

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ROHDE & SCHWARZ GMBH & CO., KG,
Petitioner,

v.

TEKTRONIX, INC.,
Patent Owner.

Case IPR2018-00647
Patent 8,675,719 B2

Before JOSIAH C. COCKS, PATRICK M. BOUCHER, and
SCOTT E. BAIN, *Administrative Patent Judges*.

BAIN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

Petitioner, Rohde & Schwarz GMBH & Co., KG (“Petitioner”), filed a Petition requesting an *inter partes* review of claims 1–10 and 12–15 of U.S. Patent No. 8,675,719 (Ex. 1001, “the ’719 patent”). Paper 2 (“Pet.”). Patent Owner, Tektronix, Inc. (“Patent Owner”), filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). In our Decision on Institution (Paper 10, “Dec. on Inst.”), we determined that the information presented in the Petition and Preliminary Response established a reasonable likelihood that the Petitioner would prevail in its challenge of claims 1–10 and 12–15 of the ’719 patent as unpatentable and, accordingly, we instituted *inter partes* review as to those claims. See 35 U.S.C. § 314(a).

During the course of trial, Patent Owner filed a Patent Owner Response (Paper 31, “PO Resp.”), Petitioner filed a Reply to Patent Owner Response (Paper 36, “Pet. Reply”), and Patent Owner filed a Sur-reply to Petitioner’s Reply (Paper 42, “PO Sur-reply”). A combined hearing for this case and the related case IPR2018-00643 was held on June 19, 2019, and a transcript of the hearing is included in the record. Paper 50.

This decision is a Final Written Decision under 35 U.S.C. § 318(a) as to the patentability of claims 1–10 and 12–15 of the ’719 patent. We have jurisdiction under 35 U.S.C. § 6. For the reasons discussed below, we hold that Petitioner has not demonstrated by a preponderance of the evidence that independent claims 1 and 12 of the ’719 patent are unpatentable under § 102 (the only ground asserted for those claims), and also has not demonstrated by a preponderance of the evidence that any of dependent claims 2–10 and 13–15 are unpatentable under § 102 or § 103(a).

A. Related Matters

The '719 patent is involved in a district court case captioned *Tektronix, Inc. v. Rohde & Schwarz USA Inc., et al.*, No. 3:18-cv-00264 (D. Ore.) and in a proceeding before the U.S. International Trade Commission, 337-TA-1104. Pet. 1. Also, in addition to this Petition, Petitioner filed another petition challenging the patentability of claims 1–10 and 12–15 of the '719 patent (IPR2018-00643) over additional references, we instituted trial in that matter, and as noted above, we held a combined hearing for this case and IPR2018-00643. As discussed in the Final Written Decision in IPR2018-00643, we held in that case that Petitioner proved by a preponderance of the evidence that some, but not all, of the challenged claims are unpatentable over the references cited therein. Petitioner also filed a petition against U.S. Patent No. 8,521,460 B2 (IPR2018-00645), which has the same filing date as the '719 patent and pertains to similar subject matter, but we denied the petition.

B. The '719 Patent

The '719 patent, titled “Multi-Domain Test and Measurement Instrument,” issued March 18, 2014, from U.S. Patent Application No. 12/892,758, filed September 28, 2010. Ex. 1001, [21], [22], [45], [54]. The '719 patent relates to “multi domain” analysis of a signal. According to Patent Owner, prior to the '719 patent, test and measurement instruments were typically designed for signal analysis in only one domain. PO Resp. 4; Ex. 1001, 1:28–33. Namely, an oscilloscope measured a signal in the time domain (e.g., voltage as a function of time), and a spectrum analyzer measured a signal in the frequency domain (e.g., displaying a signal's

frequency spectrum that indicates the power levels of various frequency components). PO Resp. 4–5; Ex. 1001, 1:9–15, 1:35–55.

According to Patent Owner, some oscilloscopes prior to the '719 patent included “limited” multi-domain analysis capability, but Patent Owner explained that such oscilloscopes implement undesirable “tradeoffs” in resolution and deficiencies in sampling rate. PO Resp. 4, 16; Ex. 1001, 1:40–47, 1:52–62. For example, Patent Owner asserts, acquiring a signal at its entire frequency range, but over short time period, permits such oscilloscopes to display a “higher-resolution waveform but only a lower-resolution frequency spectrum.” PO Resp. 5. Conversely, acquiring a narrower frequency range, but over a longer range of time, permits display of a higher-resolution frequency spectrum but lower-resolution waveform. *Id.*

Patent Owner explains that the invention of the '719 patent solves this problem by “devising two different kinds of channels in one instrument,” namely, a time domain channel and a frequency domain channel. *Id.*

According to Patent Owner:

[p]lacing both channels into the same test and measurement instrument, such that the acquisition system receives the differently-conditioned input signals output from each channel, solves the tradeoffs problem associated with performing multi-domain analysis in conventional instruments.

PO Resp. 16.

An embodiment of the claimed invention is shown in Figure 1 of the '719 patent, reproduced below.

FIGURE 1

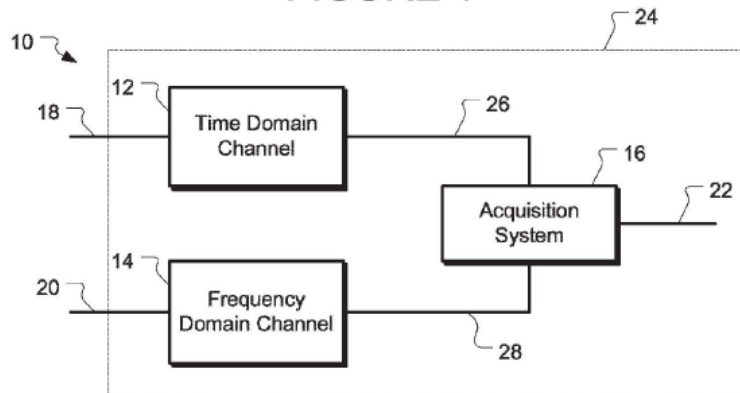


Figure 1 is a block diagram of a “test and measurement instrument [10] having a time domain channel and a frequency domain channel.” Ex. 1001, 2:26–28. In this embodiment, time domain channel 12 is configured to receive a first input signal 18, and frequency domain channel 14 is configured to receive a second input signal 20. *Id.* at 2:65–67. Each of the time domain channel 12 and frequency domain channel 14 may be configured to “process” the respective signals 18 and 20 using a variety of circuitry described in the ’719 patent. *Id.* at 3:7–4:34.¹ The respective outputs of the two channels, i.e., signals 26 and 28, are coupled to

¹ For example, the ’719 patent explains that the time domain channel 12 “can include digitizers such as multi-bit analog to digital converters, comparators[,] amplifiers, input protection[,] memories, decimators, or the like[,] attenuators, and other circuitry that cover[s] the entire bandwidth from DC to the maximum frequency.” Ex. 1001, 3:7–24. The frequency domain channel 14 may include “attenuators, filters, amplifiers, or the like that can be optimized for those signals that require frequency-domain representation,” and can include “other components that have different bandwidths, input ranges, noise figures, or the like” such as “amplifiers, mixers, local oscillators, attenuators, filters, switches, or the like.” *Id.* at 3:37–42, 3:60–64.

“acquisition system” 16, which is “configured to acquire data” from such signals and may also “include a variety of circuitry” such as “digitizers, decimators, filters, memories, or the like.” *Id.* at 4:21–26. Finally, the “acquired data 22” from acquisition system 16 can be made “available for further processing, display, analysis in the respective domain, or the like.” *Id.* at 5:23–27.

C. The Challenged Claims

Petitioner challenges claims 1–10 and 12–15 of the ’719 patent. Independent claims 1 and 12, the sole independent claims, are illustrative and are reproduced below:

1. A test and measurement instrument, comprising:
 - a time domain channel configured to process a first input signal for analysis in a time domain;
 - a frequency domain channel configured to process a second input signal for analysis in a frequency domain; and
 - an acquisition system coupled to the time domain channel and the frequency domain channel and configured to acquire data from the time domain channel and the frequency domain channel,wherein the time domain channel and the frequency domain channel are not used to process the same signal sequentially.

12. A test and measurement instrument, comprising:
- a time domain channel configured to process a first input signal for analysis in a time domain;
 - a frequency domain channel configured to process a second input signal for analysis in a frequency domain; and
 - a controller coupled to the time domain channel and the frequency domain channel and configured to control acquisition parameters of the time domain channel and the frequency domain channel such that the acquisition parameters of the time domain channel and the frequency domain channel are different.

Ex. 1001, 10:54–65, 12:13–23. Each of dependent claims 2–10 depends directly or indirectly from claim 1. *Id.* at 10:66–12:4. Each of dependent claims 13–15 depends directly from claim 12. *Id.* at 12:24–52.

D. Prior Art References Relied Upon

Petitioner relies upon the prior art set forth in the tables below:

Inventor²	Patent / Pub. No.	Relevant Dates	Exhibit No.
Hansen	US 4,802,098	issued Jan. 31, 1989 filed April 3, 1987	1015
Pickerd	US 6,681,191 B1	issued Jan. 20, 2004 filed Nov. 13, 2000	1016
Nara	EP 2 096 451 A1	published Sept. 2, 2009 filed Nov. 22, 2007	1019

Non-Patent Literature	Exhibit No.
Robert A. Witte, <i>Spectrum & Network Measurements</i> , PRENTICE HALL PTR, 1 ST ED (ISBN-10: 0130308005, ISBN-13: 978:0130308009) Oct. 30, 1992, excerpts from Chapters 1, 5, 7, and 9 (“Witte”)	1009

² For clarity and ease of reference, we only list the first named inventor.

E. Instituted Grounds of Unpatentability

We instituted review of claims 1–10 and 12–15 of the ’719 patent based on the asserted grounds of unpatentability (“grounds”) set forth in the table below. Pet. 3, 14–84.

Reference(s)	Basis	Challenged Claims
Hansen	§ 102	1, 3, 4, 5, 8, 10, 12, 13, 14, 15
Hansen and Pickerd	§ 103	2
Hansen and Witte	§ 103	6, 7, 9
Hansen	§ 103	3, 6, 7
Hansen and Nara	§ 103	14, 15

In support of its asserted grounds of unpatentability, Petitioner relies in part on the testimony of its expert witness, Dr. Villasenor. *See* Ex. 1003 (“Villasenor Decl.”); Ex. 1030 (“Villasenor Second Decl.”). In support of its response, Patent Owner relies in part on the testimony of its expert witness, Dr. Blalock. Ex. 2001 (“Blalock Decl.”); Ex. 2014 (“Blalock Second Decl.”). Both experts were cross-examined. *See* Ex. 1031 (deposition transcript of Dr. Blalock); Ex. 2018 (deposition transcript of Dr. Villasenor); Ex. 2023 (second deposition transcript of Dr. Villasenor).

II. ANALYSIS

A. Claim Construction

The ’719 patent has not expired. Pet. 3; Ex. 1001. In an *inter partes* review proceeding filed before November 13, 2018, as this proceeding was, claim terms of an unexpired patent are given their broadest reasonable

interpretation in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2016); Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018); Pet. 3; PO Resp. 8. Under the broadest reasonable interpretation standard, claim terms are generally given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art, in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1256–57 (Fed. Cir. 2007). Further, in construing the claims, we look principally to the intrinsic evidence of record, examining the claim language, 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) (citation omitted).

The parties propose substantially similar descriptions of a person of ordinary skill in the art, with each party relying on the testimony of its respective expert witness. Petitioner’s expert, Dr. Villasenor, testifies that a person of ordinary skill in the art has:

at least an undergraduate degree in electrical engineering, computer science, or a related field, and at least two years of experience in systems for performing time and frequency analysis of signals such that the person would have grasped sufficient details regarding the design and operation of test and measurement systems for time domain analysis and frequency domain analysis.

Ex. 1003, ¶ 32. Patent Owner, citing the testimony of its expert, Dr. Blalock, asserts that a person of ordinary skill in the art is someone:

hav[ing] at least a bachelor's degree in electrical engineering and at least 5 years of experience in circuit design with extensive use of a test and measurement instrument for performing evaluation and troubleshooting as part of the circuit design efforts.

PO Resp. 8 (citing Ex. 2014 (“Blalock Decl.”), ¶¶ 59–60).

Upon weighing the parties' respective assessments of a person of ordinary skill in view of the record, we adopt Petitioner's assessment and apply it to our analysis in this Decision. Petitioner's assessment takes into account that undergraduate degrees “related” to electrical engineering, such as computer science, may provide significant training regarding test and measurement instruments for time domain and frequency domain analysis. Petitioner's assessment also reflects that experience in “circuit design” (and particularly five years of experience as Patent Owner asserts) would not necessarily be required in order to sufficiently understand “details regarding the design and operation” of test and measurement instruments for time domain analysis and frequency domain analysis, as Dr. Villasenor credibly testifies. We note, however, that our conclusions set forth in this Decision would be the same were we to adopt Patent Owner's evaluation of the level of ordinary skill in the art.

1. *“test and measurement instrument”*

In the Decision on Institution, we construed “test and measurement instrument” (recited in the preamble of claim 1) as equipment that directly or indirectly measures, indicates, monitors, and/or tests. Dec. on Inst. 11–13. Although our construction was not precisely the same as the one proposed by Patent Owner (and Petitioner did not propose a construction), we reasoned that our construction was consistent with the definition of

“measurement instrument” in the technical dictionary relied upon by Patent Owner. *Id.*; Ex. 2003 (Wiley Electrical and Electronics Engineering Dictionary) (“Wiley Dictionary”). We further reasoned that our construction was consistent with the ’719 patent specification, which discloses a variety of embodiments for measuring signal values. Dec. Inst. 12–13.

During the trial in this proceeding, neither party disputed our preliminary construction of test and measurement instrument, and this claim element is not in dispute. *See infra*, Sect. II.B.3. We, therefore, adopt our preliminary construction for this Decision.

2. “channel”

The word “channel” is core to the dispute between the parties. It appears throughout the ’719 patent specification and in every claim, but it is not expressly defined in the ’719 patent. Instead, the two independent claims (i.e., claims 1 and 12) define a “channel” by reciting what particular channels are “configured” to do. Namely, a “time domain channel” is configured to “process a first input signal for analysis in the time domain,” and a “frequency domain channel” is configured to “process a second input signal for analysis in the frequency domain.”³ The parties disagree on whether the word “channel” itself must be defined using specific electronic components, particularly a digitizer, and in the Decision on Institution, we determined that it did not. Dec. on Inst. 8–9; Pet. 6–7.

³ Prior to institution, the parties agreed that the recited “channel” limitations are not means-plus-function limitations (nor is any other limitation in the claims). Pet. 6; Prelim. Resp. 17; Dec. on Inst. 8. During trial, the parties have not altered their positions.

In the Decision on Institution, we construed “channel” to mean “signal path,” which we reasoned was consistent with the dictionary cited by Patent Owner. Dec. on Inst. 9; Ex. 2007 (defining channel as “[a] course through which something may be directed or moved,” “communication route[,],” and “[t]o direct or guide along a desired course”). Again, we noted that neither party identified a clear definition of “channel” in the field of signal processing, and that definitions of “channel” in other fields of technology (such as communications) did not fit in the context of the ’719 patent. Dec. on Inst. 9; Ex. 2007 (e.g., referring to channel in the context of radio or television, as “frequency bands” for transmitting and receiving signals). We reasoned that our preliminary construction comported with the specification of the ’719 patent, which describes and illustrates (in block form) paths for a signal to propagate through circuit elements. Ex. 1001, 10:18–19. For example, in describing one embodiment, the ’719 patent states “[e]ach *path* [on the signal block diagram, Fig. 8] is configured to receive a *signal* from a local oscillator.” *Id.* (emphasis added).

During the trial, both parties asserted that a single “channel” includes one *or more* signal paths. PO Resp. 10–13; Pet. Reply 2–4. We agree with this assertion. Dependent claim 8, for example, recites the frequency domain “channel” comprising “an in-phase path” and a “quadrature-phase path,” i.e., two paths in the channel. Ex. 1001, 11:40–43; Ex. 2014 ¶¶ 66–67, 70. We, therefore, do not limit the meaning of “channel” to a single path.

We further observe that “channel” in the context of the ’719 patent represents circuitry that make up the signal path(s), including (according to the terms of the independent claims), signal processing circuitry. Ex. 1001, 3:5–5:27; *id.* (claim 1, reciting that the respective channels are “configured

to process” signals). The ’719 patent specification defines such circuitry broadly and by providing numerous examples (embodiments). The specification provides, for instance, that a time domain “channel[] can include digitizers such as . . . analog to digital converters, comparators[,] other circuitry [] such as amplifiers, input protection, or other conditioning circuitry, [and] digital processing circuitry, such as memories, decimators, or the like.” Ex. 1001, 3:7–14; *see supra*, Sect. I.B. Further, a time domain “channel[] can include amplifiers, attenuators, and other circuitry.” *Id.* at 3:22–24. A frequency domain “channel,” according to the specification, “can include attenuators, filters, amplifiers, or the like that can be optimized for those signals that require frequency-domain representation and analysis.” *Id.* at 3:36–41. Moreover, “the frequency domain channel [] can include other components that have different bandwidths, input ranges, noise figures, or the like that would otherwise be used in the time domain channel . . . [t]hat is, amplifiers, mixers, local oscillators, attenuators, filters, switches, or the like.” *Id.* at 3:60–65. The specification provides an example of a frequency domain channel including “an attenuator,” a “filter,” a “mixer,” a “local oscillator,” and an “IF filter.” *Id.* at 4:35–38. In a different embodiment, the specification describes a frequency domain channel including “a digitizer” and a “digital filter.” *Id.* at 4:60–61. As Patent Owner asserts, a “channel . . . conditions the input signal” via circuit components “such as an amplifier, a digitizer, a filter, etc.” PO Resp. 11.

Rather than defining particular “channels” by specific circuit elements, the ’719 patent (and specifically, the independent claims themselves), defines a particular “channel” by what it does. Namely, as recited in claim 1, a “time domain channel” is a channel that is “configured

to process a[n] input signal for *analysis in the time domain*.” Ex. 1001, 10:55–56 (emphasis added). A “time domain channel” is “coupled to” an acquisition system and provides data to the acquisition system. *Id.* at 10:59–62. A “frequency domain channel,” in turn, is a channel that is “configured to process a[n] input signal for *analysis in the frequency domain*.” *Id.* at 10:57–62 (emphasis added). A frequency domain channel, like a time domain channel, is recited in the claims as being “coupled to” the acquisition system and providing data to the acquisition system. *Id.* at 10:57–62 (emphasis added).

In view of the arguments and evidence of record, including the foregoing, we construe the term “channel” as circuitry providing one or more signal paths in which a signal is processed, and we construe “time domain channel” and “frequency domain channel” as described above. We are not persuaded to construe these terms further.⁴ Specifically, we are not persuaded by Patent Owner’s additional arguments that we should construe the word “channel” as:

[signal] paths from input to acquisition, where different paths are part of a shared channel if (i) the acquisition system selectively acquires from one or the other path as being in one channel or (ii) the two paths perform complementary processing for the acquisition system to receive and process together.
PO Resp. 10.

We determine that Patent Owner’s foregoing, additional proposed construction is circular and lacks sufficient support in the specification. The

⁴ We address the parties’ arguments regarding elements in the prior art, and whether such elements constitute “channel[s]” as recited in the claims, in the patentability analysis of Section II, *infra*.

proposed construction relies on the word channel itself (twice), and it is unclear what “being in one channel” or a “shared channel” means without knowing the definition of “channel.” Moreover, as Petitioner argues, these phrases are not described in the ’719 patent. Pet. Reply 2–3. Further, the specification does not explain what it means to “selectively acquire[]” or “perform complementary processing.” Patent Owner argues that Figure 4 of the ’719 patent illustrates a single channel consistent with Patent Owner’s proposed definition, but Figure 4 is only one of several embodiments described in the specification. In any event, Figure 4 does not support Patent Owner’s argument, because Figure 4 is described in the ’719 patent as “an example of the test and measurement instrument of Figure 3,” which has “a time domain channel *and* a frequency domain channel coupled to a single input.” Ex. 1001, 6:36–41, 6:59–7:9 (emphasis added).

For similar reasons, we decline to construe the word “channel” as defining a “signal path *from input to acquisition*,” as Patent Owner argues. PO Resp. 10 (emphasis added). Rather, “input” signal and “acquisition system” are separate terms expressly recited in the claims, and the claim language defines the relationship between “channels,” the first and second “input” signals, and the “acquisition system.” See, e.g., Ex. 1001, 10:55–65 (claim 1).

3. “*acquisition system*,” “*acquire*,” and “*acquisition parameters*”

“Acquisition system,” like “channel,” is a core term in the claims that is not expressly defined in the ’719 patent, but rather is described by examples of circuitry (embodiments). In the Decision on Institution, we construed “acquisition system” as a system to obtain or receive signals or

data, and we construed “acquir[ing]” a signal/data as receiving or obtaining it. Dec. on Inst. 10–11; Ex. 1001, 3:1–3, 4:67, Figs. 1, 3, 5. We rejected Patent Owner’s proposed construction that required “retaining” a “conditioned” signal, as unclear and not supported by the ’719 patent specification. Dec. on Inst. 10–11. Upon consideration of the parties’ further arguments and evidence during trial, we refine our preliminary constructions with the following clarification.

Like a channel, an “acquisition system” represents circuit elements in the ’719 patent. According to the specification, an “acquisition system [] can include a variety of circuitry [such as] digitizers, decimators, filters, memories, or the like.” Ex. 1001, 4:21–23. The ’719 patent discloses that the acquisition system “can” include “acquisition memory,” which implies data storage, but does not state that memory is required. Ex. 1001, 5:31–32. In describing signal “acquisition,” the specification frequently uses the terms “acquire” and “receive” interchangeably. *Compare* 3:16–18, 6:32–34 with 4:39, 6:41–48, 9:22–26, 10:18.

During trial, Patent Owner argues (with supporting testimony from its expert, Dr. Blalock) that “acquisition” means to “capture [a signal] to generate a record,” and an “acquisition system captures the conditioned input signal to generate a record.” PO Resp. 18, 21; Ex. 2014 ¶¶ 81–82. Patent Owner asserts that although no “particular duration” of retention is required, “an entire data record must be captured, obtained, held, possessed, stored, etc. for at least some instant.” *Id.* at 21. Patent Owner argues that its proposed construction, unlike the Board’s preliminary construction, distinguishes simple circuit elements such as a “filter” that (as Petitioner’s

expert acknowledged) cannot alone be an “acquisition system” as recited in the ’719 patent. *Id.* (citing Ex. 2018 at 196). Virtually every conceivable circuit element can “receive” a signal, Patent Owner argues, but that does not make every element an “acquisition system.” *Id.*

Petitioner replies that the Board’s preliminary construction is appropriately broad, because the ’719 patent describes many circuit elements as acquiring, obtaining, or receiving a signal, and does not limit “acquire” or “acquisition system” in the manner proposed by Patent Owner. Pet. Reply 7–8.

Upon weighing the evidence and arguments in the record, we agree with Patent Owner’s position that an “acquisition system” in the ’719 patent cannot encompass certain simple circuit elements. Our reasoning, however, is based upon other terms in the claims that surround the phrase “acquisition system,” not because of any special meaning of “acquisition” itself (such as particular conditioning) imparted by the ’719 patent or known by one of ordinary skill. Specifically, claim 1 requires that the “acquisition system” be “coupled to the time domain channel and frequency channel” and is “configured to *acquire data*” from those channels. Ex. 1001, 10:59–63 (emphasis added). An acquisition system, therefore, by the terms of claim 1 (and claim 14), acquires data.

Thus, consistent with the disclosures in the ’719 patent, as well as Petitioner’s original proposed construction and the testimony of Dr. Villasenor, Pet. 7, Ex. 1003 ¶¶ 39–42, we clarify that “acquisition system” means circuitry configured to obtain data (e.g., for analysis), and to

“acquire” a signal is to obtain the signal (data). *See also* PO Resp. 22 (“acquired signal” is “obtained” data).

We decline to adopt Patent Owner’s further proposed definition that “acquiring” means “to capture [a signal] to *generate a record*,” because we discern insufficient support in the specification for that definition. PO Resp. 18–21 (emphasis added). Although the specification mentions “record length[s],” Ex. 1001, 1:58, 4:17, 8:47, the specification does not describe “acquisition” as requiring record generation, and in fact uses “obtain” interchangeably with “acquire.” Ex. 1001, 1:40–43 (“That is, to *obtain* a small frequency step, i.e., a fine resolution in the frequency domain, a long time span is necessary in the time domain [and] [s]imilarly, to *acquire* data for a wide frequency span, a high sample rate is needed.”); *see also id.* at 3:16–18, 6:32–34.

Again, we note that other terms recited in the claims of the ’719 patent limit the “acquisition system” only to those systems that are “coupled to” the “time domain channel” and “frequency domain channel,” and are “configured to acquire data from” those two channels. Ex. 1001, 10:59–64 (claim 1), 12:34–44 (claim 14).

The parties also propose constructions for “acquisition parameters,” “time align,” and “to sample.” Pet. 8; PO Resp. 18, 22–25. We address these terms in our Final Written Decision in IPR2018-00643, but constructions of these terms are not needed to resolve this case. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (only claim terms in controversy need to be construed, and only to the extent necessary to resolve the controversy).

B. Anticipation by Hansen
(Claims 1, 3, 4, 5, 8, 10, 12, 13, 14, and 15)

1. Principles of Law

To anticipate a claim under § 102, a prior art reference “must disclose every limitation of the claimed invention, either explicitly or inherently.” *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997). The absence of a single limitation, even if that limitation would have been obvious from the cited reference, negates anticipation. *Id.*

We analyze this asserted ground of anticipation with the above-identified principles in mind.

2. Overview of Hansen (Ex. 1015)

Hansen, the primary reference Petitioner relies on throughout the Petition, is directed to a “digital bandpass oscilloscope” which “permits an operator to observe both time and frequency domain plots” of a signal. Ex. 1015 Abstract (emphasis added). Specifically, the invention disclosed in Hansen permits the “display . . . [of] waveforms representing component signals of frequency within selectable passbands of an input signal.” *Id.* at 1:7–10. In addition to displaying the component signals of frequency (i.e., frequency domain), the invention also includes a “time domain display.” *Id.* at 5:35, 5:40. An embodiment is shown in Figure 1, reproduced below.

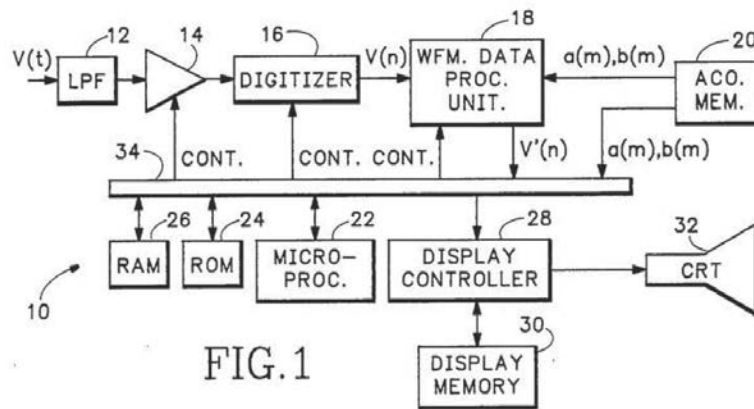


FIG. 1

Figure 1 is a block diagram depicting a digital oscilloscope 10, adapted to digitize an analog input signal (i.e., a signal expressed as voltage as a function of time, $V(t)$). Ex. 1015, 3:42–44. It includes various circuit elements such as low pass filter 12, preamplifier 14, and digitizer 16 for converting analog samples into digital data $V(n)$. *Id.* at 3:48–55. Random access acquisition memory 20 stores data sequences derived from the digital data, and waveform data processing unit 18 “interpolates and quadrature demodulates” the sequences to produce “an output data sequence $V'(n)$ representing the magnitude of the band as a function of time.” *Id.* at 3:64–4:4. Display controller 28 stores display control data in display memory 30 and “periodically updates a waveform display on the screen of a cathode ray tube (CRT) 32 according to the data stored in display memory 30.” *Id.* at 4:11–15. Microprocessor 22 is utilized to convert signal data for “frequency domain display” on the screen of CRT 32. *Id.* at 23–27.

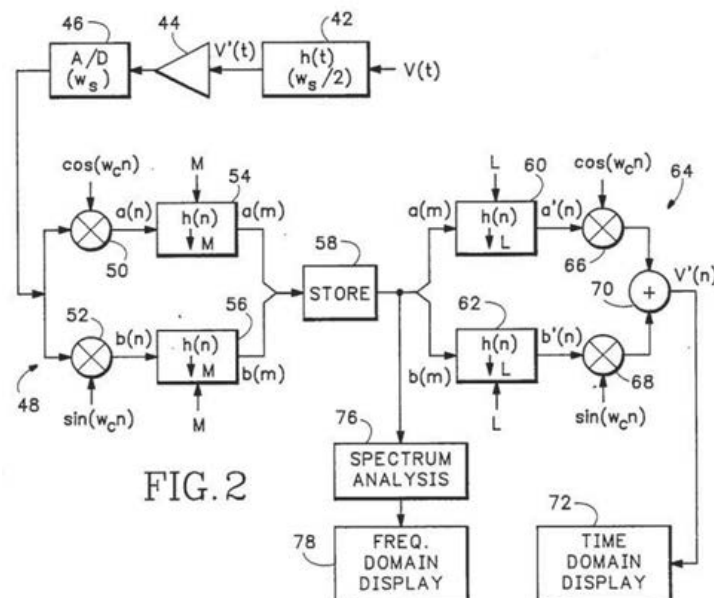
3. Challenged Claims 1, 3, 4, 5, 8, 10, 12, 13, 14, and 15 (Anticipation by Hansen)

a. Claim 1

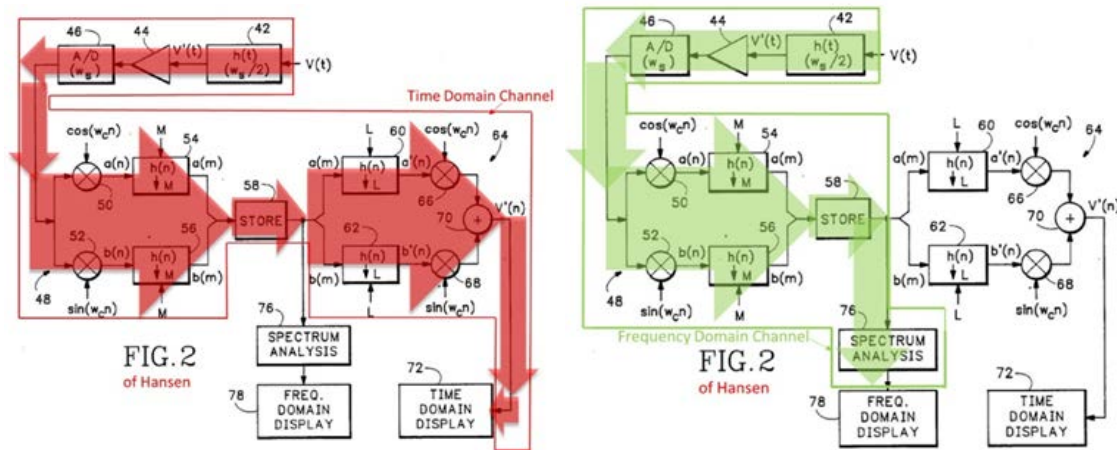
Claim 1 recites (inter alia) “a time domain channel configured to process a first input signal for analysis in a time domain” and a “frequency

domain channel configured to process a second input signal for analysis in a frequency domain.” Ex. 1001, 10:55–59. Petitioner contends Hansen discloses the recited “time domain channel” in its description of processing an analog input signal to produce “data indicating the *time dependent* behavior of the passband,” which is provided in a time domain display. Pet. 15–16 (emphasis added); Ex. 1015, 4:50–51, 5:34–36, Abstract, Fig. 2. Petitioner further contends Hansen discloses the recited “frequency domain channel” in its description of processing an analog input signal (after initial signal processing) to “perform a *spectrum analysis* of the selected frequency band” and convert the output to “display data” in the frequency domain. Pet. 16–17 (emphasis added); Ex. 1015 6:17–37; Ex. 1003 ¶¶61–62. Petitioner relies in part on the testimony of its expert, Dr. Villasenor, in support of its contentions. Ex. 1003 ¶¶ 56–62.

Petitioner’s contentions regarding the respective channels are illustrated in Petitioner’s annotations of Hansen Figure 2, reproduced below along with the original figure.



HANSEN FIGURE 2



PETITIONER’S FIRST AND SECOND ANNOTATED FIGURE 2

Hansen Figure 2 (original) depicts a “signal flow diagram” illustrating the path of signals through various circuit components, beginning with input signal $V(t)$. Ex. 1015, 3:14–15, 4:47–50. Petitioner’s first Annotated Figure 2 illustrates what Petitioner alleges is a “time domain channel,” shown by red arrows tracing the processing steps of signals along an alleged pathway toward time domain display. Pet. 15–16. Petitioner’s second Annotated Figure 2 illustrates what Petitioner alleges is a second “channel” (a frequency domain channel) in the same signal flow diagram, shown by green arrows tracing the processing steps of signals along an alleged pathway toward frequency domain display. Pet. 16–17.⁵

⁵ Petitioner’s contentions regarding the remaining elements of claim 1 are that (i) Hansen discloses a “test and measurement instrument” throughout its specification, which is not in dispute, Pet. 14–15 (citing Ex. 1015, 1:5–9, Abstract; Ex. 1003 ¶ 55); and (ii) Hansen discloses the recited “acquisition system” in Figure 2 at steps 72 (“time domain display”) and 78 (“freq. domain display”), as implemented in “architecture [disclosed in Hansen],

Patent Owner responds that Hansen Figure 2 is merely a flow diagram illustrating processing steps, not actual circuit pathways or circuit elements constituting channels (as properly construed), and that Petitioner's annotated pathways do not constitute the two distinct "channels" recited in claim 1. PO Resp. 30–36. Patent Owner relies on the testimony of Dr. Blalock in support of its contentions. Ex. 2014 ¶¶ 217–19, 231–33. Patent Owner explains that Hansen discloses the type of "conventional," limited multi-domain oscilloscope that was described in the background of the '719 patent as having deficiencies overcome by the invention recited in the '719 patent. *Id.* at 31; Ex. 2014 ¶ 229; Ex. 1001, 1:36–47. According to Patent Owner, one of ordinary skill would understand that in this type of conventional oscilloscope, different processing steps are not performed in "channels," but rather a microprocessor simply retrieves information to perform various processing steps, serially or in parallel, before displaying information in either the time domain or frequency domain. PO Resp. 31–32; Ex. 2014 ¶ 230. Additionally, Patent Owner contends that the architecture of Hansen is shown in Figure 1, not Figure 2, and Figure 1 does not illustrate distinct "channels" that are "coupled to an acquisition system" as recited in claim 1. PO Resp. 32–42; Ex. 2014 ¶¶ 241–45.

We begin our analysis by turning to our construction of "channel." As discussed in the claim construction section of this Decision, *supra*, Sect. II.A.2, we construe "channel" as circuitry providing one or more signal paths in which a signal is processed. A "time domain channel" is a distinct

e.g., display memories and display controllers as well as the displays," Pet. 18 (citing Ex. 1015, Fig. 1, 4:11–15; Ex. 1003 ¶ 64).

preamplifier 14, digitizer 16, waveform data processing unit 18, acquisition memory 20, microprocessor 22, ROM 24, RAM 26, display controller 28, display memory 30, cathode ray tube (CRT) 32, and bus 34 (which includes “data, address, and control lines”). *Id.* at 3:48–4:32.

The parties do not dispute that Hansen discloses producing both time domain and frequency domain *displays* of a signal. An embodiment is described in Hansen as follows:

a digital storage oscilloscope . . . adapted to digitize an analog input signal $V(t)$, to store a compact data sequence representation of a selected frequency 45 band of the $V(n)$ signal, and subsequently *to produce time and frequency domain displays* of the band according to the stored data sequence.

Ex. 1015, 3:42–48 (emphasis added). Claim 1, however, does not recite producing time domain and frequency domain displays, nor does it recite performing merely any time domain analysis and frequency domain analysis. Claim 1 recites a “time domain *channel*” and “frequency domain *channel*” configured to perform such analyses, wherein both channels are “coupled to” an “acquisition system.” Ex. 1001, 10:55–59 (emphasis added).

The word “channel” does not appear in Hansen, but Petitioner nevertheless argues a person of ordinary skill would understand Hansen as disclosing channels. Pet. 14–18; *see supra*. We do not find sufficient or persuasive evidence supporting this assertion.

Referring to Figures 1 and 2, *see supra* at 21, 23, Hansen provides a lengthy disclosure of operations upon analog input signal $V(t)$ which ends with display of time domain information or frequency domain information. Ex. 1015, 3:41–6:37. First, referring to steps 42, 44, and 46 of Figure 2,

Hansen discloses that “low pass filter 12,” “preamplifier [14],” and “digitizer 16” process analog input signal $V(t)$ to produce “waveform data sequence $V(n)$ ” (i.e., frequency spectrum). Ex. 1015, 4:47–65. At step 48 of Figure 2, waveform data processing unit 18 “quadrature modulates input sequence $V(n)$ ” by performing calculations at “substeps” 50 and 52 to produce data sequences $a(n)$ and $b(n)$. *Id.* at 4:66–5:11. Next, at steps 54 and 56, waveform data processing unit 18 filters and decimates the sequences $a(n)$ and $b(n)$ to produce “elements of each sequence . . . represent[ing] the time dependent behavior of [each] passband.” *Id.* at 5:12–32. At step 58, these “element sequences $a(m)$ and $b(m)$ ” are stored in acquisition memory 20. *Id.* at 5:33–34.

After storage of $a(m)$ and $b(m)$ in acquisition memory 20 (step 58), Hansen next discloses how either time domain display or frequency domain display is accomplished. For time domain display, at steps 60 and 62 the waveform data processing unit 18 “interpolation filters” sequences $a(m)$ and $b(m)$ to produce output data sequences $a'(n)$ and $b'(n)$, and then at steps 64, 66, and 68, the waveform data processing unit 18 demodulates the sequences and performs calculations to produce output sequence $V'(n)$ having the frequency spectrum illustrated in Hansen Figure 3G. *Id.* at 5:34–50. At step 72, microprocessor 22 utilizes $V'(n)$ to “form a time domain display” which represents the “time dependent behavior of input signal components.” *Id.* at 5:57–62.

For frequency domain display, on the other hand, Hanson discloses (step 76):

microprocessor 22 performs a spectrum analysis of the selected frequency band [] using a discrete Fourier transform . . . to

convert the complex time domain waveform data sequences $a(m)$ and $b(m)$ [stored in acquisition memory] to a data sequence representing the frequency domain characteristics of the band of interest in input signal $V(t)$.

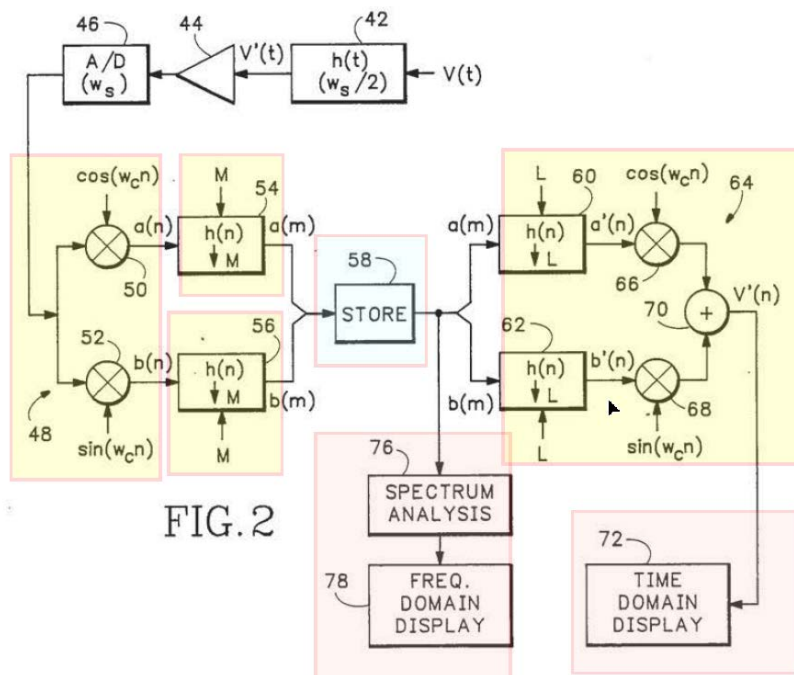
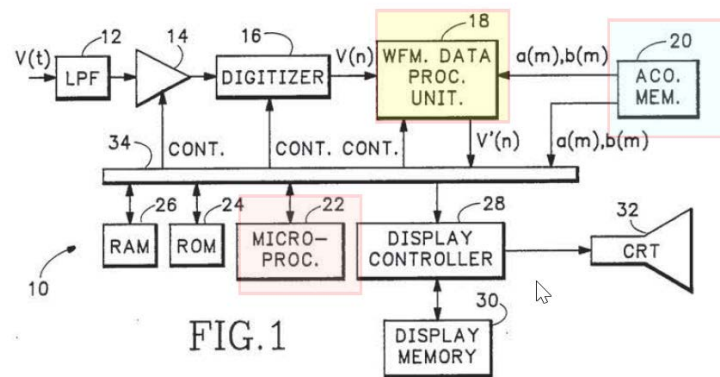
Id. at 6:17–24. Then at step 78, “microprocessor 22 [] converts this data sequence into display data transmitted to display controller 28, causing the display controller to produce a display on the screen of CRT 32.” *Id.* at 6:24–28.

Weighing the foregoing disclosures of Hansen along with the parties’ arguments and evidence (including the expert testimony presented by each party), we are not persuaded by a preponderance of the evidence that Hansen discloses a distinct time domain channel and frequency domain channel. As Patent Owner argues (PO Resp. 30), the same circuit elements in Hansen are mapped by Petitioner to the alleged “time domain channel” and “frequency domain channel” of claim 1, i.e., Petitioner has demonstrated that Hansen has (at most) one channel, not two different channels. Although Petitioner’s annotated Figure 2 of Hansen purports to show steps 60, 62, 64, 66, 68, and 70 as corresponding only to time domain processing, and thus constituting part of a distinct “time domain channel,” each of these steps represent processing by the waveform data processing unit, which (as illustrated and discussed further below) is the same element primarily constituting Petitioner’s alleged “frequency domain channel.”

Moreover, Petitioner identifies only one step in annotated Figure 2 that is part of the alleged “frequency domain channel” but not part of the “time domain channel”: step 76, “spectrum analysis.” Pet. 16–18; Ex. 1003 ¶¶ 61–62. Step 76, however, is performed by microprocessor 22, which also performs the time domain analysis represented by step 72. Ex. 1015,

5:58–60. Further, Petitioner’s annotations do not identify a distinct “acquisition system” coupled to the time domain channel and frequency domain channel, because both the acquisition memory 22 (described at step 58) and microprocessor 20 (described at steps 72 and 76) are part of the “channels” as alleged by Petitioner. Pet. 15–18; *see supra* (Petitioner’s annotations of Hansen Figure 2).

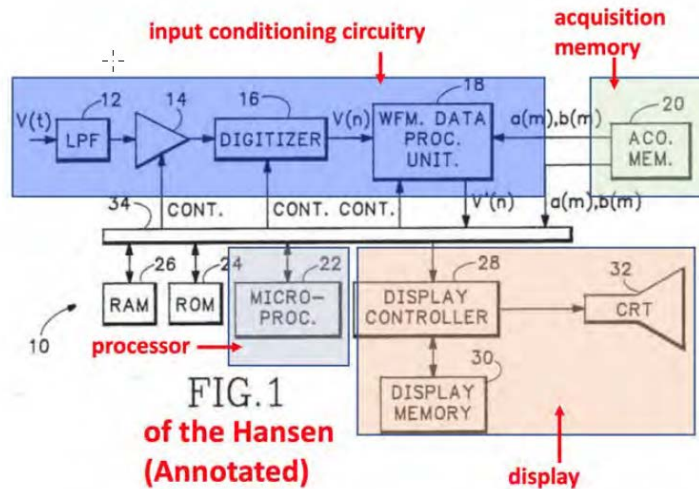
We illustrate (with annotations by the Board) some of the foregoing contradictions in Petitioner’s mapping of the claim elements, below:



The annotated illustrations show Hansen Figure 1, with “waveform data processing unit” 18 highlighted, and Hansen Figure 2, with matching highlighting corresponding to processing performed by the “waveform data processing unit.” *See supra*. Similarly, acquisition memory 20 and microprocessor 22 are highlighted in Hansen Figure 1, with matching highlighting in Hansen Figure 2 representing these elements. As seen in the annotated figures above, there is essentially complete overlap of circuit elements between Petitioner’s alleged “channels.”

Petitioner acknowledges that steps 42, 44, 46, 48, 50, 52, 54, 56, and 58 of Figure 2 are the same for both channels. *See, e.g.*, Pet. 15, 18. Petitioner, however, contends that steps 60, 62, 64, 58, and 70 are unique to the time domain channel. Pet. 15–16. These steps, however, are performed by the same waveform data processing unit 18 (Figure 1) alleged to be part of the frequency domain channel. Pet. 16–17. Similarly, Petitioner alleges step 76 to be unique to the frequency domain channel, but this step corresponds to microprocessor 22, which also performs the time domain processing at step 72. Ex. 1015, 5:58–60. Petitioner also alleges that steps 72 and 78 correspond to the “acquisition system” of claim 1 (Pet. 18), but again, these steps are performed, at least in part, by the microprocessor 20 alleged to be part of the recited “frequency domain channel.”

As Patent Owner argues, Hansen (in Figure 1) discloses one set of processing elements/operations that could be understood as a “channel” by one of ordinary skill. PO Resp. 33. Patent Owner’s annotated version of Hansen Figure 1 is reproduced below.



Patent Owner's annotated Figure 1 of Hansen is a block diagram of Hansen's circuit elements, with a "pathway" highlighted from input signal $V(t)$ through low pass filter 12, preamplifier 14, digitizer 16, and waveform processing unit 18. PO Resp. 32–33; Ex. 1015, 3:64–65; Ex. 2014 ¶ 232. Hansen discloses that the output of this group of elements is stored in acquisition memory 20, and microprocessor 22 selectively communicates with other circuit components via bus 34, to produce either a time domain or frequency domain waveform and display. PO Resp. 33–34; Ex. 2014 ¶¶ 232–34. As Patent Owner argues, however, we find that Figure 1 and the foregoing disclosures demonstrate, at most, one channel, not distinct "time domain" and "frequency domain" channels as recited in claim 1.

In summary, Petitioner has not persuaded us by a preponderance of the evidence that Hansen discloses a "time domain channel" and a "frequency domain channel," as recited in claim 1, or discloses such channels "coupled to" an acquisition system. We, therefore, are not persuaded by a preponderance of the evidence that claim 1 is anticipated by Hansen.

b. Claim 12

Independent claim 12, like claim 1, recites a “time domain channel configured to process a first input signal for analysis in the time domain,” and a “frequency domain channel configured to process a first input signal for analysis in the frequency domain.” Ex. 1001, 12:13–17. In lieu of being coupled to an “acquisition system” as in claim 1, claim 12 recites that the respective “channels” are coupled to a “controller.” *Id.* at 12:17–23.

Petitioner relies solely on its arguments for claim 1 regarding the “time domain channel” and “frequency domain channel.” Pet. 49. For the reasons discussed above, we are not persuaded by a preponderance of the evidence that Hansen discloses the “channel[s]” recited in claim 12. Accordingly, upon consideration of the parties’ arguments and evidence in the record, we find that Petitioner has not demonstrated by a preponderance of the evidence that the subject matter of claim 12 is anticipated by Hansen.

c. Dependent claims 3, 4, 5, 8, 10, 13, 14, and 15

Each of the remaining claims depends, directly or indirectly, from claim 1 or claim 12. Because we find that Petitioner has not demonstrated by a preponderance of the evidence that claim 1 and claim 12 are anticipated by Hansen, *see supra*, Petitioner also has not demonstrated that any of the dependent claims are anticipated by Hansen.

*C. Remaining Grounds and Claims
(Claims 2, 3, 6, 7, 9, 14, and 15)*

Claims 2, 3, 6, 7, 9, 14, and 15 all depend (directly or indirectly) from claim 1 or claim 12. Petitioner contends that each of these claims is unpatentable under § 103 based on Hansen alone (claim 2), or Hansen

combined with other references (claims 3, 6, 7, 9, 14, and 15). Pet. 3, 54–84. Pet. 54–83. For the limitations that are part of the dependent claims by virtue of appearing in base claim 1 or 12, Petitioner relies on its arguments regarding claims 1 and 12, and does not further address those limitations. Pet. 54–55, 60, 67, 77–78.

As discussed above, we are not persuaded by Petitioner’s arguments regarding the limitations recited in base claims 1 and 12. Accordingly, for the same reasons as discussed above, we find that Petitioner has not demonstrated that any of the claims depending from claim 1 or claim 12 are unpatentable, including claims 2, 3, 6, 7, 9, 14, and 15.

III.CONCLUSION

The table below summarizes our conclusions as to the challenged claims.

Reference(s)	Basis	Claims	Claims Proved Unpatentable	Claims Not Proved Unpatentable
Hansen	§ 102	1, 3–5, 8, 10, 12–15		1, 3–5, 8, 10, 12–15
Hansen and Pickerd	§ 103	2		2
Hansen and Witte	§ 103	6, 7, 9		6, 7, 9
Hansen	§ 103	3, 6, 7		3, 6, 7
Hansen and Nara	§ 103	14, 15		14, 15
Overall Outcome		1–10 and 12–15		1–10 and 12–15

IV. ORDER

In consideration of the foregoing, it is

ORDERED that Petitioner has not proved by a preponderance of the evidence that claims 1–10 and 12–15 of the '719 patent are unpatentable;

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

IPR2018-00647
Patent 8,675,719 B2

For PETITIONER:

Walter Renner
Roberto DeVoto
Christopher Marchese
FISH & RICHARDSON P.C.
axf-ptab@fr.com
devoto@fr.com
marchese@fr.com

For PATENT OWNER:

Michael Oblon
Matthew Johnson
Douglas Pearson
JONES DAY
moblon@jonesday.com
mwjohnson@jonesday.com
dhpearson@jonesday.com