

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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MOHAWK ENERGY LTD.,  
Petitioner,

v.

ENVENTURE GLOBAL TECHNOLOGY INC.,  
Patent Owner.

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Case IPR2016-00954  
Patent 6,695,012 B1

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Before MEREDITH C. PETRAVICK, HYUN J. JUNG, and NEIL T.  
POWELL, *Administrative Patent Judges*.

POWELL, *Administrative Patent Judge*.

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

## I. INTRODUCTION

### A. Background

Mohawk Energy Ltd. (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1, 3, 7–12, 17–19, 21–23, 25, 31–37, 42–44, 46–48, 50, 52, 53, 56, 82–87, 92–94, 96–98, 100, 102, 103, 106–109, 112–114, 116, 117, 119, 120, and 123 of U.S. Patent No. 6,695,012 B1 (Ex. 1001, “the ’012 patent”). Paper 2 (“Pet.”). Patent Owner, Enventure Global Technology Inc., filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). On October 27, 2016, we instituted *inter partes* review with an Institution Decision. Paper 7 (“Inst. Dec.”). Subsequently, Patent Owner filed a Patent Owner Response (Paper 11, “PO Resp.”), and Petitioner filed a Reply (Paper 15, “Reply”). On June 22, 2017, an oral hearing was conducted, and a copy of the transcript was entered into the record. Paper 21 (“Tr.”).

We have jurisdiction over these proceedings under 35 U.S.C. § 6. After considering the evidence and arguments of the parties, we determine that Petitioner has demonstrated by a preponderance of the evidence unpatentability of claims 1, 3, 7–12, 17–19, 21–23, 25, 31–37, 42–44, 46–48, 50, 52, 53, 56, 82–87, 92–94, 96–98, 100, 102, 103, 106–109, 112–114, 116, 117, 119, 120, and 123. *See* 35 U.S.C. § 316(e). We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a).

### B. Related Matters

The ’012 patent has been asserted in *Enventure Global Technology Inc. v. Mohawk Energy, Ltd.*, Case No. 15-1053 (S.D. Texas). Paper 4, 2.

### C. References

The grounds of unpatentability asserted by Petitioner rely on the following references:

U.S. Patent No. 3,179,168, issued April 20, 1965 (“Vincent,” Ex. 1002).

U.S. Patent No. 3,785,193, issued January 15, 1974 (“Kinley,” Ex. 1003).

U.S. Patent No. 6,029,748, issued February 29, 2000 (“Forsyth,” Ex. 1004).

CRC Handbook of Lubrication Volume 2 (E. Richard Booser ed., 1983)  
 (“CRC Volume 2,” Ex. 1005).

CRC Handbook of Lubrication and Tribology Volume 3 (E. Richard Booser  
 ed., 1994) (“CRC Volume 3,” Ex. 1006).

Tribology Data Handbook (E. Richard Booser, ed., 1997) (“Tribology  
 Handbook,” Ex. 1007).

*D. The Pending Grounds of Unpatentability*

The pending grounds in this *inter partes* review are (Inst. Dec. 28–  
30):

| Ground | Reference(s) | Statutory Basis       | Challenged Claims                                                                                                                                                                             |
|--------|--------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I      | Vincent      | 35 U.S.C.<br>§ 102(b) | 1, 3, 7–12, 17, 19, 21–23,<br>25, 31–37, 42, 44, 46–48,<br>50, 52, 53, 56, 82–87, 92,<br>94, 97, 98, 100, 102, 103,<br>106, 107–109, 112, 114,<br>116, 117, 119, 120, and<br>123 <sup>1</sup> |

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<sup>1</sup> Pet. 13–15, 23–31, 37–38, 40–46.

| Ground | Reference(s)                                                   | Statutory Basis    | Challenged Claims                                 |
|--------|----------------------------------------------------------------|--------------------|---------------------------------------------------|
| II     | Vincent with CRC Volume 2 and/or CRC Volume 3 <sup>2</sup>     | 35 U.S.C. § 103(a) | 10–12, 35–37, and 85–87 <sup>3</sup>              |
| III    | Vincent with CRC Volume 2, CRC Volume 3, or Tribology Handbook | 35 U.S.C. § 103(a) | 17, 19, 42, 44, 92, 94, 112, and 114 <sup>4</sup> |
| IV     | Vincent with CRC Volume 2                                      | 35 U.S.C. § 103(a) | 18, 43, 93, and 113 <sup>5</sup>                  |
| V      | Vincent with CRC Volume 2 or CRC Volume 3                      | 35 U.S.C. § 103(a) | 18, 43, 93, and 113 <sup>6</sup>                  |
| VI     | Vincent with CRC Volume 2 or CRC Volume 3                      | 35 U.S.C. § 103(a) | 21, 46, 96, and 116 <sup>7</sup>                  |

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<sup>2</sup> In the discussion of Ground II, Petitioner states that “[o]ne of ordinary skill in the art would be motivated to combine any of the Secondary References with” Vincent. Pet. 28. In addition to CRC Volume 2 and CRC Volume 3, the Petition generally discusses other “Secondary References.” Because Ground II provides citations to CRC Volume 2 and CRC Volume 3 (*id.*) but no citations to other “Secondary References,” we understand Ground II as not relying on any “Secondary References” other than CRC Volume 2 and CRC Volume 3, notwithstanding the reference to “any of the Secondary References.” Likewise, we understand each of the other obviousness grounds raised by Petitioner as relying only on those “Secondary References” for which the Petition provides a citation.

<sup>3</sup> Pet. 28–29.

<sup>4</sup> Pet. 29–34.

<sup>5</sup> Pet. 35–36.

<sup>6</sup> Pet. 36–37.

<sup>7</sup> Pet. 38–39.

| <b>Ground</b> | <b>Reference(s)</b>                             | <b>Statutory Basis</b> | <b>Challenged Claims</b>                     |
|---------------|-------------------------------------------------|------------------------|----------------------------------------------|
| VII           | Vincent with CRC Volume 2                       | 35 U.S.C. § 103(a)     | 23, 48, and 98 <sup>8</sup>                  |
| VIII          | Vincent with CRC Volume 2 or Tribology Handbook | 35 U.S.C. § 103(a)     | 25, 50, 100, and 117 <sup>9</sup>            |
| IX            | Vincent                                         | 35 U.S.C. § 103(a)     | 52, 53, 102, 103, 119, and 120 <sup>10</sup> |
| X             | Vincent with CRC Volume 2 or Tribology Handbook | 35 U.S.C. § 103(a)     | 52, 53, 102, 103, 119, and 120 <sup>11</sup> |
| XI            | Vincent with CRC Volume 2 or Tribology Handbook | 35 U.S.C. § 103(a)     | 31, 56, 106, and 123 <sup>12</sup>           |

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<sup>8</sup> Pet. 40–41.

<sup>9</sup> Pet. 42–43.

<sup>10</sup> Pet. 44 (stating that “it would be obvious to one of ordinary skill in the art reviewing Vincent to try 90% wax and 10% solid lubricant by volume and by weight”).

<sup>11</sup> Pet. 44.

<sup>12</sup> Pet. 46–49.

| Ground | Reference(s)                                                   | Statutory Basis                  | Challenged Claims                                                                     |
|--------|----------------------------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------|
| XII    | Forsyth                                                        | 35 U.S.C. § 102(a) <sup>13</sup> | 1, 3, 7–12, 17, 19, 32–37, 42, 44, 82–87, 92, 94, 107–109, 112, and 114 <sup>14</sup> |
| XIII   | Forsyth with CRC Volume 2 and/or CRC Volume 3                  | 35 U.S.C. § 103(a)               | 10–12, 35–37, and 85–87 <sup>15</sup>                                                 |
| XIV    | Forsyth with CRC Volume 2, CRC Volume 3, or Tribology Handbook | 35 U.S.C. § 103(a)               | 17, 19, 42, 44, 92, 94, 112, and 114 <sup>16</sup>                                    |
| XV     | Forsyth with CRC Volume 2 or CRC Volume 3                      | 35 U.S.C. § 103(a)               | 18, 43, 93, and 113 <sup>17</sup>                                                     |
| XVI    | Forsyth with CRC Volume 2 or CRC Volume 3                      | 35 U.S.C. § 103(a)               | 21, 46, 96, and 116 <sup>18</sup>                                                     |

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<sup>13</sup> In its Preliminary Response, Patent Owner argued that Petitioner identifies no statutory basis for an anticipation challenge other than 35 U.S.C. § 102(b). Prelim. Resp. 23. Patent Owner also states that Forsyth is not prior art under § 102(b) because Forsyth “issued on February 29, 2000, [such that] it was not patented or described in a printed publication more than one year prior to the filing date of the [’012 patent] (October 5, 2000).” *Id.* at 26. Given the February 29, 2000 issue date of Forsyth and the October 5, 2000 filing date of the ’012 patent, we understand Petitioner’s assertion of anticipation by Forsyth to fall under 35 U.S.C. § 102(a).

<sup>14</sup> Pet. 15–16, 23–29, 32.

<sup>15</sup> Pet. 28–29.

<sup>16</sup> Pet. 29–34.

<sup>17</sup> Pet. 36–37.

<sup>18</sup> Pet. 38–39.

| <b>Ground</b> | <b>Reference(s)</b>                                           | <b>Statutory Basis</b> | <b>Challenged Claims</b>                                                                           |
|---------------|---------------------------------------------------------------|------------------------|----------------------------------------------------------------------------------------------------|
| XVII          | Forsyth with CRC Volume 2                                     | 35 U.S.C. § 103(a)     | 23, 48, and 98 <sup>19</sup>                                                                       |
| XVIII         | Forsyth with CRC Volume 2 or Tribology Handbook               | 35 U.S.C. § 103(a)     | 25, 50, 100, and 117 <sup>20</sup>                                                                 |
| XIX           | Forsyth with CRC Volume 2 or Tribology Handbook               | 35 U.S.C. § 103(a)     | 31, 56, 106, and 123 <sup>21</sup>                                                                 |
| XX            | Kinley                                                        | 35 U.S.C. § 102(b)     | 1, 3, 7–12, 17–19, 21, 32–37, 42–44, 46, 82–87, 92–94, 96, 107–109, 112–114, and 116 <sup>22</sup> |
| XXI           | Kinley with CRC Volume 2 and/or CRC Volume 3                  | 35 U.S.C. § 103(a)     | 10–12, 35–37, and 85–87 <sup>23</sup>                                                              |
| XXII          | Kinley with CRC Volume 2, CRC Volume 3, or Tribology Handbook | 35 U.S.C. § 103(a)     | 17, 19, 42, 44, 92, 94, 112, and 114 <sup>24</sup>                                                 |
| XXIII         | Kinley with CRC Volume 2 or CRC Volume 3                      | 35 U.S.C. § 103(a)     | 18, 43, 93, and 113 <sup>25</sup>                                                                  |

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<sup>19</sup> Pet. 40–41.

<sup>20</sup> Pet. 42–43.

<sup>21</sup> Pet. 46–49.

<sup>22</sup> Pet. 16–17, 23–29, 32–35, 38.

<sup>23</sup> Pet. 28–29.

<sup>24</sup> Pet. 29–34.

<sup>25</sup> Pet. 36–37.

| Ground | Reference(s)                                            | Statutory Basis       | Challenged Claims                  |
|--------|---------------------------------------------------------|-----------------------|------------------------------------|
| XXIV   | Kinley with CRC<br>Volume 2 or CRC<br>Volume 3          | 35 U.S.C.<br>§ 103(a) | 21, 46, 96, and 116 <sup>26</sup>  |
| XXV    | Kinley with CRC<br>Volume 2                             | 35 U.S.C.<br>§ 103(a) | 23, 48, and 98 <sup>27</sup>       |
| XXVI   | Kinley with CRC<br>Volume 2 or<br>Tribology<br>Handbook | 35 U.S.C.<br>§ 103(a) | 25, 50, 100, and 117 <sup>28</sup> |
| XXVII  | Kinley with CRC<br>Volume 2 or<br>Tribology<br>Handbook | 35 U.S.C.<br>§ 103(a) | 31, 56, 106, and 123 <sup>29</sup> |

Petitioner also relies on a declaration from Ike Tripp. Ex. 1009.  
Patent Owner relies on a declaration from Robert Schaaf (Ex. 2001), as well as two declarations from Paul D. Seemuth, Ph.D. (Exs. 2002, 2006).

*E. The '012 Patent*

The '012 patent discloses a “method and apparatus for coupling tubular members to a preexisting structure.” Ex. 1001, 3:16–17. The '012 patent discloses that one embodiment of its method involves:

(1) providing one or more tubular members . . . ; (2) applying a lubricant coating to the interior walls of the tubular members . . . ; (3) coupling the first and second tubular members . . . ; and (4) radially expanding the tubular members in contact with the preexisting structure.

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<sup>26</sup> Pet. 38–39.

<sup>27</sup> Pet. 40–41.

<sup>28</sup> Pet. 42–43.

<sup>29</sup> Pet. 46–49.

*Id.* at 3:26–30.

The '012 patent shows a stage of this process in Figure 3, reproduced below. *Id.* at 5:5–9.

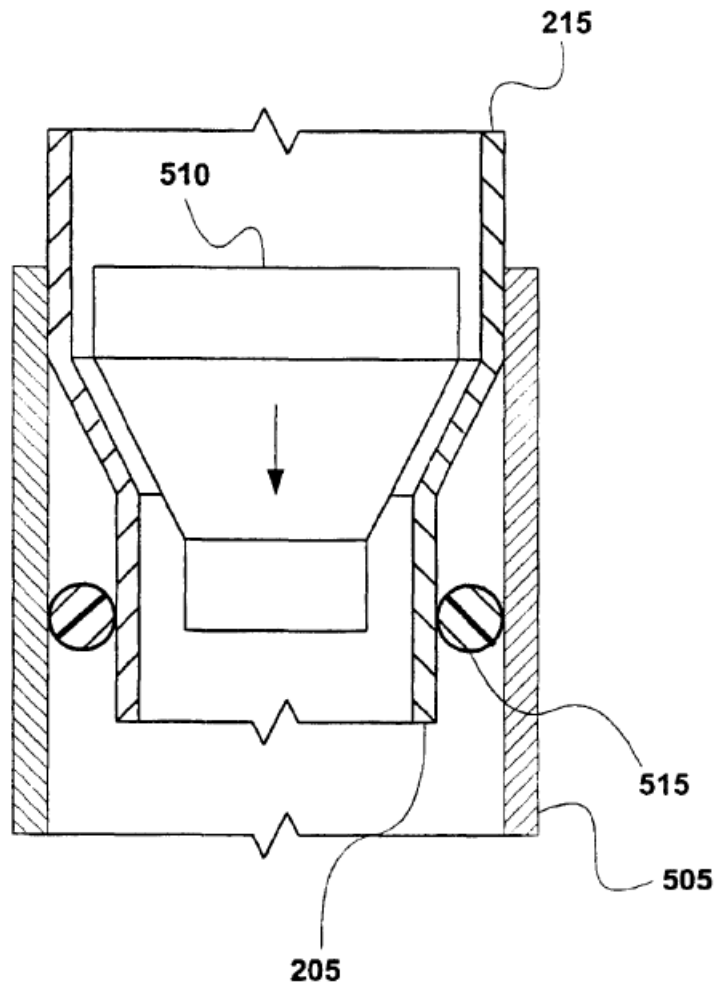


**FIGURE 3**

Figure 3 shows tubular members 205 and 215 positioned inside preexisting structure 505. *Id.* at 5:5–7. After they are in preexisting structure 505, tubular members 205 and 215 are radially expanded into contact with inside surfaces of preexisting structure 505. *Id.* at 5:5–9.

*F. Illustrative Claim*

Claims 1, 3, 7–12, 17–19, 21, 22, 25, 31, 82–87, 92–94, 96, 97, 100, 102, and 106 are independent. Each of the other challenged claims depends from one of claims 1, 3, 7–12, 17–19, 21, 22, 25, 31, 82–87, 92–94, 96, 97, 100, 102, and 106. Claim 1 is illustrative and recites:

1. A method of coupling an expandable tubular assembly including one or more tubular members to a preexisting structure, comprising:  
coating the interior surfaces of the tubular members with a lubricant;  
positioning the tubular members within a preexisting structure; and  
radially expanding the tubular members into contact with the preexisting structure.

Ex. 1001, 13:59–67.

## II. ANALYSIS

*A. Motion to Exclude/Weight of Mr. Tripp’s Testimony*

Patent Owner filed a Motion to Exclude Evidence. Paper 17 (“Motion” or “Mot.”). Petitioner filed an Opposition to Patent Owner’s Motion to Exclude Evidence. Paper 16 (“Opposition” or “Opp.”).

Patent Owner’s Motion argues that we should exclude paragraphs 45, 82, 84, 87, 88, 89, 91, 94, 97, and 109 of Mr. Tripp’s testimony, under Federal Rules of Evidence 702, because “each of these paragraphs includes a conclusion of obviousness that was made without a working understanding

of the term ‘obvious’ as it relates to patent law.” Mot. 3–8. In support of this contention, Patent Owner points to the following portions of Mr. Tripp’s deposition testimony:

Q: Do you understand what “anticipation” means in the context of how you use it in your declaration, Exhibit 1009?

A: No. I do not understand that term, sir.

Q: What about “obvious” or “obviousness?” Do you have an understanding of how that term is used in connection with your declaration, Exhibit 1009?

A: I understand that, you know, “obviousness” is based on a person that’s skilled in the art at the time can make observations and proceed from those observations.

Ex. 2005, p. 53, ll. 10-21.

Q: Do you understand that in connection with an “obvious” analysis under U.S. patent law that one of the things you have to do is provide a motivation to combine one or more or two or more references to reach this obviousness conclusion. Do you understand that?

A: I’m not familiar with that.

Q: Nobody has explained that to you?

A: No. There’s what, two, -- no.

Ex. 2005, p. 71, ll. 7-15.

Mot. 3–4.

Additionally, in its Response, Patent Owner argues that Mr. Tripp’s testimony should be excluded or given little or no weight. PO Resp. 7–13. Petitioner disputes these contentions in its Reply. Reply 6–8. Patent Owner’s Response cites the same testimony for the assertion that Mr. Tripp has an inadequate understanding of the legal framework for obviousness. PO Resp. 10–11. Patent Owner’s Response further argues that Mr. Tripp’s

testimony on the ultimate issue of anticipation should be given little or no weight because he has no understanding of the legal framework for anticipation. *Id.* at 13.

Patent Owner's Response also argues that Mr. Tripp's testimony should be given little or no weight because he does not have enough pertinent education and industry experience. *Id.* at 8–10. Specifically, Patent Owner argues that Mr. Tripp's education and experience do not match those ascribed to a person of ordinary skill in the art in Mr. Tripp's testimony that:

It is my opinion that anyone could working a tubular, such as expanding tubing, before 1999 would understand that the application of lubrication when expanding tubing is a good idea. A POSITA in the technology field of lubricant coatings for expandable tubulars at before 1999 would have needed no more than a Bachelor of Science Degree in Mechanical Engineering or Metallurgy and/or related post-graduate or industry work experience specifically related to expandable tubulars. Individuals would have at least 5 years of industry experience working with expandable tubulars. Individuals with additional education or additional industrial experience could still be of ordinary skill in the art if that additional aspect compensates for a deficit in one of the other aspects of the requirements stated above. For instance, individuals without the education background could compensate for this by having at least 10 years of industry experience working with lubrication as it relates to the manufacture and drawing of seamless and welded tubular products.

Ex. 1009 ¶ 6; PO Resp. 8–10. Patent Owner argues that Mr. Tripp has neither the education nor experience recited in Mr. Tripp's testimony about the level of ordinary level skill in the art. PO Resp. 8–10.

Petitioner's Opposition disputes that Mr. Tripp has an inadequate understanding of the legal framework for obviousness. Opp. 1–2. Petitioner

indicates that Mr. Tripp correctly testified that “‘obviousness’ is based on a person that’s skilled in the art at the time can make observations and proceed from those observations.” Ex. 2005, 53:18–21; Opp. 1. Additionally, Petitioner asserts that the question in which Mr. Tripp was asked if he knew that “one of the things you have to do is provide a motivation to combine one or more or two or more references to reach [an] obviousness conclusion” misstates the law of obviousness. Opp. 2 (citing *KSR Intern. Co. v. Teleflex Inc.*, 550 U.S. 398, 418–420 (2007)). Accordingly, his negative response does not indicate a misunderstanding of the law, Petitioner asserts. *Id.* at 2.

Petitioner further argues that we should not exclude Mr. Tripp’s testimony but give it appropriate weight, asserting that he is a technical expert providing evidence based on his technical expertise. Opp. 3–4. Regarding Mr. Tripp’s education and experience, Petitioner emphasizes that Mr. Tripp has over 40 years of experience with lubricants, including education and experience related to oil and gas industry downhole operation. Reply 7. Petitioner also asserts that we do not need to rely on Mr. Tripp’s testimony on the ultimate issues of anticipation and obviousness. *Id.* at 8.

Patent Owner does not persuade us that we should exclude paragraphs 45, 82, 84, 87, 88, 89, 91, 94, 97, and 109 of Mr. Tripp’s declaration. See 37 C.F.R. § 42.20(c). For substantially the reasons explained by Petitioner, we do not agree with Patent Owner’s assertion that Mr. Tripp’s deposition testimony demonstrates that he “has no understanding of the meaning of ‘obviousness’ or ‘motivation to combine.’” Mot. 3; Opp. 1–2. Additionally, even if we were convinced that Mr. Tripp did not adequately understand the legal test for obviousness, the paragraphs Patent Owner asks us to exclude

contain testimony other than the ultimate conclusion of obviousness. For example, paragraph 45 includes significant discussion of the nature and teachings of the asserted prior art references. Ex. 1009 ¶ 45. We determine that such testimony is helpful to our analysis, regardless of whether Mr. Tripp’s ultimate conclusion of obviousness is based on an adequate understanding of the legal framework for an obviousness determination.

Additionally, we are persuaded that Mr. Tripp has significant experience with technologies related to the subject matter of the ’012 patent. For example, the record reflects that Mr. Tripp has decades of experience with lubricants, and a considerable amount of that experience involving using lubricants with oil and gas downhole operations and expanding tubulars. *See, e.g.*, Reply 7: Ex. 2005, 7:18–8:23, 25:8–16, 31:21–32:5. Given that the “Abstract” of the ’012 patent begins with “[a] lubricant coating (240) for expandable tubulars (215),” Mr. Tripp’s experience appears closely related to the technology at hand. *See, e.g.*, 37 C.F.R. § 1.72 (“The purpose of the abstract is to enable the Office and the public generally to determine quickly from a cursory inspection the nature and gist of the technical disclosure.”); M.P.E.P § 608.01(b) (“The content of a patent abstract should be such as to enable the reader thereof, regardless of his or her degree of familiarity with patent documents, to determine quickly from a cursory inspection of the abstract nature and gist of the technical disclosure and that which is new in the art to which the invention pertains.”). To the extent Mr. Tripp’s experience does not exactly match the two examples he provides of a person of ordinary skill in the art, we note those are examples only. Indeed, he states “[i]ndividuals with additional education or additional industrial experience could still be of ordinary skill in the art if that

additional aspect compensates for a deficit in one of the other aspects of the requirements stated above,” after which he provides only one example of how additional education or industrial experience could make one a person of ordinary skill in the art. Ex. 1009 ¶ 6.

For the foregoing reasons, Patent Owner’s Motion to Exclude paragraphs 45, 82, 84, 87, 88, 89, 91, 94, 97, and 109 of Mr. Tripp’s testimony is denied. In our analysis, we have, however, exercised care to give only the appropriate weight to each aspect of Mr. Tripp’s testimony, taking into account the specific concerns expressed by Patent Owner.

#### *B. Claim Construction*

We interpret claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation approach). We presume a claim term carries its “ordinary and customary meaning,” which is “the meaning that the term would have to a person of ordinary skill in the art in question” at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) (citation and quotations omitted). This presumption, however, is rebutted when the patentee acts as his own lexicographer by giving the term a particular meaning in the specification with “reasonable clarity, deliberateness, and precision.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). For purposes of this decision, we address only certain aspects of the claims’ meaning, as necessary to resolve whether Petitioner has shown unpatentability by a preponderance of the evidence. See 35 U.S.C. § 314(a); *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir.

1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”).

*1. Wherein Clauses*

Numerous of the challenged claims contain clauses that the parties refer to as “wherein clauses.” For example, claim 10 recites “wherein the coating of lubricant is mechanically bonded to the interior surfaces of the tubular members.” Petitioner asserts that all of the wherein clauses in the challenged claims only state intended results of the limitations recited elsewhere in the claims. Pet. 17–18. Given this, Petitioner asserts that none of the wherein clauses in the challenged claims is entitled to patentable weight. *Id.* (citing *Hoffer v. Microsoft Corp.*, 405 F.3d 1326, 1330 (Fed. Cir. 2005)).

Patent Owner argues that Petitioner’s assertion is legally incorrect. PO Resp. 6–7. Patent Owner contends that *Hoffer* is inapposite because *Hoffer* involved the language “whereby” exclusively within method claims, in contrast to the challenged claims’ recitation of “wherein,” often within apparatus claims. *Id.* at 6. Patent Owner also notes that *Hoffer* states that “when the ‘whereby’ clause states a condition that is material to patentability, it cannot be ignored in order to change the substance of the invention.” *Id.* (citing *Hoffer* 405 F.3d at 1330). Patent Owner contends that none of the wherein clauses of the challenged claims recites an intended result. *Id.* at 7. Instead, Patent Owner argues the wherein clauses limit things like the type of tubular members and the properties of the lubricant or binder. *Id.* at 6–7.

Patent Owner has the better position with respect to the patentable weight of the wherein clauses in the challenged claims. We recognize that

the word “whereby” tends to introduce a result. On the other hand, however, we understand “wherein” as tending to signal a further limitation. Petitioner does not present evidence or explanation otherwise persuading us that the wherein clauses of the challenged claims merely recite an intended result. Consequently, we accord all of the wherein clauses of the challenged claims patentable weight.

## *2. Number of Tubular Members*

Petitioner argues that each of claims 1, 3, 7–9, 11, 21, 31–34, 36, 46, 52, 53, 56, 82–84, 86, 96, 102, 103, 106–109, 116, 119, 120, and 123 requires “one or more tubular members.” Reply 2–3. Patent Owner argues that each of these claims requires multiple tubular members. PO Resp. 35.

Petitioner argues that the disputed claims introduce “the tubular members” as “one or more tubular members.” Reply 2; *see* Ex. 1001, 13:59–67. Thus, Petitioner contends that the broadest reasonable interpretation of the claims is that “the tubular members” refers to the antecedent “one or more tubular members,” such that the claims require only one or more tubular members. Petitioner asserts that the prosecution history of the ’012 patent reinforces this claim construction. Reply 3. Petitioner notes that the Examiner advised that the language of claim 1 should be changed from “one or more tubular members” to “two or more” (Ex. 1016, 3), but the claims nonetheless issued with the language “one or more tubular members.” *Id.*

Patent Owner argues that each embodiment disclosed in the Specification of the ’012 patent includes multiple tubular members. PO Resp. 35. Specifically, Patent Owner argues that “[e]ach of the embodiments described in the ’012 patent discusses coupling first and

second tubular members together prior to expansion.” *Id.* (citing Ex. 1001, 3:23–31; 3:67–4:2; 5:48–58; Figs. 1, 4). Therefore, Patent Owner contends, claims 1, 3, 7–9, 11, 21, 31–34, 36, 46, 52, 53, 56, 82–84, 86, 96, 102, 103, 106–109, 116, 119, 120, and 123 require multiple tubular members. Petitioner responds that Patent Owner improperly attempts to import limitations from the Specification into the claims. Reply 2.

We find Petitioner’s arguments more persuasive than Patent Owner’s. We look first to the language of the claims. We agree with Petitioner that each claim’s recitation of “the tubular members” relies on the introduction of “one or more tubular members” as an antecedent. This conveys that the claims require one or more tubular members, not necessarily multiple tubular members. We also note that, although Patent Owner says much about coupling multiple tubular members to one another, the plain language of the claims says nothing about doing so.<sup>30</sup> *See, e.g.*, Ex. 1001, 13:59–67. Thus, the language of the claims supports Petitioner’s position.

We find unpersuasive Patent Owner’s argument that the Specification discloses only embodiments that have multiple tubular members. PO Resp. 35. The mere fact that the examples provided in the Specification have multiple tubular members simply does not compel a determination that the claims require multiple tubular members. Indeed, the first paragraph of the “Summary of the Invention” suggests otherwise, stating that:

According to one aspect of the present invention, an expandable tubular assembly is provided that includes *one or more* tubular

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<sup>30</sup> The claims refer to coupling a tubular assembly (which includes one or more tubular members) to a preexisting structure, but they do not say anything about coupling multiple tubular members together.

members and a layer of a lubricant coupled to the interior surfaces of the tubular members.

Ex. 1001, 2:2–5 (emphasis added).

Furthermore, we are persuaded that the prosecution history cited by Petitioner supports a conclusion that the correct interpretation of the claims requires only one or more tubular members. See Reply 3 (citing Ex. 1016, 3); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1317 (Fed. Cir. 2005) (Noting “prosecution history provides evidence of how the PTO and the inventor understood the patent.”). The Examiner’s advice in the Office Action to change the claim from “one or more tubular members” to “two or more” would have alerted the applicants that the Examiner was reading the claims as requiring only one or more tubular members. With this knowledge, it appears that the applicants elected to leave the language “one or more tubular members” in the claims, tending to show an intent for the claims to encompass a single tubular member. For all of the foregoing reasons, we conclude that the broadest reasonable interpretation of claims 1, 3, 7–9, 11, 21, 31–34, 36, 46, 52, 53, 56, 82–84, 86, 96, 102, 103, 106–109, 116, 119, 120, and 123 requires only “one or more tubular members,” not multiple tubular members.

### *3. Shape of One or More Tubular Members; Radially Expanding*

Claims 1 and 3 recite “one or more tubular members” and “radially expanding the tubular members.” Patent Owner never clearly advances any claim construction for the shape of the one or more tubular members or the meaning of radially expanding. In summarizing the ’012 patent, Patent Owner states that:

Because the tubular members of the ’012 patent are coupled together, they must have a circular cross-section to enable the

engagement of threads. *See* Ex. 1001 at 3:32-40 and FIG.2; *see also* Ex. 2001 at ¶ 28. Because the system of the '012 patent has a circular cross-section before and after expansion, it *radially expands* a circular tubular member to a larger diameter, as opposed to the reforming a deformed liner as shown in Vincent and Kinley. Ex. 2001 at ¶ 41.

PO Resp. 3–4. To the extent these statements imply that (1) the one or more tubular members must start with a circular cross-section and (2) radially expanding requires expanding them from that circular cross-section to another circular cross-section, we are not persuaded that the broadest reasonable interpretation of the claims is so narrow. Patent Owner's assertion that a circular cross-section is necessary rests on the assumption that the claims require multiple tubular members connected to one another via threads. For the reasons explained in Section II.B.2 above, we are unpersuaded that the claims require such a connection of multiple tubular members to one another.

And Patent Owner provides no other basis that would logically support a conclusion that the claims require expanding from one circular shape to another circular shape. Although we agree with Patent Owner's observation that expanding from one circular shape to another circular shape constitutes one example of radially expanding, it does not follow that this is the only example of radially expanding. *See* PO Resp. 4. We also find unpersuasive Patent Owner's contention that expanding from one circular shape to another requires higher-performance lubricant than other applications. *See id.* To the extent this assertion is accurate, Patent Owner does not explain its significance. Patent Owner does not provide evidence that claims 1 and 3 require such a higher-performance lubricant. And even if the claims did require such a higher performance lubricant, Patent Owner

does not provide evidence or reasoning persuading us that this would also require expanding from one circular shape to another. After all, a higher-performance lubricant would seemingly provide benefit regardless of the shape of tubular member expanded. Furthermore, Petitioner presents reasoning and evidence persuading us that the broadest reasonable interpretation of the claims is not as narrow as Patent Owner suggests. Reply 4–6; Ex. 1001, 3:18–20, 5:7–9; Ex. 1002, 8:56–62; Ex. 1003, 5:54–56, 7:68–8:1; Ex. 1004, 1:52–56, 3:44. For the foregoing reasons, to the extent Patent Owner suggests that claims 1 and 3 require expanding a tubular member from one circular shape to another, Patent Owner attempts to improperly import limitations from the Specification into the claims. See *SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004).

#### 4. *Binder and Carrier Solvent*

Certain claims, such as claim 22, recite the term “binder.” Certain other claims, such as claim 25, recite the term “carrier solvent.” The parties’ arguments raise certain issues regarding the meaning of the claim terms “binder” and “carrier solvent,” as well as the relationship between these terms. Patent Owner asserts that “the broadest reasonable meaning of a ‘binder’ is a material that holds something in place.” PO Resp. 30. Petitioner contends that the “broadest reasonable interpretation of ‘binder’ is a ‘material that promotes cohesion.’” Reply 15 (citing Ex. 2003, 2). In his deposition, Mr. Tripp described binder as “the material in which you use it to disperse your lubricant additives,” elaborating that “[i]t’s a carrier for the lubricant.” Ex. 2005, 117:20–118:3. When asked about a “binder” and a

“solvent,” Mr. Tripp testified that “I’m using the terms interchangeably.” *Id.* at 120:9–25.

Patent Owner does not proffer a particular meaning for “carrier solvent.” *See, e.g.*, PO Resp. 31–34. Patent Owner asserts that “carrier solvent” and “binder” “are two distinct materials.” PO Resp. 32. Petitioner notes that in the related district court proceeding, the parties stipulated that “carrier solvent” means “liquid that carries a substance.” Reply 16 (citing Ex. 2003, 2). Petitioner asserts that “Patent Owner claims that if something is a carrier solvent it can never be a binder and vice versa.” *Id.* Petitioner argues that nothing in the record supports such an interpretation of “carrier solvent” and “binder.” *Id.*

To the extent Patent Owner suggests that the terms “carrier solvent” and “binder” are mutually exclusive, we are not persuaded. We note, for example, that the stipulated constructions from the district court proceeding do not suggest that the terms have mutually exclusive meanings. In the district court proceeding, the stipulated construction for “carrier solvent” is “liquid that carries a substance,” and the stipulated construction for “binder” is “a material that promotes cohesion.” Ex. 2003, 2. These constructions do not appear to define mutually exclusive materials, as Patent Owner does not cite evidence persuading us that a given material could not be a liquid that carries a substance and also a material that promotes cohesion and vice versa.<sup>31</sup> Patent Owner cites a passage of the ’012 patent discussing solid

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<sup>31</sup> We recognize that the broadest reasonable interpretation standard is not applied in the district court proceeding. Nonetheless, Patent Owner has not provided evidence or explanation persuading us that the broadest reasonable

lubricants applied “as suspensions of fine particles in a carrier solvent without the presence/use of a chemical binder.” Ex. 1001, 8:4–6; PO Resp. 32. This passage indicates that a carrier solvent does not necessarily constitute a binder, but it does not persuade us that a binder cannot be a carrier solvent, or vice versa.

At the same time, this passage of the ’012 patent does persuade us that, contrary to Mr. Tripp’s testimony, “carrier solvent” and “binder” do not have interchangeable meanings. Petitioner suggests that the passage only distinguishes a “chemical binder,” as opposed to a “binder” generally, from a carrier solvent. Reply 16. We do not agree with this suggestion. Instead, we find that the passage in question demonstrates that “carrier solvent” and “binder” have different meanings.

Furthermore, we do not agree with Mr. Tripp’s understanding that “binder” simply means “a carrier for the lubricant.” *See* Ex. 2005, 117:20–118:3. As Patent Owner notes, the ’012 patent notes that a binder functions to “help hold or fix the solid lubricant to the expandable tubular member.” Ex. 1001, 7:55–57; PO Resp. 30. This indicates that the term “binder” does more than simply act as a “carrier for the lubricant.” And Mr. Tripp cites no evidence to support his belief that “binder” means any “carrier for the lubricant.” *See* Ex. 2005, 117:20–118:3.

We conclude that “carrier solvent” and “binder” have different but not necessarily mutually exclusive meanings. Additionally, the parties do not present evidence or reasoning persuading us that the broadest reasonable

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interpretation of the terms differs from the stipulated interpretation in the district court proceeding.

interpretations of the terms would differ from the stipulated constructions in the district court proceeding. Accordingly, we conclude that the broadest reasonable interpretation of “carrier solvent” encompasses “liquid that carries a substance.” *See* Ex. 2003, 2. And we conclude that the broadest reasonable interpretation of “binder” encompasses “a material that promotes cohesion.” *See id.*

*C. Ground I—Anticipation by Vincent*

*1. Overview of Vincent*

Vincent discloses setting a metallic liner inside a well casing. Ex. 1002, 1:9–10. Vincent discloses the liner may be constructed of steel or various other metals. *Id.* at 9:7–14, 10:42–46. In an example, Vincent discloses corrugated liner tube 11 inside casing 43, as shown in Figure 3, reproduced below. *Id.* at 2:44, 3:22–23.

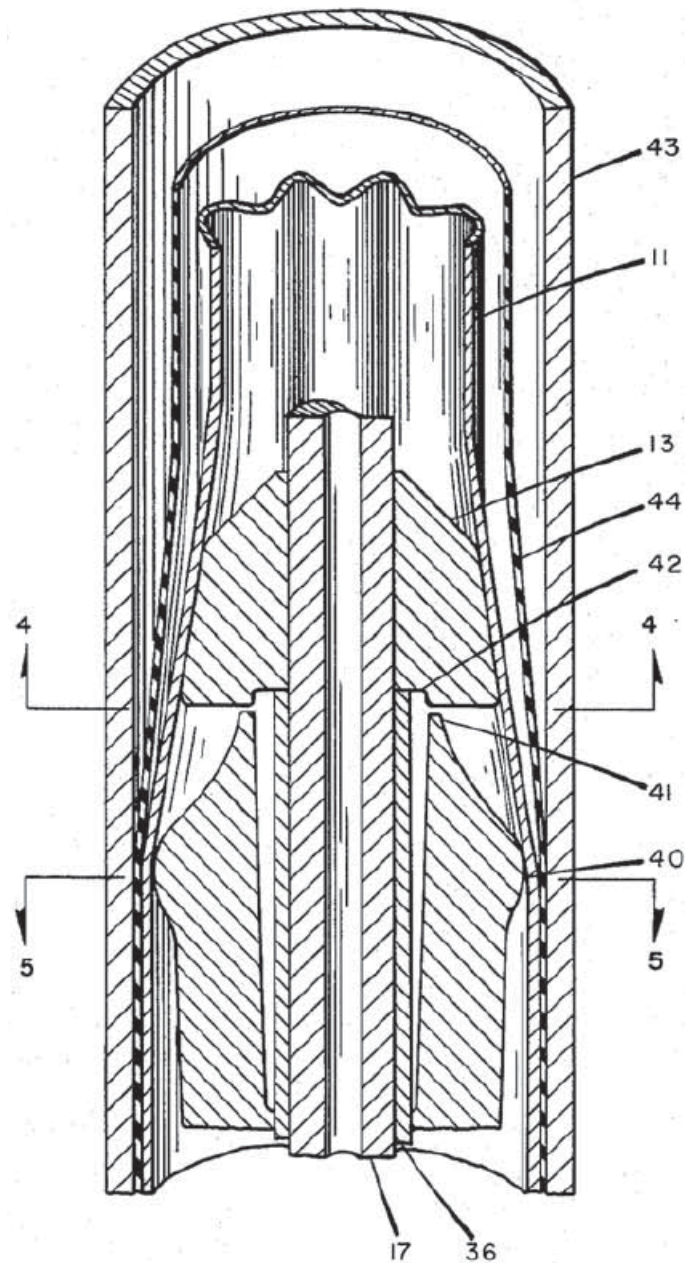


Figure 3 shows part of corrugated liner tube 11 being expanded inside casing 43. *Id.* at 3:21–22. Vincent discloses that “[t]he expanding cone and collet head have been forced partway through [] liner tube 11, expanding [liner tube 11] into a substantially cylindrical form inside [casing 43].” *Id.* at

3:28–31. Vincent further discloses that “a lubricant should be applied to the inside surface of the corrugated liner tube to decrease frictional drag on the expanding cone and collet head.” *Id.* at 12:43–45.

## 2. Discussion

### a. Overview

Petitioner explains how it believes Vincent discloses each of the limitations recited in claims 1, 3, 7–12, 17, 19, 21–23, 25, 31–37, 42, 44, 46–48, 50, 52, 53, 56, 82–87, 92, 94, 97, 98, 100, 102, 103, 106, 107–109, 112, 114, 116, 117, 119, 120, and 123, citing to record evidence. Pet. 13–15, 23–31, 37–38, 40–46; Reply 1–11, 15–21. Patent Owner argues that Vincent fails to disclose certain claim limitations. PO Resp. 18–20, 22–25, 29–35. We have reviewed Petitioner’s arguments and the underlying evidence cited in support and are persuaded that Petitioner has demonstrated by a preponderance of the evidence that Vincent anticipates claims 1, 3, 7–9, 11, 17, 19, 21, 31–34, 36, 42, 44, 46, 52, 53, 56, 82–84, 86, 92, 94, 102, 103, 106–109, 112, 114, 116, 119, 120, 123.<sup>32</sup> Pet. 13–15, 23–24, 29–32, 37–38, 43–46; Reply 2, 4–6, 19–21; Ex. 1002, 1:9–10, 1:22–24, 2:3–4, 2:34–37, 2:44–49, 3:22–23, 3:57–65, 8:56–62, 12:45–54, 12:62–63, 13:23–25, Fig. 3; Ex. 1005, 46–47; Ex. 1007, 103, 107; Ex. 1008, 308; Ex. 1009 ¶¶ 8, 11, 14, 17, 19, 24, 28, 30, 32, 36, 39, 58, 70–73, 93, 96, 99; Ex. 1016, 3. Petitioner has not demonstrated by a preponderance of the evidence that Vincent anticipates claims 10, 12, 22, 23, 25, 35, 37, 47, 48, 50, 85 87, 97–100, and

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<sup>32</sup> We reach this finding without needing to rely on Mr. Tripp’s testimony on the ultimate issue of anticipation.

117. Further discussion of the parties' disputes regarding anticipation by Vincent follows.

*b. Claims 1, 3, 7–9, 11, 21, 31–34, 36, 46, 52, 53, 56, 82–84, 86, 96, 102, 103, 106–109, 116, 119, 120, and 123—One or More Tubular Members*

Patent Owner argues that Vincent does not disclose multiple tubular members and, therefore, does not anticipate claims 1, 3, 7–9, 11, 21, 31–34, 36, 46, 52, 53, 56, 82–84, 86, 96, 102, 103, 106–109, 116, 119, 120, and 123. PO Resp. 34–35. This argument is unpersuasive because, as explained above in Section II.B.2, the broadest reasonable interpretation of these claims requires only “one or more tubular members,” not multiple tubular members. Patent Owner also suggests that Vincent differs from the '012 patent because Vincent's liner tube 11 is not initially circular, as allegedly required to allow connecting multiple tubular members together. PO Resp. 2–5. We find this argument unpersuasive because, as explained in Section II.B.3 above, we are not persuaded that the claims require a tubular member that is initially circular. *See* PO Resp. 2–5; Reply 4–6; Ex. 1001, 3:18–20, 5:7–9; Ex. 1002, 8:56–62; Ex. 1003, 5:54–56, 7:68–8:1; Ex. 1004, 1:52–56, 3:44. We have reviewed Petitioner's arguments and the underlying evidence cited in support and are persuaded that Petitioner demonstrates by a preponderance of the evidence that Vincent anticipates claims 1, 3, 7–9, 11, 21, 31–34, 36, 46, 52, 53, 56, 82–84, 86, 96, 102, 103, 106–109, 116, 119, 120, and 123.

*c. Claims 10, 12, 35, 37, 85, and 87—Chemically Bonded Lubricant and Adhesively Bonded Lubricant*

Each of claims 10, 35, and 85 require “chemically bonded” lubricant. Each of claims 12, 37, and 87 require “adhesively bonded” lubricant. The

Petition asserts that a person of ordinary skill in the art would understand Vincent's disclosure regarding lubricants to include chemically, mechanically, and adhesively bonding a lubricant to the inside of a tubular member. Pet. 27. The Petition asserts that Vincent's discussion of using graphite in a lubricant would lead a person of ordinary skill in the art to understand that Vincent discloses chemical, mechanical, and adhesive bonding of a lubricant. *Id.* at 26–27. Specifically, the Petition relies on Vincent's disclosure that “[a] preferred lubricant is made up to about 90 percent ozokerite, or its purified form ceresin wax, and about 10 percent of finely divided particles of malleable material, such as . . . graphite.” Ex. 1002, 12:46–54; Pet. 26–27.

Citing testimony of Mr. Tripp, the Petition asserts that a person of ordinary skill in the art “would understand that graphite is bonded to surfaces chemically, mechanically, and adhesively.” Pet. 27 (citing Ex. 1009 ¶¶ 41, 47, 52). As further evidence that graphite chemically, mechanically, and adhesively bonds, the Petition cites the disclosure in CRC Volume 2 that:

Bonding of lamellar solids [such as graphite] to the substrate appears to involve three mechanisms: (1) particles can be physically trapped within surface depressions, (2) crystallites may be mechanically embedded into the substrate and act as nuclei around which film growth occurs via intercrystallite cohesion, and (3) the lubricant may interact chemically with the substrate.

Ex. 1005, 277; Pet. 27. The Petition concludes that “[t]herefore, [t]he lubricants disclosed by [Vincent] would be understood by those of ordinary skill in the art to encompass chemically, mechanically, and adhesively

bonding a lubricant to an inside surface of an expandable tubular.” Pet. 27 (citing Ex. 1009 ¶¶ 41, 45, 47, 50, 52, 55).

Patent Owner argues that Vincent does not disclose chemically or adhesively bonding a lubricant to an interior surface of a tubular member. PO Resp. 18 (citing Ex. 2006 ¶¶ 5–8 (citing Ex. 2007, 6–7; Ex. 2008, 1721–22; Ex. 2009, 843–870; Ex. 2010, 235; Ex. 2011; Ex. 2012; Ex. 2013, 93–110; Ex. 2014, 26–39; Ex. 2015, 177–196)). Patent Owner argues that the portion of CRC Volume 2 cited by Petitioner does not support Petitioner’s contention that the graphite disclosed in Vincent would be chemically and adhesively bonded to a tubular member. PO Resp. 19. Patent Owner explains that the cited portion of CRC Volume 2 refers specifically to laminar solids directly applied to a surface, whereas Vincent refers to graphite suspended in wax. *Id.* Patent Owner argues that the wax would tend to encapsulate the graphite, preventing direct contact between the graphite and the substrate to which the lubricant is applied. *Id.*

Petitioner responds that the lubricant recited in the claims can include both a solid lubricant and a binder. Reply 11. Petitioner then argues that “Vincent’s graphite and wax are both components of the lubricant coating and it does not matter which component is bonded to the surface.” *Id.* In other words, Petitioner suggests that if the wax chemically or adhesively bonds to the surface, the claim is met. *See id.* Additionally, Petitioner attacks the underpinning of Dr. Seemuth’s testimony that Vincent does not disclose chemically or adhesively bonded lubricants. *Id.* at 9–11.

We find Patent Owner’s arguments and evidence more persuasive than Petitioner’s. We are not persuaded that a person of ordinary skill in the art would understand from Vincent’s disclosure of a lubricant with graphite

in wax that Vincent teaches chemical or adhesive bonding. The Petition argues that a person of ordinary skill in the art would understand the graphite disclosed by Vincent would be chemically and adhesively bonded to a surface. Pet. 26–27. This argument rests on CRC Volume 2’s disclosure regarding bonding of lamellar solids to a substrate. *Id.* at 27. Petitioner does not dispute persuasively Patent Owner’s observation that this disclosure of CRC Volume 2 relates only to direct application of lamellar solids to a surface. See PO Resp. 19; Reply 9–11. Nor does Petitioner dispute persuasively Patent Owner’s contention that the wax disclosed by Vincent would prevent the graphite from directly contacting the surface, thereby preventing chemical or adhesive bonding of the graphite to the surface. See PO Resp. 19; Reply 9–11. Thus, Petitioner has not shown that a person of ordinary skill in the art would understand that Vincent’s graphite is chemically or adhesively bonded to the surface.

Regarding Petitioner’s assertion that it does not matter whether the graphite or the wax is bonded, we are not persuaded that the wax would chemically or adhesively bond to the surface. See Pet. 27. At most, Petitioner’s observations attacking Dr. Seemuth’s testimony tend to illustrate that it may be unclear from Dr. Seemuth’s testimony whether some of Vincent’s lubricants other than graphite may bond chemically or adhesively. See Reply 9–11. We weigh this against the Petition’s citations to Mr. Tripp’s declaration. See Pet. 27 (citing Ex. 1009 ¶¶ 41, 45, 47, 50, 52, 55)). Mr. Tripp testifies that a person of ordinary skill in the art would have known that “the lubricants disclosed *could* be chemically, mechanically, and/or adhesively bonded to a surface.” Ex. 1009 ¶ 47 (emphasis added). Mr. Tripp also states that it would have been “obvious” to chemically and

adhesively bond lubricant. *E.g., id.* ¶ 45. We find these observations by Mr. Tripp about what could have been done or would have been obvious insufficient to outweigh the evidence cited by Patent Owner regarding anticipation by Vincent. Accordingly, we find that Petitioner has not demonstrated by a preponderance of the evidence that Vincent anticipates claims 10, 12, 35, 37, 85, and 87.

*d. Claims 17, 19, 42, 44, 92, 94, 112, and 114—Friction Coefficients*

Each of claims 17, 19, 42, 44, 92, 94, 112, and 114 recites a range of a coefficient of friction provided by a lubricant. Petitioner asserts that Vincent discloses lubricants providing the coefficients of friction recited in the claims. Pet. 30–32. Specifically, Petitioner asserts that the friction values recited in each claim are met by one or more of the graphite, vegetable oil, animal oil, and mineral oil disclosed by Vincent. *Id.* In support of this, Petitioner proffers Mr. Tripp’s testimony with supporting evidence. *Id.* For example, Petitioner cites Mr. Tripp’s testimony with supporting evidence that vegetable oil provides a coefficient of friction of 0.081 when used between hard steel on hard steel. *Id.* at 30 (citing Ex. 1005, 46–47; Ex. 1007, 7; Ex. 1009 ¶ 58).

Patent Owner notes that Petitioner relies on evidence outside Vincent to allegedly show that some of Vincent’s lubricants, when used between hard steel and hard steel, would have friction coefficients within the claimed ranges. *Id.* at 24. Patent Owner criticizes Petitioner’s arguments and evidence, asserting that friction coefficients can vary depending on the testing conditions. *Id.* Citing Dr. Seemuth’s testimony, Patent Owner argues that the friction coefficients in the references cited by Petitioner may

not apply in circumstances different from the test conditions used for those references. *Id.*

We have reviewed Petitioner’s arguments and the underlying evidence cited in support and are persuaded that Petitioner has demonstrated by a preponderance of the evidence that Vincent anticipates claims 17, 19, 42, 44, 92, 94, 112, and 114. Patent Owner’s arguments are not commensurate in scope with the challenged claims. The claims do not specify the materials or any particular circumstances for which the lubricant provides the coefficient of friction. Each challenged claim recites only that the lubricant provides a certain range of coefficients of friction. *See, e.g.*, Ex. 1001, 15:58–63. Accordingly, the claimed lubricant would meet the claims if it provides the claimed ranges of coefficients of friction, for example, between hard steel and hard steel. Petitioner provides evidence that certain lubricants disclosed in Vincent would provide the claimed friction coefficients when present between hard steel and hard steel. *See* Pet. 30–32. Patent Owner provides no reason to believe that any of the challenged claims, which do not recite any particular materials, would require materials other than hard steel on hard steel. *See* PO Resp. 23–24. Nor does Patent Owner point to any language in the challenged claims that requires the recited friction coefficients for any particular circumstances. *See id.*

*e. Claims 22, 23, 47, 48, 97, and 98—Solid Lubricant and Binder*

Each of claims 22, 23, 47, 48, 97, and 98 recites a “solid lubricant” and a “binder.” In asserting that Vincent anticipates claims 22, 23, 47, 48, 97, and 98, Petitioner cites Vincent’s disclosure of wax with certain materials in it as disclosing the “binder” and “solid lubricant” recited in the

claims. Pet. 40. Petitioner cites Mr. Tripp's testimony that "[t]he wax as disclosed in Vincent . . . is a binder." Ex. 1009 ¶ 78; Pet. 40.

Patent Owner argues that Petitioner has not demonstrated that Vincent's wax constitutes a "binder." PO Resp. 29–31. Patent Owner argues that Mr. Tripp's testimony that Vincent's wax is a "binder" is based on Mr. Tripp's understanding that "binder" means "a carrier for the lubricant." *Id.* at 30 (citing Ex. 2005, 117:20–118:3). Patent Owner argues that Mr. Tripp's interpretation of the term "binder" is wrong, and his assertion that Vincent's wax is a "binder" is therefore flawed. *Id.*

In response, Petitioner argues that Vincent's wax would act as a binder sometimes and as a carrier solvent at other times. Reply 16–17. As evidence that the wax would act as a binder sometimes, Petitioner cites Mr. Tripp's testimony that a lubricant manufacturing process would involve introducing graphite into wax and then solidifying the wax. *Id.* at 16 (citing Ex. 2005, 121:1–122:2). As evidence that the wax would act as a carrier solvent at other times, Petitioner cites Mr. Tripp's testimony that during application of the wax and graphite, the wax would melt. *Id.* at 16–17 (citing Ex. 2005, 122:4–20).

We are not persuaded that Petitioner has demonstrated by a preponderance of the evidence that Vincent's wax constitutes a "binder," as recited in the challenged claims. As explained in Section II.B.4 above, Mr. Tripp's understanding of the term "binder" as any "carrier for the lubricant" and interchangeable with "carrier solvent" is wrong. Because Mr. Tripp apparently applied these incorrect meanings of "binder" when testifying that Vincent's wax is a binder, we find this testimony unpersuasive. Additionally, we note that Mr. Tripp cites no underlying evidence to support

his testimony that Vincent's wax constitutes a binder, either in his declaration (*see* Ex. 1009 ¶ 78), or in his deposition (Ex. 2005, 117:20–122:20).

Indeed, Petitioner does not demonstrate by a preponderance of the evidence that Vincent's wax meets even Petitioner's proposed construction of the term “binder.” As noted above, Petitioner contends that “binder” means “material that promotes cohesion.” Mr. Tripp does not provide explanation or underlying evidence persuading us that Vincent's wax promotes cohesion. *See* Ex. 1009 ¶ 78; Ex. 2005, 117:20–122:20. And Petitioner does not otherwise provide explanation or evidence persuading us that Vincent's wax promotes cohesion. *See* Pet. 40; Reply 16–17. Accordingly, we are not persuaded that Petitioner has demonstrated by a preponderance of the evidence that Vincent anticipates claims 22, 23, 47, 48, 97, and 98.

*f. Claims 25, 50, 100, and 117—Carrier Solvent*

Each of claims 25, 50, 100, and 117 recites “a suspension of particles in a carrier solvent.” In asserting that Vincent anticipates claims 25, 50, 100, and 117, Petitioner cites Vincent's disclosure of wax with certain materials in it as disclosing the “carrier solvent” and “particles” recited in the claims. Pet. 41–42. Petitioner cites Mr. Tripp's testimony that “[t]he wax as disclosed in Vincent . . . is a carrier solvent.” Ex. 1009 ¶ 86; Pet. 42.

Patent Owner argues that, contrary to the position of Petitioner and Mr. Tripp, Vincent's wax cannot be both a binder and a carrier solvent. PO Resp. 32–33. Patent Owner explains that “[c]eresin wax has a melting point of about 150 °F and would therefore not be considered a ‘carrier solvent’ at surface temperature and, if melted to a liquid, would no longer promote

cohesion between the solid particles and the surface.” *Id.* at 33 (citing Ex. 2002 ¶ 37). Patent Owner further asserts that even if Vincent’s wax can be considered a carrier, Petitioner does not provide any evidence or explanation about how it serves as a solvent. *Id.*

In response, Petitioner argues that Vincent’s wax would act as a binder sometimes and as a carrier solvent at other times. Reply 16–17. As evidence that the wax would act as a carrier solvent at times, Petitioner cites Mr. Tripp’s testimony that during application of the wax and graphite, the wax would melt. *Id.* at 16–17 (citing Ex. 2005, 122:4–20).

We are not persuaded that Petitioner has demonstrated by a preponderance of the evidence that Vincent’s wax constitutes a “carrier solvent,” as recited in the challenged claims. As discussed above in Section II.B.4, Petitioner has not presented reasoning or evidence persuading us that the broadest reasonable interpretation of “carrier solvent” differs from the parties’ stipulated construction from the district court proceeding—“liquid that carries a substance.” *See* Ex. 2003, 2; Pet. 41–43; Reply 16. Petitioner does not demonstrate by a preponderance of the evidence that Vincent’s wax constitutes a liquid. In his declaration, where he stated that “[t]he wax as disclosed in Vincent . . . is a carrier solvent,” Mr. Tripp neither stated that Vincent’s wax is liquid, nor provided evidence that would persuade us that Vincent’s wax is liquid. *See, e.g.,* Ex. 1009 ¶ 86. Although he later testified during his deposition that Vincent’s wax would be a liquid in certain circumstances, Mr. Tripp provided no evidence to support that assertion, nor did he point to disclosure in Vincent that such circumstances would occur. *See* Ex. 2005, 121:1–124–7. For the foregoing reasons, we

are not persuaded that Petitioner has demonstrated by a preponderance of the evidence that Vincent anticipates claims 25, 50, 100, and 117.

*D. Grounds II–XI—Obviousness Based on Vincent*

*1. Overview*

Petitioner explains how it believes the limitations of each of claims 10–12, 17–19, 21, 23, 25, 31, 35–37, 42–44, 46, 48, 50, 52, 53, 56, 85–87, 92–94, 96, 98, 100, 102, 103, 106, 112–114, 116, 117, 119, 120, and 123 are taught by or obvious in view of Vincent and the other cited references, citing to record evidence. Pet. 13–15, 28–39, 40–44, 46–49. Patent Owner disputes certain aspects of Petitioner’s obviousness assertions. PO Resp. 14–16, 21–22, 26–28, 31, 34. We have reviewed Petitioner’s arguments and the underlying evidence cited in support and are persuaded that Petitioner has demonstrated obviousness by a preponderance of the evidence with respect to each claim challenged in grounds II–XI, such that Petitioner has demonstrated obviousness of each of claims 10–12, 17–19, 21, 23, 25, 31, 35–37, 42–44, 46, 48, 50, 52, 53, 56, 85–87, 92–94, 96, 98, 100, 102, 103, 106, 112–114, 116, 117, 119, 120, and 123 by a preponderance of the evidence.<sup>33</sup> Pet. 13–15, 25–49; Reply 19–21; Ex. 1002, 2:34–37, 2:44–49, 3:22–23, 3:57–65, 10:7–8, 12:45–54, Fig. 3; Ex. 1005, 46–47, 53–54, 229, 247, 258, 261–262, 269–272, 277–278, 286, 305, 308, 312; Ex. 1006, 167–169; Ex. 1007, 103, 107, 156, 551, 605; Ex. 1008, 308; Ex. 1009 ¶¶ 8, 11, 14, 17, 19, 24, 41, 43–45, 47, 50, 52, 55–60, 62–68, 70–73, 76, 78–91,

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<sup>33</sup> We reach this conclusion without needing to rely on Mr. Tripp’s testimony on the ultimate conclusion of obviousness.

93–97, 99–110. Further discussion of the parties’ disputes regarding these grounds follows.

*2. Ground II*

*a. Claims 10, 12, 35, 37, 85, and 87—Chemically Bonded Lubricant and Adhesively Bonded Lubricant*

Each of claims 10, 35, and 85 requires “chemically bonded” lubricant. Each of claims 12, 37, and 87 requires “adhesively bonded” lubricant. Petitioner asserts that these claims would have been obvious over Vincent in combination with CRC Volume 2 and/or CRC Volume 3. Pet. 28–29. Petitioner asserts, and Mr. Tripp testifies, that CRC Volume 2 and CRC Volume 3 teach chemical and adhesive bonding of lubricants. Pet. 28; Ex. 1009 ¶¶ 44, 45, 55. Mr. Tripp testifies that CRC Volume 2 and CRC Volume 3 are “industry standard texts that are commonly used for selection and/or design of lubricants,” such that a person of ordinary skill in the art looking for improved properties would refer to the texts. Ex. 1009 ¶ 110. Mr. Tripp also testifies that a person of ordinary skill in the art would understand how to combine the teachings of the references, and that doing so would not have produced any unexpected result. *Id.* Citing Mr. Tripp’s testimony, Petitioner asserts that a person of ordinary skill in the art would have been motivated to combine with Vincent’s teachings the teachings of CRC Volume 2 and CRC Volume 3, including chemically and adhesively bonding lubricants, “because these references are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in Vincent.” Pet. 28. Accordingly, Petitioner asserts that it

would have been obvious to employ chemically and adhesively bonded lubricants with Vincent's teachings. *Id.* at 28–29.

Patent Owner argues that Petitioner has provided no evidence of obviousness. PO Resp. 22. According to Patent Owner, this is so because Mr. Tripp's "opinions and analysis of invalidity . . . were arrived at with no understanding of any legal framework that should have been applied in analyzing invalidity." *Id.*

We determine that Petitioner has demonstrated by a preponderance of the evidence that claims 10, 12, 35, 37, 85, and 87 would have been obvious over Vincent, CRC Volume 2, and CRC Volume 3. Patent Owner does not dispute that CRC Volume 2 and CRC Volume 3 teach chemically and adhesively bonding lubricants. Pet. 28; Ex. 1009 ¶¶ 44, 45, 55. Patent Owner also does not dispute that CRC Volume 2 and CRC Volume 3 are industry standard texts commonly used for selection and/or design of lubricants. Ex. 1009 ¶ 110. Nor does Patent Owner dispute that combining the teachings of the references would have been within the skill of a person of ordinary skill in the art, and would have produced only predictable results. *Id.* Patent Owner's attack on Mr. Tripp's assertions of a motivation to combine and the ultimate conclusion of obviousness is unavailing because we need not rely on this testimony to determine that other undisputed aspects of his testimony provide rational underpinning for Petitioner's assertion of obviousness. We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known material (chemically and adhesively bonded lubricants) based on suitability

for the intended use—“to decrease frictional drag on the expanding cone and collet head” (Ex. 1002, 12:43–45). *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327 (1945); *In re Leshin*, 277 F.2d 197 (CCPA 1960). Furthermore, regarding the question of whether there is motivation to combine, Patent Owner cites no authority for its suggestion that Mr. Tripp would need some knowledge of a legal framework to opine regarding whether a person of ordinary skill in the art would have had a reason to combine the teachings of references.

*b. Claims 11, 36, 86—Mechanically Bonded Lubricant*

Each of claims 11, 36, and 86 requires “mechanically bonded” lubricant. Petitioner asserts that these claims would have been obvious over Vincent with CRC Volume 2 and/or CRC Volume 3. Pet. 28–29. Petitioner notes that Vincent teaches using graphite in a lubricant. *Id.* at 26–27. Petitioner indicates that Vincent’s graphite, as a lamellar solid, would be understood to mechanically bond with a substrate, noting that CRC Volume 2 discloses that:

Bonding of lamellar solids to the substrate appears to involve three mechanisms: (1) particles can be physically trapped within surface depressions, (2) crystallites may be mechanically embedded into the substrate and act as nuclei around which film growth occurs via intercrystallite cohesion, and (3) the lubricant may interact chemically within the substrate.

Ex. 1005, 277; Pet. 27. Mr. Tripp also cites this disclosure of CRC Volume 2. Ex. 1009 ¶ 54. Additionally, Mr. Tripp testifies that a person of ordinary skill in the art CRC Volume 2 and CRC Volume 3 are “industry standard texts that are commonly used for selection and/or design of lubricants,” such that a person of ordinary skill in the art looking for improved properties

would refer to the texts. Ex. 1009 ¶ 110. Mr. Tripp also testifies that combining the teachings of Vincent with CRC Volume 2 and CRC Volume 3 would have been within the level of skill in the art and would have produced only expected results. *Id.* Citing this testimony, Petitioner asserts that a person of ordinary skill in the art would have been motivated to combine the teachings of Vincent with those of CRC Volume 2 and/or CRC Volume 3 “because these are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in Vincent.” Pet. 28.

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 11, 36, and 86 would have been obvious to a person of ordinary skill in the art. We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known material (mechanically bonded lubricants) based on suitability for the intended use—“to decrease frictional drag on the expanding cone and collet head” (Ex. 1002, 12:43–45). *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197. Patent Owner argues only that Mr. Tripp’s testimony should be disregarded because he lacked adequate understanding of the legal framework associated with his conclusion of obviousness. PO Resp. 14–16. This argument is unavailing because the supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp’s testimony on ultimate legal conclusions.

3. *Ground III—Claims 17, 19, 42, 44, 92, 94, 112, and 114—  
Friction Coefficients*

Petitioner asserts that claims 17, 19, 42, 44, 92, 94, 112, and 114 would have been obvious in view of Vincent in combination with CRC Volume 2, CRC Volume 3, or Tribology Handbook. Pet. 29–34. Petitioner asserts that a person of ordinary skill in the art would have understood that some of the lubricants disclosed by Vincent would have provided friction coefficients in accordance with claims 17, 19, 42, 44, 92, 94, 112, and 114. Pet. 30–32. Petitioner also asserts that it was known from CRC Volume 2, CRC Volume 3, and Tribology Handbook that lubricants providing the claimed friction coefficients were available. *Id.* at 33. Citing Mr. Tripp’s testimony, Petitioner also asserts that it would have been obvious to combine with Vincent’s teachings the teachings of CRC Volume 2, CRC Volume 3 or Tribology Handbook regarding lubricants providing friction coefficients according to the challenged claims. *Id.*

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 17, 19, 42, 44, 92, 94, 112, and 114 would have been obvious. Because Petitioner has persuaded us that a person of ordinary skill in the art would understand that Vincent discloses all limitations of these claims (*see* Section II.C.2.d), Petitioner persuades us that these claims would have been obvious. Additionally, we are persuaded that combining the teachings of the references in the manner suggested by Petitioner is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Furthermore, the proposed combination involves selection of lubricants known to provide the claimed friction coefficients, based on

suitability for the intended use—“to decrease frictional drag on the expanding cone and collet head” (Ex. 1002, 12:43–45). *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197.

Patent Owner argues that the friction coefficients in the references cited by Petitioner may not apply in circumstances different from the test conditions used for those references. PO Resp. 24. As explained above in Section II.C.2.d, this argument is not commensurate in scope with the challenged claims.

Patent Owner also argues that Petitioner’s obviousness challenge fails because Mr. Tripp lacks sufficient understanding of the legal framework for a conclusion of obviousness. *Id.* at 14–16. This argument is unavailing because the supporting evidence provided by Petitioner and Mr. Tripp is sufficient to demonstrate obviousness without need to rely on Mr. Tripp’s conclusion of obviousness.

#### 4. *Grounds IV and V—Claims 18, 43, 93, and 113*

Each of claims 18, 43, 93 and 113 requires a lubricant or a coating of lubricant that is “selected from the group consisting of: sodium stearates, calcium stearates, zinc stearates, zinc phosphate, manganese phosphate, C-Lube-10, C-Phos-58-M, C-Phos-58-R, polytetrafluoroethylene, molybdenum disulfide, and metallic soaps.” Petitioner argues that claims 18, 43, 93, and 113 would have been obvious over Vincent in combination with CRC Volume 2. Pet. 35–36. Petitioner notes that Vincent teaches using lead and graphite as lubricants. *Id.* at 35. Petitioner cites CRC Volume 2 as teaching certain advantages to using molybdenum disulfide as a lubricant in lieu of graphite. *Id.* 35–36. Mr. Tripp testifies that CRC Volume 2 is an “industry standard text[] that [is] commonly used for selection and/or design of

lubricants,” such that a person of ordinary skill in the art looking for improved properties would refer to the texts. Ex. 1009 ¶ 110. Mr. Tripp also testifies that a person of ordinary skill in the art would understand how to combine the teachings of the references, and that doing so would not have produced any unexpected result. *Id.* Petitioner asserts that “[o]ne of ordinary skill in the art would be motivated to combine [CRC Volume 2 with Vincent] because [CRC Volume 2 is] the type[] of reference[] that one of ordinary skill in the art would use to aid them in selecting lubricants as described in Vincent.” *Id.* at 36. Petitioner concludes that it would have been obvious to substitute the molybdenum sulfide taught by CRC Volume 2 for the graphite taught in Vincent. *Id.*

Petitioner also asserts that claims 18, 43, 93, and 113 would have been obvious over Vincent in combination with CRC Volume 2 or CRC Volume 3. Pet. 36–37. Citing CRC Volume 2 and CRC Volume 3, Petitioner asserts that molybdenum disulfide and polytetrafluoroethylene were known, commercially available lubricants. *Id.* at 36. Petitioner asserts that a person of ordinary skill in the art would have been motivated to combine these teachings of CRC Volume 2 and CRC Volume 3 with Vincent because CRC Volume 2 and CRC Volume 3 “are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in Vincent.” *Id.* at 36–37.

Patent Owner argues that Petitioner fails to show obviousness of claims 18, 43, 93, and 113. PO Resp. 26–28. Patent Owner asserts that the portions of Mr. Tripp’s testimony cited by Petitioner are faulty because he “does not understand the concepts of ‘motivation to combine’ or ‘obviousness.’” *Id.* at 27. Patent Owner argues that aside from noting that

CRC Volume 2 and CRC Volume 3 are the types of references that persons of ordinary skill in the art use to select lubricants, Petitioner does not provide any reason to combine the teachings of the references. *Id.* at 26–27. Additionally, citing Mr. Tripp’s deposition testimony, Patent Owner suggests that certain disadvantages would result from substituting molybdenum disulfide for Vincent’s graphite. *Id.* at 27 (citing Ex. 2005, 148:13–149:5).

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 18, 43, 93, and 113 would have been obvious over Vincent in combination with CRC Volume 2, and would have also been obvious over Vincent in combination with CRC Volume 2 or CRC Volume 3. Patent Owner does not dispute that CRC Volume 2 teaches using molybdenum disulfide as a lubricant. Patent Owner also does not dispute that CRC Volume 2 and CRC Volume 3 are industry standard texts commonly used for selection and/or design of lubricants. Nor does Patent Owner dispute that combining the teachings of the references would have been within the skill of a person of ordinary skill in the art, and would have produced only predictable results.

Patent Owner’s attack on Mr. Tripp’s assertions of a motivation to combine and the ultimate conclusion of obviousness is unavailing because we need not rely on this testimony to determine that other undisputed aspects of his testimony provide a rational underpinning for Petitioner’s assertion of obviousness.

Additionally, contrary to Patent Owner’s suggestion, Petitioner provides evidence of reasons that a person of ordinary skill in the art would view molybdenum disulfide, in particular, as a desirable substitute for

graphite. Specifically, the cited portion of CRC Volume 2 explains that molybdenum disulfide would tend to have comparatively desirable attributes related to quality, low friction, and load-carrying capacity. Ex. 1005, 269–272; Pet. 35–36.

Furthermore, the portion of Mr. Tripp’s deposition testimony cited by Patent Owner does not significantly undermine Petitioner’s assertion that molybdenum disulfide would have been an obvious substitute for graphite. See PO Resp. 27 (citing Ex. 2005, 148:13–149:5). Although this testimony identifies one drawback of molybdenum disulfide—cost—it also identifies further advantages—easier cleanup and “lower overall deformation forces and improved lubricity over the graphite.” Ex. 2005, 148:13–149:5. In sum, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 18, 43, 93, and 113 would have been obvious over Vincent in combination with CRC Volume 2 and would have been obvious over Vincent in combination with CRC Volume 2 or CRC Volume 3. Pet. 35–37.

*5. Ground VI—Claims 21, 46, 96, and 116*

Each of claims 21, 46, 96, and 116 recites a lubricant or a coating of lubricant “selected from the group consisting of: graphite, molybdenum disulfide, lead powder, antimony oxide, poly tetrafluoroethylene, and silicone polymers.” Petitioner asserts that claims 21, 46, 96, and 116 would have been obvious over Vincent in combination with CRC Volume 2 or CRC Volume 3. Pet. 38–39. Petitioner and Mr. Tripp assert that CRC Volume 2 and CRC Volume 3 disclose lubricants recited in the challenged claims. Pet. 38; Ex. 1009 ¶ 76. Mr. Tripp also testifies that CRC Volume 2 and CRC Volume 3 are “industry standard texts that are commonly used for

selection and/or design of lubricants,” such that a person of ordinary skill in the art looking for improved properties would refer to the texts. Ex. 1009 ¶ 110. Mr. Tripp also testifies that combining the teachings of Vincent with those of CRC Volume 2 or CRC Volume 3 would have been within the level of ordinary skill in the art and would have produced nothing more than predictable results. *Id.* Citing this testimony, Petitioner asserts that a person of ordinary skill in the art would have been motivated to combine with the teachings of Vincent the lubricant teachings of CRC Volume 2 and CRC Volume 3 “because these references are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in Vincent.” Pet. 39.

We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known lubricants based on suitability for the intended use—“to decrease frictional drag on the expanding cone and collet head” (Ex. 1002, 12:43–45). *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197. Thus, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 21, 46, 96, and 116 would have been obvious over Vincent in combination with CRC Volume 2 or CRC Volume 3.

6. *Ground VII—Claims 23, 48, and 98—Solid Lubricant and Binder*

Each of claims 22, 47, and 97 recites a “solid lubricant” and a “binder.” Claims 23, 48, and 98 depend from claims 22, 47, and 97, which recite a “solid lubricant” and a “binder.” Ex. 1001, 16:45–57, 18:54–63,

23:35–48. Claims 23, 48, and 98 specify that the “binder” is selected from the following group:

epoxy, acrylic, urea-formaldehyde, melamine formaldehyde, furan based resin, acetone formaldehyde, phenolic, alkyd resins, and silicone modified alkyd resin.

*Id.* at 16:52–57, 18:58–63, 23:43–48.

Petitioner asserts that claims 23, 48, and 98 would have been obvious in view of Vincent and CRC Volume 2. Pet. 40–41. Petitioner notes that Vincent discloses:

A preferred lubricant is made up to about 90 percent ozokerite, or its purified form ceresin wax, and about 10 percent of finely divided particles of malleable material, such as copper, lead, graphite, nutshells, or the like.

Ex. 1002, 12:50–54; Pet. 40. Petitioner asserts that this discloses using solid lubricants with the wax. Pet. 40. Specifically, Petitioner asserts that copper, lead, graphite, and nutshells constitute solid lubricants. *Id.* Petitioner also asserts that CRC Volume 2 discloses that some of the binders listed in the challenged claims, including epoxy, acrylics, phenolic, alkyd resins, and silicone, were in common use. *Id.* (citing Ex. 1005, 278; Ex. 1009 ¶¶ 81–82, 84). Mr. Tripp testifies that CRC Volume 2 discloses that “lamellar solids are often incorporated within a synthetic resin binder to produce a ‘bonded coating.’” Ex. 1009 ¶ 82 (citing Ex. 1005, 277). Petitioner indicates that it would have been obvious to use the binders disclosed in CRC Volume 2 with the solid lubricants disclosed in Vincent, explaining that a person of ordinary skill in the art would have been motivated to do so because CRC Volume 2 is “the type[] of reference[] that one of ordinary skill in the art would use to aid them in selecting lubricants as described in Vincent.” *Id.* at 40–41. Mr. Tripp testifies that a person of ordinary skill in the art would

understand how to combine the teachings of the references, and that doing so would not have produced any unexpected result. Ex. 1009 ¶ 110. Patent Owner argues that Petitioner presents no evidence of obviousness because Mr. Tripp’s testimony was provided without adequate understanding of applicable legal framework. PO Resp. 31.

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 23, 48, and 98 would have been obvious over Vincent and CRC Volume 2. Patent Owner does not dispute that Vincent teaches solid lubricants in wax, or that CRC Volume 2 teaches that it was known to use solid lubricants with a binder, including a number of the binders recited in the claims. See Pet. 40–41; Ex. 1009 ¶¶ 78, 81–82, 84; PO Resp. 28–31. Patent Owner also does not dispute that CRC Volume 2 is an “industry standard text[] . . . commonly used for selection and/or design of lubricants.” Ex. 1009 ¶ 110. Nor does Patent Owner dispute that combining the teachings of the references would have been within the skill of a person of ordinary skill in the art, and would have produced only predictable results. *Id.* We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. See *KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known lubricants based on suitability for the intended use—“to decrease frictional drag on the expanding cone and collet head” (Ex. 1002, 12:43–45). See, e.g., Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197.

The supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp’s testimony on ultimate legal conclusions. See, e.g.,

*KSR*, 550 U.S. at 417 (“If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability.”). Accordingly, Patent Owner’s argument that Mr. Tripp lacked adequate knowledge of the legal framework for obviousness is unavailing. In sum, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 23, 48, and 98 would have been obvious over Vincent and CRC Volume 2.

*7. Claims 22, 47, and 97—Obviousness*

As explained in Section II.D.6 Petitioner has demonstrated that claims 23, 48, and 98 would have been obvious over Vincent and CRC Volume 2. Accordingly, we determine that Petitioner has also demonstrated obviousness of the claims from which they depend—claims 22, 47, and 97. *See, e.g., Callaway Golf Co. v. Acushnet Co.*, 576 F.3d 1331, 1344 (Fed. Cir. 2009) (“A broader independent claim cannot be nonobvious where a dependent claim stemming from that independent claim is invalid for obviousness.”).

*8. Ground VIII—Claims 25, 50, 100, and 117—Carrier Solvent*

Each of claims 25, 50, 100, and 117 recites “a suspension of particles in a carrier solvent.” Petitioner asserts that claims 25, 50, 100, and 117 would have been obvious in view of Vincent and CRC Volume 2 or Tribology Handbook. Pet. 42–43. Petitioner notes that Vincent discloses:

A preferred lubricant is made up to about 90 percent ozokerite, or its purified form ceresin wax, and about 10 percent of finely divided particles of malleable material, such as copper, lead, graphite, nutshells, or the like.

Ex. 1002, 12:50–54; Pet. 41–42. Petitioner asserts that this discloses using solid lubricants with the wax. Pet. 41–42. Specifically, Petitioner asserts

that copper, lead, graphite, and nutshells constitute solid lubricants. *Id.* at 42. Petitioner also asserts that using a carrier solvent to apply a solid lubricant was common practice. *Id.* (citing Ex. 1009 ¶¶ 89–91). Petitioner notes that Tribology Handbook discloses that “[g]raphite is commonly used as a dry powder or as dispersion in water, oils, greases, or solvents.” Ex. 1007, 156; Pet. 42. Petitioner also notes that CRC Volume 2 discloses that “[g]raphite and MoS are extensively used as additives in conventional oils and greases to reduce friction and wear.” Ex. 1005, 286; Pet. 42. Petitioner argues that a person of ordinary skill in the art would have been motivated to combine the teachings of Vincent with those of Tribology Handbook and CRC Volume 2 “because these are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in Vincent.” Pet. 42 (citing Ex. 1009 ¶¶ 89–91). Mr. Tripp testifies that a person of ordinary skill in the art would understand how to combine the teachings of the references, and that doing so would not have produced any unexpected result. Ex. 1009 ¶ 110. Patent Owner argues that Petitioner presents no evidence of obviousness because Mr. Tripp’s testimony was provided without adequate understanding of applicable legal framework. PO Resp. 34.

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 25, 50, 100, and 117 would have been obvious in view of Vincent and CRC Volume 2 or Tribology Handbook. Patent Owner does not dispute that Vincent teaches solid lubricants in wax. Thus, similar to the claimed “suspension of particles in a carrier solvent,” Vincent teaches applying solid lubricant suspended in another material. Additionally, Patent Owner does not dispute that one

known, common practice for applying a solid lubricant suspended in another material was applying a solid lubricant suspended in a carrier solvent. See Pet. 41–42; Ex. 1009 ¶¶ 78, 89–91; Ex. 1005, 286; Ex. 1007, 156; PO Resp. 31–34. Patent Owner also does not dispute that Tribology Handbook and CRC Volume 2 are “industry standard texts that are commonly used for selection and/or design of lubricants.” Ex. 1009 ¶ 110; PO Resp. 31–34. Nor does Patent Owner dispute that combining the teachings of the references would have been within the skill of a person of ordinary skill in the art, and would have produced only predictable results. Ex. 1009 ¶ 110; PO Resp. 31–34. We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. See *KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known lubricants based on suitability for the intended use—“to decrease frictional drag on the expanding cone and collet head” (Ex. 1002, 12:43–45). See, e.g., Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197.

The supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp’s testimony on ultimate legal conclusions. Accordingly, Patent Owner’s argument that Mr. Tripp lacked adequate knowledge of the legal framework for obviousness is unavailing.

*9. Ground IX—Claims 52, 53, 102, 103, 119, and 120*

Each of claims 52, 53, 102, 103, 119, and 120 requires lubricant with a percent solids falling within a certain range. Petitioner asserts that these claims would have been obvious in view of Vincent. Pet. 44; Ex. 1002, 12:50–54; Ex. 1005, 286; Ex. 1007, 551; Ex. 1009 ¶ 93–97. Petitioner

asserts that Vincent discloses the claimed ranges. *Id.* Petitioner also asserts that it would have been obvious to try using lubricants with solids in the claimed ranges. *Id.* Patent Owner argues only that Mr. Tripp’s testimony should be disregarded because he lacked adequate understanding of the legal framework associated with his conclusion of obviousness. PO Resp. 14–16. This argument is unavailing because the supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp’s testimony on ultimate legal conclusions. We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that Vincent discloses the limitations of the challenged claims. Accordingly, we are persuaded that the challenged claims would have been obvious in view of Vincent.

*10. Ground X—Claims 52, 53, 102, 103, 119, and 120*

Petitioner asserts that claims 52, 53, 102, 103, 119, and 120 would have been obvious in view of Vincent in combination with CRC Volume 2 or Tribology handbook. Pet. 44. Petitioner asserts that CRC Volume 2 and Tribology Handbook disclose lubricants meeting the limitations recited in claims 52, 53, 102, 103, 119, and 120. *Id.* (citing Ex. 1005, 286; Ex. 1007, 551; Ex. 1009 ¶ 97. Mr. Tripp testifies that CRC Volume 2 and Tribology Handbook “are industry standard texts that are commonly used for selection and/or design of lubricants.” Ex. 1009 ¶ 110. Mr. Tripp also testifies that combining the teachings of Vincent with the lubricant teachings of CRC Volume 2 or Tribology Handbook would have been within the level of ordinary skill in the art and would have produced only expected results. *Id.* We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known

technologies with predictable results. *See KSR*, 550 U.S. at 417.

Additionally, the proposed combination involves selection of known lubricants based on suitability for the intended use—“to decrease frictional drag on the expanding cone and collet head” (Ex. 1002, 12:43–45). *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197. We are persuaded that Petitioner has demonstrated by a preponderance of the evidence obviousness of the challenged claims.

Patent Owner argues only that Mr. Tripp’s testimony should be disregarded because he lacked adequate understanding of the legal framework associated with his conclusion of obviousness. PO Resp. 14–16. This argument is unavailing because the supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp’s testimony on ultimate legal conclusions.

*11. Ground XI—Claims 31, 56, 106, and 123*

Each of claims 31, 56, 106, and 123 recites using lubrication that comprises one or more of the following: ester, sulfurized oil; alkanolamides; amine; amine salt; olefin; polyolefins; C-8 to C-18 linear alcohol; derivatives of C-8 to C-18 linear alcohol including ester; derivatives of C-8 to C-18 linear alcohol including amine; derivatives of C-8 to C-18 linear alcohol including carboxylate; sulfonate; polyethylene glycol; silicone; siloxane; dinonyl phenol; ethylene oxide block copolymer; and propylene oxide block copolymer.

E.g., Ex. 1001, 17:36–58. Petitioner asserts that claims 31, 56, 106, and 123 would have been obvious over Vincent in combination with CRC Volume 2 or Tribology Handbook. Pet. 46–49. Noting that Vincent discloses using

vegetable oil and sperm oil as lubricants, Petitioner asserts that it was known that vegetable oils and sperm oil are esters. *Id.* at 46.

Additionally, Petitioner asserts, and Mr. Tripp testifies, that CRC Volume 2 and Tribology Handbook disclose the common use of a number of the components recited in the challenged claims. *Id.* at 46–49; Ex. 1009 ¶¶ 100–109. Mr. Tripp also testifies that CRC Volume 2 and Tribology Handbook “are industry standard texts that are commonly used for selection and/or design of lubricants.” Ex. 1009 ¶ 110. Mr. Tripp further testifies that combining the teachings of Vincent with the lubricant teachings of CRC Volume 2 and Tribology Handbook would have been within the level of skill in the art and would have produced only expected results. *Id.*

Petitioner argues that a person of ordinary skill in the art would have been motivated to combine the teachings of Vincent with the lubricant teachings of CRC Volume 2 or Tribology Handbook “because these references are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in Vincent.” Pet. 49.

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 31, 56, 106, and 123 would have been obvious to a person of ordinary skill in the art. We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known lubricants based on suitability for the intended use—“to decrease frictional drag on the expanding cone and collet head” (Ex. 1002, 12:43–45). *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197.

Patent Owner argues only that Mr. Tripp’s testimony should be disregarded because he lacked adequate understanding of the legal framework associated with his conclusion of obviousness. PO Resp. 14–16. This argument is unavailing because the supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp’s testimony on ultimate legal conclusions.

*E. Ground XII—Anticipation by Forsyth*

*1. Overview of Forsyth*

Forsyth discloses “a method and apparatus of running downhole tubing or casing of a size smaller than tubing or casing already set in the hole and expanding the smaller tubing to a larger size downhole.” Ex. 1004, 1:6–9. Figures 1a through 1d of Forsyth “are a sectional view of the tool supporting a piece of tubing to be expanded just prior to any actual expansion.” *Id.* at 2:61–64. Figure 1c is reproduced below.

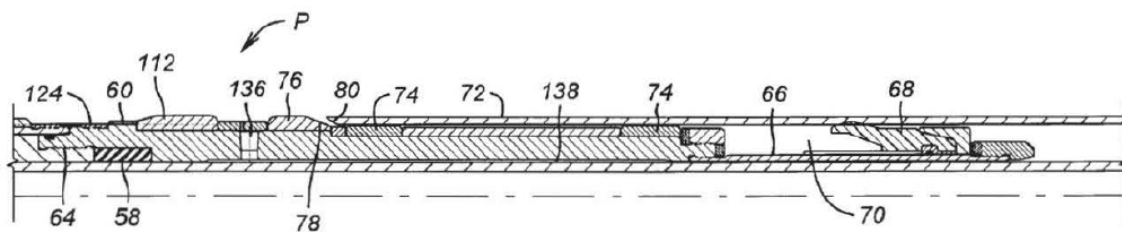


**FIG. 1C**

Figure 1c shows tubing 72 and piston P with body 60. *Id.* at 3:23–28. Forsyth discloses that wedge 76 accomplishes expansion of tubing 72. *Id.* at 3:31–32. As wedge 76 moves through tubing 72, “grease is being distributed on the inside diameter of [] tubing 72 from cavity 70.” *Id.* at 4:48–50.

## 2. Discussion

### a. Overview

Petitioner explains how it believes Forsyth discloses the limitations of each of claims 1, 3, 7–12, 17, 19, 32–37, 42, 44, 82–87, 92, 94, 107–109, 112, and 114, citing to record evidence. Pet. 15–16, 23–29, 32. Patent Owner argues that Forsyth fails to disclose certain claim limitations. PO Resp. 20, 22–25, 36. We have reviewed Petitioner’s arguments and the underlying evidence cited in support and are persuaded that Petitioner has demonstrated by a preponderance of the evidence that Forsyth anticipates claims 1, 3, 7–9, 11, 17, 19, 32–34, 36, 42, 44, 82–84, 86, 92, 94, 107–109, 112, and 114.<sup>34</sup> Pet. 15–16, 23–25, 29–32; Reply 4, 19–21; Ex. 1004, 1:6–9, 1:16–21, 2:25–28, 4:49–50, 5:56–59, 6:11–12, 6:17–19; Ex. 1005, 46–47; Ex. 1009 ¶¶ 10–11, 15, 17, 21–22, 26, 30, 34, 38–39, 58–59. Petitioner has not demonstrated by a preponderance of the evidence that Forsyth anticipates claims 10, 12, 35, 37, 85, 87. Further discussion of the parties’ disputes regarding anticipation by Forsyth follows.

### b. Claims 1, 32–37, 42, and 44—Coating

Independent claim 1 recites “coating the interior surfaces of the tubular members with a lubricant.” Each of claims 32–37, 42, and 44 depends from independent claim 1. Petitioner and Patent Owner dispute whether Forsyth teaches “coating the interior surfaces of the tubular members,” as recited in claim 1. Petitioner contends that Forsyth does, pointing to, *inter alia*, Forsyth’s disclosure that “[t]he expansion of the

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<sup>34</sup> We reach this finding without need to rely on Mr. Tripp’s testimony on the ultimate issue of anticipation.

tubing 72 is facilitated by the reservoir of grease in cavity 70 which is distributed along the internal wall of tubing 72 as the wedge 76 progresses.” Ex. 1004, 4:49–50; Pet. 16 (citing Ex. 1004, 4:49–50, 5:56–59, 6:17–19; Ex. 1009 ¶¶ 15, 17). Patent Owner argues that Forsyth’s distribution would produce no better than an un-even application of grease “that is not equivalent to coating the interior surfaces with a lubricant. PO Resp. 36.

In response, Petitioner maintains that Forsyth discloses “coating.” Reply 4. Petitioner asserts that Patent Owner does not dispute Forsyth anticipates claim 11, which uses “coating” as a noun. *Id.* Petitioner asserts that if Forsyth has a coating, then a coating step necessarily occurred previously. *Id.* Petitioner also asserts that the claims do not require any specific distribution pattern. *Id.*

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that Forsyth discloses “coating the interior surfaces of the tubular members,” as recited in claim 1. Facially, it would appear that when grease is “distributed along the internal wall of tubing 72,” this constitutes “coating the interior surfaces of the tubular members.” Consistent with Petitioner’s arguments, Patent Owner does not advance any evidence or arguments persuading us that the claim term “coating” requires any particular type of distribution. Indeed, as Petitioner notes, Patent Owner has asserted that the claim term “coating” means “applying a substance to a surface.” See Prelim. Resp. 18; see also Ex. 2002 ¶ 31 (testifying person of skill in the art would understand claim term “coating” to mean “applying a substance to a surface”). We find that when Forsyth’s grease is “distributed” on the inside of tubing 72, this involves applying the grease to the inside surface of tube 72.

*c. Claims 10, 12, 35, 37, 85, and 87—Chemically Bonded Lubricant and Adhesively Bonded Lubricant*

Each of claims 10, 35, and 85 requires “chemically bonded” lubricant. Each of claims 12, 37, and 87 requires “adhesively bonded” lubricant. Petitioner asserts that Forsyth discloses these limitations, noting that Forsyth discloses “grease is being distributed on the inside diameter of the tubing.” Pet. 27 (citing Ex. 1004, 4:49–50). Citing Mr. Tripp’s testimony, the Petition asserts that a person of ordinary skill in the art would understand the disclosed distribution of grease to include chemical and adhesive bonding of a lubricant to a surface. *Id.* at 28 (citing Ex. 1009 ¶¶ 42, 44, 45, 48, 50, 53, 55).

Patent Owner argues that Forsyth does not disclose chemical or adhesive bonding of lubricant to a tubular member. PO Resp. 20. Patent Owner notes that Forsyth does not specify a type of grease. *Id.* Citing Dr. Seemuth’s testimony, Patent Owner argues that greases generally are semi-solid and held in place via their viscosity, not bonded chemically or adhesively to a substrate. *Id.* (citing Ex. 2006 ¶ 11 (citing Ex. 2007 6–7; Ex. 2008, 1721–22; Ex. 2009, 843–870; Ex. 2010, 235; Ex. 2011; Ex. 2012; Ex. 2013, 93–110, Ex. 2014, 26–39, Ex. 2015, 177–196)).

In response, Petitioner maintains that Forsyth’s grease chemically and adhesively bonds to the substrate. Reply 11–12. Petitioner argues that “the ‘012 Patent does not say what ‘adhesively bonded’ means” (*id.* at 11), and that “Dr. Seemuth’s citations do not provide the meaning of ‘adhesively bonded’” (*id.* at 12). Noting that the “general meaning of ‘adhesive’ is ‘sticky,’ and ‘bond’ is something that holds things together,” Petitioner argues that “[f]undamentally, grease is sticky. It adheres to stuff.” *Id.*

Petitioner also argues that Dr. Seemuth indicates grease is bonded primarily via electrostatic forces. *Id.* Petitioner asserts that this meets Dr. Seemuth's definitions of adhesively bonded and chemically bonded. *Id.*

We do not find Petitioner's arguments more persuasive than Patent Owner's. At most, Petitioner's observations regarding Dr. Seemuth's testimony tend to demonstrate that it is not clear from Dr. Seemuth's testimony whether Forsyth's grease would adhesively or chemically bond to the substrate. *See* Reply 11–12. We weigh this against the testimony of Mr. Tripp cited by the Petition. *See* Pet. 28 (citing Ex. 1009 ¶¶ 42, 44, 45, 48, 50, 53, 55). Mr. Tripp testifies that a person of ordinary skill in the art “would understand that the lubricant disclosed *could* be chemically . . . or adhesively bonded to a surface.” Ex. 1009 ¶ 42 (emphasis added). Mr. Tripp also testifies that it would have been “obvious” to employ chemical bonding. *Id.* ¶ 45. We find these observations by Mr. Tripp about what could have been done or would have been obvious insufficient to outweigh the evidence cited by Patent Owner regarding anticipation by Forsyth. Regarding Petitioner's assertions that “grease is sticky” and “[i]t adheres to stuff,” Petitioner provides no more than attorney argument for this contention. *See* Reply 12. We find that Petitioner has not demonstrated by a preponderance of the evidence that Forsyth anticipates claims 10, 12, 35, 37, 85, and 87.

*d. Claims 17, 19, 42, 44, 92, 94, 112, and 114—Friction Coefficients*

Each of claims 17, 19, 42, 44, 92, 94, 112, and 114 recites a range of a coefficient of friction provided by a lubricant. Petitioner asserts that Forsyth discloses lubricant providing the coefficients of friction recited in the claims.

*Id.* at 29–30, 32. Specifically, Petitioner asserts that the friction values recited in each claim are met by Forsyth’s grease, when used between hard steel and hard steel. *Id.* (citing Ex. 1005, 46–47; Ex. 1009 ¶ 59). Patent Owner argues that the test results in the references cited by Petitioner would not apply for all conditions. PO Resp. 23–24. As explained in Section II.C.2.d, this argument is not commensurate in scope with the language of the challenged claims. We find that Petitioner has established by a preponderance of the evidence that claims 17, 19, 42, 44, 92, 94, 112, and 114 are anticipated by Forsyth.

*F. Grounds XIII–XIX—Obviousness Based on Forsyth*

*1. Overview*

Petitioner explains how it believes the limitations of each of claims 10–12, 17–19, 21, 23, 25, 31, 35–37, 42–44, 46, 48, 50, 56, 85–87, 92–94, 96, 98, 100, 106, 112–114, 116, 117, and 123 are taught by or obvious in view of Forsyth and the other cited references, citing to record evidence. Pet. 15–16, 28–34, 36–43, 46–49. Patent Owner disputes certain aspects of Petitioner’s obviousness assertions. PO Resp. 14–16, 21–22, 26–28, 34. We have reviewed Petitioner’s arguments and the underlying evidence cited in support and are persuaded that Petitioner has demonstrated obviousness by a preponderance of the evidence with respect to each claim challenged in grounds XIII–XIX, such that Petitioner has demonstrated obviousness of each of claims 10–12, 17–19, 21, 23, 25, 31, 35–37, 42–44, 46, 48, 50, 56, 85–87, 92–94, 96, 98, 100, 106, 112–114, 116, 117, and 123 by a

preponderance of the evidence.<sup>35</sup> Pet. 15–16, 25–43, 45–49; Reply 19–21; Ex. 1004, 1:6–9, 1:16–21, 4:49–50, 5:56–59, 6:11–12, 6:17–19; Ex. 1005, 46–47, 53–54, 229, 247, 258, 261–262, 269–272, 277–278, 286, 305, 308, 312; Ex. 1006, 167–169; Ex. 1007, 103, 156, 605; Ex. 1008, 308; Ex. 1009 ¶¶ 10–11, 15, 17, 21–22, 26, 41–42, 44–45, 47–48, 50, 52–53, 55, 59, 62–68, 76, 79–91, 99–110. Further discussion of the parties’ disputes regarding these grounds follows.

## *2. Ground XIII*

### *a. Claims 10, 12, 35, 37, 85, and 87—Chemically Bonded Lubricant and Adhesively Bonded Lubricant*

Each of claims 10, 35, and 85 requires “chemically bonded” lubricant. Each of claims 12, 37, and 87 requires “adhesively bonded” lubricant. Petitioner asserts that it would have been obvious to combine the teachings in CRC Volume 2 and CRC Volume 3 of chemically and adhesively bonding lubricants with the teachings of Forsyth. Pet. 28–29. Petitioner asserts that a person of ordinary skill in the art would have been motivated to use chemical and adhesive bonding, as taught in CRC Volume 2 and CRC Volume 3, “because these references are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Forsyth.” Pet. 28.

Patent Owner argues that Petitioner has provided no evidence of obviousness. According to Patent Owner, this is so because Mr. Tripp’s “opinions and analysis of invalidity . . . were arrived at with no

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<sup>35</sup> We reach this conclusion without needing to rely on Mr. Tripp’s testimony on the ultimate conclusion of obviousness.

understanding of any legal framework that should have been applied in analyzing invalidity.” PO Resp. 22.

For substantially the same reasons discussed in Section II.D.2 above, we find Petitioner’s arguments more persuasive than Patent Owner’s. We determine that Petitioner has demonstrated by a preponderance of the evidence that claims 10, 12, 35, 37, 85, and 87 would have been obvious over Forsyth, CRC Volume 2, and CRC Volume 3.

*b. Claims 11, 36, and 86—Mechanically Bonded Lubricant*

Each of claims 11, 36, and 86 requires “mechanically bonded” lubricant. Petitioner asserts that these claims would have been obvious over Forsyth with CRC Volume 2 and/or CRC Volume 3. Pet. 28–29. Petitioner asserts that mechanically bonded lubricants were known. For example, Petitioner notes that CRC Volume 2 discloses that:

Bonding of lamellar solids to the substrate appears to involve three mechanisms: (1) particles can be physically trapped within surface depressions, (2) crystallites may be mechanically embedded into the substrate and act as nuclei around which film growth occurs via intercrystallite cohesion, and (3) the lubricant may interact chemically within the substrate.

Ex. 1005, 277; Pet. 27. Mr. Tripp also cites this disclosure of CRC Volume 2. Ex. 1009 ¶ 54. Additionally, Mr. Tripp testifies that a person of ordinary skill in the art CRC Volume 2 and CRC Volume 3 are “industry standard texts that are commonly used for selection and/or design of lubricants.” Ex. 1009 ¶ 110. Mr. Tripp also testifies that combining the teachings of Forsyth with CRC Volume 2 and CRC Volume 3 would have been within the level of skill in the art and would have produced only expected results. *Id.* Citing this testimony, Petitioner asserts that a person of ordinary skill in the art

would have been motivated to combine the teachings of Forsyth with those of CRC Volume 2 and/or CRC Volume 3 “because these are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Forsyth.” Pet. 28.

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 11, 36, and 86 would have been obvious to a person of ordinary skill in the art. We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known material (mechanically bonded lubricant) based on suitability for the intended use. *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197.

Patent Owner argues only that Mr. Tripp’s testimony should be disregarded because he lacked adequate understanding of the legal framework associated with his conclusion of obviousness. PO Resp. 14–16. This argument is unavailing because the supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp’s testimony on ultimate legal conclusions.

*3. Ground XIV—Claims 17, 19, 42, 44, 92, 94, 112, and 114—Friction Coefficients*

Petitioner asserts that claims 17, 19, 42, 44, 92, 94, 112, and 114 would have been obvious in view of Forsyth in combination with CRC Volume 2, CRC Volume 3, or Tribology Handbook. Pet. 29–34. Petitioner asserts that a person of ordinary skill in the art would have understood that a

lubricant disclosed by Forsyth would have provided friction coefficients in accordance with claims 17, 19, 42, 44, 92, 94, 112, and 114. Pet. 32.

Petitioner also asserts that it was known from CRC Volume 2, CRC Volume 3, and Tribology Handbook that lubricants providing the claimed friction coefficients were available. *Id.* at 33. Citing Mr. Tripp's testimony, Petitioner also asserts that it would have been obvious to combine with Forsyth's teachings the teachings of CRC Volume 2, CRC Volume 3 or Tribology Handbook regarding lubricants providing friction coefficients according to the challenged claims. *Id.*

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 17, 19, 42, 44, 92, 94, 112, and 114 would have been obvious. Because Petitioner has persuaded us that a person of ordinary skill in the art would understand that Forsyth discloses all of the limitations of these claims (*see* Section II.E.2.d), Petitioner persuades us that these claims would have been obvious. Additionally, we are persuaded that combining the teachings of the references in the manner suggested by Petitioner is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Furthermore, the proposed combination involves selection of lubricants known to provide the claimed friction coefficients, based on suitability for the intended use. *See, e.g.,* Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197.

Patent Owner argues that the friction coefficients in the references cited by Petitioner may not apply in circumstances different from the test conditions used for those references. PO Resp. 24. As explained above in

Section II.E.2.d, this argument is not commensurate in scope with the challenged claims.

Patent Owner also argues that Petitioner's obviousness challenge fails because Mr. Tripp lacks sufficient understanding of the legal framework for a conclusion of obviousness. *Id.* at 14–16. This argument is unavailing because the supporting evidence provided by Petitioner and Mr. Tripp is sufficient to demonstrate obviousness without need to rely on Mr. Tripp's conclusion of obviousness.

#### *4. Ground XV—Claims 18, 43, 93, and 113*

Each of claims 18, 43, 93 and 113 requires a lubricant or a coating of lubricant that is “selected from the group consisting of: sodium stearates, calcium stearates, zinc stearates, zinc phosphate, manganese phosphate, C-Lube-10, C-Phos-58-M, C-Phos-58-R, polytetrafluoroethylene, molybdenum disulfide, and metallic soaps.” Petitioner asserts that claims 18, 43, 93, and 113 would have been obvious over Forsyth in combination with CRC Volume 2 or CRC Volume 3. Pet. 36–37. Citing CRC Volume 2 and CRC Volume 3, Petitioner asserts that molybdenum disulfide and polytetrafluoroethylene were known, commercially available lubricants. *Id.* at 36. Petitioner asserts that a person of ordinary skill in the art would have been motivated to combine these teachings of CRC Volume 2 and CRC Volume 3 with Forsyth because CRC Volume 2 and CRC Volume 3 “are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Forsyth.” *Id.* at 36–37. With respect to this challenge, Patent Owner presents the same arguments that it presents regarding Petitioner's assertions of obviousness over Vincent in combination with CRC Volume 2 or CRC Volume 3. PO Resp. 26–28. For

substantially the same reasons as discussed above in Section II.D.4, we find these arguments advanced by Patent Owner less persuasive than Petitioner's arguments and evidence. We determine that Petitioner has demonstrated by a preponderance of the evidence that claims 18, 43, 93, and 113 would have been obvious over Forsyth in combination with CRC Volume 2 or CRC Volume 3.

*5. Ground XVI—Claims 21, 46, 96, and 116*

Petitioner asserts that claims 21, 46, 96, and 116 would have been obvious over Forsyth in combination with CRC Volume 2 or CRC Volume 3. Pet. 38–39. Petitioner and Mr. Tripp assert that CRC Volume 2 and CRC Volume 3 disclose lubricants recited in the challenged claims. Pet. 38; Ex. 1009 ¶ 76. Mr. Tripp also testifies that CRC Volume 2 and CRC Volume 3 are “industry standard texts that are commonly used for selection and/or design of lubricants.” Ex. 1009 ¶ 110. Mr. Tripp also testifies that combining the teachings of Forsyth with those of CRC Volume 2 or CRC Volume 3 would have been within the level of ordinary skill in the art and would have produced nothing more than predictable results. *Id.* Citing this testimony, Petitioner asserts that a person of ordinary skill in the art would have been motivated to combine with the teachings of Forsyth the lubricant teachings of CRC Volume 2 and CRC Volume 3 “because these references are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Forsyth.” Pet. 39.

We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Furthermore, the proposed combination involves selection of known

lubricants based on suitability for the intended use. *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197. In view of this, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 21, 46, 96, and 116 would have been obvious over Forsyth in combination with CRC Volume 2 or CRC Volume 3.

*6. Ground XVII—Claims 23, 48, and 98*

Petitioner asserts that claims 23, 48, and 98 would have been obvious in view of Forsyth and CRC Volume 2. Pet. 40–41. Petitioner contends that CRC Volume 2 discloses that some of the binders listed in the challenged claims, including epoxy, acrylics, phenolic, alkyd resins, and silicone, were in common use. *Id.* (citing Ex. 1005, 278; Ex. 1009 ¶¶ 81–82, 84). Mr. Tripp testifies that CRC Volume 2 discloses that “lamellar solids are often incorporated within a synthetic resin binder to produce a ‘bonded coating.’” Ex. 1009 ¶ 82 (citing Ex. 1005, 277). Petitioner indicates that it would have been obvious to use the binders disclosed in CRC Volume 2 with the teachings of Forsyth, explaining that a person of ordinary skill in the art would have been motivated to do so because CRC Volume 2 is “the type[] of reference[] that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Forsyth.” *Id.* at 40–41. Mr. Tripp testifies that a person of ordinary skill in the art would understand how to combine the teachings of the references, and that doing so would not have produced any unexpected result. Ex. 1009 ¶ 110. Patent Owner argues that Petitioner presents no evidence of obviousness because Mr. Tripp’s testimony was provided without adequate understanding of applicable legal framework. PO Resp. 31.

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 23, 48, and 98 would have been obvious over Forsyth and CRC Volume 2. We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known lubricant based on suitability for the intended use. *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197.

Patent Owner argues only that Mr. Tripp’s testimony should be disregarded because he lacked adequate understanding of the legal framework associated with his conclusion of obviousness. PO Resp. 14–16. This argument is unavailing because the supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp’s testimony on ultimate legal conclusions.

7. *Ground XVIII—Claims 25, 50, 100, and 117—Carrier Solvent*

Each of claims 25, 50, 100, and 117 recites “a suspension of particles in a carrier solvent.” Petitioner asserts that using a carrier solvent to apply a solid lubricant was common practice. *Id.* (citing Ex. 1009 ¶¶ 89–91). Petitioner notes that Tribology Handbook discloses that “[g]raphite is commonly used as a dry powder or as dispersion in water, oils, greases, or solvents.” Ex. 1007, 156; Pet. 42. Petitioner also notes that CRC Volume 2 discloses that “[g]raphite and MoS are extensively used as additives in conventional oils and greases to reduce friction and wear.” Ex. 1005, 286; Pet. 42. Petitioner argues that a person of ordinary skill in the art would have been motivated to combine the teachings of Forsyth with those of

Tribology Handbook and CRC Volume 2 “because these are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Forsyth.” Pet. 42 (citing Ex. 1009 ¶¶ 89–91). Patent Owner argues that Petitioner presents no evidence of obviousness because Mr. Tripp’s testimony was provided without adequate understanding of applicable legal framework. PO Resp. 34.

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 25, 50, 100, and 117 would have been obvious in view of Forsyth and CRC Volume 2 or Tribology Handbook. We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See* KSR, 550 U.S. at 417. Additionally, the proposed combination involves selection of known lubricant based on suitability for the intended use. *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197. The supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp’s testimony on ultimate legal conclusions. Accordingly, Patent Owner’s argument that Mr. Tripp lacked adequate knowledge of the legal framework for obviousness is unavailing. *See* Pet. 41–42; Ex. 1009 ¶¶ 89–91, 110; Ex. 1005, 286; Ex. 1007, 156.

*8. Ground XIX—Claims 31, 56, 106, and 123*

Petitioner argues that claims 31, 56, 106, and 123 would have been obvious over Forsyth in combination with CRC Volume 2 or Tribology Handbook. Pet. 46–49. Petitioner asserts, and Mr. Tripp testifies, that CRC Volume 2 and Tribology Handbook disclose the common use of a number of

the components recited in the challenged claims. *Id.* at 46–49; Ex. 1009 ¶¶ 100–109. Mr. Tripp also testifies that CRC Volume 2 and Tribology Handbook “are industry standard texts that are commonly used for selection and/or design of lubricants.” Ex. 1009 ¶ 110. Mr. Tripp further testifies that combining the teachings of Forsyth with the lubricant teachings of CRC Volume 2 and Tribology Handbook would have been within the level of skill in the art and would have produced only expected results. *Id.*

Petitioner argues that a person of ordinary skill in the art would have been motivated to combine the teachings of Forsyth with the lubricant teachings of CRC Volume 2 or Tribology Handbook “because these references are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Forsyth.” Pet. 49.

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 31, 56, 106, and 123 would have been obvious to a person of ordinary skill in the art. We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of a known lubricant based on suitability for the intended use. *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197. Patent Owner argues only that Mr. Tripp’s testimony should be disregarded because he lacked adequate understanding of the legal framework associated with his conclusion of obviousness. PO Resp. 14–16. This argument is unavailing because the supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of

the evidence without need to consider Mr. Tripp's testimony on ultimate legal conclusions.

*G. Ground XX—Anticipation by Kinley*

*1. Overview of Kinley*

Kinley discloses “[a]pparatus for repairing tubular members, such as oil well casing or tubing, wherein a malleable liner is expanded into sealed engagement with inside of such tubular member.” Ex. 1003, [57]. Figure 2 of Kinley is reproduced below.

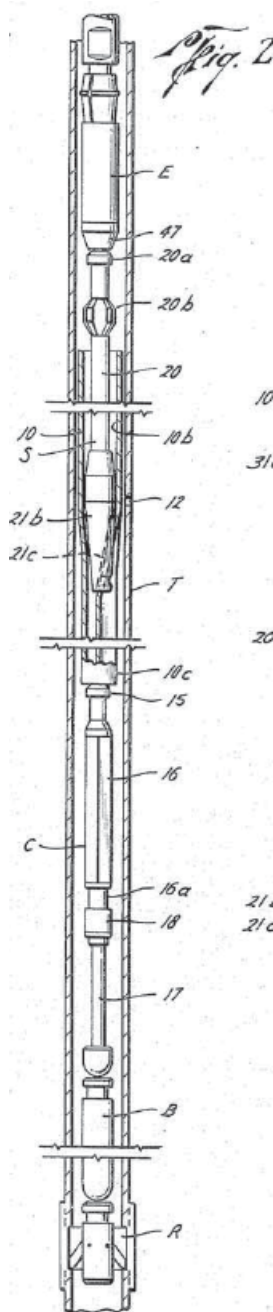


Figure 2 of Kinley shows liner 10 located downhole in production tubing T. *Id.* at 2:18–19. Liner 10 consists of thin-walled steel tube with oil-resistant elastomer on its outside and a slippery, fluoride plastic on its inside. *Id.* at 2:22–25. Kinley discloses liner 10 may be expanded as a swaging tool S is driven therethrough, and that expanding tool E is also provided for

expanding liner 10. *Id.* at 3:1–12, 3:35–36. Kinley discloses that expanding tool E includes mandrel 30 to which collet 31 mounts. *Id.* at 3:52, 3:65–4:2. Collet 31 includes fingers 31c, 31d, and 31e. *Id.* at 4:2–4. “[S]ince the collet is made of resilient steel or other resilient material, the fingers 31c, 31d, and 31e are bendable or extendable inwardly and outwardly.” *Id.* at 4:8–11. When expanding tool E is driven into liner 10, ridges 31h on flexible fingers 31c, 31d, and 31e “engage the inside wall [of] the liner 10 and expand the liner into sealed engagement with the inside wall of the tubing T.” *Id.* at 6:51–55.

## 2. Discussion

### a. Overview

Petitioner explains how it believes Kinley discloses each of the limitations recited in claims 1, 3, 7–12, 17–19, 21, 32–37, 42–44, 46, 82–87, 92–94, 96, 107–109, 112–114, and 116, citing to record evidence. Pet. 16–17, 23–29, 32–35, 38. Patent Owner argues that Kinley fails to disclose certain limitations. PO Resp. 20–26, 36–37. We have reviewed Petitioner’s arguments and the underlying evidence cited in support and are persuaded that Petitioner has demonstrated by a preponderance of the evidence that Kinley anticipates claims 1, 3, 7–9, 11, 17, 19, 21, 32–34, 36, 42, 44, 46, 82–84, 86, 92, 94, 96, 107–109, 112, 114, and 116.<sup>36</sup> Pet. 16–17, 23–25, 29–34, 37–39; Reply 2–6, 19–21; Ex. 1001, 3:18–20, 5:7–9; Ex. 1003, 1:6–7, 2:21–28, 1:41–47, 2:21–25, 5:54–56, 7:68–8:1; Ex. 1006, 131; Ex. 1009 ¶¶ 9, 11, 16, 17, 20, 22, 25, 30, 34, 38–39, 56–60, 75; Ex. 1016, 3.

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<sup>36</sup> We reach this finding without need to rely on Mr. Tripp’s testimony on the ultimate issue of anticipation.

Petitioner has not demonstrated by a preponderance of the evidence that Kinley anticipates claims 10, 12, 18, 35, 37, 43, 85, and 87, 93, and 113. Further discussion of the parties' disputes regarding anticipation by Kinley follows.

*b. Claims 1, 3, 7–9, 11, 21, 32–34, 36, 46, 82–84, 86, 96, 107–109, and 116—One or More Tubular Members*

Patent Owner argues that Kinley does not disclose multiple tubular members and, therefore, does not anticipate claims 1, 3, 7–9, 11, 21, 32–34, 36, 46, 82–84, 86, 96, 107–109, and 116. PO Resp. 36–38. This argument is unpersuasive because, as explained above in Section II.B.2, the broadest reasonable interpretation of these claims requires only “one or more tubular members,” not multiple tubular members. Patent Owner also suggests that Kinley differs from the '012 patent because Kinley's liner 10 is not initially circular, as allegedly required to allow connecting multiple tubulars together. PO Resp. 2–5. We find this argument unpersuasive because, as explained in Section II.B.3 above, we are not persuaded that the claims require a tubular member that is initially circular. Additionally, Kinley discloses that after swaging tool S forms liner 10 into a substantially cylindrical (i.e., circular) shape, liner expanding tool E expands “liner 10 into sealed engagement with the inside wall 11 of the tubing T.” Ex. 1003, 3:35–39.

*c. Claims 10, 12, 35, 37, 85, and 87—Chemically Bonded Lubricant and Adhesively Bonded Lubricant*

Each of claims 10, 35, and 85 requires “chemically bonded” lubricant. Each of claims 12, 37, and 87 requires “adhesively bonded” lubricant. The Petition notes that Kinley discloses using “a slippery fluoride plastic.” Pet. 28. Citing Mr. Tripp's testimony, Petitioner asserts that a person of ordinary

skill in the art “would understand the fluoride plastic coating of [Kinley] to encompass chemically, mechanically, and adhesively bonding a lubricant to an inside surface of an expandable tubular.” *Id.* (citing Ex. 1009 ¶¶ 43–45, 49, 50, 54, 55).

Patent Owner argues that Kinley does not disclose chemical or adhesive bonding. PO Resp. 20–21. Patent Owner argues that the cited portions of Mr. Tripp’s testimony “rely on an admitted misrepresentation of the cited art in making the statement that ‘PTFE is an example of a slippery fluoride plastic.’” *Id.* at 21 (citing Ex. 1009 ¶¶ 43–45, 49, 50, 54, 55; Ex. 2005, 137.). Citing Dr. Seemuth’s testimony, Patent Owner further asserts that even if a slippery fluoride plastic were considered a PTFE, a person of ordinary skill in the art would understand the properties of PTFE would not allow it to be chemically or adhesively bonded to another surface. *Id.* (citing Ex. 2006 ¶ 15 (citing Ex. 2020, 296; Ex. 2021, 149; Ex. 2022; Ex. 2023; Ex. 2024, 933-937)).

In response, Petitioner maintains that Kinley discloses a lubricant chemically and adhesively bonded to the substrate. Reply 12–14. Petitioner maintains that a person of ordinary skill in the art would understand that Kinley’s disclosure of “slippery fluoride plastic” teaches PTFE. *Id.* at 12–13. Additionally, citing portions of Exhibits 2006, 2022, and 2023, Petitioner disputes Dr. Seemuth’s testimony that the properties of PTFE would not allow chemically or adhesively bonding it to a surface. *Id.* at 14.

We do not find Petitioner’s arguments and evidence more persuasive than Patent Owner’s. Here again, Petitioner’s criticism of Dr. Seemuth’s testimony tends to demonstrate, at most, that it is not clear from Dr. Seemuth’s testimony whether PTFE can chemically or adhesively bond to a

substrate. Against this, we weigh Mr. Tripp’s testimony that PTFE “can be” chemically or adhesively bonded to a surface (Ex. 1009 ¶ 43), and that it would have been “obvious” to implement chemical or adhesive bonding (*id.* ¶¶ 45, 55). Assuming, *arguendo*, that a person of ordinary skill in the art would understand Kinley’s disclosure of “slippery fluoride plastic” as teaching PTFE, we are not persuaded that Petitioner has demonstrated by a preponderance of the evidence that a person of ordinary skill in the art would understand Kinley as disclosing that the PTFE would be chemically or adhesively bonded to the substrate. Accordingly, we find that Petitioner has not demonstrated by a preponderance of the evidence that Kinley anticipates claims 10, 12, 35, 37, 85, and 87.

*d. Claims 17, 19, 42, 44, 92, 94, 112, and 114—Friction Coefficients*

Each of claims 17, 19, 42, 44, 92, 94, 112, and 114 recites a range of a coefficient of friction provided by a lubricant. Petitioner asserts that Kinley discloses lubricant providing the coefficients of friction recited in the claims. *Id.* at 29–30, 32. Specifically, Petitioner asserts that the friction values recited in each claim are met by Kinley’s slippery fluoride plastic. *Id.* (citing Ex. 1006, 131; Ex. 1009 ¶ 60). Patent Owner argues that the test results in the references cited by Petitioner would not apply for all conditions. PO Resp. 23–24. As explained in Section II.C.2.d above, this argument is not commensurate in scope with the language of the challenged claims. We find that Petitioner has established by a preponderance of the evidence that claims 17, 19, 42, 44, 92, 94, 112, and 114 are anticipated by Kinley.

*e. Claims 18, 43, 93, and 113*

Each of claims 18, 43, 93 and 113 requires a lubricant or a coating of lubricant that is “selected from the group consisting of: sodium stearates, calcium stearates, zinc stearates, zinc phosphate, manganese phosphate, C-Lube-10, C-Phos-58-M, C-Phos-58-R, polytetrafluoroethylene, molybdenum disulfide, and metallic soaps.” Petitioner asserts that Kinley anticipates claims 18, 43, 93, and 113. Pet. 34–35. Citing Kinley’s disclosure of “slippery, fluoride plastic,” Petitioner asserts that Kinley discloses PTFE (polytetrafluoroethylene), as recited in the challenged claims. *Id.* at 34. Petitioner cites Mr. Tripp’s testimony that “[a] person of ordinary skill would understand that PTFE is an example of a slippery fluoride plastic.” Ex. 1009 ¶ 54.

Citing his deposition testimony, Patent Owner asserts that Mr. Tripp has admitted that this is an incorrect reading of Kinley’s disclosure of a “slippery, fluoride plastic.” PO Resp. 26 (citing Ex. 2005, 137:3–7). In the cited portion of the deposition, when asked if “PTFE is a fluoride plastic,” Mr. Tripp responded “[i]t is a fluoropolymer. That would be a more accurate description of it.” Ex. 2005, 137:3–7.

In response, Petitioner contends that Patent Owner mischaracterizes Mr. Tripp’s deposition testimony. Reply 13. Petitioner notes that, in addition to stating that “fluoropolymer” is a more accurate description of PTFE, Mr. Tripp said that “PTFE can be incorporated into a high-density, polyethylene-based plastic; and it can be used as a slippery fluoride-based plastic.” Ex. 2005, 137:18–20; Reply 13. Petitioner also notes Mr. Tripp’s testimony that “‘PTFE’ and ‘teflon’ have become synonymous terms in the industry, Teflon being the coating developed with PTFE, a type of plastic

coating, and PTFE being one of the components in that coating.” Ex. 2005, 138: 21–24; Reply 13. After discussing Dr. Seemuth’s testimony regarding the meaning of “slippery, fluoride plastic,” Petitioner asserts that “Patent Owner has provided no credible argument that PTFE, a famous very slippery fluorine containing plastic, is not what Kinley was referring to in saying a ‘slippery fluoride plastic.’” Reply 13.

This argument misplaces the burden of persuasion, which rests on Petitioner. We are not persuaded that Petitioner has demonstrated by a preponderance of the evidence that Kinley’s disclosure of a “slippery fluoride plastic” refers to PTFE. Notwithstanding Petitioner’s arguments to the contrary, Mr. Tripp’s equivocation on whether PTFE itself is accurately considered a “fluoride plastic” significantly undermines Petitioner’s position. Mr. Tripp’s testimony that “PTFE *can* be incorporated into a . . . plastic” and that “it *can* be used as a slippery fluoride-based plastic” do little to rehabilitate Petitioner’s position. Ex. 2005, 137:18–21. Mr. Tripp’s assertion that PTFE and Teflon have become synonymous is also of little persuasive value, as Mr. Tripp cites no supporting evidence for this assertion. *Id.* at 138:21–24. For the foregoing reasons, we are not persuaded that Petitioner has demonstrated by a preponderance of the evidence that Kinley anticipates claims 18, 43, 93 and 113.

#### *H. Grounds XXI–XXVII—Obviousness Based on Kinley*

##### *1. Overview*

Petitioner explains how it believes the limitations of each of claims 10–12, 17–19, 21, 23, 25, 31, 35–37, 42–44, 46, 48, 50, 56, 85–87, 92–94, 96, 98, 100, 106, 112–114, 116, 117, and 123 are taught by or obvious in view of Kinley and the other cited references, citing to record evidence.

Pet. 15–16, 28–34, 36–43, 46–49. Patent Owner disputes certain aspects of Petitioner’s obviousness contentions. PO Resp. 14–16, 21–22, 26–28, 34. We have reviewed Petitioner’s arguments and the underlying evidence cited in support and are persuaded that Petitioner has demonstrated obviousness by a preponderance of the evidence with respect to each claim challenged in grounds XXI–XXVII, such that Petitioner has demonstrated obviousness of each of claims 10–12, 17–19, 21, 23, 25, 31, 35–37, 42–44, 46, 48, 50, 56, 85–87, 92–94, 96, 98, 100, 106, 112–114, 116, 117, and 123 by a preponderance of the evidence.<sup>37</sup> Pet. 16–17, 25–43, 45–49; Reply 19–21; Ex. 1003, 1:41–47, 2:21–25; Ex. 1005, 53–54, 229, 247, 258, 261–262, 277–278, 286, 305, 308, 312; Ex. 1006, 131, 167–169; Ex. 1007, 103, 156, 605; Ex. 1008, 308; Ex. 1009 ¶¶ 9, 11, 16–17, 20, 22, 25, 43–45, 49–50, 54–60, 75–76, 79–82, 84–85, 87–91, 99–110. Further discussion of the parties’ disputes regarding these grounds follows.

## *2. Ground XXI*

### *a. Claims 10, 12, 35, 37, 85, and 87—Chemically Bonded Lubricant and Adhesively Bonded Lubricant*

Each of claims 10, 35, and 85 requires “chemically bonded” lubricant. Each of claims 12, 37, and 87 requires “adhesively bonded” lubricant. Petitioner asserts that it would have been obvious to combine the teachings in CRC Volume 2 and CRC Volume 3 of chemically and adhesively bonding lubricants with the teachings of Kinley. Pet. 28–29. Petitioner asserts that a person of ordinary skill in the art would have been motivated to use chemical and adhesive bonding, as taught in CRC Volume 2 and CRC

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<sup>37</sup> We reach this conclusion without needing to rely on Mr. Tripp’s testimony on the ultimate conclusion of obviousness.

Volume 3, “because these references are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Kinley.” Pet. 28.

Patent Owner argues that Petitioner has provided no evidence of obviousness. According to Patent Owner, this is so because Mr. Tripp’s “opinions and analysis of invalidity . . . were arrived at with no understanding of any legal framework that should have been applied in analyzing invalidity.” PO Resp. 22.

For substantially the same reasons discussed in Section II.D.2 above, we find Petitioner’s arguments more persuasive than Patent Owner’s. We determine that Petitioner has demonstrated by a preponderance of the evidence that claims 10, 12, 35, 37, 85, and 87 would have been obvious over Kinley, CRC Volume 2, and CRC Volume 3.

*b. Claims 11, 36, and 86—Mechanically Bonded Lubricant*

Each of claims 11, 36, and 86 requires “mechanically bonded” lubricant. Petitioner asserts that these claims would have been obvious over Kinley with CRC Volume 2 and/or CRC Volume 3. Pet. 28–29. Petitioner asserts that mechanically bonded lubricants were known. For example, Petitioner notes that CRC Volume 2 discloses that:

Bonding of lamellar solids to the substrate appears to involve three mechanisms: (1) particles can be physically trapped within surface depressions, (2) crystallites may be mechanically embedded into the substrate and act as nuclei around which film growth occurs via intercrystallite cohesion, and (3) the lubricant may interact chemically within the substrate.

Ex. 1005, 277; Pet. 27. Mr. Tripp also cites this disclosure of CRC Volume 2. Ex. 1009 ¶ 54. Additionally, Mr. Tripp testifies that a person of ordinary

skill in the art CRC Volume 2 and CRC Volume 3 are “industry standard texts that are commonly used for selection and/or design of lubricants.” *Id.* Mr. Tripp also testifies that combining the teachings of Kinley with CRC Volume 2 and CRC Volume 3 would have been within the level of skill in the art and would have produced only expected results. *Id.* Citing this testimony, Petitioner asserts that a person of ordinary skill in the art would have been motivated to combine the teachings of Kinley with those of CRC Volume 2 and/or CRC Volume 3 “because these are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Kinley.” Pet. 28.

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 11, 36, and 86 would have been obvious to a person of ordinary skill in the art. We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known material (mechanically bonded lubricants) based on suitability for the intended use. *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197. Patent Owner argues only that Mr. Tripp’s testimony should be disregarded because he lacked adequate understanding of the legal framework associated with his conclusion of obviousness. PO Resp. 14–16. This argument is unavailing because the supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp’s testimony on ultimate legal conclusions.

3. *Ground XXII—Claims 17, 19, 42, 44, 92, 94, 112, and 114—  
Friction Coefficients*

Petitioner asserts that claims 17, 19, 42, 44, 92, 94, 112, and 114 would have been obvious in view of Kinley in combination with CRC Volume 2, CRC Volume 3, or Tribology Handbook. Pet. 29–34. Petitioner asserts that a person of ordinary skill in the art would have understood that a lubricant disclosed by Kinley would have provided friction coefficients in accordance with claims 17, 19, 42, 44, 92, 94, 112, and 114. Pet. 30–32. Petitioner also asserts that it was known from CRC Volume 2, CRC Volume 3, and Tribology Handbook that lubricants providing the claimed friction coefficients were available. *Id.* at 33. Citing Mr. Tripp’s testimony, Petitioner also asserts that it would have been obvious to combine with Kinley’s teachings the teachings of CRC Volume 2, CRC Volume 3 or Tribology Handbook regarding lubricants providing friction coefficients according to the challenged claims. *Id.*

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 17, 19, 42, 44, 92, 94, 112, and 114 would have been obvious. Because Petitioner has persuaded us that a person of ordinary skill in the art would understand that Kinley discloses all of the limitations of these claims (see Section II.G.2.d), Petitioner persuades us that these claims would have been obvious. Additionally, we are persuaded that combining the teachings of the references in the manner suggested by Petitioner is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Furthermore, the proposed combination involves selection of lubricants known to provide the claimed friction coefficients, based on

suitability for the intended use. *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197.

Patent Owner argues that the friction coefficients in the references cited by Petitioner may not apply in circumstances different from the test conditions used for those references. PO Resp. 24. As explained above in Section II.G.2.d, this argument is not commensurate in scope with the challenged claims. Patent Owner also argues that Petitioner’s obviousness challenge fails because Mr. Tripp lacks sufficient understanding of the legal framework for a conclusion of obviousness. *Id.* at 14–16. This argument is unavailing because the supporting evidence provided by Petitioner and Mr. Tripp is sufficient to demonstrate obviousness without need to rely on Mr. Tripp’s conclusion of obviousness.

#### 4. *Ground XXIII—Claims 18, 43, 93, and 113*

Each of claims 18, 43, 93 and 113 requires a lubricant or a coating of lubricant that is “selected from the group consisting of: sodium stearates, calcium stearates, zinc stearates, zinc phosphate, manganese phosphate, C-Lube-10, C-Phos-58-M, C-Phos-58-R, polytetrafluoroethylene, molybdenum disulfide, and metallic soaps.” Petitioner asserts that claims 18, 43, 93, and 113 would have been obvious over Kinley in combination with CRC Volume 2 or CRC Volume 3. Pet. 36–37. Citing CRC Volume 2 and CRC Volume 3, Petitioner asserts that molybdenum disulfide and polytetrafluoroethylene were known, commercially available lubricants. *Id.* at 36. Petitioner asserts that a person of ordinary skill in the art would have been motivated to combine these teachings of CRC Volume 2 and CRC Volume 3 with Kinley because CRC Volume 2 and CRC Volume 3 “are the types of references that one of ordinary skill in the art would use to aid them

in selecting lubricants as described in . . . Kinley.” *Id.* at 36–37. With respect to this challenge, Patent Owner presents the same arguments that it presents regarding Petitioner’s assertions of obviousness over Vincent in combination with CRC Volume 2 or CRC Volume 3. PO Resp. 26–28. For substantially the same reasons as discussed above in Section II.D.4, we find these arguments advanced by Patent Owner less persuasive than Petitioner’s arguments and evidence. We determine that Petitioner has demonstrated by a preponderance of the evidence that claims 18, 43, 93, and 113 would have been obvious over Kinley in combination with CRC Volume 2 or CRC Volume 3.

*5. Ground XXIV—Claims 21, 46, 96, and 116*

Petitioner asserts that claims 21, 46, 96, and 116 would have been obvious over Kinley in combination with CRC Volume 2 or CRC Volume 3. Pet. 38–39. Petitioner and Mr. Tripp assert that CRC Volume 2 and CRC Volume 3 disclose lubricants recited in the challenged claims. Pet. 38; Ex. 1009 ¶ 76. Mr. Tripp also testifies that CRC Volume 2 and CRC Volume 3 are “industry standard texts that are commonly used for selection and/or design of lubricants.” Ex. 1009 ¶ 110. Mr. Tripp also testifies that combining the teachings of Kinley with those of CRC Volume 2 or CRC Volume 3 would have been within the level of ordinary skill in the art and would have produced nothing more than predictable results. *Id.* Citing this testimony, Petitioner asserts that a person of ordinary skill in the art would have been motivated to combine with the teachings of Kinley the lubricant teachings of CRC Volume 2 and CRC Volume 3 “because these references are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Kinley.” Pet. 39.

We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known lubricants based on suitability for the intended use. *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197. Thus, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 21, 46, 96, and 116 would have been obvious over Kinley in combination with CRC Volume 2 or CRC Volume 3.

6. *Ground XXV—Claims 23, 48, and 98*

Petitioner asserts that claims 23, 48, and 98 would have been obvious in view of Kinley and CRC Volume 2. Pet. 40–41. Petitioner contends that CRC Volume 2 discloses that some of the binders listed in the challenged claims, including epoxy, acrylics, phenolic, alkyd resins, and silicone, were in common use. *Id.* (citing Ex. 1005, 278; Ex. 1009 ¶¶ 81–82, 84). Mr. Tripp testifies that CRC Volume 2 discloses that “lamellar solids are often incorporated within a synthetic resin binder to produce a ‘bonded coating.’” Ex. 1009 ¶ 82 (citing Ex. 1005, 277). Petitioner indicates that it would have been obvious to use the binders disclosed in CRC Volume 2 with the teachings of Kinley, explaining that a person of ordinary skill in the art would have been motivated to do so because CRC Volume 2 is “the type[] of reference[] that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Kinley.” *Id.* at 40–41. Mr. Tripp testifies that a person of ordinary skill in the art would understand how to combine the teachings of the references, and that doing so would not have produced any unexpected result. Ex. 1009 ¶ 110. Patent Owner argues that

Petitioner presents no evidence of obviousness because Mr. Tripp's testimony was provided without adequate understanding of applicable legal framework. PO Resp. 31.

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 23, 48, and 98 would have been obvious over Kinley and CRC Volume 2. We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known lubricants based on suitability for the intended use. *See, e.g., Ex. 1009* ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197.

Patent Owner argues only that Mr. Tripp's testimony should be disregarded because he lacked adequate understanding of the legal framework associated with his conclusion of obviousness. PO Resp. 14–16. This argument is unavailing because the supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp's testimony on ultimate legal conclusions.

*7. Ground XXVI—Claims 25, 50, 100, and 117—Carrier Solvent*

Claims 25, 50, 100, and 117 require a lubricant that includes “particles in a carrier solvent.” Petitioner asserts that using a carrier solvent to apply a solid lubricant was common practice. *Id.* (citing Ex. 1009 ¶¶ 89–91). Petitioner notes that Tribology Handbook discloses that “[g]raphite is commonly used as a dry powder or as dispersion in water, oils, greases, or solvents.” Ex. 1007, 156; Pet. 42. Petitioner also notes that CRC Volume 2 discloses that “[g]raphite and MoS are extensively used as additives in

conventional oils and greases to reduce friction and wear.” Ex. 1005, 286; Pet. 42. Petitioner argues that a person of ordinary skill in the art would have been motivated to combine the teachings of Kinley with those of Tribology Handbook and CRC Volume 2 “because these are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Kinley.” Pet. 42 (citing Ex. 1009 ¶¶ 89–91). Patent Owner argues that Petitioner presents no evidence of obviousness because Mr. Tripp’s testimony was provided without adequate understanding of applicable legal framework. PO Resp. 34.

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 25, 50, 100, and 117 would have been obvious in view of Kinley and CRC Volume 2 or Tribology Handbook. We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known lubricants based on suitability for the intended use. *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197. The supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp’s testimony on ultimate legal conclusions. Accordingly, Patent Owner’s argument that Mr. Tripp lacked adequate knowledge of the legal framework for obviousness is unavailing. *See* Pet. 41–42; Ex. 1009 ¶¶ 89–91, 110; Ex. 1005, 286; Ex. 1007, 156.

8. *Ground XXVII—Claims 31, 56, 106, and 123*

Petitioner argues that claims 31, 56, 106, and 123 would have been obvious over Kinley in combination with CRC Volume 2 or Tribology Handbook. Pet. 46–49. Petitioner asserts, and Mr. Tripp testifies, that CRC Volume 2 and Tribology Handbook disclose the common use of a number of the components recited in the challenged claims. *Id.* at 46–49; Ex. 1009 ¶¶ 100–109. Mr. Tripp also testifies that CRC Volume 2 and Tribology Handbook “are industry standard texts that are commonly used for selection and/or design of lubricants.” Ex. 1009 ¶ 110. Mr. Tripp further testifies that combining the teachings of Kinley with the lubricant teachings of CRC Volume 2 and Tribology Handbook would have been with the level of skill in the art and would have produced only expected results. *Id.* Petitioner argues that a person of ordinary skill in the art would have been motivated to combine the teachings of Kinley with the lubricant teachings of CRC Volume 2 or Tribology Handbook “because these references are the types of references that one of ordinary skill in the art would use to aid them in selecting lubricants as described in . . . Kinley.” Pet. 49.

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 31, 56, 106, and 123 would have been obvious to a person of ordinary skill in the art. We are persuaded that combining the teachings of the references is within the level of skill in the art and involves no more than combining known technologies with predictable results. *See KSR*, 550 U.S. at 417. Additionally, the proposed combination involves selection of known lubricants based on suitability for the intended use. *See, e.g.*, Ex. 1009 ¶ 110; *Sinclair*, 325 U.S. 327; *Leshin*, 277 F.2d 197.

Patent Owner argues only that Mr. Tripp's testimony should be disregarded because he lacked adequate understanding of the legal framework associated with his conclusion of obviousness. PO Resp. 14–16. This argument is unavailing because the supporting evidence provided by Mr. Tripp and Petitioner demonstrates obviousness by a preponderance of the evidence without need to consider Mr. Tripp's testimony on ultimate legal conclusions.

### III. CONCLUSION

For the reasons expressed above, we determine that Petitioner has shown by a preponderance of the evidence:

Anticipation of claims 1, 3, 7–9, 11, 17, 19, 21, 31–34, 36, 42, 44, 46, 52, 53, 56, 82–84, 86, 92, 94, 102, 103, 106–109, 112, 114, 116, 119, 120, 123 by Vincent;

Obviousness of claims 10–12, 35–37, and 85–87 over Vincent with CRC Volume 2 and/or CRC Volume 3;

Obviousness of claims 17, 19, 42, 44, 92, 94, 112, and 114 over Vincent with CRC Volume 2, CRC Volume 3, or Tribology Handbook;

Obviousness of claims 18, 43, 93, and 113 over Vincent with CRC Volume 2;

Obviousness of claims 18, 43, 93, and 113 over Vincent with CRC Volume 2 or CRC Volume 3;

Obviousness of claims 21, 46, 96, and 116 over Vincent with CRC Volume 2 or CRC Volume 3;

Obviousness of claims 22, 23, 47, 48, 97, and 98 over Vincent with CRC Volume 2;<sup>38</sup>

Obviousness of claims 25, 50, 100, and 117 over Vincent with CRC Volume 2 or Tribology Handbook;

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<sup>38</sup> With respect to claims 22, 47, and 97, see Section II.D.7 above.

Obviousness of claims 52, 53, 102, 103, 119, and 120 over Vincent;

Obviousness of claims 52, 53, 102, 103, 119, and 120 over Vincent with CRC Volume 2 or Tribology Handbook;

Obviousness of claims 31, 56, 106, and 123 over Vincent with CRC Volume 2 or Tribology Handbook;

Anticipation of claims 1, 3, 7–9, 11, 17, 19, 32–34, 36, 42, 44, 82–84, 86, 92, 94, 107–109, 112, and 114 by Forsyth;

Obviousness of claims 10–12, 35–37, and 85–87 over Forsyth with CRC Volume 2 and/or CRC Volume 3;

Obviousness of claims 17, 19, 42, 44, 92, 94, 112, and 114 over Forsyth with CRC Volume 2, CRC Volume 3, or Tribology Handbook;

Obviousness of claims 18, 43, 93, and 113 over Forsyth with CRC Volume 2 or CRC Volume 3;

Obviousness of claims 21, 46, 96, and 116 over Forsyth with CRC Volume 2 or CRC Volume 3;

Obviousness of claims 23, 48, and 98 over Forsyth with CRC Volume 2;

Obviousness of claims 25, 50, 100, and 117 over Forsyth with CRC Volume 2 or Tribology Handbook;

Obviousness of claims 31, 56, 106, and 123 over Forsyth with CRC Volume 2 or Tribology Handbook;

Anticipation of claims 1, 3, 7–9, 11, 17, 19, 21, 32–34, 36, 42, 44, 46, 82–84, 86, 92, 94, 96, 107–109, 112, 114, and 116, by Kinley;

Obviousness of claims 10–12, 35–37, and 85–87 over Kinley with CRC Volume 2 and/or CRC Volume 3;

Obviousness of claims 17, 19, 42, 44, 92, 94, 112, and 114 over Kinley with CRC Volume 2, CRC Volume 3, or Tribology Handbook;

Obviousness of claims 18, 43, 93, and 113 over Kinley with CRC Volume 2 or CRC Volume 3;

Obviousness of claims 21, 46, 96, and 116 over Kinley with CRC Volume 2 or CRC Volume 3;

Obviousness of claims 23, 48, and 98 over Kinley with CRC Volume 2;

Obviousness of claims 25, 50, 100, and 117 over Kinley with CRC Volume 2 or Tribology Handbook; and

Obviousness of claims 31, 56, 106, and 123 over Kinley with CRC Volume 2 or Tribology Handbook.

Additionally, for the reasons expressed above, we determine that Petitioner has not shown by a preponderance of the evidence:

Anticipation of claims 10, 12, 22, 23, 25, 35, 37, 47, 48, 50, 85 87, 97–100, and 117 by Vincent;

Anticipation of claims 10, 12, 35, 37, 85, 87 by Forsyth; and

Anticipation of claims 10, 12, 18, 35, 37, 43, 85, and 87, 93, and 113 by Kinley.

#### IV. ORDERS

For the reasons given, it is:

ORDERED that claims 1, 3, 7–12, 17–19, 21–23, 25, 31–37, 42–44, 46–48, 50, 52, 53, 56, 82–87, 92–94, 96–98, 100, 102, 103, 106–109, 112–114, 116, 117, 119, 120, and 123 of the '012 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.

Case IPR2016-00954

Patent 6,695,012 B1

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