

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DYNATEMP INTERNATIONAL INC.
and
FLUOROFUSION SPECIALTY CHEMICALS, INC.
Petitioner

v.

R421A LLC
Patent Owner

Case No. IPR2023-00619
Patent No. 11,345,840 B2

PETITION FOR *INTER PARTES* REVIEW

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EXHIBITS for IPR Petition and Declaration of Dr. Koehler
re U.S. Patent No. 11,345,840 (IPR2023-0619)

- 1001 U.S. Patent No. 11,345,840 to Kenneth M. Ponder et al. (“’840 patent”)
- 1002 Prosecution History of the ’840 patent (“’840 Prosecution History”)
- 1003 Declaration of Dr. Michael G. Koehler
- 1004 Curriculum Vitae of Dr. Michael G. Koehler
- 1005 U.S. Patent 5,492,643 (“’643 Patent”)
- 1006 Provisional Application No. 60/501,049 (“’049 Provisional”)
- 1007 Prosecution History of Application No. 10/937,736 (“’736 Application Prosecution History”)
- 1008 Prosecution History of U.S. Patent No. 9,982,179 (“’179 Prosecution History”)
- 1009 Prosecution History of U.S. Patent No. 10,703,949 (“’949 Prosecution History”)
- 1010 Petition for IPR of the ‘179 Patent
- 1011 Patent Owner Preliminary Response to Petition of ‘179 Patent
- 1012 PTAB Discretionary Denial of Petition for IPR of ‘179 Patent
- 1013 Japanese Patent Document H05-117643 (“Yoshida”)
- 1014 U.S. Patent No. 6,640,841 (“Thomas”)
- 1015 Published PCT Application No. WO/93/24597 (“Schnur”)
- 1016 U.S. Patent No. 6,606,868 (“Powell”)
- 1017 U.S. Patent No. 6,207,071 (“Takigawa”)
- 1018 Siva Gopalnarayanan, *Choosing the Right Refrigerant*, MECH. ENG’G. 92 (Oct. 1998)
- 1019 Kramer, “Why Not Mineral Oil?”, 41(11) ASHRAE Journal 55 (Nov 1999) (“Kramer”)

- 1020 RMS Website from early 2002 - “FreeZone Overview” page
- 1021 Japanese Patent Document 07-042454 (“Segami”)
- 1022 Radermacher & Jung, *Theoretical Analysis of Replacement Refrigerants for R22 for Residential Use*, Report for US EPA, EPA/400/1-91/041 (1992)
- 1023 Excerpts of Mr. Ponder Deposition testimony (including pages 87-89, 139-143, 201-202, 214-215)
- 1024 Original Japanese version of EX1013 (Yoshida)
- 1025 Agreed Claim Constructions in *R421A LLC, d/b/a Choice Refrigerants v. Dynatemp International, Inc. et. al*, 5:20-cv-00147 (E.D. N.C.), which has been consolidated with *Dynatemp International Inc. et al. v. RMS of Georgia et al.*, 5:20-cv-142 (E.D. N.C.), pending (collectively, “Patent Family Litigation”)
- 1026 Haynes, *Thermophysical Properties of HCFC Alternatives*, NIST Report DOE/CE/23810-80 (1996),
- 1027 Widiatmo et al., *Liquid Densities of Alternative Refrigerants Blended with Difluoromethane, Pentafluoroethane, and 1,1,1,2-Tetrafluoroethane*, 42 J. Chem. Eng. Data, 270-277 (1997) (“Widiatmo”),
- 1028 Gunther & Steimle, *Mixing Rules for the Specific Heat Capacities of Several HFC-Mixtures*, 20 Int. J. Refrig. 235 (1997),
- 1029 McLinden, *Thermodynamic Properties of CFC Alternatives: A Survey of the Available Data*, 13 Int. J. Refrig. 149 (1990)
- 1030 McLinden, *The History of NIST’s Refrigerants Program II. Thermophysical Properties Research*, 107 ASHRAE TRANSACTIONS 699, CI-01-09-5 (2001)
- 1031 Didion, *The History of NIST's Refrigerants Program: I. Zeotropic Mixture Cycles and Heat Transfer*, 107 ASHRAE Transactions 688, 692 (2001)
- 1032 Holcombe et al., *Selected Thermodynamic Properties for Mixtures of R-32 (Difluoromethane), R-125 (Pentafluoroethane), R-134A (1,1,1,2-Tetrafluoroethane), R-143A (1,1,1-Trifluoroethane), R41*

(Fluoromethane), R-290 (Propane), and R-744 (Carbon Dioxide),
NIST Tech. Note 1397 (1997)

- 1033 RMS Website from early 2002 - “FreeZone Chiller Conversion” page
- 1034 U.S. Pat. No. 5,254,280 (“280 Patent”)
- 1035 Killinger & Killinger, HEATING & COOLING ESSENTIALS, The
Goodheart-Willcox Company, Inc. (2003)
- 1036 Jim Calm, *Comparative Properties and Efficiency of R-421A for
Retrofit Use to Replace R-22* (2013), available at
<https://www.choicerefrigerants.com/resources>
- 1037 Domanski et al., *NIST Vapor Compression Cycle Design Program*,
NIST (2003) (describing CYCLE_D version 3.0), available at
https://tsapps.nist.gov/publication/get_pdf.cfm?pub_id=100984.
- 1038 McLinden & Didion, *CFCs – Quest for Alternative Refrigerants*, 29-
12 ASHRAE J. 32, 36 (1987)
- 1039 Published Patent Application US2002/0046568 (Thomas et al.), which
has the same disclosure as U.S. Patent No. 6,640,841 (EX1014)
- 1040 Brown et al., CYCLE_D, Version 6.
- 1041 McLinden & Huber, *(R)Evolution of Refrigerants*, 65 J. CHEM. ENG.
DATA § 2.4.1 (2020), available at
[https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8739722/pdf/nihms-
1642330.pdf](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8739722/pdf/nihms-1642330.pdf).
- 1042 Original Japanese version of EX1021 (Segami)
- 1043 Certificate of Translation for EX1021 (Segami)
- 1044 Certificate of Translation for EX1013 (Yoshida)
- 1045 ASHRAE Designation and Safety Classification of Refrigerants

I. INTRODUCTION

Dynatemp International Inc. and Fluorofusion Specialty Chemicals, Inc. (collectively, “Petitioner”) petition for *Inter Partes* Review (“IPR”) under 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42 to invalidate all claims of U.S. Patent No. 11,345,840 B2 to Ponder et al. (“’840 Patent”; EX1001), titled “Refrigerant with Lubricating Oil for Replacement of R22 Refrigerant” and currently owned by R421a LLC (“Patent Owner”). Mr. Ponder, one of the named inventors on the ‘840 Patent, is president of Patent Owner. The ‘840 Patent’s prosecution history is EX1002.

This petition relies on three newly-discovered references – none of which were before the Examiner or anyone else at the Patent Office, including the PTAB – and demonstrates that claims 1-12 of the ’840 Patent are unpatentable based on (a) one reference teaching, inter alia, specific percentages of R-125 and R-134a and (b) two references teaching additional features found primarily in the dependent claims presented in this petition. As shown, there exists a reasonable likelihood that Petitioner will prevail with respect to at least one of the challenged claims. Accordingly, Petitioner respectfully submits that an IPR should be instituted and that claims 1-12 should be cancelled as unpatentable.

II. REQUIREMENTS FOR IPR UNDER 37 C.F.R. § 42.104

A. Grounds for Standing Under 37 C.F.R. § 42.104(a)

Petitioner certifies that the '840 Patent is available for IPR. Petitioner is not barred or estopped from requesting review of challenged claims 1-12 on the below-identified grounds.

B. Challenge Under 37 C.F.R. § 42.104(b)(1)-(2) and Relief Requested

Petitioner requests *inter partes* review and cancellation of all claims (1-12) of the '840 Patent. The bases for this request are summarized in the table, followed later by detailed descriptions showing where each limitation can be found in the cited prior art and the relevance of that prior art. References to 35 U.S.C. § 102-103 are pre-AIA. EX1003, the Declaration of Michael Koehler, Ph.D (C.V. at EX1004), provides additional explanation and support.

Ground	'840 Patent Claims	Basis for Rejection
1(A)	1-4, 6-12;	§102 over Yoshida;
1(B)	1-12	§103 over Yoshida and the general knowledge in the art
2 & 3	3, 5, 7, and 11	§103 over Yoshida combined with either (Ground 2) Schnur or (Ground 3) Thomas

III. SUMMARY OF THE STATE OF THE ART AND THE '840 PATENT

A. Background and State of the Art

The following background is based on Dr. Koehler's Declaration (EX1003) and is supported by numerous prior art references. *See infra* Section VI.B.3 (discussing reasons to combine prior art). Refrigeration technology (which includes air-conditioning) moves heat. The dominant method (and the one disclosed in the '840 Patent) is the vapor-compression cycle in which a refrigerant evaporates on the low-pressure side, taking in heat (and thus making the surrounding air cooler), and then is mechanically compressed and condensed into a liquid on the high-pressure side, releasing heat. EX1003, ¶¶33-38.

For decades into the 1980s, the primary refrigerants in the relevant refrigeration systems were chlorofluorocarbons (CFC) like R-11 and R-12 and hydrochlorofluorocarbons (HCFC) like R-22. (Most refrigerants are assigned "R" numbers for standardization purposes.) In the 1980s it became apparent that CFCs and HCFCs harmed the environment by reducing the ozone layer and contributing global warming. The chlorine in the CFCs and HCFCs correlated to harming the ozone. *Id.*, ¶¶41-44.

In response, the international community agreed to the Montreal Protocol, which set deadlines to ban the use of CFCs and HCFCs. As CFCs were more

harmful to the ozone, the Protocol scheduled their phase out first, followed by HCFCs. The Montreal Protocol set off a worldwide flurry of research and development for new refrigerants. Replacement options quickly focused on hydrofluorocarbons (HFCs) and blends of HFCs, because they were safe, performed well as refrigerants, and did not harm the ozone (because they did not contain chlorine). Two of the most important HFCs, and the focus of the ‘840 Patent,¹ are R-125 (pentafluoroethane) and R-134a (1,1,1,2-tetrafluoroethane). *Id.*, ¶¶45-46. These were not new chemicals – they had existed for decades. *Id.*, ¶104.

The focus on blends of HFCs resulted in intense research to organize and establish reliable data on thermodynamic and other blend properties, which data were used in mathematical models predicting and modeling the performance of the new refrigerants. Scientists organized and accumulated mountains of basic data for HFCs and blends, such as molar mass, density, boiling point, dew point, critical temperature and pressure, and specific heat capacity. In addition, scientists collected basic safety and environmental data (including Ozone Depletion Potential (ODP) and Global Warming Potential (GWP)). EX1003, ¶¶45-46.

By the 1990s, particular attention had focused on blends of R-125 and R-134a as replacements for R-22, and data for these blends was widely published.

¹ Central to each claim in the ‘840 Patent is a blend “consisting of” 59-57% R-125 and 41-43% R-134a.

This research included not only the blends' basic properties at a range of concentrations, but also sophisticated equations of state (EOS), which calculate the properties of any blend, such as pressure-temperature (P-T) relationships and heat taken in or released in a phase change. Using an EOS, for example, one could instantly calculate a variety of properties of any binary blend of R-125 and R-134a. *Id.*, ¶¶ 45-52.

The EOS were embodied and used in government-made and publicly-available software, such as REFPROP, first released by NIST in the 1980s and updated periodically. *Id.*, ¶107; EX1030, pp.702-706. The EOS also serve as important inputs into mathematical models of the HFC blends' performance in a vapor compression system (e.g., air-conditioner). Using these models, one can calculate the performance data for any desired blend. EX1003, ¶¶108, 122. Performance data includes important metrics such as volumetric capacity and coefficient of performance (COP) across a range of operating temperatures, pressures, and design conditions. *Id.* Volumetric capacity is the cooling ability of a refrigerant per unit volume; COP, sometimes referred to as efficiency, is the ratio of heat extracted to the work required to extract the heat. *Id.*, ¶48. All else equal, a high capacity and high COP are desirable traits. *Id.*

Using the mathematical models and simulations available, exploring the properties and performance of any specific blend (e.g., 50% R-125, 50% R-134a

versus 58% R-125, 42% R-134a) was straightforward. *Id.*, ¶¶52, 106-108. Indeed, in the 1990s, several publications explored COP and capacity data for a variety of blends of R-125 and R-134a to be used as R-22 replacements in air-conditioning and refrigeration equipment. *Id.*, ¶¶49-50, 123-125. One prominent and widely available simulation model in the 1990s was NIST's CYCLE_D. *Id.*, ¶¶48, 122; EX1031 p.692.

Thus, by the late 1990s, scientists had explored a variety of HFC blends to replace R-12 and R-22. Some blends involved only R-125 and R-134a, whereas others used or included other HFCs. Each blend had its known advantages and could be evaluated for properties and performance at any concentration using well-established tools. EX1003, ¶¶51-52.

Scientists followed at least two paths when developing HFC blends. One path designed blends “from scratch” to optimize important metrics such as COP, capacity, and global warming impact. These blends might have different P-T characteristics from R-22, and thus new apparatuses (e.g., air-conditioners) would need to be designed to work with them. *Id.* at ¶87.

In the alternative, scientists also developed so-called “drop-in” replacements for R-22. *Id.* These could be used in existing air-conditioners, but to do so their P-T characteristics would need to approximate those of R-22 so that they could work

in the existing systems. *Id.* A blend with P-T characteristics markedly different from R-22 would not function well (if at all) in an existing apparatus. *Id.*

By the late 1990s, varying the ratio of R-125 and R-134a in binary blends led to known and easily calculable changes in properties and performances, including changes in P-T characteristics, capacity, and COP. *Id.*, ¶¶47-52. Thus, one skilled in the art would have known the characteristics and advantages of different ratios of R-125 and R-134a, and could have (and did) easily optimize for a particular variable of interest, including P-T match, COP, capacity, etc. *Id.*, 51-52. Because of this, the art often reported ranges of concentrations for blends. *Id.*, ¶52. One skilled in the art would immediately understand that any particular ratio in the range could be used and would be able to calculate each blend's properties easily. *Id.*

B. The '840 Patent and Its Prosecution History

The '840 Patent issued on May 31, 2022, from U.S. Patent Application No. 16/920,905 ("the '905 application"), filed on July 6, 2020. EX1001. Generally, the '840 Patent focuses on a refrigerant composition (or in common parlance, "blend") used to replace R-22 in air-conditioning, refrigeration, and HVAC equipment, the blend consisting of pentafluoroethane (R-125) and 1,1,1,2-tetrafluoroethane (R-134a) at a ratio of 59-57% R-125 and 41-43% R-134a by weight. Some dependent claims require the refrigerant composition to be blended with a lubricant or

alternatively additives including an acrylic polymer, a corrosion inhibitor, a surfactant, a foaming agent, and mixtures thereof (or both a lubricant and an additive).

The '840 Patent and its ancestors copied liberally from third-party U.S. Patent 5,492,643, issued to Weber in 1996 (EX1005, "'643 Patent"), a patent covering a product that Mr. Ponder sold prior to his alleged "invention" covered by the '840 Patent. To create '840 Patent's written description, applicants appear to have copied the text of the '643 Patent verbatim and simply replaced various words such as one of the refrigerants (chlorodifluoroethane (R-142b), to R-125), the specific ROYCO lubricant (783C/D to 2302), the refrigerant to be replaced (R-12 to R-22), and the refrigerant blend percentages, along with other minor modifications. The prior art '643 Patent covered a product, RB-276, which Mr. Ponder sold before supposedly inventing the claimed invention. EX1003, ¶¶54-55; EX1020.

The application that issued as the '840 Patent is a continuation of Application No. 15/989,655, filed on May 25, 2018, now U.S. Patent No. 10,703,949 ("'949 patent"), which is a continuation of Application No. 13/493,491, filed on June 11, 2012, now U.S. Patent No. 9,982,179 ("'179 patent"), which is a continuation of Application No. 12/961,045, filed on December 6, 2010, now U.S. Patent No. 8,197,706 ("'706 patent"), which is a continuation of Application No. 10/937,736,

(“‘736 Application”) filed on September 8, 2004, now abandoned (*collectively, the ‘949, the ‘179, and the ‘706 Patents are the “Family Patents.”*). The ‘840 Patent also claims priority to provisional Application No. 60/501,049, filed on September 8, 2003, which is the earliest possible date to which the ‘840 Patent can claim priority. EX1001, 1:17-18.

The ‘049 Provisional required a lubricant to be blended with the R-125/R-134a blend. It also claimed the refrigerant ratios as 40-45% R-125 and 60-55% R-134a. During prosecution of the ‘736 Application, applicants argued they had accidentally switched the R-125 and R-134a percentages throughout the application. *See* EX1006, p.15-19; EX1007, p.R03665-R03673. The Examiner objected that switching the percentages to 60-55% R-125 and 40-45% R-134a would add new matter. *See* EX1007, R03730-R03732. Applicants submitted a declaration by Mr. Gbur stating that the switched percentages were “obvious errors” because the P-T characteristics of the blend would shift in a recognizable, predictable way as the percentages of R-125 and R-134a changed. EX1007, R03748-R03749.

During the long and tortuous prosecution for the family, the applicants continually tried to obtain broader claims, first broadening the class of lubricants and eventually shedding any requirement of a lubricant. At the same time, they

narrowed their claimed ratios to 57-59% R-125 and 43-41% R-134a, as claimed in the '840 Patent.

As with the '179 and '949 Patents, the Examiner of the '840 Patent application rejected the claims as obvious over U.S. Patent No. 6,207,071 ("Takigawa"; EX1017), which teaches a binary blend consisting of 40-60% R-125 and 60-40% R-134a. EX1002, B0074-0075. Applicants overcame the rejection by, inter alia, submitting arguments and a declaration by inventor Mr. Ponder alleging unexpected results of the particular claimed ratios of 59-57% R-125, 41-43% R-134a. EX1002, B0033-0064. The alleged unexpected results related to P-T characteristics and COP performance.

As will be seen, applicants generated the P-T data (e.g., in Table 2 of the '840 Patent and in the declaration) using the publicly-available REFPROP modeling program (or equivalent). Applicants did not rely on any actual experimental data in the specification. Mr. Ponder would tell the USPTO via an inventor's declaration that the computer-generated, predictively-modeled P-T data, which showed the claimed 58/42% blend of R-125/R-134a had a closer P-T match to R-22 than a prior art 60/40% blend, was "unexpected." EX1002, B0055-B0056.

As will be seen, applicants generated the COP data relied on in the declaration from the publicly-available CYCLE_D predictive modeling program. *Id.*, ¶122. Based on the data derived from CYCLE_D, applicants told the USPTO

that the COP performance of the claimed 58/42% blend was “unexpectedly” better than the prior art 60/40% blend. EX1002, B0056- B0058.

The Examiner allowed the claims after the response/declaration. EX1002, B0021. The same rejection and argument/declaration response occurred in the parent ‘179 Patent and ‘949 Patent. EX1008, R05224; EX1009, R05450-5453, R05470-5504.

1. IPR Petition Regarding Parent Patents

Petitioner, through different counsel, petitioned for post-issuance review of the Family Patents. The earlier petitions did not include any of the prior art submitted herein (Yoshida, Thomas, and Schnur), nor anything duplicative of it. This new art, discovered after the earlier petitions were filed, explicitly teaches what the art before the Examiner and the Board did not, and what the applicants argued was “unexpected”: specifically, teaching a goal (and how to achieve the goal) of matching the P-T characteristics of the R-125/R-134a blend to that of R-22.

In addition, that prior petition did not argue the alleged “unexpected results” pointed to during prosecution were in fact entirely expected and in the prior art. The earlier petitions regarding the Family Patents did not have the benefit of the new art discussed herein, and those earlier petitions merely argued that the claimed ratios of 58/42% R-125/R-134a, which differed slightly from a 60/40% blend

shown in the prior art, did not have a “significant effect” on P-T characteristics and “showed no appreciable difference” on COP performance. EX1010, p.24-28.

Thus, rather than showing, as this petition does, that the P-T characteristics and COP results were explicitly taught and entirely expected/predictable and known in the prior art, the former petition argued that there was no “significant, practical advantage” in the differences between the then-cited prior art and the claims. While the earlier petitions were not incorrect, they did not have the benefit of the art cited herein and also failed adequately to demonstrate the applicants’ false representations that results were “unexpected.” In other words, those petitions did not show that the alleged unexpected results were in fact known and expected.

Without reaching the merits of any argument submitted, the Board used its discretion to deny the petition regarding the ‘179 Patent, indicating that the prior art relied on in the earlier petition was substantially the same as that considered by the USPTO. *Id.*, p.22. That petition, however, did not include the newly-discovered art of Yoshida, Thomas, and Schnur, which is relied on herein.

2. Summary of the ‘840 Patent’s Admissions and Claimed Subject Matter

The ‘840 Patent admits several features are in the prior art, including:

- that corrosion inhibitors and acrylic polymers were known in the art. EX2001, 9:26-28.

- that supplying refrigerant compositions under pressure in a cylinder can fitted with an outlet compatible with an R-22 recharging manifold was known in the art. *Id.*, 2:27-34.
- that R-22 “until recently ... was the major, if not sole refrigerant, used in residential air-conditioners [and] refrigerators.” *Id.*, 1:46-50.

The ‘840 Patent contains three independent claims, 1, 5, and 9, which contain similar limitations. Claim 1 is in a Jepson format, thereby admitting the preamble is in the prior art. It further requires substituting the R-22 with a composition designed to achieve a phase change over the working temperatures and pressures in the apparatus designed for R-22. The composition must “consist of” a blend of R-125 and R-134a (though, as will be seen, additives can be present). The blend must be in ratios of 59%-57% by weight R-125 and 41%-43% by weight R-134a.

Claim 9 differs from Claim 1 in that it claims the composition directly rather than including the apparatus in which it is used. Claim 5 covers a method of refilling the R-22 apparatus with the composition and specifies a step, which the patent admits is well-known, of supplying the substitute composition under pressure in a cylinder can fitted with an outlet compatible with a chlorodifluoromethane recharging manifold of the apparatus.

Dependent Claims 2, 4, 6, 8, 10, and 12 specify that the apparatus is refrigeration equipment, air-conditioning equipment, or HVAC equipment.

Dependent Claims 3, 7, and 11 specify that the composition is (a) blended with additives selected from the group consisting of acrylic polymers, corrosion inhibitors, surfactants, foaming agents, and mixtures thereof, or (b) is blended with a lubricant present up to 20% by weight, or (c) both.

C. Brief Introduction to The Prior Art References

As explained above, the earliest possible priority date of the '840 Patent is September 8, 2003. As shown below, the applied references have versions that are prior art to the '840 Patent under pre-AIA 35 U.S.C. § 102(b), as well as 102(a) 102(e).

1. Yoshida

Japanese Patent Document H05-117643 ("Yoshida"; EX1013) published on May 14, 1993, is prior art under 102(b). Neither the PTO nor the Board had Yoshida before it in any proceeding involving the '840 Patent or its Family Patents, nor is Yoshida duplicative of any art considered. The original Japanese document is included as EX1024 and the certificate of translation as EX1044.

Yoshida teaches a binary refrigerant blend of R-125 and R-134a to replace R-22 so as not to harm the ozone layer and minimize GWP. *Id.*, ¶¶4-5; EX1003, *Id.*, ¶¶58-60. It teaches matching R-22's vapor pressure (i.e., P-T curve) and teaches a preferred ratio of approximately 55 to approximately 65% by weight R-125 and approximately 30 to approximately 45% by weight R-134a. EX1013, ¶11;

EX1003, ¶¶60-61. Yoshida also teaches an optional third component, propane.

EX1013, ¶11; EX1003, ¶58. Thus, Yoshida teaches a narrower range of ratios for

binary R-125/R-134a blends than any prior art previously considered. Unlike

Takigawa (EX1017), which was relied on by the Examiner, Yoshida teaches to

match R-22's P-T characteristics, the exact goal of the '840 Patent. EX1003, ¶60.

In addition, Yoshida plainly teaches that the hydrocarbon is optional by listing it as present from zero to an upper limit. EX1013, ¶5, 8, 11; EX1003, ¶58.

2. Thomas

U.S. Patent No. 6,640,841 ("Thomas"; EX1014) issued on November 3, 2003, and is a divisional of U.S. patent application no. 09/943,063, filed on Aug. 30, 2001 and published on April 25, 2002 as US2002/0046568 (EX1039), which claims the benefit of U.S. Provisional Application No. 60/235,746, filed Sept. 27, 2000. It is prior art under 102(a) and 102(e) (and its identical sister publication US2002/0046568 (EX1039) is prior art under 102(b), but more precise citations to EX1014 are used herein). Neither the PTO nor the Board had Thomas before it in any proceeding involving the '840 Patent or its Family Patents, nor is Thomas duplicative of any art considered.

Unlike Yoshida, Thomas does not teach narrow percentage ranges for binary mixtures of R-125 and R-134a, though it does teach the binary mixture as an option. EX1003, ¶65. Otherwise, it generally teaches the other limitations.

EX1003, GROUND-3. Thomas teaches an R-22 replacement refrigerant composition comprising (1) hydrofluorocarbon refrigerants (such as R-125 and R-134a), (2) a surfactant, and (3) a solubilizing agent (which can be a lubricant). EX1014, 1:23-33; 3:28-41. The composition is designed to facilitate lubricant circulation and return of traditional lubricants (e.g., mineral oil) after an existing system is emptied of its chlorine-containing refrigerant. EX1014, 1:23-2:39; EX1003, ¶64.

Thomas teaches the refrigerant can be “[a]ny of a wide range of non-chlorine-containing refrigerants ... includ[ing] ... R-134a ... [and] R-125... and mixtures thereof.” *Id.*, 3:28-41. The solubilizing agent can be lubricants such as PAGs and polyol esters. *Id.*, 4:50-65; EX1003, ¶67. In addition to teaching a surfactant and a lubricant, Thomas further teaches that the composition can also include other “additives and materials” such as “corrosion inhibitors.” EX1014, 5:40-52.

3. Schnur

Published PCT Application No. WO/93/24597 (“Schnur”; EX1015) published on December 9, 1993, and is thus prior art under 102(b). Neither the PTO nor the Board had Schnur before it in any proceeding involving the ‘840 Patent or its Family Patent, nor is Schnur duplicative of any art considered. As

explained in GROUNDS 2 & 3, Schnur teaches an alternative solution to the lubricant issue as compared to Thomas.

Unlike Yoshida, Schnur does not teach narrow percentage ranges for binary mixtures of R-125 and R-134a, though it does teach the binary R-125/R-134a mixture as an option, and it also further teaches blending 15% by weight or less a polyol ester lubricant. EX1015, pp.1-2, 13-14, 22-24; EX1003, ¶72. It generally teaches the other limitations. EX1003, GROUND-2. Schnur also teaches that “additives, such as ... corrosion inhibitors, detergents, ... [and] antifoaming agents,” and mixtures thereof can be included. EX1015, p.10.

IV. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art of the '840 Patent would have had at least a bachelor's degree in Mechanical Engineering, Chemical Engineering, or Chemistry with at least 3-5 years of experience in a combination of (1) design and synthesis of refrigerant compositions, (2) testing and evaluation of refrigerant compositions in the laboratory and/or refrigeration systems, and (3) chemical blends and formulations relevant to refrigerant compositions. EX1003, ¶30. The refrigerant compositions can include refrigerants, lubricating oils, and additives. *Id.* Preferably, such a person would have a Ph.D. in one of the named areas. *Id.* Such a person might also not have a formal bachelor's degree but would need 8-10 years of experience in the above-mentioned areas. *Id.*

V. CLAIM CONSTRUCTION UNDER 37 C.F.R. §§ 42.104(b)(3)

Claim terms should be construed according to the *Phillips* standard and given their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention, in light of the specification and the prosecution history of the patent. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (en banc); 37 C.F.R. § 42.100.

In litigation involving the ancestor Family Patents, the parties agreed to the following claim constructions. See EX1025.

Parties' Agreed Upon Claim Construction Proposals	
TERM	DEFINITION
apparatus	refrigeration equipment, air-conditioning equipment, and HVAC equipment
chlorodifluoromethane refrigerant	R-22
substituting the chlorodifluoromethane with a refrigerant composition	replacing R-22 in an apparatus with a refrigerant composition
refrigerant	substance used in a refrigeration system that, after compression in the system's compressor, gives off heat as it changes from gas to liquid in the condenser and, after injection into the evaporator, absorbs heat as it changes from liquid to gas before it is returned to the compressor

refrigerant composition designed to achieve a phase change	refrigerant composition designed so that the refrigerant composition, after compression in a refrigeration system's compressor, gives off heat as it changes from gas to liquid in the condenser and, after injection into the evaporator, absorbs heat as it changes from liquid to gas before it is returned to the compressor
consisting of	composed only of the element or elements specified
substitute refrigerant composition	refrigerant composition usable in an apparatus as a substitute for R-22
cylinder can	cylindrical container like the standard 25 or 30 lb. container used for containing R-22
chlorodifluoromethane recharging manifold	a port for conveying R-22 from a pressurized container into an apparatus

Although the '840 Patent claims do not use the term "refrigerant," the claimed "composition designed to achieve a phase change over a range of working temperatures and pressures of the apparatus" plainly refers to a refrigerant blend. EX1003, ¶13. It is also clear that additives and lubricants are not considered part of the claimed "composition." *Compare* '840 Patent Claim 1 with Claim 3.

Otherwise, no formal claim constructions are necessary.

VI. CLAIMS 1-12 OF THE '840 PATENT ARE UNPATENTABLE

The '840 Patent includes 12 claims, and claims 1, 5, and 9 are independent. This petition shows how the references listed above render the claims unpatentable as anticipated or obvious.

A. GROUNDS 1(A&B): Yoshida (A) Anticipates or (B) Renders Obvious the Challenged Claims

As described below, Yoshida anticipates or, where specifically denoted, would have rendered all challenged claims obvious as of the priority date.

1. Claim 1.

- a) **“In an apparatus designed for use with chlorodifluoromethane refrigerant, the improvement comprising...”**

GROUND 1(A): A Jepson claim admits the preamble is in the prior art.

Further, Yoshida discloses systems designed for R-22, including air-conditioner and refrigeration systems. EX1013, ¶¶ 1-2, 8; EX1003, GROUND-1, claim 1[a].

GROUND 1(B): (Same as Ground 1(A)).

- b) **“substituting the chlorodifluoromethane with...”**

GROUND 1(A): Yoshida teaches replacing R-22 refrigerant with a substitute refrigerant composition that “can be used in a current apparatus as an alternative to R22.” EX1013, ¶¶ 2, 7, 8, 22(3); EX1003, GROUND-1, claim 1[b].

GROUND 1(B): (Same as Ground 1(A)).

c) “a composition designed to achieve a phase change over a range of working temperatures and pressures of the apparatus...”

GROUND 1(A): Yoshida’s substitute composition for R-22 is a “working fluid” that will undergo a “condensation process and the evaporation process,” which is a phase change over a range of temperatures and pressures of the apparatus. EX1013, ¶¶ 8; EX1003, GROUND-1, claim 1[c]. Yoshida specifically teaches embodiments in which the condensation temperature and vaporization temperature are substantially equal to R-22 and where the “working fluid [has] a vapor pressure equivalent to that of R-22 at approximately 0 to approximately 50°C which is a use temperature of a heat pump device such as for an air-conditioner and a refrigerator, and which can be used in a current apparatus as an alternative to R22.” EX1013, ¶¶ 8, 14-15; EX1003, GROUND-1, claim 1[c].

In a closed system like Yoshida’s air-conditioner or refrigerator with a given working fluid, the range of working temperatures correspond to a range of working pressures. *See, e.g.*, EX1001, Table 2; EX1003, GROUND-1, claim 1[c].

GROUND 1(B): (Same as Ground 1(A)).

d) “the composition consisting of a blend of tetrafluoroethane and pentafluoroethane...”

GROUND 1(A): Yoshida teaches the substitute compositions consist of a blend of R-134a (1,1,1,2-tetrafluoroethane) and R-125 (pentafluoroethane).

EX1013, ¶11. Propane is disclosed as an optional component that can be present at “0 to about 6% by weight.” *Id.*; EX1003, GROUND-1, claim 1[d].

GROUND 1(B): (Same as Ground 1(A)).

e) “wherein said pentafluoroethane is present in an amount of 59% to 57% by weight and said tetrafluoroethane is present in an amount of 41% to 43% by weight of the combined weight of the pentafluoroethane and tetrafluoroethane on the basis of the combined weights of said pentafluoroethane and said tetrafluoroethane totaling 100%...”

Yoshida teaches a narrow preferred ratio of 55% to 65% weight R-125, and, where optional propane is omitted, balance R-134a (35-45% weight). *See* EX1013, ¶11; EX1003, GROUND-1, claim 1[e]. Where optional propane is omitted, the percentage by weight is calculated using the combined weight of the pentafluoroethane and tetrafluoroethane on the basis of the combined weights of the only two compounds present, pentafluoroethane and tetrafluoroethane, totaling 100%. EX1003, GROUND-1, claim 1[e].

GROUND 1(A):

Yoshida’s narrow range represents a disclosure of distinct species of whole-number percentage/ratios (e.g., 65/35%, 64/36%, ... 55/45%), which anticipates the claimed range. EX1003, GROUND-1(A), claim 1[e]. A broader prior art range anticipates a narrower claimed range when the prior art discloses the range with sufficient specificity that one skilled in the art can immediately envision the

species and there is nothing critical about the narrower claimed range (that is, the changes in properties are predictable or known). *Genentech, Inc. v. Hospira, Inc.*, 946 F.3d 1333, 1338 (Fed. Cir. 2020) (holding that an overlapping range in the prior art was prima facie anticipating); *Ineos USA LLC v. Berry Plastics Corp.*, 783 F.3d 865, 869 (Fed. Cir. 2015) (prior art broader range anticipated); *ClearValue, Inc. v. Pearl River Polymers, Inc.*, 668 F.3d 1340, 1345 (Fed. Cir. 2012) (same); *Perricone v. Medicis Pharm. Corp.*, 432 F.3d 1368, 1377 (Fed. Cir. 2005) (same).

Because binary mixtures of R-125 and R-134a were so well studied and understood, one skilled in the art would immediately recognize the individual members of the genus as the whole-number percentages between 55% to 65% pentafluoroethane by weight and 35% to 45% tetrafluoroethane by weight. EX1003, GROUND-1(A), claim 1[e]. The '840 Patent and the trade generally understands ratios of such binary blends in whole-number increments. *Id.*; *see also* EX1002, B0047 (stating that “refrigerants are defined by percentages of, for example, $\pm 1\%$.”), B0054-B0055 (noting ASHRAE’s formulation tolerances of $\pm 1\%$). Tolerances of $\pm 1\%$ show that a $\pm 1\%$ change doesn’t materially change the properties. EX1003, GROUND-1(A), claim 1[e].

Further, the prior art, including pre-critical date versions of REFPROP and CYCLE_D (programs applicants used to calculate the data supposedly showing unexpected results – see EX1003, ¶¶115, 122), show that changes of percentages

yielded predictable and well-understood changes in relevant properties such that each species was immediately identifiable to one skilled in the art. EX1003, GROUND-1, claim 1[e], ¶¶106-108, 115-128. Indeed, one skilled in the art would have immediately recognized the individual species of ratios and their properties down to the tenth of a percent. EX1003, GROUND-1(A), claim 1[e].

“Once the patent challenger has established, through overlapping ranges, its prima facie case of anticipation,” the burden of production shifts to the patentee and “the court must evaluate whether the patentee has established that the claimed range is critical to the operability of the claimed invention.” *Genentech*, 946 F.3d at 1338. As explained further in Section VI.C, below, regarding unexpected results, there is nothing critical about the claimed ranges as compared to range of species disclosed by Yoshida.

GROUND 1(B):

In the event that the Board does not find this limitation anticipated, Yoshida’s narrow range of 55-65% R-125 and 45-35% R-134a renders the claim limitation obvious. “Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. . . . [N]ormally, it is to be expected that a change in temperature, or in *concentration*, or in both, would be an unpatentable modification.” *E.I.*

DuPont de Nemours & Co. v. Synvina C.V., 904 F.3d 996, 1006 (Fed. Cir. 2018) (quoting *In re Aller*, 220 F.2d 454, 456 (CCPA 1955)) (emphasis added).

The Examiner found that *Takigawa*'s (EX1017) twice-as-broad range rendered the limitation obvious and that routine optimization would arrive at the claimed range with an expectation of success. EX1002, B0074-B0075. The BPAI found the same for similar claim limitations in the Family Patents. EX1007, R03992-R03993. *Takigawa*, however, unlike *Yoshida*, did not explicitly teach to match the vapor pressure of the blend of R-125/R-134a to that of R-22 for the range of temperatures encountered by an air conditioner or other apparatus EX1013, ¶8. Dr. Koehler shows that a skilled artisan, following *Yoshida*'s explicit teaching, would have easily adjusted by routine optimization the ratios of R-125 and R-134a within the range taught by *Yoshida* to reach the ratio of the claimed composition. EX1003, GROUND-1(B), claim 1[e].²

As explained in Section VI.C, below, no unexpected results rebut the obviousness presumption. For example, during prosecution, to avoid *Takigawa*, applicants argued *Takigawa* did not teach matching the blend's vapor pressure to that of R-22. EX1002, B0047-B0049. In contrast to *Takigawa*, *Yoshida* explicitly teaches optimizing the blend to match R-22's vapor pressure, i.e., R-22's

² Note that applicants previously attempted to claim ranges of 55-60% R-125; 45-40% R-134a, a range almost as broad as *Yoshida*'s. *See, e.g.*, EX1007, R03788.

thermodynamic P-T characteristics for the range of temperatures encountered by an air conditioner or other apparatus. *Id.*; EX1013, ¶¶8, 11, 22(3) (providing “a working fluid having a vapor pressure equivalent to that of R22”); EX1003, GROUND-1(B), claim 1[e]. Indeed, optimizing blends was well known, including to match the vapor pressure of R-22. EX1003, GROUND-1(B), claim 1[e]; EX1018, p.94 (“[B]y adjusting the composition of a blend... the vapor pressure of the final fluid can be adjusted to match that of the CFC or HCFC being replaced.”); EX1005, 1:15-18 (the third-party patent that the ‘840 Patent copied teaches the “refrigerants are mixed in a defined ratio such that the temperature-pressure relationship of the mix approximates that of” R-12).

The ‘840 Patent teaches to mix R-125 and R-134a “in a defined ratio such that the temperature-pressure relationship of the mix approximates that of Refrigerant R-22” for the range of temperatures encountered by an air conditioner or other apparatus EX1001, 1:30-33; *see also id.* 4:12-16. Applicants also argued in prosecution that the 57-59% R-125 blend best matches/approximates the thermodynamic pressure-temperature characteristics (i.e., the vapor-pressure) of R-22. EX1002, B0055-B0056. If applicants’ claim is true, one of skill would have been motivated *by Yoshida’s explicit teaching* to optimize/adjust within Yoshida’s 55-65% R-125 blend until the claimed range of 57-59% R-125 was reached. EX1003, GROUND-1(B), claim 1[e].

One would have expected success because Yoshida is directed to the same problem as the claimed invention (finding a non-ozone-depleting substitute for R-22 that matches R-22's vapor-pressure). *Id.* Further, the characteristics of the blend as the ratios changed were well-understood. *Id.* Additionally, a skilled artisan would have expected success because, Yoshida teaches the narrow 55-65% R-125 (and 45-35% R-134a) range *and* to adjust within that range to match the blend's vapor pressure to that of R-22, the very property the '840 Patent seeks to optimize. *Id.*

f) “and wherein the tetrafluoroethane is 1,1,1,2-tetrafluoroethane.”

GROUND 1(A): 1,1,1,2-tetrafluoroethane is R-134a, which Yoshida teaches. EX1013, ¶¶ 11; EX1003, GROUND-1, claim 1[f].

GROUND 1(B): (Same as Ground 1(A)).

2. Claims 2, 4, 6, and 8: “wherein the apparatus is selected from the group consisting of refrigeration equipment, air-conditioning equipment, and HVAC equipment.”

Dependent Claims 2, 4, 6, and 8 have identical substantive wording.

GROUND 1(A): Yoshida anticipates this Markush grouping by teaching two of the species, the use of its refrigerant compositions in “an air conditioner and a refrigerator.” E.g., EX1013, ¶8; EX1003, GROUND-1, claim 2.

GROUND 1(B): (Same as Ground 1(A)).

3. Claims 3, 7, and 11.

Dependent Claims 3, 7, and 11 have identical substantive wording. The ‘840 Patent lists the claim limitations in the alternative, such that prior art teaching any one of them anticipates the claim. *Schering Corp. v. Geneva Pharms., Inc.*, 339 F.3d 1373, 1380 (Fed. Cir. 2003).

a) “the composition is blended with an additive selected from the group consisting of an acrylic polymer, a corrosion inhibitor, a surfactant, a foaming agent, and mixtures thereof ...”

GROUND 1(A): Not applicable for this limitation.

GROUND 1(B): This limitation contains a Markush group. The inclusion of acrylic polymers, corrosion inhibitors, surfactants, foaming agents would have been obvious from general knowledge in the art. EX1003, GROUND-1(B), claim 3[a]; *see also* GROUNDS 2&3, *infra*, at this claim limitation. The ‘840 Patent admits that corrosion inhibitors and acrylic polymers were known in the art since they were included in a lubricant the patent admits was commercially available. EX1001, 9:26-28. The ‘840 Patent provides no detail regarding foaming agents or surfactants, indicating the applicant’s reliance on the general knowledge of those skilled in the art. *See In re Howarth*, 654 F.2d 103, 107 (C.C.P.A. 1981) (“If [the applicant] chooses to rely upon general knowledge in the art to render his disclosure enabling, then the burden rests upon him to establish that those of

ordinary skill in the art can be expected to possess or know where to obtain this knowledge.”).

b) “or blended with a lubricant wherein the lubricant is present up to 20% by weight of the composition on the basis of the combined weights of said pentafluoroethane and said tetrafluoroethane totaling 100%...”

GROUND 1(A): This claim limitation does not require any lubricant, as it is specified as “up to about 20% by weight,” and the language “up to” includes zero as the lower limit. *In re Mochel*, 470 F.2d 638, 176 USPQ 194 (CCPA 1974) (citing *Arness v. Franks*, 138 F.2d 213, 31 CCPA 737 (1943) and *In re Egbert*, 298 F.2d 947, 49 CCPA 888 (1962)); *see also Ex Parte Feng*, Appeal 2017-009448 at p.4-5, 2018 WESTLAW 4739994 *2 (P.T.A.B. Sept. 14, 2017) (“Inclusion of the remaining components recited in claim 1 in the claimed nickel-based alloy is optional by virtue of the recitation that these components are present in amounts ‘up to’ particular percentages.”); *Ex Parte Bryan*, Appeal No. 2017-003366 at p.6 (P.T.A.B. Dec. 13, 2017) (“We note that the term ‘up to’ includes zero as a lower limit.”).

GROUND 1(B): If the Board finds Ground 1(A) unpersuasive, one skilled in the art also would have known from general knowledge that a variety of lubricants were available for use with R-125 and R-134a and could be blended in the

refrigerant composition. *See, e.g.*, GROUNDS 2&3, below, at this claim limitation; EX1003, GROUND-1(B), at claim 3/7/11[b].

c) “or both.”

Either alternative satisfies the claim. In addition, one skilled in the art would have known that additives and lubricants could both be included at the same time. *See, e.g.*, GROUNDS 2&3, below, at this claim limitation.

4. Claim 5.

a) “A method for refilling an apparatus designed for use with a chlorodifluoromethane refrigerant, the method comprising ...”

GROUND 1(A): Regarding the phrase “apparatus designed for use with a chlorodifluoromethane refrigerant,” Yoshida discloses systems designed for R-22, including air-conditioner and refrigeration systems. EX1013, ¶¶ 1-2, 8; EX1003, GROUND-1, claim 1[a]. The remainder of the preamble recites a method for refilling the apparatus. Yoshida teaches its blend “can be used in a current apparatus as an alternative to R22.” EX1013, ¶8. Hence, the “current [R-22] apparatus” must be refilled with the Yoshida blend. EX1003, GROUND-1(A), claim 5[a].

GROUND 1(B): In the event the Board finds this limitation is not anticipated, it would have been obvious to one skilled in the art based on general

knowledge to refill an apparatus designed for R-22 with a replacement refrigerant.

EX1003, GROUND-1(B), claim 5[a]

b) “(1) selecting a substitute composition designed to be a substitute for the chlorodifluoromethane refrigerant...”

GROUND 1(A): Yoshida teaches replacing R-22 refrigerant with a substitute refrigerant composition that “can be used in a current apparatus as an alternative to R22.” EX1013, ¶¶ 2, 7, 8, 22(3); EX1003, GROUND-1, claim 1[b]; *id.* at GROUND-1, claim 5[b]. Yoshida teaches to use (i.e., select for use) its blend in a current (R-22) apparatus. EX1003 GROUND-1, claim 5[b].

GROUND 1(B): (Same as Ground 1(A)).

c) “and designed to achieve a phase change over a range of working temperatures and pressures of the apparatus...”

GROUND 1(A): Yoshida’s substitute composition for R-22 is a “working fluid” that will undergo a “condensation process and the evaporation process,” which is a phase change over a range of temperatures and pressures of the apparatus. EX1013, ¶¶ 8; EX1003, GROUND-1, claim 1[c]; *id.* at claim 5[c]. Yoshida specifically teaches embodiments in which the condensation temperature and vaporization temperature are substantially equal to R-22 and where the “working fluid [has] a vapor pressure equivalent to that of R-22 at approximately 0 to approximately 50°C which is a use temperature of a heat pump device such as

for an air-conditioner and a refrigerator, and which can be used in a current apparatus as an alternative to R22.” EX1013, ¶¶ 8, 14-15; EX1003, GROUND-1, claim 1[c]; *id.* at claim 5[c].

In a closed system like Yoshida’s air-conditioner or refrigerator with a given working fluid, the range of working temperatures correspond to a range of working pressures. *See, e.g.*, EX1001, Table 2; EX1003, GROUND-1, claim 1[c]; *id.* at claim 5[c].

GROUND 1(B): (Same as Ground 1(A)).

d) “the substitute composition consisting of a blend of tetrafluoroethane and pentafluoroethane...”

GROUND 1(A): Yoshida teaches the substitute compositions consist of a blend of R-134a (1,1,1,2-tetrafluoroethane) and R-125 (pentafluoroethane). EX1013, ¶11. Propane is disclosed as an optional component that can be present at “0 to about 6% by weight.” *Id.*; EX1003, GROUND-1, claim 1[d]; *id.* at claim 5[d].

GROUND 1(B): (Same as Ground 1(A)).

e) “wherein said pentafluoroethane is present in an amount of 59% to 57% by weight ... totaling 100%...”

See identical claim wording of Claim 1[e]. To avoid needless repetition, the analysis of Claim 1[e], above, is expressly incorporated herein by reference.

f) “and wherein the tetrafluoroethane is 1,1,1,2-tetrafluoroethane...”

GROUND 1(A): 1,1,1,2-tetrafluoroethane is R-134a, which Yoshida teaches. EX1013, ¶¶ 11; EX1003, GROUND-1, claim 1[f]; *id.* at claim 5[f].

GROUND 1(B): (Same as Ground 1(A)).

g) “(2) supplying the substitute composition under pressure, in a cylinder can fitted with an outlet compatible with a chlorodifluoromethane recharging manifold of the apparatus.”

GROUND 1(A): Not applicable to this limitation.

GROUND 1(B): *See* claim limitations 5[b] and 5[c], above, which are incorporated here by reference. Yoshida teaches “an alternative to R22” “having a vapor pressure equivalent to that of R22” EX1013, ¶8. The ‘840 Patent admits it was known to recharge R-22 systems from a standard 30-pound pressurized cylinder, and that “the cylinders are fitted with a dispensing outlet compatible with a commercially available refrigeration manifold.” EX1001, 2:27-34. Replacement refrigerants for R-22 are stored in the same standard cylinders fitted with the same outlets. *See supra* Section V (defining cylinder can “cylindrical container like the standard 25 or 30 lb. container used for containing R-22”); EX1003, GROUND-1, claim-5[g]; EX1035, pp. 238-242. Thus, a skilled artisan would have known from the general knowledge in the art, which is admitted to be known generally in the

art by the '840 Patent, to store Yoshida's blend in a standard pressurized cylinder fitted with the same outlet and to supply it from same. *Id.*

5. Claim 9

a) "A composition designed to be used as a substitute for R-22 chlorodifluoromethane refrigerant..."

GROUND 1(A): Yoshida teaches a composition designed to replace R-22 refrigerant and that this substitute refrigerant composition "can be used in a current apparatus as an alternative to R22." EX1013, ¶¶ 2, 7, 8, 22(3); EX1003, GROUND-1, claim 1[b]; *id.* at claim 9[a].

GROUND 1(B): (Same as Ground 1(A)).

b) "the substitute composition consisting of a blend of tetrafluoroethane and pentafluoroethane..."

GROUND 1(A): Yoshida teaches the substitute compositions consist of a blend of R-134a (1,1,1,2-tetrafluoroethane) and R-125 (pentafluoroethane). EX1013, ¶11. Propane is disclosed as an optional component that can be present at "0 to about 6% by weight." *Id.*; EX1003, GROUND-1, claim 1[d]; EX1003, GROUND-1, at claim 9[b].

GROUND 1(B): (Same as Ground 1(A)).

c) “wherein said pentafluoroethane is present in an amount of 59% to 57% by weight ... totaling 100%...”

See identical claim wording of Claim 1[e]. To avoid needless repetition, the analysis of Claim 1[e], above, is expressly incorporated herein by reference.

d) “and wherein the tetrafluoroethane is 1,1,1,2-tetrafluoroethane.”

GROUND 1(A): 1,1,1,2-tetrafluoroethane is R-134a, which Yoshida teaches. EX1013, ¶¶ 11; EX1003, GROUND-1, claim 1[f]; EX1003, GROUND-1, claim 9[d].

GROUND 1(B): (Same as Ground 1(A)).

6. Claims 10 and 12.

Dependent Claims 10 and 12 have identical limitations.

a) “wherein the composition is designed for use in an apparatus...”

This phrase is not patentably distinct from claim limitations 1[a, b, &c], which require a composition substituting for R-22 designed to be used in an apparatus. *See* limitations 1[a, b, &c], above, the analysis of which is expressly incorporated herein by reference. In summary:

GROUND 1(A): Yoshida discloses apparatuses/systems designed to use R-22, including air-conditioner and refrigeration systems. EX1013, ¶¶ 1-2, 8; EX1003, GROUND-1, claim 1[a]; *id.* at claim 10[a] and 12[a]. Yoshida teaches

replacing R-22 refrigerant with a substitute refrigerant composition that “can be used in a current apparatus as an alternative to R22.” EX1013, ¶¶ 2, 7, 8, 22(3); EX1003, GROUND-1, claim 1[b]; *id.* at claim 10[a] and 12[a].

GROUND 1(B): (Same as Ground 1(A)).

b) “[the apparatus] selected from the group consisting of refrigeration equipment, air-conditioning equipment, and HVAC equipment...”

This limitation is substantively identical to that of claims 2, 4, 6, and 8. The analysis is the same:

GROUND 1(A): Yoshida anticipates this Markush grouping by teaching two of the species, the use of its refrigerant compositions in “an air conditioner and a refrigerator.” E.g., EX1013, ¶8; EX1003, GROUND-1, claim 2; *id.* at claim 10[b] and 12[b].

GROUND 1(B): (Same as Ground 1(A)).

c) “the composition designed to undergo a phase change over a range of working temperatures and pressures of the apparatus.”

The wording is substantively identical to claim limitation 1[c]. The analysis is the same:

GROUND 1(A): Yoshida’s substitute composition for R-22 is a “working fluid” that will undergo a “condensation process and the evaporation process,” which is a phase change over a range of temperatures and pressures of the

apparatus. EX1013, ¶¶ 8; EX1003, GROUND-1, claim 1[c]; *id.* at claim 10[c] and 12[c]. Yoshida specifically teaches embodiments in which the condensation temperature and vaporization temperature are substantially equal to R-22 and where the “working fluid [has] a vapor pressure equivalent to that of R-22 at approximately 0 to approximately 50°C which is a use temperature of a heat pump device such as for an air-conditioner and a refrigerator, and which can be used in a current apparatus as an alternative to R22.” EX1013, ¶¶ 8, 14-15; EX1003, GROUND-1, claim 1[c]; *id.* at claim 10[c] and 12[c].

In a closed system like Yoshida’s air-conditioner or refrigerator with a given working fluid, the range of working temperatures correspond to a range of working pressures. *See, e.g.*, EX1001, Table 2; EX1003, GROUND-1, claim 1[c]; *id.* at claim 10[c] and 12[c].

GROUND 1(B): (Same as Ground 1(A)).

B. GROUNDS 2 & 3: Yoshida Combined with either Schnur or Thomas Renders Claims 3, 5, 7, and 11 Obvious

As described below, Yoshida combined with Schnur (GROUND 2) or Yoshida combined with Thomas (GROUND 3) would have rendered claims 3, 5, 7, and 11 obvious as of the priority date. Schnur and Thomas are alternatives, presented together for efficiency. Schnur and Thomas teach different solutions to the issue of circulating lubricant through the system and to the compressor. As

explained in detail below, Schnur teaches to use a polyol ester lubricant mixed with the refrigerant blend to provide lubrication to the compressor. Thomas teaches leaving the traditional mineral oil in the system and adding additives (including lubricants) to the refrigerant blend to provide lubrication to the compressor. Reasons to combine each reference with Yoshida are presented after the claims.

1. Claims 3, 7, and 11.

Dependent Claims 3, 7, and 11 have identical substantive wording.

a) “the composition is blended with an additive selected from the group consisting of an acrylic polymer, a corrosion inhibitor, a surfactant, a foaming agent, and mixtures thereof ...”

See GROUND 1 at this limitation, the analysis of which is expressly incorporated herein by reference.

GROUND 2: Schnur teaches a lubricant blended with the refrigerant composition (which can consist of R-125 and R-134a), and that the lubricant contains³ “other materials generally denoted in the art as additives, such as ... corrosion inhibitors, detergents, ... antifoaming agents” including mixtures thereof. EX1015, p.10; EX1003, GROUNDS-2&3, Claim 1 and 3[a]. Any one of the three listed additives would anticipate the limitation. One skilled in the art would

³ Note the claim limitation does not require the absence of a lubricant. Thus, when the additives are included with a lubricant as taught in the reference, this limitation is satisfied.

understand that detergents are an example of surfactants. EX1003, GROUNDS-2&3, Claim 3[a]. One skilled in the art would understand that a foaming agent and an anti-foaming agent refer to the same thing. *Id.*

GROUND 3: Thomas teaches blending a refrigerant composition (which can consist of R-125 and R-134a) with a surfactant EX1014, *passim*, e.g., abstract. Thomas also teaches that the composition “can include other additives For example, ... corrosion inhibitors, ... antifoaming agents, ... and the like. Examples of such additives are disclosed in U.S. Pat. No. 5,254,280.” *Id.*, 5:41-53; *see* EX1003, GROUNDS-2&3, Claim 1 and 3[a].

b) “or blended with a lubricant wherein the lubricant is present up to 20% by weight of the composition on the basis of the combined weights of said pentafluoroethane and said tetrafluoroethane totaling 100%...”

See GROUND 1 at this limitation, the analysis of which is expressly incorporated herein by reference.

GROUND 2: Schnur teaches a polyol ester (POE) lubricant blended with the refrigerant composition (which can consist of R-125 and R-134a). EX1015, pp.1-2, 13, 17-24. Schnur teaches lubricant amounts of 2% to 15%, thus disclosing an anticipating subset of the broader claimed range. *Id.*, pp.14, 22-23; EX1003, GROUNDS-2&3, Claim 3[b].

GROUND 3: Thomas teaches the refrigerant composition (which can consist of R-125 and R-134a) can include a solubilizing agent, which can be a lubricant. EX1014, 4:50-66 (listing PAG and POE lubricants as solubilizing agent options). Thomas teaches the lubricant can be present in “any suitable amount[.]” *Id.*, 5:54-55. For the solubilizing agent/lubricant Thomas teaches up to 30% by weight of the refrigerant gases as preferable and 3% to 12% as most preferable. *Id.* 5:54-6:6; EX1003, GROUNDS-2&3, Claim 3[b].

Thomas separately teaches that in addition to the solubilizing agent, the refrigerant composition can include additional “lubricants.” EX1014, 5:49-52. Thomas does not specify the amount of this additional optional lubricant, but it would have been routine optimization for one skilled in the art to choose the amount of lubricant based on the desired function. EX1003, GROUNDS-2&3, Claim 3[b]; *see also* EX1002, B0074-0075 (stating, regarding the Takigawa reference, that “[d]etermination of the lubrication-effective amount of a disclosed lubricant amounts to routine optimization”).

c) “or both.”

Either alternative satisfies this limitation. As shown immediately above, Schnur and Thomas each teaches both.

2. Claim 5.

Although Yoshida expressly teaches all but the last limitation of Claim 5, to show the similarities of Schnur and Thomas with Yoshida, and to provide additional support for reasons to combine, all limitations are addressed below.

a) “A method for refilling an apparatus designed for use with a chlorodifluoromethane refrigerant, the method comprising ...”

See GROUND 1 at this limitation, the analysis of which is expressly incorporated herein by reference.

GROUND 2: Schnur teaches that its lubricant can be used with refrigerants in “refrigerating machinery,” EX1015, p. 13-14.

GROUND 3: Thomas teaches removing R-22 from a refrigeration or air-conditioning apparatus and replacing with a replacement composition. EX1014, 2:10-64, 6:13-61; EX1003, GROUNDS-2&3, Claim 5[a].

b) “(1) selecting a substitute composition designed to be a substitute for the chlorodifluoromethane refrigerant...”

See GROUND 1 at this limitation, the analysis of which is expressly incorporated herein by reference.

GROUND 2: In addition, Schnur teaches replacing chlorine-containing refrigerants (like R-22) with “chlorine-free heat transfer fluids ... in refrigerant systems.” EX1015, p.2; EX1003, GROUNDS-2&3, Claim 5[b].

GROUND 3: Thomas teaches substituting (emptying) the chlorodifluoromethane and selecting a substitute refrigerant composition designed to replace R-22. EX1014, 2:10-64, 6:13-61; EX1003, GROUNDS-2&3, Claim 5[b].

c) “and designed to achieve a phase change over a range of working temperatures and pressures of the apparatus...”

See GROUND 1 at this limitation, the analysis of which is expressly incorporated herein by reference.

GROUND 2: Schnur teaches that the substitute compositions are for hermetically sealed compressors in air-conditioners and refrigerators, and teaches a vapor compression cycle, which involves refrigerant phase changes. EX1015, Abstract, p.22 (claims 19-20); EX1003, GROUNDS-2&3, Claim 5[c].

GROUND 3: Thomas teaches that the substitute compositions are designed to replace R-22 in systems like air-conditioners and refrigerators with evaporators, and thus to achieve a phase change over working temperatures and pressures of an apparatus. EX1014, 1:45-47, 2:10-64, 6:13-61; EX1003, GROUNDS-2&3, Claim 5[c].

d) “the substitute composition consisting of a blend of tetrafluoroethane and pentafluoroethane...”

See GROUND 1 at this limitation, the analysis of which is expressly incorporated herein by reference.

GROUND 2: Schnur teaches refrigerant compositions that can consist of any of four HFC refrigerants, including pentafluoroethane and tetrafluoroethane, and mixtures thereof. EX1015, pp.1-2, 13, 17-24; EX1003, GROUNDS-2&3, Claim 5[d].

GROUND 3: Thomas teaches the refrigerant composition can consist of “[a]ny of a wide range of non-chlorine-containing refrigerants Examples of refrigerants suitable for use . . . include HFC’s such as 1,1,1,2-tetrafluoroethane (“R-134a), pentafluoroethane (“R-125”). . . and mixtures thereof.” EX1014, 3:32-40; EX1003, GROUNDS-2&3, Claim 5[d].

e) “wherein said pentafluoroethane is present in an amount of 59% to 57% by weight ... totaling 100%...”

See GROUND 1 at this limitation, the analysis of which is expressly incorporated herein by reference. Neither Schnur nor Thomas teaches specific percentages (but Yoshida does).

f) “and wherein the tetrafluoroethane is 1,1,1,2-tetrafluoroethane...”

See GROUND 1 at this limitation, the analysis of which is expressly incorporated herein by reference.

GROUND 2: Schnur teaches 1,1,1,2-tetrafluoroethane. EX1015, pp. 2, 22-24.

GROUND 3: Thomas teaches 1,1,1,2-tetrafluoroethane. EX1014, 3:35.

g) “(2) supplying the substitute composition under pressure, in a cylinder can fitted with an outlet compatible with a chlorodifluoromethane recharging manifold of the apparatus.”

See GROUND 1 at this limitation, the analysis of which is expressly incorporated herein by reference.

GROUND 2: Schnur does not have a specific disclosure of this step. The ‘840 Patent admits is obvious, and this step is obvious to a skilled artisan based on general knowledge.

GROUND 3: Thomas teaches “recharging a refrigerant system that contains a chlorine-containing refrigerant” by removing the chlorine containing refrigerant and “introducing into the system” a substitute refrigerant composition. EX1014, Abstract, 2:10-47.

Further, Thomas teaches:

Any of a wide range of methods for introducing the refrigerant composition to a refrigeration system comprising a hydrocarbon-based lubricant can [be] used in the present invention. For example, one method comprises attaching a refrigerant container to the low-pressure side of a refrigeration system and turning on the refrigeration system compressor to pull the refrigerant into the system. ... Alternatively, a wide range of charging tools, known to those of skill in the art, are commercially available. Accordingly, in light of the above disclosure, those of skill in the art will be readily able to introduce non-chlorine compositions into refrigeration systems according to the present invention without undue experimentation.

Id., 6:13-30. This teaches one skilled in the art to supply the substitute composition under pressure from a cylinder can fitted with an outlet, because, as the '840 Patent admits, pressurized cylinders with conventional outlets were known in the art.

EX1003, GROUNDS-2&3, Claim 5[g].

3. Reasons to Combine and Expectation of Success

a) General Reasons to Combine and Expectation

As stated in Section III.A, intense worldwide government and market pressures fueled searches to replace chlorine-containing CFCs and HCFCs (like R-22) with non-ozone depleting refrigerants and to find lubricants that would work with the new refrigerants. *E.g.*, EX1001, 1:56-2:14; EX1013, ¶3; EX1003, ¶¶43-46, 86. The search led to HFCs. EX1013, ¶3-5; EX1018, p.93-94. The government

and market pressures would have motivated one skilled in the art to combine and interchange teachings in each of the references cited herein as they all relate to replacing CFCs and HCFCs with HFCs. EX1003, ¶86.

By 2002, the art followed two options. First, one could design a replacement refrigerant from scratch to be used in a new apparatus designed specifically for the pressure and other characteristics of the new refrigerant. EX1003, ¶87; EX1018, p.95 (discussing R-410A). Second, one could use existing R-22 systems and design a so-called “drop-in” refrigerant that would replace and match R-22’s characteristics such as operating pressure, such that the replacement would work with an existing system with minimal or no modifications. EX1003, ¶87; EX1013, ¶¶8, 22(3); EX1014, 1:23-2:39; EX1016, 5:35-37; EX1018, p.95 (discussing R-407C, an early drop-in).

The move to HFC refrigerants, which did not work well with mineral oil lubricants traditionally used with CFCs and HCFCs, also created intense market pressure to either find new lubricants that would work well with HFCs or find ways to make traditional lubricants work with HFCs. EX1003, ¶88; EX1014, 1:23-2:39 (discussing replacing the traditional lubricant or alternatively using additives with the HFC blend); EX1016, 4:7-31 (using hydrocarbon additives with HFC blend); EX1015, pp.1-2, (developing new POE lubricants to work with HFCs);

EX1019, pp.55-58 (discussing solutions); EX1018, p.95 (stating that HFCs are immiscible with traditional lubricants and so use PAGs or POEs).

Before allegedly inventing the '840 Patent's claims, Mr. Ponder sold two products embodying two known, alternative solutions to the lubricant return issue. First, Mr. Ponder sold RB-276, which is covered by EX1005, the '643 Patent. EX1003, ¶54; EX1020. RB-276 facilitated lubricant return with an additive, a ROYCO light naphthenic lubricant, that thinned the mineral oil. EX1003, ¶55; EX1033, ¶5. The "thinned" mineral oil could be returned to the compressor with the flow of refrigerants. EX1003, ¶55. In addition, Mr. Ponder sold R-417A, a mixture of R-125 and R-134a, together with a hydrocarbon (butane), which facilitated the mineral oil lubricant's return to the compressor. EX1003, ¶53. These solutions, known in the art and specifically to Mr. Ponder, are examples of known alternatives used to facilitate mineral oil return. *Id.* ¶56. Mr. Ponder also indicated a desire to avoid selling R-417A because he couldn't "control it," i.e., it was patented by someone else. *Id.*, ¶53.

Generally, a skilled artisan would have expected success by combining or interchanging the explicit teachings of the various references discussed herein because, in addition to following the explicit teachings of the references, by 2002 HFC blends, including R-125 and R-134, were well-studied at ranges of

concentrations and mixed with a variety of additives and POE and lubricants, all of which had already been shown to succeed. *Id.*, ¶89.

b) Reasons to Combine Yoshida with Schnur and Schnur with Yoshida; Expectation of Success

One skilled in the art would have been motivated to combine Yoshida with Schnur because each tackles the same problem of implementing non-ozone-depleting chlorine-free HFC refrigerants in air-conditioners and refrigerators. EX1003, ¶90. A reason to combine two references can be found from the nature of the problem to be solved, particularly where the two references address the same problem. *See, e.g., KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, (2007); *Ruiz v. A.B. Chance Co.*, 357 F.3d 1270, 1276 (Fed. Cir. 2004) (upholding obviousness determination based on reason to combine from the nature of the problem).

Schnur specifies that it works with HFCs, specifically including blends of R-134a and R-125, which provides a reason to combine its teachings with Yoshida's specific blend. EX1003, ¶90; EX1015, pp. 1-2, 13-14, 22-24.

Yoshida's blend is an R-22 replacement, but Yoshida does not teach what lubricant to use with it. One would not run a car engine without lubricant. Similarly, no skilled artisan would use Yoshida's blend in systems without lubricant, and Schnur teaches options for adding a lubricant with binary HFC blends of R-125 and R-134a, which provides another reason to combine it with

Yoshida. EX1003, ¶91; *see also* EX1019, p.55-58 (describing using either POEs or traditional mineral oil); EX1018, p.95 (teaching using POE lubricants with HFCs).

In sum, based on the common problems addressed, the interrelated teachings, and the known need for lubrication in the system, one would have been motivated to start with Yoshida and add Schnur's lubricant as well as the optional additives taught. EX1003, ¶92. One skilled in the art would have seen the benefits of using Schnur's lubricant because it would circulate through the system and lubricate the compressor. *Id.* ¶¶91-92.

For the same reasons, one would have also been motivated to start with Schnur and use the specific blend taught by Yoshida, which is simply a specific blend within the genus taught by Schnur. *Id.*, ¶92. One skilled in the art would have immediately seen the benefits of adopting Yoshida's blend, which would match the vapor pressure of R-22, allowing use as a drop-in replacement. *Id.*

By 2002, one would have been extremely confident of the success of the combination because Yoshida's blend is a specific blend (a narrow range of R-125 and R-134a) contemplated by the genus of blends disclosed in Schnur (which includes, *inter alia*, any mixture of R-125 and R-134a). *Id.*, ¶93. R-125/R-134a blends had been studied for years and operated predictably, including in their interactions with the lubricants taught by Schnur. *Id.* In addition, the combination

would entail following Schnur's precise teaching of using POEs that are soluble in blends of R-125 and R-134a, leading one skilled to expect success. *Id.*

c) Reasons to Combine Yoshida with Thomas and Thomas with Yoshida; Expectation of Success

One skilled in the art would have been motivated to combine Yoshida with Thomas because each tackles the same problem of implementing non-ozone-depleting chlorine-free HFC refrigerants in air-conditioners and refrigerators, particularly including replacing R-22. EX1003, ¶94. A reason to combine two references can be found from the nature of the problem to be solved, particularly where the two references address the same problem. *See, e.g., KSR Int'l.*, 550 U.S. 398; *Ruiz*, 357 F.3d at 1276.

Thomas specifies that it works with HFCs, specifically including blends of R-125 and R-134a, which provides a reason to combine it with Yoshida's specific blend. EX1003, ¶94; EX1014, 3:32-40.

Yoshida's blend is an R-22 replacement, but Yoshida does not teach what lubricant to use with it. Again, one would not run a car engine without lubricant. Similarly, no skilled artisan would use Yoshida's blend in systems without lubricant, and Thomas teaches options for leaving existing mineral oil in the system and including various lubricants with binary HFC blends of R-125 and R-134a, which provides another reason to combine it with Yoshida. *Id.*, ¶95;

EX1014, 1:23-5:19; *see also* EX1019, p.55-58 (describing using either POEs or traditional mineral oil); EX1018, p.95 (teaching using POE lubricants with HFCs).

In addition, one skilled in the art would have understood that using Yoshida's R-125/R-134a blend in existing equipment would necessitate emptying the R-22 and filling it with the new blend, and would have seen the benefits of Thomas's easy and inexpensive option, which allows leaving the existing mineral oil lubricant in the system. EX1003, ¶95; EX1014, 1:55-2:47; *see also* EX1019, pp.55-57 (noting the benefits of retaining old mineral oil in an existing system).

In sum, based on the common problems addressed, the interrelated teachings, and the known need for lubrication in the system, one would have been motivated to start with Yoshida and add any of Thomas's lubricants and optionally its additives. EX1003, ¶96.

For the same reasons, one would have also been motivated to start with Thomas and use the blend taught by Yoshida, which is simply a specific blend within the genus taught by Thomas. *Id.*, ¶96.

By 2002, one would have been extremely confident of the success of the combinations because Yoshida's blend (a narrow range of R-125 and R-134a) is a specific blend contemplated by the genus of blends disclosed in Thomas (which includes, *inter alia*, any mixture of R-125 and R-134a). *Id.*, ¶97. R-125/R-134a blends had been studied for years and operated predictably, including in their

interactions with the lubricants/solubilizers taught by Thomas. *Id.* In addition, the combination would entail following Thomas's precise teaching of using additives with blends of R-125 and R-134a, leading one skilled to expect success. *Id.*

C. There Are No Unexpected Results

When a claimed range is rendered obvious by a broader prior art range, a patentee will often argue that the claimed range demonstrates unexpected results, as the applicants did when prosecuting the '840 Patent (see EX1002, B0055-B0058). As explained in detail below, however, the Examiner did not have the benefit of the Yoshida reference. Yoshida explicitly teaches to match the P-T characteristics of the blend of R-125 and R-134a to that of R-22, which would lead one skilled in the art directly and predictably to the claimed percentages. EX1003, GROUND-1(A&B), claim 1[e]. The P-T characteristics of blends of R-125 and R-134a were well-known and followed predictable patterns as concentrations varied. *Id.* ¶¶47, 52, 109-117. Therefore, there are no unexpected results. Rather, when one skilled in the art followed Yoshida's teachings, it would lead predictably to the claimed blend percentages and the accompanying properties. *Id.* ¶¶109-134.

1. Pressure-Temperature (P-T) Characteristics

The prior art available to and relied on by the Examiner differed from Yoshida in a fundamental way: Yoshida explicitly teaches to match the P-T characteristics of the blend of R-125 and R-134a to the known vapor pressure of R-

22 across the relevant working temperatures.⁴ EX1003, ¶¶60, 101, GROUND-1(B), claim 1[e]; EX1013, ¶8.

Following Yoshida's teaching would have led one skilled in the art predictably and directly to the claimed percentages in the '840 Patent. EX1003, ¶¶60, 101, 109. The P-T characteristics of both R-22 and R-125/R-134a blends were well-known years before 2002, and thus selecting the R-125/R-134a blend that best matched R-22's P-T characteristics at a given temperature was easy and predictable, and thus expected, to a PHOSITA. EX1003, ¶¶109-118. Indeed, the very predictive modeling software used by Owner to create the P-T graphs used in the application and in Mr. Ponder's declaration (EX1002, pp. B0055-B0056) would have enabled anyone who could use the software and follow Yoshida's teaching to adjust the percentages of R-125 and R-134a in a blend to match the P-T curve of R-22.

"Normally, it is to be expected that a change in temperature, or in **concentration**, or in both, would be an unpatentable modification." *In re Aller*, 220

⁴ In prosecuting the '840 Patent, to overcome a prima facie obviousness rejection in view of a prior art reference called Takigawa, Mr. Ponder declared that, "unexpectedly R421A [the 58% blend] better approximates the pressure-temperature (P-T) characteristics of Freon (R-22) than [Takigawa's 60% blend]." EX1002, B0056. Takigawa nowhere taught to match the P-T characteristics of an R-125/R-134a blend to that of R-22.

F.2d 454, 456 (1955) (emphasis added). Patentability may be achieved only if the results achieved at the designated concentrations are “unexpectedly good.” *In re Antonie*, 559 F.2d 618, 620 (CCPA 1977). ***By definition, whether something is unexpected must be compared to what was expected.*** *E.g., Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1371 (Fed. Cir. 2007) (“Thus, in order to properly evaluate whether a superior property was unexpected, the court should have considered what properties were expected.”); *Bristol-Myers Squibb Co. v. Teva Pharms. USA, Inc.*, 752 F.3d 967, 977 (Fed. Cir. 2014) (“When assessing unexpected properties, therefore, we must evaluate the significance and ‘kind’ of expected results along with the unexpected results.”).

The predictability of the P-T behavior of blends of R-125 and R-134a as the percentages change is shown in several ways. First, even applicants’ expert, Mr. Gbur, admitted in 2007 that the change in P-T characteristics as concentrations changed was expected. EX1007, R03748-R03749 (stating that the switched percentages of R-125/R-134a in the application was an obvious error and stating a skilled artisan “would recognize that as the concentration of pentafluoroethane dropped in a [R-125/R-134 blend], the Pressure vs. Temperature profile would likewise drop”); EX1003, ¶¶110-112.

Second, the higher boiling point of R-134a versus R-125 dictates which way a P-T curve (like the curve shown in Mr. Ponder’s 2017 declaration) will shift as

concentrations of R-134a/R-125 change, and prior art lab data disclosed P-T characteristics of various blends of R-134a/R-125. EX1003, ¶¶113-114, 117.

Third, well before 2002, equations and programs like REFPROP predicted and accurately modeled the P-T curves (i.e., data) for R-125/R-134a blends over the full range of ratios of R-125 and R-134a. EX1003, ¶115. Thus, selecting the blend of R-125/R-134a that matched the well-known vapor pressure characteristics of R-22 would have been easy and routine. EX1003, ¶¶113, 118.

Indeed, Table 2 of the ‘840 Patent and the data in Mr. Ponder’s 2017 Declaration were generated using the publicly available computer program, REFPROP (or equivalent). EX1003, ¶¶115-116. This is remarkable, given that such equations and programs *define what is expected*, and further given that the ‘840 Patent falsely describes the data from Table 2 as based on “tests” of actual mixtures of R-125, R-134a, *and a lubricant*. See EX1001, 8:14-22 (using past-tense language). *REFPROP does not (and did not at any time) have the capability of entering the ROYCO 2302 lubricant (or any other lubricant) as a mixture component*. EX1003, ¶116. Of course, the PTO does not have access to tools like REFPROP, and it was entitled to take applicants at their word that the data in Table 2 was based on “tests.” Amazingly therefore, during prosecution applicants used the results of well-known mathematical models (REFPROP), *which define*

what is expected P-T behavior, to argue for unexpected P-T results. EX1003, ¶115.

In sum, following Yoshida’s teaching to match the vapor pressure of an R-125/R-134a blend to the well-known vapor pressure characteristics of R-22 would involve the routine, well-understood, and predictable application of basic scientific principles and equations (EOS) and data. EX1003, ¶118. The EOS and software like REFPROP provide the *expected* P-T characteristics of blends of R-125 and R-134a and the *expected* P-T match to R-22. EX1003, ¶115.

2. Coefficient of Performance (COP)

An important characteristic of a refrigerant blend, and one to which applicants repeatedly pointed during prosecution, is the coefficient of performance (“COP”). EX1002, B0056-B0057, ¶¶8-9; EX1003, ¶119. The ‘840 Patent, however, is silent as to COP. COP, sometimes referred to as efficiency, is the ratio of heat extracted to the work required to extract the heat. EX1003, ¶48, 119.

There is nothing unexpected about the COP of the claimed blend of R-125 and R-134a. Indeed, the COP of the blend will depend directly on the concentration of the constituents in the blend. EX1003, ¶121. As explained in the previous subsection, following Yoshida’s explicit teaching leads to the specifically claimed ratio range of R-125 and R-134a. The COP of the blend will be dictated by its concentrations of R-125 and R-134a; this is expected, not unexpected. *Id.*

In addition, one skilled in the art would have easily calculated the COP of any given blend of R-125 and R-134a – this was well-known. *Id.*, ¶120, 122-123. First, the prior art long ago revealed the relationship between COP and refrigerant percentages in a blend, so there was nothing unexpected about the amount and direction of change in COP with a change in concentration of R-125/R-134a. EX1003, ¶¶123-126; EX1021, Table 2; EX1022, p.33; EX1016, Tables 1-3. One skilled in the art would have understood that as the percentage of R-125 increased in an R-125/R-134a blend, the COP would decrease, and by how much. EX1003, ¶¶123-126

Second, the COP of any blend of R-125 and R-134a was easily calculable for a range of temperatures before the priority date of the '840 Patent using the prior art CYCLE_D (or equivalent) predictive modeling program, which defined what was *expected*, not *unexpected*. EX1003, ¶122. There is nothing unexpected about the COP of any R-125/R-134a blend as calculated by CYCLE_D.

In addition, one skilled in the art would also have known that an R-125/R-134a blend with more R-125 would have a progressively worse (i.e., lower) COP at higher temperatures compared to a blend with less R-125. *Id.* ¶127. This behavior would have been easily predicted and expected based on the higher critical temperature of R-134a over R-125, combined with the well-known fact that a substance's COP degrades as its critical temperature is approached, meaning that

R-125/R-134a blends with higher concentrations of R-125 will predictably have lower COP performance at higher temperatures. EX1003, ¶128; EX1038, p.36.

3. Global Warming Potential (GWP)

Another important characteristic of a blend is its GWP. EX1003, ¶129.

Applicants pointed to it as an important characteristic. EX1002, at B0046 (*Office Action Response Dated 12-6-21*, at p. 6); *see also* EX1008, at R05197-R05198; EX1011, p.20.

The new prior art cited herein, Yoshida, specifically discusses the importance of a low GWP (EX1013, ¶9), whereas the art relied on by the Examiner, Takigawa, was silent as to GWP. EX1003, ¶131. The '840 Patent does not refer to GWP, either. For many years for the '840 Patent, scientists routinely calculated the GWPs of HFC blends, including binary blends of R-125 and R-134a. EX1022, p. 48-51; EX1003, ¶133.

Any specific blend of R-125/R-134a will have a specific GWP that is dictated by its concentration (or ratio) of R-125/R-134a. EX1003, ¶133. Therefore, because one following Yoshida's teaching to match the vapor pressure of a blend of R-125/R-134a to that of R-22 would have arrived at the claimed ratios, those ratios would necessarily have specific GWPs dictated by their refrigerant concentrations. EX1003, ¶134.

The GWP of a given ratio of R-125/R-134a is found by simple math (the sum of the individual component's mass fraction multiplied by that component's GWP). EX1003, ¶133. There is nothing unexpected about the GWP of any blend of R-125 and R-134a. EX1003, ¶134.

In litigation involving Family Patents, Mr. Ponder admitted the GWP of a blend is simple math. EX1023, p.221:21-222:1 (answering that the change of the GWP is not unexpected, but only “math”).

In sum, blends of R-125 and R-134a were very well studied by 2002, and their characteristics as concentrations of R-125 and R-134a changed were well-known and predictable.

VII. NON-INSTITUTION UNDER § 325(d) WOULD BE IMPROPER

The Board should institute this IPR under the *Advanced Bionics* test for § 325(d) discretion because the evidence identified in this Petition was not before the Office, nor was anything substantially similar. *See Advanced Bionics, LLC v. MEDEL Elektromedizinische Gerate GmbH*, IPR2019-01469, Paper 6, at 6–11 (Pat. Tr. & App. Bd. Feb. 13, 2020) (precedential).

None of Yoshida, Thomas, and Schnur, nor any reference substantially similar, was before the USPTO during examination of the '840 Patent. *See Thorne Research, Inc. v. Tr. of Dartmouth Coll.*, IPR2021-00491, Paper 18, at 8–9 (Pat. Tr. & App. Bd. Aug. 12, 2021) (reference disclosing additional subject matter is

not substantially the same). Additionally, as described above in Section VI.C, there is nothing unexpected about the changes in properties between the blend ratios disclosed by Yoshida and those claimed by the '840 Patent. Those properties follow naturally and predictably from following Yoshida's teachings. Further, under *Advanced Bionics* factor (f), the additional evidence in this petition demonstrates that Mr. Ponder relied on predictive modeling software for the data in his application and his declaration, and this software demonstrated expected results, not unexpected results. *See Advanced Bionics*, IPR2019-01469 at 10.

In addition, the earlier petition for the '179 Patent was discretionarily denied under *Advanced Bionics*. *See* EX1012, pp.26-27. Recently, the Director Vidal has indicated the importance of allowing a petitioner to pursue a decision on the merits to follow the congressional grant of power to revisit earlier patent grants and improve patent quality. *Code200, UAB v. Bright Data*, IPR2022-00861 & IPR2022-00862, Paper 18, at 5-6 (Pat. Tr. & App. Bd. Aug. 23, 2022) (Vidal decision) (concerning discretionary denial under *General Plastic*). By analogy, Petitioner should obtain a review on the merits in this case.

VIII. PAYMENT OF FEES – 37 C.F.R. § 42.103

Petitioner authorizes the Patent and Trademark Office to charge Deposit Account No. 133080 for the fee set forth in 37 C.F.R. § 42.15 for this Petition and

further authorizes payment for any additional fees to be charged to this Deposit Account.

IX. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Real Party-In-Interest

Dynatemp International Inc. and Fluorofusion Specialty Chemicals, Inc. are the real parties-in-interest.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

Petitioner is not aware of any disclaimers, reexamination certificates, or judicial or administrative proceedings for the '840 Patent.

Patent Owner is asserting the Family Patents in litigation against Petitioner in *R421A LLC, d/b/a Choice Refrigerants v. Dynatemp International, Inc. et al.*, 5:20-cv-00147 (E.D. N.C.), which has been consolidated with *Dynatemp International Inc. et al. v. RMS of Georgia et al.*, 5:20-cv-142 (E.D. N.C.), pending.

As described in Section III.B.1, Petitioner has previously filed post-grant petitions on the Family Patents: (1) IPR of the '706 patent (IPR2021-00199, terminated upon agreement); (2) IPR of the '179 patent (IPR2020-01660, institution denied); and (3) PGR of the '949 patent (PGR2021-00008, terminated upon agreement).

Based on public sources, an additional civil action involving some Family Patents and different defendants is pending: *R421A LLC d/b/a Choice Refrigerants et al. v. BMP USA, Inc. et al.*, 8:22-cv-0225 (M.D. Fl.), pending (asserting infringement of the '706 patent and the '179 patent).

C. Lead and Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation of counsel.

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A. Service Information Under 37 C.F.R. § 42.8(b)(4)

Please address correspondence/service to the above-listed addresses.

Petitioner consents to email service at mkeipdocket@michaelbest.com (referencing No. 217522-0002) and cc'ing jrtrembath@michaelbest.com and lsosborn@michaelbest.com.

X. CONCLUSION

Claims 1-12 of the '840 Patent are unpatentable over the art cited herein. Accordingly, Petitioner requests that the Board cancel claims 1-12.

Respectfully submitted,

Dated: February 21, 2023

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CERTIFICATE OF WORD COUNT UNDER 37 CFR §42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter partes* Review totals under 12,878 words, according to the word-processing system used to prepare this Petition, (which word count in this case include the words in the Table of Contents and Certification Under 42.24(d), but not, Mandatory Notices, Certificate of Service, Table of Authorities, or appendix of exhibits, as set forth in 37 CFR § 42.24(a)(1).

Dated Feb. 21, 2023

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) et seq. and 42.105(b), the undersigned certifies that on February 20, 2023, a complete and entire copy of this Petition for *Inter Partes* Review and all supporting exhibits were provided via Federal Express, next day, to the Patent Owner by serving the correspondence address of record as follows:

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