003 ¶ 265). Petitioner further contends that to the extent the claimed “keyfact retrieval model” requires the use of a vector-space retrieval model, “then Braden-Harder in view of Grossman renders this obvious” because Braden-Harder acknowledges that use of a statistical vector-space model was conventional. *Id.* at 59 (citing Ex. 1020, 25:35–36). Petitioner asserts that Grossman teaches a vector-space model and further provides reasons for combining Braden-Harder with Grossman. *Id.* at 59–61 (citing Ex. 1010, 13, 16, 18, 80; Ex. 1020, 11:4–7, 17:16–18; Ex. 1003 ¶¶ 267, 272–275). Lastly, Petitioner contends that Braden-Harder (with Messerly) teaches using *tf-idf* weights augmented by its logic-form-triples weight constant that when implemented with Grossman calculates a similarity coefficient using vector-space mode that results in an order of retrieval results. *Id.* at 61–62 (citing *id.* § VI.A.1.c (1), § VI.A.1.d; Ex. 1020, 8:2–6, 16:35–40; Ex. 1003 ¶¶ 279–281).

Patent Owner argues that Braden-Harder’s “predetermined” weights do not teach or suggest the claimed “weigh factors according to a keyfact pattern,” which are described in the ’908 patent as keyfact weight constants “determined experimentally on the basis of distribution of keyfact pattern of document collection.” PO Resp. 24–28. Petitioner argues that we “considered and rejected Uniloc’s previous identical arguments” in the

Decision to Institute and that “Uniloc adds nothing to dispute” our preliminary determinations. Pet. Reply 27.

We agree with Petitioner that Patent Owner’s arguments directed to the “keyfact retrieving step” are the same arguments Patent Owner raised in the Preliminary Response. *Compare* PO Resp. 24–28, *with* Prelim. Resp. 27–31. For the same reasons discussed in the Decision to Institute, those arguments are not persuasive. *See* Dec. 33–34. That is, we do not agree that the “weigh factors” must be determined experimentally or cannot be predetermined weights as Patent Owner asserts. Moreover, the ’908 patent describes determining the weight constants “on the basis of distribution of keyfact pattern of document collection” (Ex. 1001, 7:62–64) like Braden-Harder, which similarly describes that its weights “reflect[] a relative importance ascribed to that relation in indicating a correct semantic match between a query and a document.” Ex. 1020, 16:27–29. In other words, Braden-Harder’s weights are assigned based on the keyfact pattern, like in the ’908 patent. Ex. 1003 ¶ 265.

e. Claim 6: Motivation and Rationale to Combine

Petitioner argues a person of ordinary skill in the art would have been motivated and found it obvious to combine the teachings of Braden-Harder and Grossman. *See, e.g.*, Pet. 52–53. Petitioner asserts that Grossman teaches that tables (or their equivalents), such as those shown in the table of Figure 4 of the ’908 patent²¹, were known for implementing document-index structures such as the indexed database in Braden-Harder. *Id.* (citing Ex. 1003 ¶ 244). Petitioner contends, and we agree, that “[s]uch a technique

²¹ Petitioner makes this assertion assuming that the “keyfact index structure” is in the form of each of the specific tables in Figure 4 of the ’908 patent. *See* Pet. 52–53.

for generating the index structure would have been an obvious implementation to a POSITA at the time of the '908 patent, as taught in Grossman.” *Id.* at 53 (citing Ex. 1010, 134–137). Patent Owner does not dispute Petitioner’s showing regarding the reasons to combine Braden-Harder and Grossman. *See generally* PO Resp.

For all of the reasons above, we determine that Petitioner has demonstrated by a preponderance of the evidence that claim 6 would have been obvious over Braden-Harder in view of Grossman.

f. Dependent Claims 7–12

Each of claims 7–12 depend directly or indirectly from independent claim 6. Petitioner identifies supporting portions of Braden-Harder and Grossman, along with arguments and supporting evidence as to how the combined teachings of Braden-Harder and Grossman account for the additional limitations of these dependent claims. Pet. 63–84.

For example, claim 7 depends from claim 6 and recites, “wherein said step of keyfact extracting comprises the steps of analyzing morphology of an input sentence and obtaining tag sequences of part-of-speech by attaching part-of-speech tags.” Petitioner references its showing for claim 6 and argues, and we agree, that Braden-Harder analyzes morphology of input sentence to parse text into its constituent words using a stored lexicon. *Id.* at 63 (citing Ex. 1020, 5:33–35, 11:62–12:1, 12:30–34). Petitioner further argues, and we agree, that during its morphological analysis, “Braden-Harder (as explained in Heidorn) attaches each parsed word with a part-of-speech tag to obtain tag sequences.” *Id.* (citing Ex. 1020, 12:41–42, 43; Ex. 1022, 3:36–40; Ex. 1003 ¶¶ 286–287). For the “selecting a tag sequence of part-of-speech out of said tag sequences of part-of-speech” limitation of claim 7, Petitioner again refers to its showing for claim 6 and argues, and we

agree, that Braden-Harder (with Heidorn) uses syntactic analysis to select a final tag sequence out of a set of tag sequences. *Id.* at 63–64 (citing Ex. 1022, 4:20–22, 4:56–58; Ex. 1003 ¶¶ 289–292). Claim 7 also recites, “extracting a keyfact pattern by applying said tag sequence of part-of-speech to a keyfact pattern rule.” Petitioner refers to its showing for claim 6, and persuasively argues, with supporting testimony, that Braden-Harder uses semantic analysis to extract a logical form graph by applying its syntactic-parse tree (with the associated part-of-speech tag sequence) to at least one semantic rule. *Id.* at 64 (citing Ex. 1003 ¶¶ 294–295). Lastly, claim 7 recites, “applying said keyfact pattern to a keyfact pattern generation rule and generating a keyfact list.” Petitioner refers to its showing for claim 6, and persuasively argues, with supporting testimony, that Braden-Harder applies the logical form graph to a series of graph-walk rules to generate a list of logical form triples. *Id.* at 65 (citing Ex. 1003 ¶¶ 212–218, 296–298).

Patent Owner argues that the “Petition is keyed to incorrect claim constructions which improperly attempt to incorporate limitations from dependent claims into independent claim 6.” PO Resp. 29. We have addressed that argument in our claim construction discussion above. Patent Owner does not otherwise address separately Petitioner’s arguments and supporting evidence as to how the combined teachings of Braden-Harder and Grossman account for the additional limitations of dependent claims 7–12. *See Id.* at 28–29; Pet. Reply 30; Sur-reply 1–22. We have reviewed Petitioner’s arguments and supporting evidence as to how the combined teachings of Braden-Harder and Grossman accounts for the additional limitations of dependent claims 7–12, and we agree with and adopt Petitioner’s analysis. *See* Pet. 63–84. Accordingly, Petitioner has demonstrated by a preponderance of the evidence that the subject matter of

dependent claims 7–12 would have been obvious over the combined teachings of Braden-Harder and Grossman.

E. Remaining Grounds Challenging Claims 6–12

For the reasons discussed above, Petitioner has shown, by a preponderance of the evidence that claims 6–12 are unpatentable as obvious over Braden-Harder and Grossman. In addressing this ground, we have addressed all of the challenged claims. *See* 35 U.S.C. § 318(a) (requiring the Board to “issue a final written decision with respect to the patentability of any patent claim challenged by the petitioner and any new claim added under section 316(d)”); *see also SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2108) (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”). Accordingly, we need not and do not decide whether Petitioner has shown by a preponderance of the evidence that claims 6–12 are unpatentable based on the remaining challenges. *Cf. In re Gleave*, 560 F.3d 1331, 1338 (Fed. Cir. 2009) (not reaching other grounds of unpatentability after affirming the anticipation ground); *see also Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (holding that once a dispositive issue is decided, there is no need to decide other issues).

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has shown by a preponderance of the evidence that claims 6–12 of the '908 patent are unpatentable, as summarized in the following table:

Claims	35 U.S.C. §	References	Claims Shown Unpatentable	Claims Not Shown Unpatentable
6–12	103(a) ²²	Braden-Harder, Grossman	6–12	
6–12	103(a)	Braden-Harder, Heidorn, Messerly, Grossman		
7–9	103(a)	Braden-Harder, Grossman, Kucera		
7–9	103(a)	Braden-Harder, Heidorn, Messerly, Grossman, Kucera		
9	103(a)	Braden-Harder, Grossman, Miller		
9	103(a)	Braden-Harder, Heidorn, Messerly, Grossman, Miller		
9		Braden-Harder, Grossman, Kucera, Miller		
9		Braden-Harder, Heidorn, Messerly, Grossman, Kucera, Miller		

²² As explained immediately above, we need not and do not decide whether Petitioner has shown by a preponderance of the evidence that claims 6–12 also would have been obvious based on the remaining grounds not addressed in this Decision.

Claims	35 U.S.C. §	References	Claims Shown Unpatentable	Claims Not Shown Unpatentable
Overall Outcome			6–12	

IV. ORDER

Accordingly, it is:

ORDERED that claims 6–12 of the '908 patent have been shown to be unpatentable; 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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