

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WELLMATICS, LLC, GR ENERGY SERVICES MANAGEMENT, LP, GR
ENERGY SERVICES OPERATING GP, LLC, AND GR WIRELINE, L.P.,
Petitioners

v.

CANATEX COMPLETIONS SOLUTIONS, INC.
Patent Owner

Case IPR2023-01149
U.S. Patent 10,794,122

EXPERT DECLARATION OF JOHN RODGERS, PH.D., P.E.

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Exhibit No.	Description
2001	Expert Declaration of John Rodgers, Ph.D., P.E.
2002	<i>Curriculum Vitae</i> of John Rodgers, Ph.D., P.E.
2003	Excerpts from The American Heritage Dictionary (2 nd College Ed. 1982)
2004	Excerpts from The Oxford American Desk Dictionary (1998)
2005	U.S. Patent Application Publication No. U.S. 2019/0257297
2006	U.S. Patent No. 6,082,454
2007	U.S. Patent No. 9,695,656
2008	Prysmian Group ESP Cables – Flat Cables brochure
2009	U.S. Patent No. 4,383,803
2010	Definition of “sucker rod pump” from SLB Energy Glossary (2023)
2011	Excerpts from Webster’s New World College Dictionary (4 th Ed. 1999)
2012	Lyons et al., “Standard Handbook of Petroleum and Natural Gas Engineering,” (3 rd Ed. 2016)
2013	Excerpts from Transcript of Sept. 26, 2023 Markman Hearing in <i>Canatex Completions Solutions, Inc. v. Wellmatics et al.</i> , Civil Action No. H-22-CV-3306
2014	49 C.F.R. § 173.50
2015	Transcript of August 3, 2023 Testimony of Dr. Gary Wooley in IPR2022-01372
2016	“Oilfield Explosive Safety,” American Petroleum Institute, API Recommended Practice 67 (Third Ed. Oct. 2019)
2017	Excerpts from Bellarby, Jonathan, “Well Completion Design,” Elsevier, Vol. 56 (2009)

Exhibit No.	Description
2018	“The Defining Series: Electrical Submersible Pumps,” Schlumberger (Jan. 1, 2015)
2019	Excerpts from Takacs, Gabor, “Electrical Submersible Pumps Manual: Design, Operations and Maintenance,” Gulf Professional Publishing (2 nd Ed. 2018).
2020	Coiled Tubing ESP Cable brochure, Schlumberger
2021	Grove et al., “Explosion-induced damage to oilwell perforating gun carriers,” ISSN 1743-3509, WIT Press (2006)
2022	Definition of “shaped charge” from SLB Energy Glossary
2023	Defendants’ Response to Plaintiff’s Motion for Preliminary Injunction (Dkt. 59) in <i>Canatex Completions Solutions, Inc. v. Wellmatics</i> , Civil Action No. 4:22-CV-3306
2024	Avenger® Motor Lead Extension brochure, Summit ESP
2025	Trident® brochure, Schlumberger
2026	Fetoui, “ESP cable,” Production Technology
2027	Kosmicki et al., “Jet Pumps Improve Bakken Shale Economics,” Hart Energy (Feb. 1, 2017)
2028	Degollado, “explosion Atascosa County Sheriff: Perforating gun somehow exploded, www.ksat.com (Jan. 15, 2013)
2029	“Oil field blast kills one worker, injures another in New Mexico,” Reuters (Mar. 12, 2015)
2030	Accident Report Detail, “Perforating Gun Kills Employee And Injures Another” Report ID 0627700 www.osha.gov (Sept. 14, 2005)
2031	29 C.F.R. § 1910.109
2032	Excerpts from 27 C.F.R., § 555, Subparts D, F, and K
2033	“Federal Explosives Licenses and Permits,” Bureau of Alcohol, Tobacco, Firearms and Explosives (Aug. 11, 2023)
2034	Excerpts from 49 C.F.R., §§ 171, 172, 173, 174, 177, and 180

Exhibit No.	Description
2035	“How Does an Electric Submersible Pump (ESP) Work?,” Kimray, Inc.
2036	Schlumberger REDA ESP System Cables brochure

I. INTRODUCTION

1. I have been retained by Canatex Completions Solutions, Inc. (“Canatex”) in connection with the above-captioned *inter partes* review proceeding involving U.S. Patent No. 10,794,122 (“the ’122 Patent”). Specifically, I have been asked to provide my expert technical opinions on issues relating to claim construction and validity. I reserve the right to revise, supplement, and/or amend my opinions based on new information presented to me.

2. I am being compensated by Canatex at my standard hourly consulting rate of \$350 per hour for my time spent on this matter. My compensation is not contingent on the outcome of the case or on the substance of my opinions.

3. I have no financial interest in any of the parties involved.

II. EDUCATION AND WORK HISTORY

4. I have a B.S.E. in mechanical engineering and materials science and a second major in mathematics from Duke University. I have an M.S. from the Massachusetts Institute of Technology (“MIT”) and a Ph.D. from MIT, both from the Department of Aeronautics and Astronautics. In my research and academics at MIT, I worked with active material systems and their application to structural actuation and vibration control. Much of the work involved the development of actuation systems for helicopter vibration control and other industrial and defense

applications. In addition, I worked on the development of novel piezoelectric material systems for use in actuation and sensing applications.

5. I am a professional engineer (P.E.) licensed in Texas, North Dakota, and Connecticut and have over fifteen years of experience in the oilfield industry. I founded and have worked in my engineering consulting business, Starboard Innovations, LLC, since 2000. In my career, I have worked on a wide variety of applications across many industries, though the bulk of my work has come in the development of downhole tools where I have been focused since 2003. I have developed new mechanical tools and software tools focused on a variety of different downhole applications. Several of the tools focused on measuring and analyzing the dynamic response of downhole tools and the surrounding wellbore and formation. Other tools that I have developed involved mechanical actuation systems such as firing heads, frac sleeves, cementing sleeves, and plugging devices. One example was a through-tubing bridge plug, designed for high expansion-ratio applications, which is now a product used in the field. Another design involved an autonomous, self-navigating wellbore plug with the option for dissolvable components. I have developed or worked on downhole tool designs for several other applications including: acoustic telemetry, measurements while drilling (MWD), test valves, fracture and cementing sleeves, and wireline fluid sensing. My involvement with many of these development projects included designing, performing engineering

analyses and simulations, developing manufacturing processes, building prototypes, running qualification tests, and supporting field trials.

6. More specifically, the largest part of my oilfield experience has come in the area of perforating technology. I have worked extensively with Halliburton's Jet Research Center (JRC) over this time. This work has included heading several failure investigations and leading a decade-long effort to better understand the dynamic response of the perforating gun string, wellbore, and formation to the detonation of shaped charges during perforating. I have developed modeling and simulation tools to predict the dynamic response of these systems. I have designed, qualified, and fabricated a perforation evaluation tool for measuring the dynamic pressures, loads, accelerations, and temperature within the gun string, adjacent to detonating explosives. I have also helped to design or redesign a number of firing head systems for actuating tubing-conveyed guns.

7. In the course of the above projects, I worked on-site at JRC with testing perforating gun systems. I worked with explosives technicians in the gun-loading shop and witnessed the loading of charges, detonating cord, and RED detonators in preparation for live explosive tests. I am familiar with many of the safety procedures used in the gun-loading environment, in the handling of the loaded guns, and the firing of the guns. I have worked on instrumenting guns for collecting data from the detonation, including direct measurements of the deformation of the gun carriers and

the internal pressure due to the blast. I have supported numerous field trials including the providing of instrumentation and downhole tool prototypes, performing the forensic examination of guns and gun system elements returned from the field, and performing analysis on field data.

8. I have developed finite element analysis (FEA) methods for simulating the detonation of perforating gun detonation. The efforts have focused on understanding the behavior of novel gun system geometries, identifying potential failure modes for the gun carriers and other components of the system, evaluating the damage caused to nearby loaded guns with select-fire detonations occurring in adjacent zones, evaluating shaped-charge interactions, and optimizing detonation timing in independently-controlled firing systems to minimize shock loading.

9. I have direct experience in working with a number of downhole tools that utilize hydraulic pistons and sliding sleeves to actuate valves or to release mechanical engagement. Examples include the following: ball valve actuation mechanism, perforating gun releasable connector, hydraulic fracturing sleeve, hydraulic cementing sleeve, and rupture disc activation. I have worked on the design, analysis, testing, and field operation of these downhole tools.

10. I am the sole and/or contributing author of over fifteen publications relating to this field. A comprehensive list of publications is in my attached

curriculum vitae (C.V.). I am a member of the Society of Petroleum Engineers (SPE) and American Society of Mechanical Engineers (ASME).

11. I have been named as an inventor on over thirty U.S. Patents. A comprehensive list of my patents is contained in my attached C.V. A number of these patents involve developments related to the perforating projects described above.

12. Exhibit 2002 is a copy of my current C.V. further elaborating on my professional background and qualifications.

III. BASES FOR OPINION

13. The opinions set forth in this Declaration are my own. In forming the opinions herein, I have considered the Petition for *Inter Partes Review* (“Petition”) filed against the ’122 Patent (including all of its Exhibits), all materials cited in this Declaration, and my education, training, and experience.

14. My analysis of the materials relating to this matter is ongoing and I will continue to review any new material that is provided to me. This Declaration represents certain opinions that I have formed to date and the bases for those opinions. I reserve the right to revise, supplement, and/or amend my opinions based on new information presented to me and on my continuing analysis of the materials cited herein or later provided to me.

IV. LEGAL STANDARDS

15. Although I rely on several legal principles in my Declaration, I am not an attorney and I do not have a legal background. Counsel for Canatex has provided me with the legal principles contained in this report. I have accepted those principles as binding and my opinions rely on those principles, which are explained below.

A. Person of Ordinary Skill in the Art

16. I understand that “a person of ordinary skill in the art” (abbreviated here as “POSA”) is a hypothetical person having ordinary skill in the art at the time of the claimed invention. Such a person would necessarily have the capability of understanding any scientific and engineering principles applicable to the pertinent art. I understand that factors that may be considered in determining the level of ordinary skill in the art include, but are not limited to, the following:

- a. the educational level of the inventor;
- b. the type of problems encountered in the art;
- c. prior art solutions to those problems;
- d. the rapidity with which innovations are made;
- e. the sophistication of the technology; and
- f. the educational level of active workers in the field.

17. I understand that a person of ordinary skill in the art is not a real person, but rather is a hypothetical individual having the qualities reflected by the factors above. This hypothetical person has knowledge of all prior art in the relevant field as if it were arranged on a workshop wall and takes from each reference what it would teach to a person of ordinary skill in the art.

B. Claim Construction

18. I understand that some claims are independent, and that those independent claims are complete by themselves. Other claims refer back to these independent claims and are “dependent” on those claims. The dependent claims include all of the limitations of the claims on which they depend, as well as the limitations recited by the dependent claim itself.

19. It is my understanding that claim construction, or the interpretation of the claims of a patent, is ultimately a question of law. I have been informed that claim terms are generally presumed to carry their ordinary and customary meaning. However, I understand that a patent applicant may act as his own lexicographer and is entitled to expressly provide alternate definitions of words in common usage. But if the patent applicant uses a term that is in common usage without clearly providing an alternate definition, then that term should generally be understood as having its common meaning.

20. I understand that a person of ordinary skill in the art is deemed to read a claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent specification and the “file history” of the patent developed during examination by the Patent Office, which is also referred to as the “prosecution history.”

21. I understand that the claims, the specification, and the file history are referred to as “intrinsic evidence,” and are to be read as a person of ordinary skill in the art at the time of the invention would have done at the time of the alleged invention. I also understand that the specification is the single best guide to the meaning of a disputed term.

22. I understand that the plain and ordinary meaning of a claim term may be narrowed based on statements made by a patentee during prosecution of the patent at issue. This is referred to as “prosecution disclaimer.” Such a disclaimer can arise from both claim amendments and arguments made to the United States Patent and Trademark Office (USPTO). However, I understand that the doctrine does not apply unless the disclaimer is “both clear and unmistakable to one of ordinary skill in the art.” When determining whether disclaimer applies, the allegedly disclaiming statements must be considered in the context of the entire prosecution. Additionally, if the challenged statements are ambiguous or amenable to multiple reasonable interpretations, prosecution disclaimer is not established.

23. In addition to the intrinsic evidence, I understand that the court or tribunal may also consider other relevant evidence, which is called “extrinsic evidence,” concerning relevant scientific principles, the meaning of technical terms, and the state of the art. Such evidence includes the testimony of expert witnesses. Although extrinsic evidence may be used to resolve ambiguities that may exist after reviewing the intrinsic evidence, I understand that extrinsic evidence cannot be used to contradict a claim construction that is clear from the intrinsic evidence.

24. I understand that a claim may be considered to be “indefinite.” In order for a claim to not be indefinite, the claim is required to inform those skilled in the art about the scope of the invention with reasonable certainty when viewed in light of the specification and prosecution history.

C. Patentability

25. I understand that for an invention claimed in a patent to be valid and patentable, it must be, among other things, new and not obvious in light of what was known and came before it. That which was known or came before the invention claimed is generally referred to as “prior art.”

26. I understand that there are two ways in which prior art may render a patent claim unpatentable. First, the prior art can be shown to “anticipate” the claim. Second, the prior art can show that the claim was obvious to a person of ordinary skill in the field of the invention at the time the invention was made.

27. I understand that, for a patent claim to be “anticipated” by the prior art, each and every element or requirement of the claim must be found, expressly or inherently, in a single prior art reference.

28. It is my understanding that whether a claimed invention is obvious is a question of law, with underlying factual inquiries that are determined from the perspective of a person of ordinary skill in the art at the time of the claimed invention.

29. It is my understanding that a claimed invention is obvious if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art (a “POSA”).

30. It is my understanding that obviousness requires consideration of the following underlying factual inquiries:

- determining the scope and content of the prior art
- ascertaining the differences between the claimed invention and the prior art;
- resolving the level of ordinary skill in the art; and
- evaluating objective evidence or “secondary considerations” of non-obviousness, such as commercial success, long-felt but unresolved needs, failure of others, industry praise, and unexpected results.

31. It is my understanding that a reference must be analogous art to the claimed invention in order to be properly considered for use in an obviousness inquiry. It is my understanding that a reference is analogous art to the claimed invention if:

- the reference is from the same field of endeavor as the claimed invention (even if it addresses a different problem); or
- the reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention).

32. It is my understanding that whether a reference is reasonably pertinent turns on how the problem faced by the inventor is reflected, either explicitly or implicitly, in the specification.

33. It is my understanding that the following are exemplary rationales that may support a conclusion of obviousness:

- Combining prior art elements according to known methods to yield predictable results;
- Simple substitution of one known element for another to obtain predictable results;
- Use of known techniques to improve a similar method or product in the same way;
- Applying a known technique to a known method or product ready for improvement to yield predictable results;

- Obvious to try – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art; and
- Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

34. In addition to the above, I understand that a person of ordinary skill in the art may resort to logic, judgment and common sense available to him or her at the time of the invention to find a claim feature obvious, even if the prior art relied on does not explicitly state or teach that feature. I understand that when common sense is relied on to find a feature obvious, the reasoning for that conclusion must be articulated with sufficient clarity.

35. I also understand that a patent claim is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. An obviousness determination requires finding both that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so. I understand that it is important to be careful not

to allow hindsight reconstruction of references to produce the claimed invention, without any explanation as to how or why the references would be combined to produce the claimed invention.

36. Regarding “objective evidence” or “secondary considerations,” I understand that for such evidence to be relevant to the obviousness of a claim, there must be a causal relationship (called a “nexus”) between the claim and the evidence. I also understand that such objective evidence may include: commercial success of products covered by the patent claims; long-felt need for the invention; failed attempts by others to solve the problem addressed by the invention; copying of the invention by others in the field; unexpected results achieved by the invention; praise of the invention; the taking of licenses under the patent by others; expressions of surprise by experts and those skilled in the art at the making or use of the invention; and that the patentee proceeded contrary to the accepted wisdom of the prior art.

37. I understand that a person of ordinary skill is also a person of ordinary creativity. I further understand that the obviousness analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, but instead can take into account “ordinary innovation” that does no more than yield predictable results, which are inferences and creative steps that a person of ordinary skill in the art would be understood to employ.

38. I understand that sometimes it will be necessary to look to interrelated teachings of multiple patents and publications; the effects of demands known to the relevant field or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art. I understand that all these issues may be considered to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.

D. Prior Art

39. I understand that for purposes of this proceeding, prior art includes patents and printed publications in or outside the United States before the effective filing date of the claimed invention. I also understand that prior art includes U.S. patents, published U.S. patent applications, and published international applications (pursuant to the Patent Cooperation Treaty) that themselves have an effective filing date before the effective filing date of the claimed invention, as long as they name another inventor.

40. I also understand that prior art may include any public disclosure, including any products in public use, on sale, or otherwise available to the public, before the effective filing date of the claimed invention. I understand that information that constitutes prior art generally must be information that was publicly disclosed before the effective filing date of the claimed invention. I understand that

there may be exceptions to what is prior art but have been instructed that they are not relevant for purposes of my opinions here.

E. Inherency

41. I understand that if a prior art reference does not expressly set forth a particular claim element, the prior art may still disclose that element if it is “inherent” in its disclosure. To establish inherency, it is my understanding that evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference. It is my understanding that inherency may not be established by probabilities or possibilities. In other words, it is my understanding that the mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency.

42. I understand that under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform a claimed method, then the method will be considered to be anticipated by the prior art device. I also understand that when the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process.

V. OPINION ON LEVEL OF ORDINARY SKILL IN THE ART

43. I have not been asked by counsel for Patent Owner to offer my opinion on the qualifications of a person having ordinary skill in the art. For purposes of the

preliminary response only, I have instead been asked to assume that the person of ordinary skill in the art has the level of skill proposed by Petitioners as of August 30, 2016, which I reproduce below:

A person of ordinary skill in the art at the time of filing of the '122 Patent ("POSA") falls generally within the skill level of a person with either: (1) a B.S. in an engineering or science discipline, or similar field, who has at least two years of experience designing, working with, selecting, or running downhole completion tools, or (2) 3-4 years of work experience designing, working with, selecting, or running downhole completion tools.

Petition, 7. My qualifications far exceed this proposed definition as set forth above. Should the Board decide to institute trial, I reserve the right to propose my own definition of a POSA.

44. While I have applied Petitioners' proposed qualifications of a POSA, I disagree with Petitioners' generalized assertions as to what a "POSA would have known." *See id.* at 7-8. A few specific examples of my disagreement are provided below.

45. Petitioners assert that "[t]here are a finite number of ways of actuating a downhole tool including electrically, hydraulically, mechanically (e.g., motors, tension, percussion, etc.), combustibles, and ingestion of wellbore pressure. These would all be viewed as design alternatives by a POSA." *Id.* at 7. I disagree that a POSA would have considered there to be a "finite" (i.e., very limited) number of ways of actuating a downhole tool. Petitioners provide a list of categories of *general*

principles of operation that downhole tools may rely on for actuating, but within each category are countless different ways of implementing those principles.

46. Petitioners' expert, Dr. Gary Wooley, further lists several references and summarizes them in an oversimplified list as a "finite number of ways of actuating a downhole tool". Ex. 1002 ¶ 25. Each of the cites describes a special application briefly described here: electrically-activated propellant that generates fluid pressure to release slips (Ex 1005), preventing the failure of shear pins by continuously pumping fluid through a coiled tubing string (Ex. 1012), a shaped charge detonation that is automatically triggered to release upon gun detonation and that is used to shift a piston to free a collet (Ex. 1008), a pressure-balanced automatic perforating gun release using a frangible plug (Ex. 1013), a hydraulic pump at the surface that shifts a piston to free a collet engaging a fishneck (Ex. 1007), dropping a ball and applying pressure through tubing to shift a piston which allows a collet to release and shift and then allows locking dogs to disengage (Ex. 1014). However, this list merely provides a few narrow examples and some highly specialized applications and is far from a broad coverage of available actuation technologies and methods that might be considered by a POSA.

47. A POSA also would not have considered each of these generic categories to necessarily be "design alternatives" to one another. *Id.* Whether the actuation-principles of one downhole tool could be or would be considered a viable

design alternative for use in another downhole tool depends on numerous factors, including the design-purpose of each tool and the compatibility of the first downhole tool's actuation-mechanism with the second downhole tool's design and design-purpose. For example, a POSA would not consider high-explosive actuation used in perforating guns to be compatible or suitable for use in downhole tools that rely on hydraulic-actuation for non-perforating applications. Similarly, a POSA would not typically consider an electrical-actuation mechanism to be suitable for use in a downhole tool where no wireline is available, as wireline is generally required for electrical-actuation. A POSA will only consider the approaches that make sense for a given application. In other words, it is simply inaccurate to generally assert that every type of actuation-mechanism would be considered a design alternative to every other type of actuation-mechanism.

48. I also disagree with Petitioners' assertion that "[i]nternal chambers, pistons, collets, locking sleeves, slips, pins, equalization ports, and fishnecks are ... would be viewed as interchangeable design choices." Petition, 8. This assertion is illogical because many of these components are fundamentally different and serve fundamentally different purposes, meaning they cannot be "interchangeable" by definition. As one of numerous possible examples, a fishneck is used so that downhole tools can be retrieved ("fished") from a well bore, while a locking sleeve serves an entirely different purpose of holding components in place. These are two

very different and unrelated things. This would be like listing a hammer, screwdriver, and wrench and saying that they are interchangeable—they cannot be because they do not perform the same function.

49. Petitioners also assert that “[c]ombustion and hydraulics are interchangeable ways of actuating releasable connections.” *Id.* This is simply not true. Not only are combustion and hydraulics not generically “interchangeable” but a POSA may be strongly discouraged from simply swapping one such design for the other. The Petitioners’ suggestion that hydraulics and combustion are interchangeable does not make sense as the details of the design of any releasable connection would be quite different and would have differing components, functions, and features, each with advantages and disadvantages. A prime example of this is the Petitioners’ proposal of replacing Bebak’s hydraulic-actuation mechanism with the electrically-actuated explosive shaped charge of Forehand. As I explain in Section VII.B below, a POSA would have been strongly discouraged from modifying Bebak in this manner.

VI. OPINIONS ON CLAIM CONSTRUCTION

A. The plain and ordinary meaning of “source.”

50. I have been asked to provide my opinion as to the meaning of the “a source of fluid pressure” in the ’122 Patent as understood by a POSA.

51. Independent claims 1 and 13 recite a “second part comprising ... a

source of fluid pressure in communication with the expansion chamber, wherein, upon activation, the source of fluid pressure is configured to apply fluid pressure to move the locking piston from the locking position toward the release position.” Ex. 1001.

52. “Source” is not a term of art in the industry, but nonetheless has a widely accepted meaning as “origin”—i.e., the place from which something originates. *See* Ex. 2003 at 8 (defining “source” as “[a] place or thing from which something comes or derives; point of *origin*.”); Ex. 2003 at 7 (defining “origin” as “A point of origination; *source*”); *see also* Ex. 2004 at 6 (defining “source” as “place, person, or thing from which something issues or originates”); Ex. 2004 at 5 (defining “origin” as “beginning or starting point; *source*”).

53. The written description of the ‘122 Patent is consistent with this widely accepted meaning. It teaches that the source of fluid pressure may be a combustible 42, or alternatively a gas cylinder, within the second part 14 of the release tool. Ex. 1001, 4:5-12 (“Combustible 42 may be any suitable material that is able to be ignited remotely Other combustibles 42 may be used, or other sources of fluid pressure....”).

54. A POSA would understand that in the combustion embodiment, when the combustible 42 ignites and burns it creates fluid pressure that travels to the piston 32 via ports 44. Ex. 1001, 3:59-65. A POSA would readily understand that the

“source” of fluid pressure in this embodiment is combustible 42 and the fluid ports 44 are merely components that communicate fluid pressure from the source. The ports 44 are not a source of the fluid pressure because the fluid pressure does not originate with the fluid ports. This is further demonstrated by the fact that the ports 44 are never referred to or identified as a “source,” while the combustible is expressly referred to as a “source” of fluid pressure as discussed above. *Id.* (“As shown, expansion chamber 38 and combustion chamber 41 ***are connected*** by ports 44, such that any gas pressure that results from the combustion of combustible 42 is applied to piston section 36 of locking piston 32, causing it to move from the locked position to the release position.”) The ports 44 are instead only described and depicted as a fluid pathway for conveying fluid *from* the combustible 42, which is the “source of fluid pressure.”

55. A POSA would also understand that in the gas cylinder embodiment the “source of fluid pressure” is the gas cylinder, which would be substituted for the combustible 42 depicted in Figure 1. Ex. 1001, 3:55-58 (“[T]here may be a gas cylinder that release gas pressure upon activation....”). In that embodiment, the ports 44 would again be the fluid pathway for conveying fluid pressure from the gas cylinder.

56. The specification also discloses an embodiment where fluid pressure is provided “from the surface” via “a fluid line.” Ex. 1001, 3:55-59 (“For example,

there may be a a fluid line that provides gas or liquid to expansion chamber 38 from surface, etc.”). In this embodiment, the “source of fluid pressure” resides at the surface, such as a hydraulic pump that communicates fluid to the release tool via the fluid line. While the fluid line is a component that communicates the fluid pressure from the pump, a POSA would understand that the fluid line is not itself a source of fluid pressure. Thus, even though the specification discloses an embodiment where a source of fluid pressure is at the surface, a POSA would not understand the claims to be directed to that embodiment because independent claims 1 and 13 expressly require that the “source of fluid pressure” is part of the “second part” of the “releasable connection for a downhole tool string.” In other words, those claims require that the “source of fluid pressure” resides within the claimed downhole releasable connection, just like claim 7 requires that a “combustible” resides within the claimed downhole releasable connection.

57. The plain and ordinary meaning of “source” is further demonstrated by other patent publications in the oil and gas industry. For instance, U.S. Patent Application Publication 2019/0257297 to Petitioner GR Energy Services Management, LP is directed toward a pumping system comprising “a *fluid source (tank)* 130” (blue) and “fluid pump 126.” Ex. 2005 ¶ [0029].

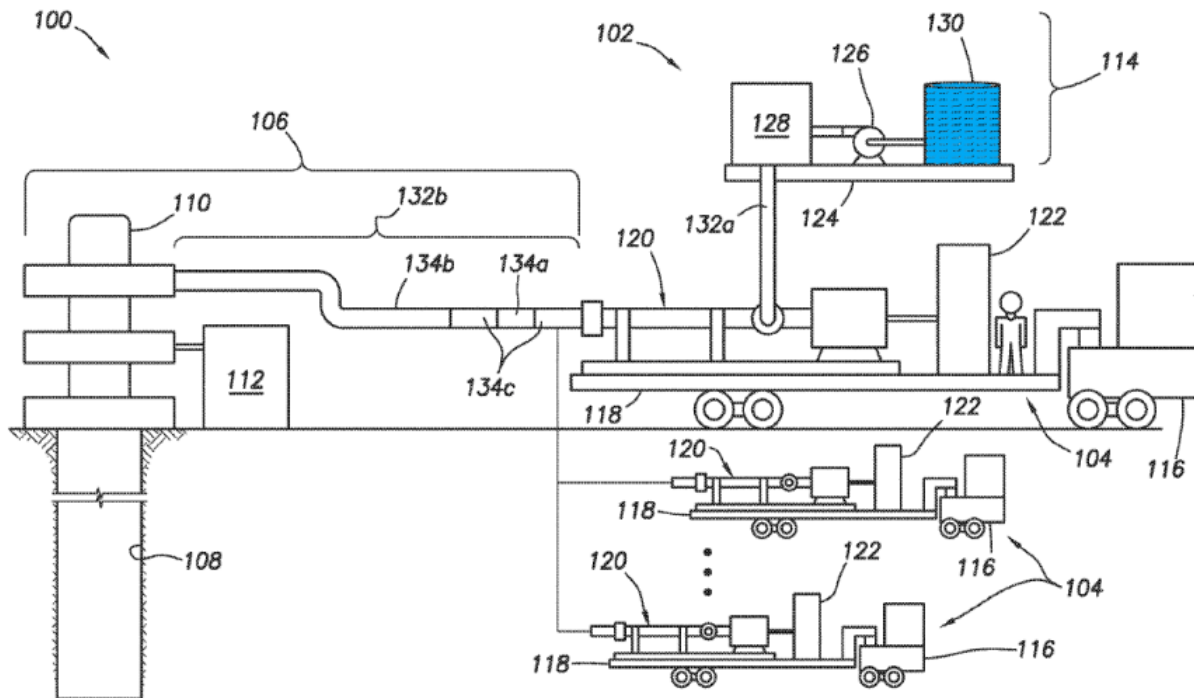


FIG. 1

58. As shown, the only fluid “source” in the entire system is tank 130, which the pump 126 draws fluid from and pumps through fluid connectors 132a, pump assembly 120, and fluid connectors 132b to the wellsite. *Id.* ¶¶ [0029]-[0030]. The “source” of fluid is tank 130 and the “source” of fluid pressure is the pump 126, and connectors 132a and 132b are merely the mechanisms for conveying the fluid and pressure in the system. This reference thus reflects the distinction between a “source” (e.g., a tank, pump) and the means for transporting something (e.g., fluid connectors) from a source.

59. U.S. Patent No. 6,082,454 is directed toward spooled coiled tubing strings and teaches, in reference to Figure 1, that a “hydraulic line 162 is preferably

run along the tubing 111 for supplying fluid under pressure from a surface source to hydraulically operated devices” and further that “the hydraulically operated downhole devices are activated by supplying fluid under pressure from a source at the surface (not shown) via the hydraulic line 162.” Ex. 2006 at 4:64-5:9.

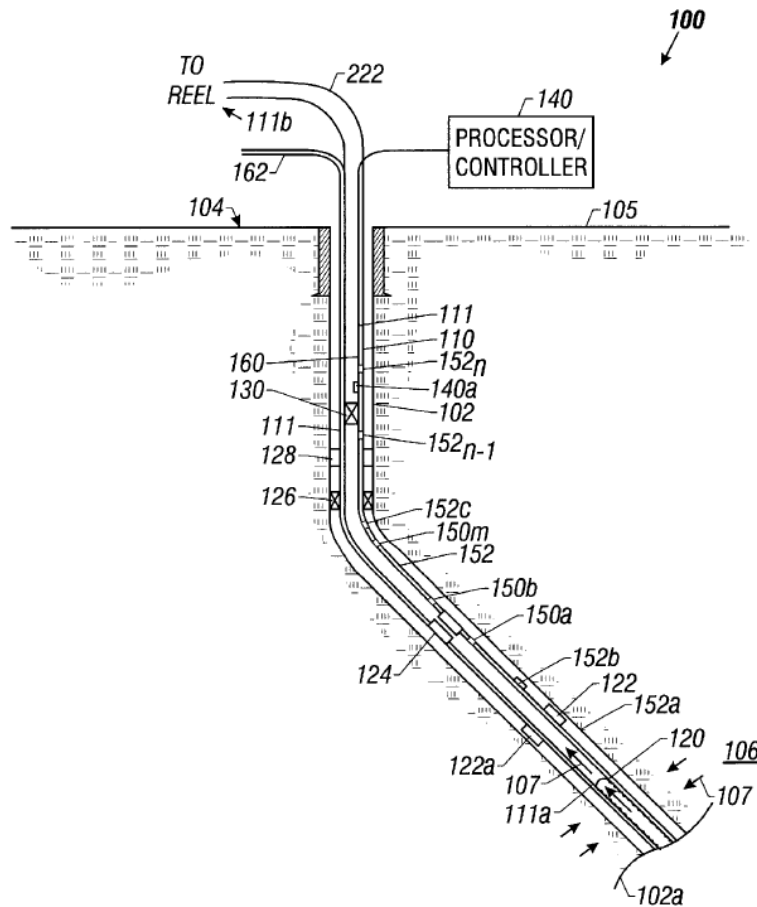


FIG. 1

60. U.S. Patent No. 9,695,656 likewise distinguishes a “source of fluid pressure” (i.e., the “origin” of the fluid pressure) from the components used to communicate the fluid pressure from the source. Ex. 2007 at 13:23-35 (“The external

source of fluid may be located at surface.... The shifting tool may be configured to be coupled *to a conduit, such as coiled tubing, a work string, or the like for communicating with a source of fluid pressure.*”).

61. U.S. Patent No. 4,383,803 is directed toward “a device for lifting liquid from boreholes [that] comprises a pump which is located downhole in the region of a production formation and which consists of a fluid-actuated, double-action piston. The pump is connected by **fluid pressure lines to a source of fluid pressure** disposed above ground.” Ex. 2009, Abstract. This reference clearly uses “source” consistent with its commonly understood meaning to refer to the origin. *See id.* at 3:54-60 (“To drive the piston downwardly, the four way fluid valve 27 is operated to connect *supply line 19 to the source of fluid pressure* and to exhaust the supply line 21. Fluid under pressure passes from the line 19....”).

62. The Schlumberger (SLB) Energy Glossary also provides guidance as to the meaning of “source.” It defines a “sucker rod pump” as “[a]n artificial-lift pumping system using a surface power **source** to drive a downhole pump assembly.” Ex. 2010. In other words, the “power source” is the device at the surface where the power originates—not the wires running downhole to the pump assembly.

63. All of these neutral publications use the term “source” consistent with its ordinary meaning as the place from which something originates, not to refer to any component that merely conveys something (e.g., a conduit that conveys fluid or

fluid pressure, a wire that conveys power) from a source. Consistent with the specification, dictionary definitions, and usage in the oil and gas industry, the term “source of fluid pressure” would be understood by a POSA to refer to the place from which something originates (e.g., a combustible, gas cylinder, hydraulic pump).

B. Petitioners’ proposed construction.

64. I understand that Petitioners argue that “source of fluid pressure” would be understood to refer to “component(s) that communicate(s) fluid pressure.” Petition, 18. Petitioners are mistaken because “source” has a widely accepted, common understanding as explained above and their proposed construction would encompass *any* component through which fluid pressure travels. In the context of the embodiments of the ’122 Patent, this would mean that every fluid path through the release tool is a “source,” depriving the term of all meaning.

65. Petitioners’ understanding is premised on a fundamental misunderstanding of the specification. Specifically, Petitioners rely on the following two passages—read in conjunction—to argue that the specification clearly refers to a “fluid line” as a “source of fluid pressure:”

Fluid pressure may include pressure applied by a liquid or a gas, which may be communicated to expansion chamber 38 in various ways. For example, there may be a gas cylinder that releases gas pressure upon activation, a fluid line that provides gas or liquid to expansion chamber 38 from surface, etc.

Other combustibles 42 may be used, or other sources of fluid pressure as discussed above, depending on the preferences of the user and the specifications for a particular situation.

Ex. 1001, 3:53-58, 4:9-10. Petitioners assert that in this passage “other sources of fluid pressure” refers to the previously referenced fluid line. They are mistaken.

66. A POSA would recognize that the portion of the specification describing the fluid line states that the “gas or liquid” in the fluid line is sourced “*from the surface*” (i.e., the source). As I previously explained, the widely accepted and common meaning of “source” is the place from which something originates, which the specification clearly teaches is the “*surface*”—not the fluid line. A POSA would thus readily understand that in this embodiment the “source of fluid pressure” necessarily resides at the surface, such as a hydraulic pump that communicates fluid to the release tool via the fluid line.

67. A fundamental flaw with Petitioners’ interpretation of these passages is that it ignores the widely accepted meaning of the commonly understood word “source,” which is the meaning that a POSA would have attributed to that word in the context of the specification. In other words, a POSA would recognize that “source” refers to the “origin,” and thus, necessarily know and appreciate that the references to “sources of fluid pressure” cannot plausibly refer back to the previously discussed “fluid line,” but rather refers to the “surface” from which the fluid pressure originates.

68. It is also my opinion that even if there was some ambiguity as to whether “sources of fluid pressure” refers to the previously referenced “fluid line” or “surface,” such ambiguity would not be understood by a POSA to be a clear redefinition of the ordinary meaning of “sources of fluid pressure.” This is because there would still be uncertainty as to whether the statement “other sources of fluid pressure as discussed above” refers back to the “*fluid line*” as Petitioners propose or the “*surface etc.*”

69. I understand that Petitioners also contend that “in light of the open-ended claim language itself and the specification, a POSA would understand the claimed ‘source of fluid pressure’ to include both *sources* that actually create fluid pressure at the desired location and *sources* that guide fluid pressure created elsewhere to the desired location, including fluid lines from the surface.” Petition, 19 (citing Ex. 1002, ¶ 71). They are again mistaken, because a “source” does not guide something “created elsewhere.” Petitioners are simply disregarding the fact that “source” has a well-known, customary meaning in the art as the place from which something *originates*, as demonstrated by numerous objective pieces of evidence above.

70. I understand that Petitioners also rely on the Examiner’s application of the claims to the prior art during examination. Petition, 37. However, I have been informed and understand that the Examiner applied a broader claim construction

standard than the one applicable here. Consequently, it is my opinion that a POSA would not rely on the Examiner's application. But even if the Examiner had applied the same standard applicable in these proceedings, it would be my opinion that the Examiner's application of "source of fluid pressure" was misplaced because, as demonstrated above, "source" has an established customary meaning in the art that refers to the place from which something originates, not simply the means for conveying something.

71. For the reasons above, a POSA would understand Petitioners' proposed construction for "source of fluid pressure" to be inconsistent with the established meaning of "source" as evidenced by numerous objective pieces of evidence. Petitioners' proposed construction is so broad that it would allow for countless "sources" of fluid pressure to be identified within a downhole tool. For example, in the Figure 3 embodiment, each of ports 44 would be "sources" of fluid pressure, even though the only "source" in that embodiment is combustible 42. In fact, under Petitioners' proposal any component through which fluid travels within the tool would be a "source," entirely depriving the term of its meaning. This would mean that literally any fluid path through the release tool of Figure 1 could be considered a "source of fluid pressure." Such an interpretation is inconsistent with the specification, which never refers to or identifies a fluid line or port that conveys fluid from the surface as a "source" but instead merely teaches that a fluid line or port

may be used to communicate fluid pressure “*from*” a source at the surface. Ex. 1001 at 3:55-58.

VII. OPINIONS ON VALIDITY

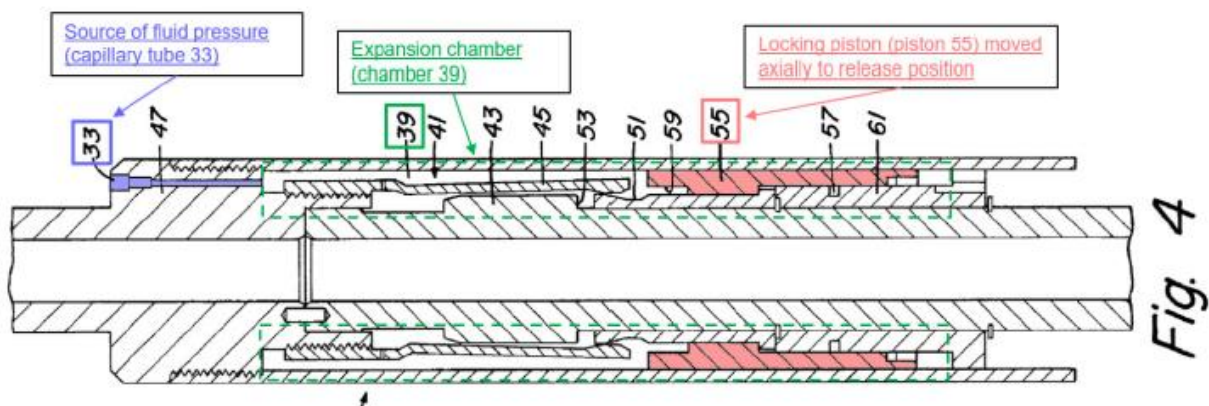
A. Ground 1: Whether Bebak Anticipates Any Claim.

72. In Ground 1, Petitioners allege that Bebak anticipates independent claims 1 and 13 and dependent claims 5, 6, 17 and 18.

1. Claims 1, 13: Whether Bebak’s release tool comprises a “source of fluid pressure.”

73. It is my opinion that Bebak cannot anticipate independent claims 1 or 13 because it does not teach or suggest that its release adapter 17 includes the required “source of fluid pressure.” Petitioners argue that the capillary tube 33 in Bebak’s release adapter 17 meets the “source of fluid pressure” limitation:

Petitioners’ Incorrectly Annotated Version of Bebak, Fig. 4



Petition, 34-35. However, Petitioners’ identification of the capillary tube 33 as the “source of fluid pressure” is based on their construction of “component(s) that communicate(s) fluid pressure.” As explained in Section VI above, that construction

is inconsistent with the meaning of that term as understood by a POSA, which is simply the “origin.”

74. A POSA would not understand capillary tube 33 to be an “origin of fluid pressure.” Rather, capillary tube 33 is merely a conduit for conveying fluid pressure *from* the source—namely the hydraulic pump that “pump[s] hydraulic fluid down through capillary tube 33.” Ex. 1007 at 2:59-62; *see also* Ex. 1007 at 1:39-42 (“The locking mechanism is actuated *from the surface* by pumping hydraulic fluid down *through* capillary tube...”). Stated another way, the capillary tube 33 merely “communicates fluid pressure” (as Petitioners acknowledge, Petition at 36), but it is certainly not the origin of the fluid pressure, which would be a hydraulic pump (or other source) thousands of feet uphole at the surface.

75. Petitioners also allege that “capillary tube 33 . . . is an ‘origin of fluid pressure’ in the second part.” Petition, 36 (citing Ex. 1002 ¶ 121). However, neither Petitioners nor Dr. Wooley explain how or why the capillary tube 33 qualifies as an “origin” of fluid pressure. It is quite clear that the fluid pressure originates with the hydraulic pump at the surface, not in the capillary tube. Petitioners and Dr. Wooley do not cite any objective evidence (e.g., dictionaries, treatise, prior art patents or publications) to support this assertion, but instead merely make this assertion without any factual support or basis. Because the fluid pressure does not originate with the capillary tube 33, it would not be considered a “source” of fluid pressure,

76. Petitioners’ position that Bebak’s capillary tube 17 is the “origin” of fluid pressure is simply not true. “Source” has a well-known, common meaning as the place from which something originates, as I explained above in Section VI.A. The fluid pressure of Bebak does not originate within the release tool, but rather originates with a hydraulic pump thousands of feet uphole.

77. I understand that Petitioners and Dr. Wooley assert that “to the extent it is argued that Bebak’s hydraulic pump at the surface providing hydraulic pressure down to the capillary 33 constitutes the claimed ‘source of fluid pressure,’ a POSA would also consider the hydraulic pump to ‘comprise’ the claimed ‘second part.’” Petition, 27; *see also id.* at 37 (“a POSA can consider the hydraulic pump and capillary tube to ‘comprise’ the claimed ‘second part.’”). However, neither Petitioners nor Dr. Wooley provide any explanation as to why or how a POSA would understand a pump located thousands of feet uphole from the release tool to make up part of the release tool.

78. This theory is inconsistent with the plain claim language and the specification. The claims are not directed toward a “system” of disparate components. Rather, they are directed toward an apparatus—i.e., “a releasable **connection** for **a downhole** tool string.” The claims plainly require that that “source of fluid pressure” is part of the “second part,” which itself is part of the **downhole**

string. A POSA would thus not understand a hydraulic pump located at the surface to somehow be a component of the claimed release tool.

79. This is particularly so considering the specification, which in no way teaches or suggests that a pump thousands of feet uphole at the surface is part of the releasable connection. The specification only describes and depicts the claimed “second part” as comprising downhole components as part of a downhole “releasable connection” that is raised and lowered through the wellbore via a wireline or tubing. Ex. 1001 at 1:5-8 (“This relates to a releasable connection in a downhole tool string, such as a wireline or tubing string, and in particular, a connection that releases as a result of fluid pressure.”); *Id.* at 2:43-47 (“Releasable connection 10 is designed for use in a downhole tool string (not shown), such as a wireline or tubing string. In one example, releasable connection 10 may be included in a downhole tool string for use in directional drilling.”). The specification does in fact teach that a source of fluid pressure can reside at the surface, but such a source is clearly not a component of the second part. Rather, the hydraulic pump would be a separate and distinct component located at the surface that is in fluid communication with the second part (e.g., via a fluid line). *See e.g.*, Ex. 1001 at 3:55-58 (explaining that a “fluid line” may provide gas or liquid to the expansion chamber “*from the surface*”).

80. In summary, a POSA would not understand Bebak to teach or suggest

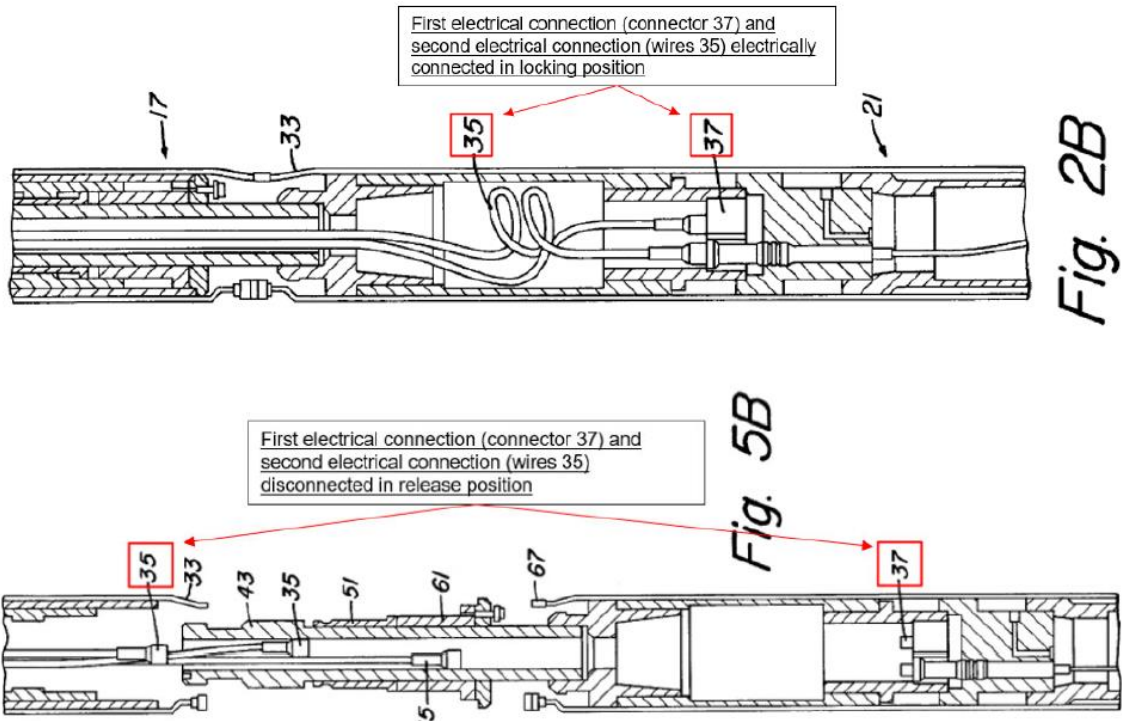
a source of fluid pressure within the alleged second part because the capillary tube 33 is not a “source of fluid pressure.” A POSA would also not understand the hydraulic pump—located thousands of feet uphole at the surface—to somehow make up any portion of the alleged second part.

2. Claims 12, 13: Whether Bebak satisfies the “Electrical Limitation.”

81. Dependent claim 12 and independent claim 13 recite “wherein the first part carries a first electrical connection, and the second part carries a second electrical connection, the first and second electrical connection being electrically connected when the releasable engagement profile of the second part engages the connection profile of the first part, and becomes disconnected when the releasable engagement profile disengages the connection profile” (hereafter the “Electrical Limitation”). It is my opinion that Bebak does not expressly or implicitly teach this limitation.

82. As shown below, Petitioners identify connector 37 as the “first electrical connection” and wires 35 as the “second electrical connection.”

Petitioners' Annotated Drawings



Petition, 38. There are several fundamental mistakes in Petitioners' analysis.

83. A POSA would not understand the releasable connection of Bebak—“release adapter 17”—to have any electrical connections. As shown below, Figures 3 and 4 of Bebak visibly depict the “release adapter 17,” which does not include “connectors 37” or “wires 35.” Ex. 1007 at 2:11-15 (“FIG. 3 is an enlarged sectional side view of a release tool in the submersible pump assembly of FIG. 1, and is shown in an engaged position. FIG. 4 is an enlarged sectional side view of the release tool of FIG. 3, and is shown in a released position.”).

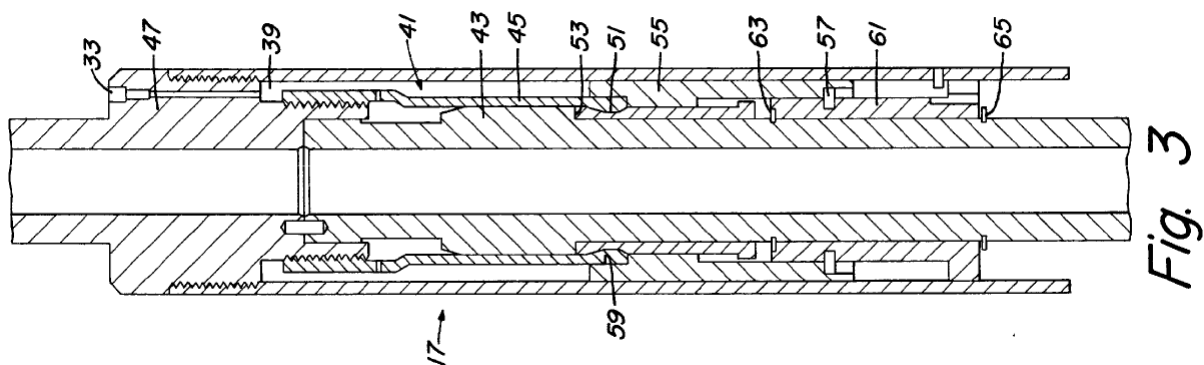


Fig. 3

bbb

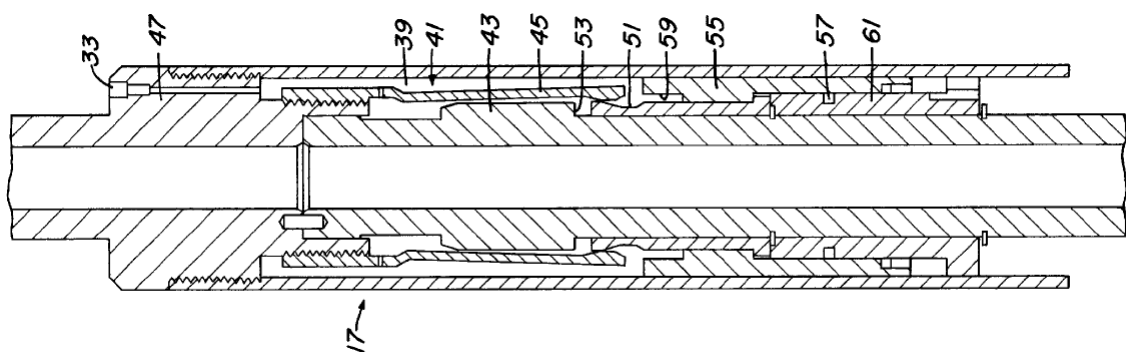


Fig. 4

Bebak also plainly teaches that the “connectors 37 [are] located at the upper end *of pump 21.*” Ex. 1007 at 2:37-42. In other words, the connectors 37 are part of the pump 21, not the release adapter 17. This is affirmed by Figures 1, 2A and 2B, which when viewed in conjunction with Figures 3 and 4 (which identify the “release adapter 17”) show that the portion of the wellbore assembly containing connectors 37 is located at the upper end of the pump (pink), which is beneath the release adapter 17 (green):

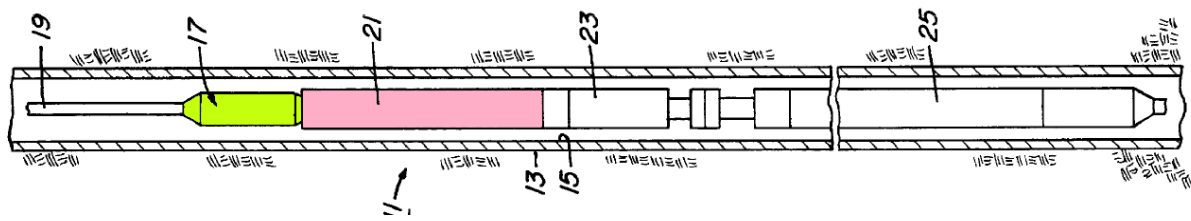


Fig. 1

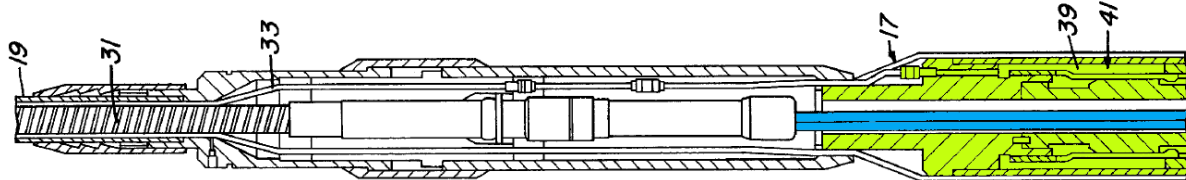


Fig. 2A

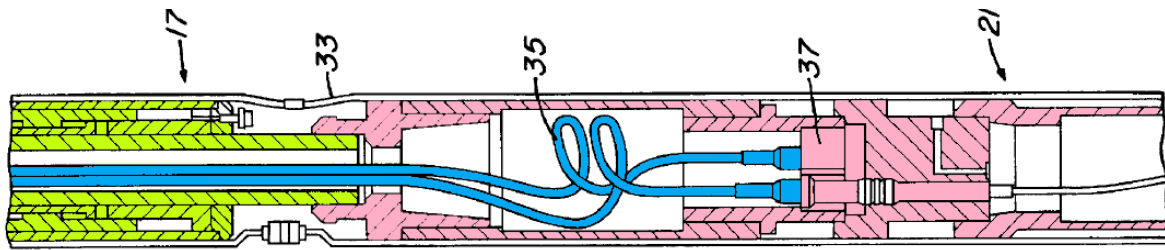


Fig. 2B

In view of these unambiguous disclosures, a POSA would understand that the extent of the release adapter 17 is the green portion, which does not include connector 37.

84. Turning next to wires 35 (blue), Bebak explains that they are part of “power cable 31” that is suspended (or dangled) from above release adapter 17. Ex. 1007 at 2:36-41. In other words, the wires 35 are part of the power cable 31 above the release adapter 17, but not part of the release adapter 17 itself. In fact, Figures 3 and 4 depict release adapter 17 without any power cables, because release adapter 17 provides *no electrical functionality*. The mere fact that wires are dangled through the release adapter 17 does not itself mean that it has electrical connections.

85. Bebak's release adapter also would not be understood to "carry" an electrical connection. As shown in Figures 3 and 4 of Bebak, it does not have any form of electrical connection or any electrical functionality at all. And as further shown in Figure 2A above, to the extent any electrical connections are "carried" by the system depicted in Figures 1, 2A and 2B, they are carried by the pump 21 (pink) and not the release adapter 17 (green). Ex. 2004 at 3 (defining "carry" as "to support or hold up, esp. while moving"); Ex. 2003 at 4 (defining "carry" as "to hold or bear while moving"; Ex. 2011 at 4 (defining "carry" as "to hold or support while moving"). Thus, it is the pump 21 that physically "supports" and "moves" the electrical connections as the entire assembly is lowered through the wellbore. In contrast, the wires 35 freely dangle through the central passage of the release adapter and the adapter can be released and separated without affecting or moving the electrical connection in any way. Because the wires 35 are not supported or moved by the release adapter 17, a POSA would not understand them to be "carried" as required by the claims. Likewise, because the connectors 37 are not part of the release adapter 17, a POSA would likewise not understand them to be "carried" by the alleged "first part."

86. This understanding is consistent with the '122 specification, which only discloses embodiments where the electrical connections 52, 54 are physically supported by the release tool and the movement of the release tool is what moves

the electrical connections. *See* Ex. 1001 at 4:31-36 (“When assembling first and second parts 12 and 14, the electrical connection is made by the concentrically-located electrodes 52 and 54 to allow an electrical signal to pass through releasable connection 10 to the tools below releasable connection 10.”). Specifically, electrical connection 54 is mounted within the first part 12 such that the electrical connection is both supported by, and moves with, the first part 12. Likewise, electrical connection 52 is mounted within second part 14 such that this electrical connection is similarly supported by, and moves with, the second part 14. Thus, each of the first part and second part “carries” an electrical connection.

87. The electrical connection between the wires 35 and connector 37 does not occur within the release adapter as required by the plain language of claims 12 and 13. Specifically, the Electrical Limitation requires “the first and second electrical connection *being electrically connected* when the releasable engagement profile of the second part engages the connection profile of the first part.” As explained above, the electrical connection between the wires 35 and connectors 37 occurs in the pump 21 (pink), not the release adapter 17 (green) as required by the claims. Consequently, Bebak fails to teach or suggest a release adapter that has an electrical connection between the two electrical connections.

88. Petitioners argue that:

Patent Owner also argued that wires 35 (“second electrical connection”) and connector 37 (“first electrical connection”) do not

meet this limitation because they are not electrically connected within the release adapter 17, and the claim supposedly requires the engagement of the two first and second electrical connection to occur within the “releasable connection.” EX1018, 6. This argument also fails. First, Patent Owner again relied on the non-limiting preamble and non-existent limitations. The claim requires that “the first part carries a first electrical connection” and “the second part carries a second electrical connection.” EX1001, 6:64-66 (emphasis added). Bebak meets the claim language because the first part “carries” connector 37 (“first electrical connection”), and the second part comprises a release adapter 17 that “carries” the wires 35 (“second electrical connection”).

Petition, 40-41. However, Petitioners focus only on the “carries” language while ignoring the other portion of the claim language at issue—“the first and second electrical connection *being electrically connected*.” A POSA would thus understand that the claim language not only requires that there are two electrical connections “carried” by the claimed release tool, but also that those two electrical connections must be connected to one another “when the releasable engagement profile ... engages the connection profile.” Ex. 2001 ¶ 88. It would be readily apparent to a POSA that the electrical connection between the first and second electrical connections, which are “carried” by the first and second parts respectively, necessarily occurs within the claimed releasable connection. This is consistent with the specification, which teaches that the electrode 54 of first part 12 and the electrode 52 of second part 14 are connected within the releasable connection 10. Ex. 1001 at 4:24-36. Because the electrical connection between wires 35 and connector 37

occurs within pump 21 and not release adapter 17, the electrical connection does not occur within a releasable connection as required by the claims.

B. Ground 3: Whether the Combination of Bebak and Forehand Renders Any Claim Obvious.

89. Independent claims 1 and 13 require a “second part comprising: ... a source of fluid pressure,” while independent claim 7 requires a source of fluid pressure in the form of “a combustible disposed within the expansion chamber.” Petitioners allege that it would have been obvious to modify Bebak’s release adapter 17 by adding Forehand’s electrically initiated explosive charge such that the “shockwave” created by the shaped charge would initiate the release. For the reasons below, it is my opinion that not only would a POSA have had no motivation to make the proposed modification, but a POSA would have been strongly discouraged from doing so.

1. Overview of Asserted Art

90. Before addressing Petitioner’s specific theories of obviousness, it is helpful to first discuss the purpose and design of the release tools in Bebak and Forehand.

a. Bebak’s Hydraulic-Based “Release Adapter” for Pumps

91. Bebak’s “Summary of the Invention” explains that the “release adapter” is designed for submersible pump assemblies, which are used in the production stage of a well to produce hydrocarbons from the formation. *See* Ex. 1007

at 1:31 (“A submersible pump assembly has a release adapter on a string of coiled tubing.”). More specifically, Bebak is a release tool used to separate a coiled tubing string from a downhole pump. *Id.* Such pumps are also known as “electrical submersible pumps” (“ESPs”) because they are submersed in wellbore fluid.

92. Bebak actuates its release adapter 17 by pumping hydraulic fluid from a pump at the surface, down capillary tube 33, and into chamber 39, which causes piston 55 to shift and shear pins 57. Ex. 1007 at 2:59-67. This allows the piston 55 to shift in the downhole direction, allowing the collet 41 to release the profile 51. *Id.* at 2:64-3:6. Lifting the coiled tubing string above them separates the release tool from the submersible pump assembly. *Id.*

93. There are four aspects of this release adapter design that I believe are important to keep in mind.

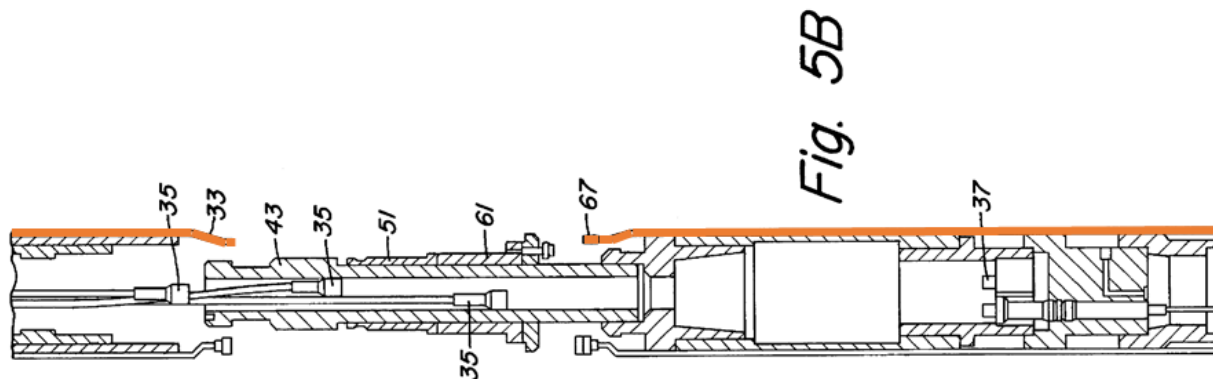
94. First, the release adapter 17 is reusable at minimal cost and effort because the only damage caused by releasing the release adapter 17 is the shearing of pins 57. Once the lower part of the release adapter 17 is pulled to surface via its fishing neck, the release adapter 17 can easily be reassembled and reused by simply disassembling and cleaning the tool and replacing the shear pins and o-ring seals. By reusing the release adapter, the provider can save significant cost by not having to replace the entire tool.

95. Second, because the release mechanism relies on hydraulic fluid pumped from the surface, the release tool is considerably safer for personnel to physically handle and transport than tools containing explosives. Bebak's release adapter has no stored energy within the tool itself. The source of energy to actuate the release mechanism is not contained within the tool but rather is provided from the surface via a fluid control line. For other downhole tools that utilize an energetic material that is stored and transported within the tool itself, special precautions must be taken for handling and transporting the tool. This is because inadvertent activation of the energetic material could cause harm to the personnel handling the tool as well as personnel and equipment in the vicinity of the tool.

96. Third, because the release tool does not rely on explosives, it is not subject to stringent transport requirements for explosives, and it can be handled by personnel that do not have explosives training. For example, federal regulations require special handling, permits, and packaging for explosives via the Department of Transportation (DoT), Alcohol Tobacco and Firearms (ATF), and Occupational Safety and Health Association (OSHA). *See generally*, Ex. 2014 (49 C.F.R. § 173.50); Ex. 2031 (29 C.F.R. § 1910.109); Ex. 2032 (27 C.F.R. § 555, subparts D, F, and K); Ex. 2033; Ex. 2034 (49 C.F.R. §§171-173, 177-178). A federal explosives user permit is also required to use explosives within the U.S. Ex. 2032 (27 C.F.R. § 555, subpart D); Ex. 2033. The DoT regulations further require that the downhole

tool must be assembled on-site so that the detonator and explosives may be transported separately. Ex. 2034 at 327 (49 C.F.R. §177.848). In addition, the American Petroleum Institute (API) has recommendations for the handling and operation of downhole tools containing explosives to ensure safe and secure operations. Ex. 2016 at 67. A POSA would understand that dealing with explosives and the necessary regulations and recommendations adds a substantial layer of cost and complexity to the operation of any downhole tool including the aspects of hiring and training personnel to address, implement and monitor operations, the changes to operations to deal with the explosives, and the additional liability of working with explosives.

97. Fourth, Bebak's release is initiated using fluid control lines ("hydraulic capillary tubes"), and fluid control lines would typically be present to control other downhole completion equipment even if the release adapter was not in the system. *See e.g.*, Ex. 2020. Specifically, Bebak includes an additional control line (orange) that runs below the release adapter as tubing 33 and coupling 67 visible in Fig. 5B (annotated below). Ex. 1007 at 2:67-3:4.



This means that the fluid control line used to actuate Bebak's release adapter can simply be run downhole along with the other fluid control lines that already have to be run downhole as part of the overall system installation with a minimum of added cost or complexity.

98. Fifth, Bebak does not rely on electrical actuation of its release mechanism and in fact specifically teaches that it does not want to rely on electrical actuation or use wireline. *Id.* at 3:14-16 ("Unlike prior art devices, the release tool of the present invention ***does not rely on electricity to be actuated.***"); *Id.* at 1:16-23 (discussing drawbacks of prior art including that "[i]n another prior art device, the release tool is electrically actuated and ***requires the use of a wire line cable.***"). A POSA would understand that in Bebak, the pump or ESP is run into the well on coiled tubing and that would not include any electrical communication or wireline cable to control or power equipment other than the specialized high-power cables needed to power the pump itself.

99. To rely on electrical actuation would require a dedicated wireline connection from the surface to the downhole release adapter, adding significantly to the cost and complexity of the downhole tool and requiring electrical surface equipment to interface with and control the downhole release. Bebak's design takes advantage of the fluid control lines to both control and provide energy for the release mechanism without the added complexity that would come with electrical actuation, leaving the release tool as a simple mechanical-hydraulic design with zero electrical functionality.

b. Forehand's Explosive Charge-Based "Automatic Release Mechanism" for Perf Guns

100. As discussed above, Bebak is focused on a release tool for downhole pump assemblies used in the production stage of a well. Forehand, on the other hand, is focused on a release tool for perforating guns that are used in the completion stage of a well. Ex. 1008 at 1:6-12 ("The invention is concerned with a perforating gun...."). A POSA would immediately recognize that perforating is a fundamentally different and more dangerous application involving the use of high explosives to blast a hole in the surrounding formation so that the formation can subsequently be fractured. *See id.* at 1:51-52 ("Summary of the Invention" explaining that a "perforating gun automatic release mechanism is provided which utilizes *the explosive shock wave* resulting from detonation of the gun to activate the release.").

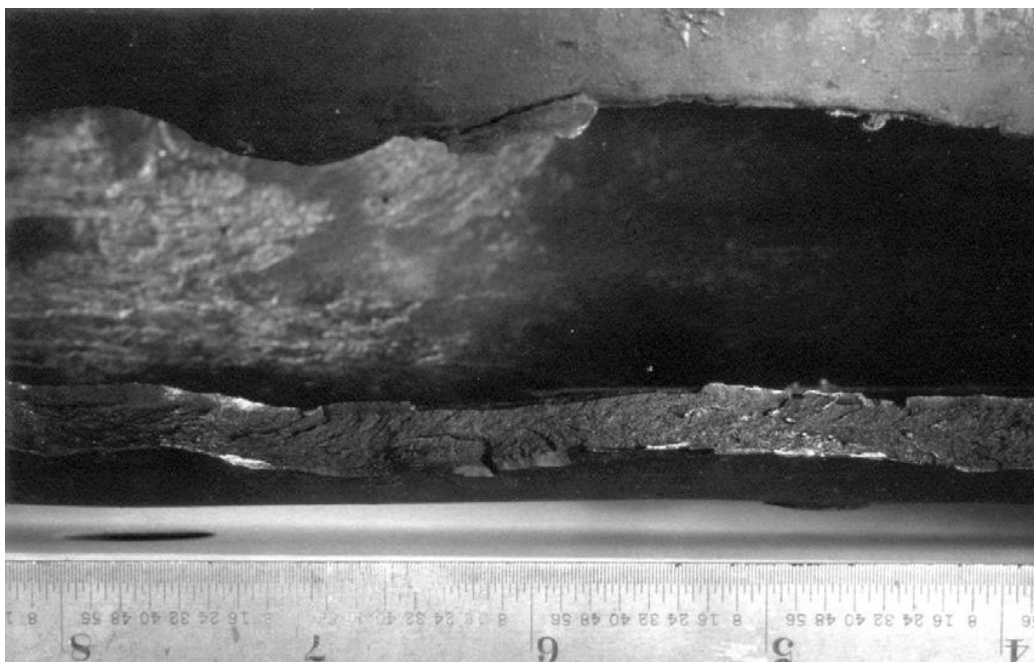
101. As Forehand explains, these high-explosive “shaped charges” create an “explosive shockwave,” which a POSA would understand to refer to the high-velocity jet of molten metal that penetrates the perf gun housing, the wellbore casing (e.g., steel, cement) and the formation as a result of the explosion. *See id.* at 5:50-51 (“Detonation of shaped charge 68 creates an explosive shock wave...”); *see also* Ex. 2022 (defining “shaped charge” as “An explosive device that utilizes a cavity-effect explosive reaction to generate **a high-pressure, high-velocity** jet that creates a perforation tunnel. The shape of the explosive material and powdered metal lining determine the shape of the jet and performance characteristics of the charge. The **extremely high pressure and velocity** of the jet cause materials, such as steel, cement and rock formations, to flow plastically around the jet path, thereby creating the perforation tunnel.”).

102. The following gun carrier damage photos illustrate the explosive energy released by shaped charges and the nature of the damage that can occur to steel structures in close proximity to shaped charges as a result of the rapid energy release, high pressure shock, and fragments or shrapnel produced. Ex. 2021 at 9.

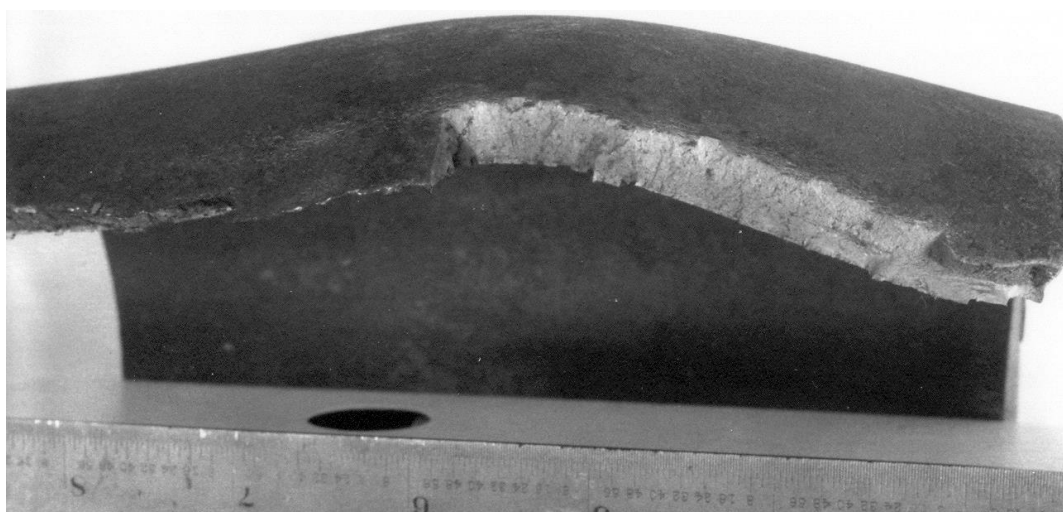
103. The first photo below illustrates the steel housing of a perforating gun carrier (or housing) torn by explosive debris caused by pressure acting on the interior surface. *Id.*



104. The second photo below illustrates a fracture in the steel housing that was initiated by fragments or shrapnel produced by the shaped charge detonation. *Id.* The case that forms the shaped charge and other structure used to position the charges typically break apart and become high-energy projectiles upon detonation. *Id.*



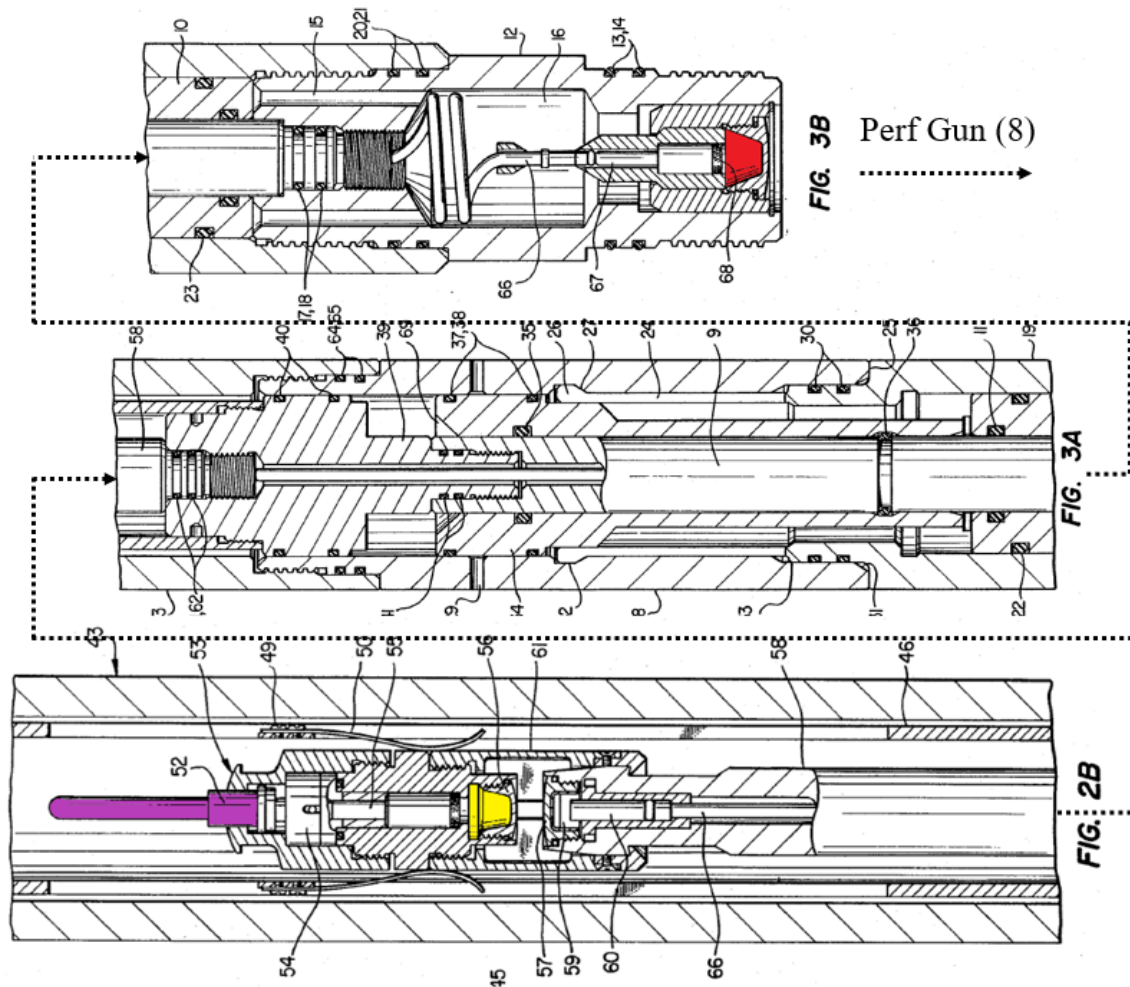
105. The third photo below illustrates additional deformation of the housing due to the extreme pressures and a resulting fracture surface. *Id.*



106. While these photos are only illustrative in nature, they provide an indication of the severe effects of charge detonation in a confined structure. Perforating tools are specially designed to function with explosives and the tools housing the explosives are not often reused because of the damage incurred during

detonation. Tools that are redressable or reusable are most often thick, solid, steel parts such as gun connectors that do not deform significantly during the blast. Tools that involve moving parts, such as sliding pistons or sleeves, are not redressable after exposure to such explosive forces because of the deformation to structures and surfaces. Tools with sliding sleeves, commonly utilized in downhole actuation mechanisms, can be deformed due to blast loading, causing them to get stuck or jam. The blast damage to surfaces can also degrade seal performance and create friction that resists piston travel.

107. A POSA would understand that Forehand is focused on creating a release mechanism that does not rely on a discrete step in the operation to release the perf gun, nor the addition of any particular tools or machinery not already present in the perforating gun application to perform the release. Ex. 1008 at 1:39-43. To that end, Forehand discloses an “automatic release mechanism” that releases the perforating gun and part of the release mechanism into the wellbore upon explosive detonation of a perforating gun. *See id.* at 1:51-54 (“A perforating gun automatic release mechanism is provided which utilizes the explosive shock wave resulting from detonation of the gun to activate the release.”). As shown in my annotated versions of Figures 2A-3B below, Forehand’s automatic release mechanism relies on a series of shaped charges 56 (yellow), 68 (red):



Firing pin 52 (purple) is physically impacted to initiate a chain reaction of shaped charge explosions, beginning first with shaped charge 56 followed by shaped charge 68 and then the shaped charges within perforating guns 8. *See id.* at 5:38-50 (“Impact on firing pin 52 will cause detonation, in sequence, of the following: ignition cartridge, explosive booster charge 55, shaped charge 56, explosive booster charge 59, explosive cap 60, detonator cord 66, explosive booster charge 67 and shaped charge 68.... Detonation of shaped charge 68 in turn causes detonation of perforating gun 8, which is attached to bushing sub 12....”).

108. There are six aspects of Forehand's release tool that are important to keep in mind.

109. First, Forehand relies on the detonation of shaped charges to create an explosive shockwave to effectuate release of its tool. Shaped charges are "high explosives" that cause a violent explosion designed to destroy and deform. A shaped charge is characterized by a high-velocity jet produced by the detonation of a high-explosive and metallic liner. Ex. 2017 at 4. Detonation is a chemical reaction that propagates via a shock wave at supersonic speed. *Id.* The secondary high explosives used in shaped charges are difficult to detonate and require a separate detonator that is more sensitive to an initiating stimulus and able to trigger the detonation. *Id.* In perforating guns like those found in Forehand, the detonation sequence is typically initiated by a spark or small explosion that causes a primary explosive to detonate. The primary explosive is more sensitive than the secondary explosives used in the detonating cord and shaped charges and is easier to initiate. The primary explosive detonation causes a detonating cord to detonate. *Id.* The detonating cord makes contact with every shaped charge, causing each to detonate in sequence. Forehand takes advantage of the existing detonation chain through the gun system via the detonating cord to initiate a special shaped charge that is used to actuate the gun release mechanism. Ex. 1008 at 5:38-52.

110. Second, because Forehand uses shaped charges the automatic release adapter is not reusable. Shaped charges are designed to blast an opening in the casing of a perforating gun and the casing of the well, and thus detonation of a shaped charge results in irreparable damage to the housing of a perforating gun (known as the “gun carrier”). Forehand itself expressly teaches that the perforating gun 8, bushing sub 12, and the release sub 19 are released into the “rathole” of the well. Ex. 1008 at 2:19-25. (“The weight of the gun is then given effect as a force sufficient to pull the heads out of the groove, taking the coupling member (and all the firing components attached thereto) out of the housing, whereupon they fall into the rathole of the well.”). A POSA would understand the “rathole” to essentially be the “dumpster” at the bottom of the wellbore where equipment is permanently disposed of in the well. One of the reasons for the permanent disposal of the release sub 19, bushing sub 12, and perforating guns in the rat hole is that they have no reuse value, and it is cheaper to simply drop them in the rat hole instead of bringing them to surface.

111. Third, there must be a mechanism to detonate the release charges. For example, the embodiment depicted in Forehand relies on an impact firing pin 52 located on the uphole end of the tool string that must be physically impacted to initiate detonation. The impact is typically achieved by dropping a steel bar from the surface so that it freefalls down to impact the firing pin. Forehand also describes an

embodiment where the detonation could occur remotely via electrical signal, though it is not depicted or further explained. Typically, this would involve a wireline cable running from the surface to the downhole tool to provide the electrical signal.

112. Fourth, because Forehand relies on explosives to trigger its release, it is significantly more dangerous than release tools that do not rely on explosives. *See e.g.*, Ex. 2028 at 2; Ex. 2029; Ex. 2030. Adding explosives to a tool that does not already have explosives present (as in perforating guns) effects a major change in the way the tool must be transported and handled because of the safety and security risks involved. Please refer to my discussion of this point above in paragraph 96 where I discuss the transportation and handling requirements in more detail. Even beyond these requirements and the best efforts of operators to follow them, it is inevitable that serious injuries and even deaths can result from the handling of high explosives when an employee or contractor becomes complacent and fails to follow all requirements and recommendations. Ex. 2028 at 2; Ex. 2029; Ex. 2030 (evidencing serious injuries resulting from explosive shaped charges).

113. Fifth, the presence of explosives in Forehand's release adapter necessarily means it would be subject to the stringent transportation and handling requirements for explosives set forth by the Department of Transportation and could only be handled by personnel certified and trained to handle explosives. Ex. 2014 at 1(49 C.F.R. § 173.50); Ex. 2034 at 218 (49 C.F.R. § 172.704); Ex. 2017 at 6; Ex.

2012 at 3; Ex. 2016 at 66-68. This significantly increases the cost and difficulty associated with assembling and transporting tools that rely on explosives. It also limits the tools' use to personnel specifically trained/certified to handle explosives. For example, while the personnel handling perforating guns would be expected to have such training/certification, service personnel for other downhole applications (e.g., ESP pump operations) would not be expected to have such certification/training and thus would not be able to handle or use such a tool. This is because service companies that are involved in perforating maintain a highly trained workforce of technicians that are skilled in handling shaped charges, loading guns, and running perforating jobs. The transportation of shaped charges requires special licensing and is more costly as a result. Ex. 2034 at 218 (49 C.F.R. § 172.704); Ex. 2032 (27 C.F.R. § 555, subpart D); Ex. 2033. In addition, federal regulations require that the detonator must be shipped separately from the charge and be assembled at the wellsite. Ex. 2034 at 327 (49 C.F.R. § 177.848). This requires trained personnel and special handling procedures.

114. Sixth, explosively actuated mechanisms, such as Forehand's, are generally less reliable than hydraulically actuated tools. The detonation of Forehand's shaped charges creates intense shock loading on the surrounding and nearby tools and structures because of the rapid gas generation and supersonic shock wave that results from the explosion. The rapid expansion of explosive gases will

create high temperatures and pressures, as well as shrapnel, inside the closed volume within a release tool. This will in turn result in high stresses and deformations in the components of the system. As a result, components may be deformed before they can shift, causing mechanisms to jam and release to fail. In addition to generating shock loading in the release tool itself, the shock loads will propagate into the pump potentially causing damage to any sensitive components such as bearings and rotating components, electronics, etc.

2. All Claims: Whether the combination of Bebak and Forehand renders obvious a “source of fluid pressure” (claims 1, 13) or “combustible” (claim 7) in the second part.

115. The Petition alleges that it would have been obvious to modify Bebak’s release adapter 17 by adding Forehand’s explosive charge such that the “shockwave” created by the shaped charge would initiate the release. However, Petitioners’ obviousness analysis ignores the drastically different applications and designs of Bebak and Forehand’s release tools discussed above, which fundamentally undermines the proposed combination. When each reference is read in context, not only would a POSA not have been motivated to combine Forehand’s explosive charge with Bebak, a POSA would have been strongly discouraged from doing so.

a. Whether a POSA would have been discouraged from combining Forehand with Bebak.

116. Petitioners’ obviousness analysis is premised on broad statements that I believe overlook the detailed teachings of Bebak and Forehand. However, before

turning to that analysis I will first explain why a POSA would have lacked a motivation to combine Forehand with Bebak, and why Bebak teaches away from the use of electrically-actuated explosive charges.

117. Petitioners recognize that Forehand's release is caused by "detonation of *an explosive charge*" and assert that the explosive charges are "combustibles." Petition 22, 62. Petitioners propose adding an explosive charge "like Forehand's" to Bebak's release adapter so that a hydraulic pump and fluid lines would not be needed and so that Bebak's tool could be released remotely using an electrical signal. *Id.* at 59. There are several reasons a POSA would not have been motivated to modify Bebak as proposed.

118. Shaped charges ("explosive charges") create a highly destructive shockwave that permanently damages and deforms the device housing the shaped charge. Petitioners themselves acknowledge that shaped charges "are used to *punch a hole* in the casing, cement, and formation" and that the "detonation *blasts a hole* through the casing and cement and into the formation." Petition, 5. Despite this recognition, Petitioners and Dr. Wooley assert that a POSA would have been motivated to place an explosive charge "within the expansion chamber" of Bebak. Petition, 60.

119. A POSA would have been discouraged from relying on an explosive charge, because an explosive charge would permanently damage and deform the

physical structure surrounding the explosive, including the outer housing and portion of the locking piston facing the explosive charge. As I explained before, Bebak's hydraulic fluid-based design is redressable because the only physical damage is the shearing of shear pins 72. Thus, once the released part of released adapter 17 is fished out of the well, only the seals and shear pins 72 would need to be replaced to reuse the release adapter. If an explosive charge were imparted into Bebak's alleged expansion chamber, the explosion would permanently deform the upper portion of release adapter 17 and render the release adapter unusable for future use. The detonation could also damage the fishneck in the lower portion of the release adapter that is also directly exposed within the proposed expansion chamber and that could prevent the future retrieval of the costly pump itself. Bebak describes that the pump will be retrieved using a fishing string in a later intervention step. Ex. 1007 at 1:48-51.

120. Imparting an explosive charge into Bebak's release adapter would also make the tool significantly more unsafe for transportation and handling. Because shaped charges are high explosives, they pose a serious risk to human health and safety. Ex. 2017 at 6; Ex. 2012 at 3 ("The perforating operation is one of the potentially most hazardous, due to the high explosives used. This requires strict attention to the care and handling of explosives, ensuring personnel are properly

trained.”) A POSA would have thus been strongly discouraged from relying on explosives over the much safer hydraulic actuation already provided by Bebak.

121. A POSA would have also been discouraged from relying on an explosive charge in Bebak because there are stringent guidelines for the transportation and handling of explosives. *see supra* ¶¶ 96, 113. It is considerably more burdensome and costly to transport a downhole tool that relies on explosives, and field personnel must be specifically trained in explosives to handle such tools. In Bebak, the pumping personnel present on the wellsite would be able to handle and operate the “as-is” release adapter but modifying it to incorporate an explosive release would prevent those same personnel from handling or operating the release adapter without additional explosive training and/or certification.

122. A POSA would have further recognized that the use of an explosive charge in Bebak’s alleged expansion chamber would increase the risk of malfunction because of the shock loads and resulting stresses from the detonation. Bebak’s release adapter 17 is designed to be actuated using hydraulic fluid pressure, which does not create an explosion or “shockwave.” Specifically, shaped charges create intense shock loading on the surrounding and nearby tools and structures because of the rapid gas generation and supersonic shock wave that results from the explosion. The rapid expansion of explosive gases will create high temperatures and pressures as well as shrapnel inside the closed volume within a release tool. This will in turn

result in high stresses and deformations in the components of the system. As a result, components may be deformed before they can shift, causing mechanisms to jam and release to fail. In addition to generating shock loading in the release tool itself, the shock loads will propagate into the pump beneath the release adapter, potentially causing damage to the pump's sensitive components. The blast loading could also damage the sensitive power cables passing through the interior of the Bebak release adapter potentially causing pump failure. An ESP is an expensive tool (> ~\$200,000) that has a long life in operation. Ex. 2027 at 2. Operators would not want to risk damage to such an expensive asset by relying on explosive release mechanisms anywhere near the ESP.

123. For example, if an explosive charge were placed in the alleged expansion chamber of Bebak, it would be positioned in the annular space between the collet 45 and the relatively thin outer housing of the release adapter.¹ An explosive shockwave, high-velocity jet, high dynamic pressures, and shrapnel would be expected to cause significant damage to both the collet and outer housing, which could interfere with the release of the tool such as by jamming the mechanism or rupturing the pressure housing. It could also result in fragments or pieces of the release adapter being released into the wellbore, which could interfere with fishing

¹ Note that it is not clear that a shaped charge and additional required elements of the detonation chain could even fit within the available radial clearance of the Bebak tool.

the pump out. Ex. 1007 at 1:48-51. Indeed, a POSA would understand that one of the reasons that Forehand's explosive charge is located so far from the piston and collet is to allow the shockwave to dissipate so that it reduces the likelihood of malfunction and deformation of the release components.

124. A POSA would have also recognized that the physical properties of shaped charges render them incompatible with the release adapter of Bebak, which is designed for downhole pump environments. The Bebak pump release tool is designed to operate in a downhole environment where the pump may be used for months or years at a time before any possible release command is received. The operating environment would necessarily involve high temperatures as is typical in a subterranean wellbore. This poses a significant limitation for the use of explosives because high explosive materials degrade rapidly at elevated temperatures as illustrated in the plot below:

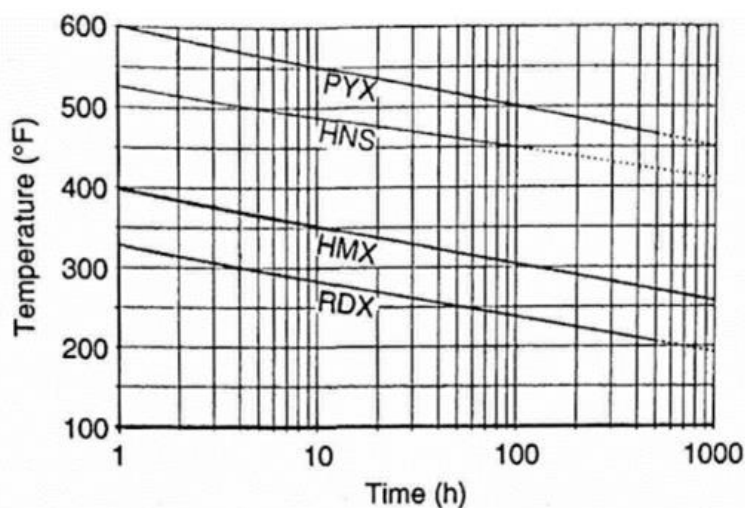


Figure 2.36 Temperature stability of perforating explosives (courtesy of M. J. Economides, L. T. Watters, and S. Dunn-Norman).

Ex. 2017 at 5-6; *see also* Ex. 2016 at 49-52.

125. In perforating applications, the shaped charges only have to survive for a period of hours before being detonated so that the extent of the degradation is limited. This degradation would limit the duration that such a release tool could stay downhole and be expected to perform. The degradation does not manifest as a gradual reduction in output energy but rather limits the ability to detonate at all. Failure to properly detonate can have catastrophic consequences for perforating operations potentially causing gun failure and/or damage to the wellbore. Simply put, the lifespan of shaped charges in the environment of an ESP is simply unacceptable, which is another reason a POSA would never have considered using Forehand's explosive charge in the release adapter of Bebak. Relying on explosive charges to effectuate release of Bebak's pump release adapter would result in the adapter failing to release at all due to degradation of the explosives over time.

126. Relying on an electrically-actuated explosive charge would also require a separate and continuous communication link to safely send a coded signal to the onboard electronic firing system to initiate the explosion. For example, the API recommends the use of secure communication through a wireline. Ex. 2016 at 25, 32-33. For the safety of personnel handling the tool after the detonator has been installed, secure communications ensure that the detonator cannot be triggered inadvertently by requiring a digital arming code to be received for activation. This

requires a wireline connection to the surface equipment that monitors the electrical connection and transmits the activation signal when commanded. This would unnecessarily add a layer of cost and complexity to Bebak's release adapter, which is comparatively much simpler to initiate using hydraulic fluid sourced from the surface pump.

127. In short, the structural integrity of Bebak's release adapter, its reliability, its expected useful life, and its redressability would all be degraded or nullified if modified to include an explosive charge actuation mechanism, substantially adding to the cost to build and maintain the tools. The tool would also have to be assembled on-site, rather than at the shop, to install the detonator leading to potential errors or contamination that would further degrade reliability. The cost of transporting and operating the release tool would also increase due to the explosive classification and the need to maintain the electrical connection for safe arming and operation of the explosive device.

128. These are all apparent major disadvantages of relying on explosive charges to release a downhole tool, which is why it was very uncommon to use high explosives as an actuation means in downhole tools. This may beg the question—then why does Forehand rely on explosive charges? The answer is simple. Forehand's automatic release tool is designed for use in a perf gun string, which *already* relies on many explosive shaped charges within the perf gun. Because a

perforating gun already relies on many shaped charges, the addition of additional explosive charges to release the perforating guns does not impart these additional disadvantages. The transportation handling, safety, personnel training, and secure communication link are already in place. The challenge for Forehand was to design a reliable mechanism for release in the harsh environment and that effort was offset by the automatic synchronization with the firing of the guns. *See* 1008 at 1:39-43.

129. In contrast, Bebak relies on a hydraulic release mechanism that does not have any of these disadvantages. Since the ESP application of Bebak already requires fluid control lines to be used, it simply uses the existing control mechanism already present in that application. (See e.g., Ex. 2020 at 1). There was simply no need or reason for a POSA to consider modifying Bebak's release adapter to rely on explosive shaped charges.

130. In addition to imparting an explosive shaped charge into Bebak's alleged expansion chamber, Petitioners also propose detonating the explosive charge remotely using an electrical signal. Petition, 59-60.² However, a POSA would

² While Forehand's depicted embodiment relies on physically contacting firing pin 52 to begin the chain reaction of explosions, Petitioners do not explain or address how that mechanism could even be implemented in Bebak's modified release adapter 17. Consequently, Patent Owner addresses the "electrical" detonation combination proposed by Petitioners, which is the only actuation mechanism that Petitioners propose in the combination.

understand Bebak to teach away from reliance on electricity to actuate the release of release adapter 17. As Bebak elaborates:

Downhole release tools for submersible pump bottom hole assemblies are well known in the art. *Unfortunately*, some of these devices require remote operation or actuation that requires electrical power to be available at the downhole assembly.... In another prior art device, the release tool *is electrically actuated* and requires the use of a wire line cable.... Thus, an improved apparatus and method for releasing a submersible pump bottom hole assembly is needed.

Ex. 1007 at 1:12-27.

131. To that end, Bebak’s invention involves a release adapter 17 that is hydraulically actuated and does not rely on electricity. Bebak teaches that “[t]he release tool of the present invention has several advantages *Unlike prior art devices*, the release tool of the present invention does *not* rely on electricity to be actuated.” Ex. 1007 at 3:14-16. A POSA would understand Bebak to be teaching away from relying on electricity to trigger release of the release adapter 17. It is apparent that one of the primary driving factors behind Bebak’s design is to eliminate the need to trigger release using a remote electrical connection, which is why Bebak relies on hydraulic pressure provided from a pump at the surface.

132. Moreover, a POSA would be discouraged from following the path set forth in Forehand—i.e., using an explosive charge to initiate tool release—based on the design of Bebak. Specifically, in the downhole pump application of Bebak it was commonplace to utilize hydraulic control lines to control downhole equipment

beneath the pump. *Supra* ¶ 97; *See* also Ex. 2020. Bebak itself relies on a hydraulic control line that runs to downhole equipment beneath the release adapter. *Id.* A POSA would have thus been discouraged from modifying Bebak to rely on an entirely distinct form of release actuation when Bebak's release adapter relies on hydraulic lines that would already be present to control other downhole equipment.

b. Petitioners' obviousness analysis is fundamentally flawed.

133. Petitioners' obviousness analysis ignores the issues discussed above, which fundamentally undermine their obviousness theory. Each of Petitioners' arguments is addressed in turn.

134. Petitioners argue:

Forehand describes an automatic gun release mechanism that uses a piston and collet locking mechanism actuated by pressure from the firing of the gun (*detonation of combustibles*). Because a POSA would readily know that a *combustible* generates internal pressure in a perforation gun, the release mechanism of Forehand actuated by *combustible* pressure would have suggested to a POSA that the piston and collet locking mechanism used by Bebak could likewise use pressure from a *combustible* placed in the expansion chamber instead of hydraulic pressure carried to the expansion chamber by a capillary tube.

Petition, 58 (emphasis added).

135. Petitioners and Dr. Wooley fail to account for the fact that Forehand relies on *explosive shaped charges* and that Petitioners are expressly proposing modifying Bebak to include those *explosive shaped charges* into Bebak's alleged expansion chamber. As discussed above, there are numerous problems associated

with modifying Bebak to rely on explosive shaped charges for its actuation. *Supra* ¶¶ 116-132. Petitioners and Dr. Wooley do not address any these problems, all of which would have been readily apparent to a POSA and would have strongly discouraged a POSA from modifying Bebak as proposed.

136. Petitioners next argue that “A POSA would also have been motivated because Forehand and Bebak both relate to releasable connections for downhole applications.” Petition, 58. But the fact that Forehand and Bebak both relate to releasable connection does not evidence or support that a POSA would have been motivated to replace Bebak’s hydraulic-actuation mechanism with the fundamentally different and more dangerous explosive shaped charge of Forehand. The fact that Forehand and Bebak relate to releasable tools merely goes toward whether those references qualify as “analogous art” (e.g., that they are in the same field of endeavor), not whether a POSA had a motivation to combine features from Forehand into Bebak. As demonstrated in detail above, not only was a POSA not motivated to add an electrically-actuated explosive shaped charges to Bebak but a POSA would be strongly motivated to avoid doing so.

137. Petitioners also argue that “[a] POSA would also have been motivated because the system of Forehand automatically releases gun strings when they fire, whereas Bebak’s modified system has the advantage of releasing as desired (such as if the string were stuck) without firing the gun or if there were other tools but no

gun.” Petition, 58-59. But this purported “motivation” is quite illogical, because Petitioners are proposing adding Forehand’s explosive charge to Bebak’s alleged expansion chamber. Petition, 57-58. Bebak’s “as-is” system already allows for “releasing as desired” because its release is not tied to the operation of the downhole pump (or any other tool for that matter) but rather can be actuated as desired by simply operating the hydraulic pump at the surface. Consequently, replacing Bebak’s hydraulic actuation mechanism with an electrically-actuated explosive charge as in Forehand would not provide the advantage of allowing Bebak’s release adapter to “release as desired”—it already “releases as desired” via its hydraulic actuation mechanism.

138. It is worth noting that both Bebak and Forehand rely on actuation mechanisms that would be expected to be present in their existing applications. Specifically, Bebak advantageously relies on hydraulic control lines which are used in downhole pumping applications, while Forehand likewise relies on explosives charges that are already used with perforating guns. Petitioner’s proposed modification—removing Bebak’s hydraulic actuation and replacing it with electrically-initiated explosive charges—would eliminate this advantage of Bebak, adding unnecessary cost and complexity to its release adapter for no apparent reason.

139. Petitioners also state that “[t]he combination of prior art references to include a combustible would have had a reasonable expectation of success because

this **was a highly predictable art**, implementing the feature **would be simple**, and there **would be no reason for a POSA to doubt success**.... It also amounts to using **known prior art methods** according to their established functions to yield predictable results.” Petition, 59 (citing Ex. 1002, ¶ 178) (emphasis added). This series of statements lacks any explanation or supporting evidence. Dr. Wooley merely recites the exact same statements in his declaration, with notable exception: “Furthermore, all of the above-mentioned motivations within the common sense and knowledge of a POSA would also have applied to this combination of Bebak and Forehand. *See* Ex. 1002 ¶ 178. However, Dr. Wooley does not provide any explanation or evidence supporting any of this testimony, including his assertion that adding Forehand’s explosive charge to Bebak involves “common sense” and information within the general knowledge of a POSA.

140. Regardless, the proposed combination here is not “simple” or “highly predictable,” as it involves replacing the hydraulic actuated mechanism of Bebak and with the electrically actuated explosive charge of Forehand. This is a fundamental redesign of Bebak’s system requiring, among other things, significantly reinforcing the internal components of Bebak’s adapter (e.g., locking piston, housing wall) to withstand the explosion and shockwave created by the explosive shaped charges.

141. It is not clear that Forehand's shaped charge would even fit within the available radial clearance of the alleged annular expansion chamber. Moreover, the detonation would result in a shockwave, a high-velocity jet of molten metal, extreme dynamic pressures, and shrapnel all of which would be likely to cause damage to the collet, release piston, and pressure housing of the release adapter. The damage would likely cause significant plastic deformation in the components of the release mechanism as well as damage to seal surfaces that would prevent the piston from sliding and collet from releasing—i.e. the mechanism would be likely to jam—thus preventing proper release of the ESP below. A failure to release would then present a major expense to the operator to try and remedy the problem. The detonation would also risk damaging the high-voltage cables passing through the interior of the release adapter, threatening function of the pump.

142. Even if the proposed combination was “simple” or part of a “highly predictable art” (it is not), Petitioners and Dr. Wooley do not explain how they propose redesigning Bebak's release adapter to accommodate the modifications. As explained above, this a fundamental redesign of Bebak's system, that would be very complex. It is certainly not “simple” or obvious based on “common sense.”

143. Petitioners also allege that:

A POSA would also have been motivated to combine Forehand's combustible pressure feature with Bebak because there were a finite number of ways to generate force to move a release mechanism, which include hydraulics, combustibles, electric motors, ingestion of wellbore

pressure, and tension. *Id.*, ¶ 179. A POSA would have viewed these as obvious design alternatives, each with certain advantages and disadvantages. *Id.*

Petition, 59-60.

144. The mere fact that numerous ways to generate force to release a mechanism may have been known does not mean it is automatically obvious to use any of those mechanisms with any other device that requires release. While Petitioners offer the statement that these various mechanisms are “obvious design alternatives, each with certain advantages and disadvantages,” they do not provide any explanation or evidence to support this assertion. As I have already discussed, it was certainly not obvious to replace Bebak’s hydraulic actuation mechanism with an electrically-actuated explosive charge (which is not a combustible as later explained), nor would there be any apparent advantages from making those proposed modifications. There would only be the major disadvantages I previously addressed. *See Supra* ¶¶ 121-137.

145. Moreover, the fundamentally different “ways to generate force” are also certainly not “obvious design alternatives.” Just because a particular means has been used somewhere in the oilfield before does not mean that a POSA would consider it for use in Bebak’s release tool. The selection depends upon many factors and in particular, the available infrastructure and operational constraints that would immediately cause many options to be ruled out. For example, the Bebak tool is run

on coiled tubing and has fluid control lines available. It does not have wireline communication or any electrical functionality so a POSA would not consider any solutions that would require a wireline, such as an electric motor. Using a combustible will necessarily require a means of triggering, which typically involves electrical communication via a wireline link as well.

146. In short, a POSA will only consider the approaches that make sense for a given application and none of the proposed alternatives would meet the needs for Bebak. Consequently, it is simply wrong to consider all of the various ways of generating force to move a release mechanism to be obvious design alternatives to one another in all applications/designs. Indeed, the proposed combination of Bebak and Forehand is a perfect example of this—a POSA would never consider combining Forehand’s explosive shaped charge actuation mechanism with Bebak’s release adapter for the many reasons discussed herein. *See supra* ¶¶ 116-132.

147. Petitioners next assert that:

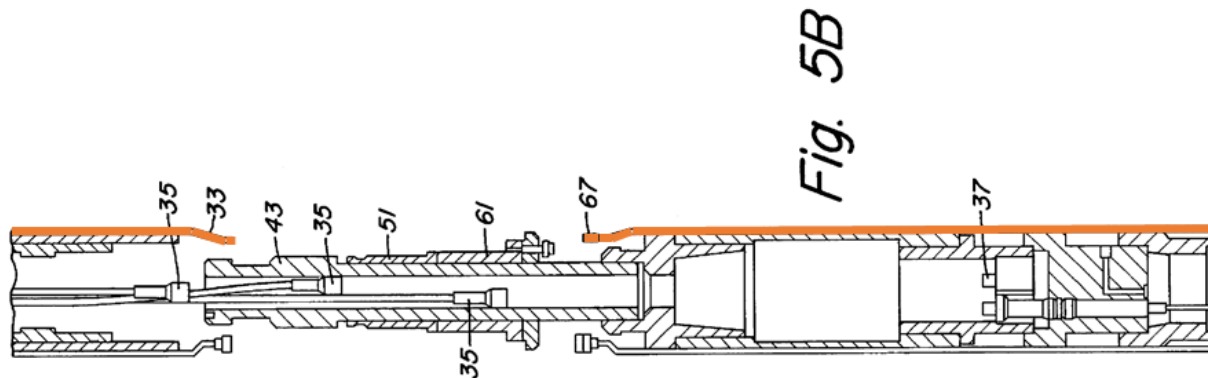
A POSA would have been motivated to modify, for example, the hydraulic system of Bebak to use a combustible like Forehand’s because it would not require the use of hydraulic pumps and lines to actuate the releasable connection, but instead would allow for the releasable connection to be actuated by an electrical signal to detonate and release the pressure from the combustible. *Id.*

Petition, 59-60.

148. Petitioners do not provide any rationale or explanation as to why a POSA would have had any reason to move away from Bebak’s hydraulic pump and

capillary tubes 33 to actuate the release adapter. For instance, Petitioners do not identify a single drawback or disadvantage of Bebak's reliance on hydraulic actuation to effectuate release, but instead just assume without explanation that a POSA would have been motivated to rely on an explosive charge detonated via electrical signal. Petitioners are wrong for several reasons.

149. Bebak's release adapter 17 is designed for use with downhole pump assemblies where fluid control lines are ordinarily run with the coiled tubing to control other downhole equipment. See also Ex. 2020. Figures 5A and 5B of Bebak show the fluid control line coupling 67 (orange) that allows for hydraulic fluid to be provided to equipment beneath the release adapter 17:



Given that Bebak's release adapter 17 is used in applications that already require running fluid control lines down the wellbore, there is simply no reason a POSA would have been motivated to switch to an entirely different release mechanism, especially explosive charges that introduce the litany of disadvantages previously discussed.

150. Additionally, neither Petitioners nor Dr. Wooley explain how actuating Bebak's release adapter using electrical signals or explosive charges would have been understood to provide any advantage over, or improvement upon, Bebak's hydraulic actuation. In fact, as previously explained, Bebak expressly teaches away from electrical actuation and there were numerous apparent, major disadvantages associated with using explosive charges in a downhole tool. *Supra* ¶¶116-132.

151. Petitioners also argue that “[s]uch electrical detonation systems were well known in the art for both firing perforation guns and releasing tool strings.” Petition, 60. The only evidence cited by Petitioners to support this statement is Dr. Wooley's testimony, which itself only cites Forehand and the Hunting Titan Brochure (Ex. 1009) as evidence. But both Forehand and HTB relate specifically to wireline tools, and Bebak discourages the use of wireline to initiate release. Ex. 1007 at 1:12-24) (“Unfortunately, some of these devices require remote operation or actuation that requires electrical power to be available at the downhole assembly.... [I]n another prior art device, the release tool is electrically actuated and ***requires the use of a wire line cable.***”). Moreover, even if electrical detonation systems had been well known for use in applications not involving wireline, that still does not mean a POSA would have been motivated replace Bebak's hydraulic actuation system with Forehand's explosive charges or electrical detonation. A POSA would consider the technical feasibility of making the proposed modifications, including the advantages

and disadvantages, and have been strongly discouraged from doing so. *Supra* ¶¶ 116-132.

152. Petitioners further assert that:

A POSA would also have been motivated to implement a “combustible disposed *within the expansion chamber*” because it would place the combustible directly in the path of the component that needed to be moved by the pressure from the combustible, as opposed to a more indirect path such as the embodiments depicted in the figures of the ’122 Patent that rely on multiple chambers to communicate pressure from the combustible to the locking piston. *Id.*, ¶ 180. A POSA would also have been motivated because a POSA would have known that pressure from an explosion dissipates as it passes through a volume from basic physics principles.

Petition, 60.

153. This alleged motivation is not directed to whether it would be obvious to incorporate Forehand’s electrically detonated explosive charge into Bebak. Rather, this motivation incorrectly assumes that doing so would have been obvious, and further addresses whether it would have been obvious to *specifically locate* the explosive charge in the alleged expansion chamber. Because it would not have been obvious to modify Bebak to incorporate an electrically actuated explosive charge, a POSA would not have found it obvious to locate said explosive charge in any particular part of Bebak’s release adapter.

154. Petitioners finally argue that:

[A] POSA would have had a reasonable expectation of success in making this combination of Bebak and Forehand’s features. Releasable connections are a long established and very predictable art, and the

modification described amounts to replacement of one known pressure source with another. Id., ¶ 181. A POSA would have been confident in the success of this approach.

Petition, 60-61.

155. Petitioners have provided no specific reasoning demonstrating that a POSA would have had a reasonable expectation of success in making the major modification proposed, or that a POSA would have recognized the modification to amount to nothing more than simple substitution. Instead, a POSA would have found there to be a high risk that the proposed modification would not be successful because of the shock wave and dynamic pressure resulting from the explosion, which would damage the release adapter and likely cause release failure or damage to the pump. This is a sharp contrast with the slow, controlled pressure increase provided by the surface pump in Bebak, which is communicated to the release adapter via a hydraulic control line. This is far from simply swapping known pressure sources when one is dramatically different than the other. Consequently, a POSA would have expected Bebak's release adapter to require a fundamental redesign to account for such an explosion and the associated shock wave.

c) Petitioners fail to adequately explain their proposed modifications or show a reasonable expectation of success.

156. Petitioners propose replacing Bebak's hydraulically actuated release mechanism with an electrically detonated explosive charge as taught by Forehand.

However, Petitioners do not provide any explanation as to how these proposed modifications could actually be made with any expectation of success.

157. Neither Petitioners nor Dr. Wooley explain how Bebak's release tool adapter would be modified to allow for electrical actuation. Instead, they only generally assert that Bebak could be modified to "be actuated by an electrical signal to detonate and release the pressure from the combustible." Petition, 59-60. However, Bebak's release adapter relies on a fundamentally different design—it is actuated using hydraulic pressure pumped down from a surface pump through a capillary tube connected to annular space of the adapter. The Petition does not explain how Bebak's release adapter could be or would be modified to transform it into an electrically actuated tool. This is particularly problematic because Forehand's electrical actuation system runs through the center of the automatic release mechanism, where the mechanism of Bebak is actuated via the annular space surrounding the central passageway. A POSA would understand Bebak to require a fundamental redesign to allow for electrical actuation given where the surface pump's fluid pressure enters the tool.

158. Additionally, Petitioners do not explain how an explosive charge could be incorporated into Bebak's release adapter design without major structural changes. As Forehand explains, release of its automatic release tool requires a series of components, including explosive booster charges (55, 59, and 67), shaped charges

(56, 68), and numerous other components required for those two charges to be detonated. Ex. 1008 at 5:40-43. In other words, adding an explosive charge to Bebak is not as simple as simply placing explosive charge 68 into Bebak—it would also require at minimum the ignition cartridge, explosive booster charges (55, 59, and 67) and shaped charges (56, 68) to effectuate the explosion that triggers shifting of the piston. Petitioners do not explain how these components could be incorporated Bebak, including where they would even fit within the Bebak’s design.

159. Forehand places its explosive charge 68 far from the piston 10, because it needs to allow the explosive shockwave to dissipate before reaching the piston. Placing an explosive charge in the annular space of Bebak (the alleged expansion chamber) as proposed by Petitioners would result in significant damage to the internal components of Bebak upon detonation, likely causing the tool to malfunction and certainly destroying its redressability. Petitioners do not explain how Bebak’s release adapter could successfully be redesigned to accommodate such a vastly different actuation mechanism.

3. Claim 8: Whether the combination of Bebak and Forehand renders this limitation obvious.

160. Petitioners assert that “meeting this element is *shown* by the portion of the expansion chamber that includes the combustible and a second portion of the expansion chamber that includes the locking piston because fluid expands into both areas of Bebak and Forehand” and that “these portions would be bordering one

another and would be connected and thus the volumes are in fluid communication.”

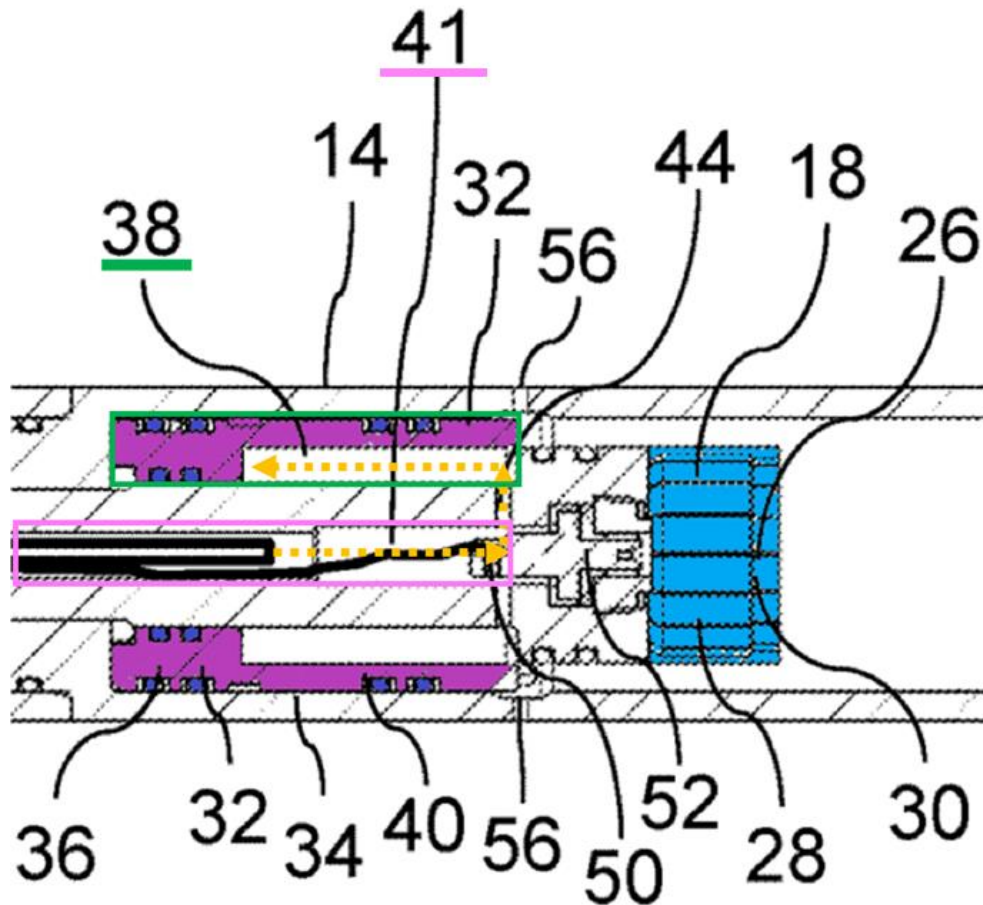
Petition, 62.

161. Tracking the language of claim 8, the specification teaches that the expansion chamber may include multiple volumes that fluid expands into, with the volumes being in fluid communication:

According to another aspect, the expansion chamber may comprise a first volume that contains the combustible, and a second volume that encloses at least a portion of the locking piston, the first volume being in fluid communication with the second volume.

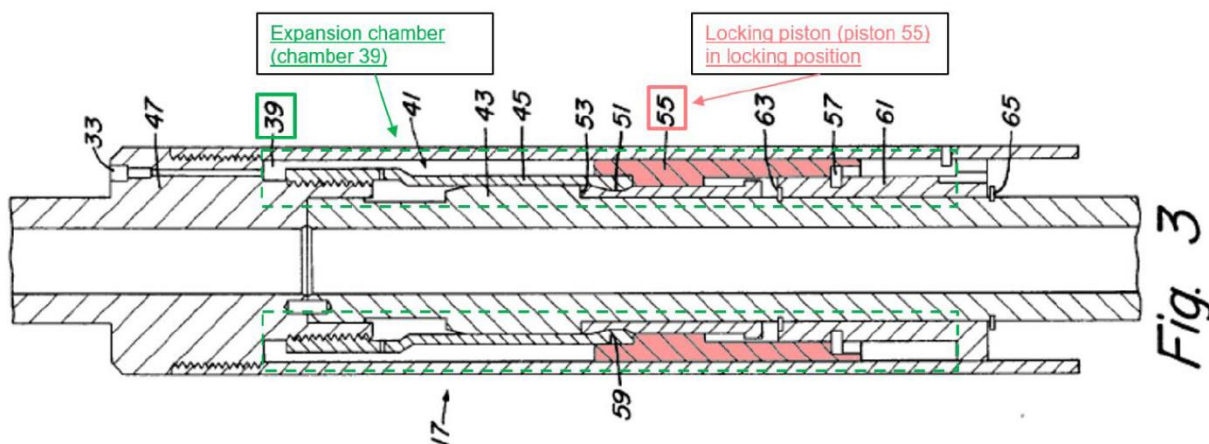
Ex. 1001, 1:63-67 (emphasis added).

162. In reference to the annotated version of Figure 1 below, a **first volume 41** (pink) contains the combustible, a **second volume 38** (green) comprises **piston 32** (purple) and both volumes are in **fluid communication** (orange) communicate via ports 44:



163. While element 38 is referred to as an “expansion chamber” and element 41 is identified as “combustion chamber,” the specification further explains that “[i]t will be understood that expansion chamber 38 and combustion chamber 41 may *be considered a single chamber.*” Ex. 1001, 3:65-67. A POSA would thus understand the expansion chamber to refer to one or more volumes (e.g., both the pink and green volumes above) that the fluid expands into. This is consistent with claim 8 reciting that the “expansion chamber” “comprises a *first volume* containing a combustible and a *second volume* enclosing at least a portion of the locking piston, with both volumes being in fluid communication.”

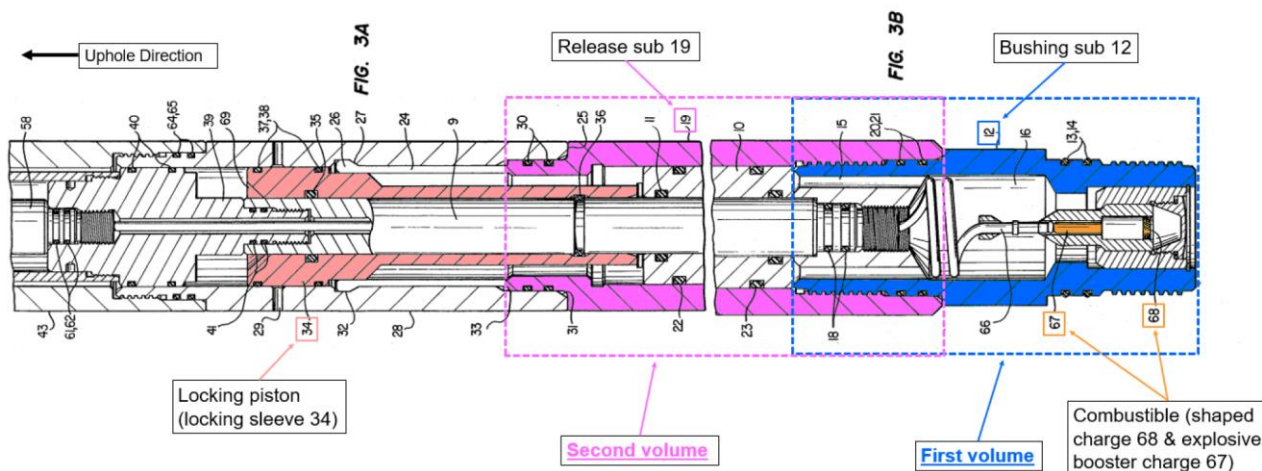
164. Petitioners suggest adding Forehand's explosive charge "within the expansion chamber" of Bebak. Petition, 65. That would place the explosive charge of Forehand within the portion of the green box to the left of piston 55, outside of collet 45:



165. Petitioners do not explain how the space in the green box (annular chamber 39) constitutes two distinct "volumes." Nevertheless, a POSA would understand there to be only a single volume within the green box, which is where piston 55, collet 41, and explosive charge (as added by Petitioners combination of Bebak and Forehand) reside. In other words, the green box identifies a single volume comprising multiple discrete components, just as the volume (green) in Figure 1 of the '122 patent is referred to as a single volume. While the central passage through the release adapter constitutes an additional volume, as shown that volume is isolated from the alleged expansion chamber and clearly cannot satisfy the claim requirements. Consequently, even if a POSA would have been motivated to place an

explosive charge into the annular chamber 39 of Bebak, the combination would still not satisfy the requirements of claim 8.

166. Petitioners further argue that “Forehand shows the combustible as oriented as required by Claim 8.” Petition, 62. Petitioners then offer an annotated version of Figures 3A-3B *of Forehand* to show where the first and second volume exist *in Forehand*:



Id.

167. Even if Forehand did show two volumes that satisfy the requirements of claim 8, Petitioners do not explain how Bebak’s release adapter could be modified to have that same configuration. A POSA would understand that Forehand’s automatic release tool design is fundamentally different than the design of Bebak’s release adapter, as is apparent from simply comparing Figures 3A-B of Forehand with Figure 3 of Bebak. Petitioners do not explain how Bebak could be fundamentally redesigned to have the alleged two-volume arrangement of Forehand,

or *where* the additional volume could even be located in Bebak. Instead, Petitioners essentially argue that because Forehand is alleged to teach the two volumes as claimed, it would automatically be obvious to redesign Bebak's release adapter to have that same design feature. Moreover, Dr. Wooley's testimony that a POSA would have been motivated to include the explosive charge in a second volume of Bebak is contradicted by his prior testimony in this proceeding that a POSA would have been motivated to place the explosive charge in the annular space 39 (i.e., the alleged "first volume"). Ex. 1002 ¶ 180. A POSA would understand, however, that modifying Bebak's release adapter in this manner would require a fundamental and significant redesign of Bebak's release adapter.

4. Claim 9: Whether the combination of Bebak and Forehand renders obvious a combustible "configured to be detonated by an electrical signal."

168. Petitioners do not provide any explanation as to how Bebak's hydraulically-actuated release adapter could be converted into an electrically-actuated tool. Petitioners instead only vaguely propose sticking Forehand's explosive charge into the isolated annular chamber 39 of Bebak, without any discussion or explanation as to how Bebak could be modified to allow for electrical actuation of that charge. Petitioners' arguments with respect to Claim 9 are just as unexplained, as Petitioners essentially argue that because Forehand teaches its tool could be electrically actuated, that automatically means that Bebak's drastically

different tool could have likewise been electrically actuated despite it having a fundamentally different design.

C. Ground 4: Whether the combination of Bebak and Forehand renders obvious claim 15.

169. Petitioners argue that because the Patent Examiner applied Read’s alleged concentric connections to the claims, “a POSA would have known the teachings of Read and would have been motivated *to use those teachings* to combine the similar teachings of HTB and Bebak because both concern releasable connections.” Petition, 67. However, this argument does not contain any reason a POSA would have actually been motivated to use concentric electrical connections at all in Bebak’s release adapter. Instead, Petitioners appear to essentially argue that because concentric electrical connections were allegedly known, a POSA would have automatically found it obvious to use them with Bebak simply because Bebak and HTB relate to releasable connections. A POSITA would also not understand the mere fact that the Examiner applied the completely different prior art reference Read to mean there would have been a motivation to combine the drastically different Bebak and HTB references.

170. The remainder of Petitioners’ analysis is focused on demonstrating that concentric electrical connections were allegedly “ubiquitous in the art.” I first note that Dr. Wooley’s testimony about the allegedly “ubiquitous” nature of such

electrical connections is inconsistent with his testimony from August 3, 2023 in another IPR involving perforating guns:

15 Q Would you agree that concentric electrical
16 connections are ubiquitous and well-known ways to
17 transfer electricity to downhole tools?

18 MR. STEIN: Objection. Scope.

19 A Yeah, in general, no. That's silly. There
20 are tools that have it. But to be ubiquitous, in my
21 understanding meaning it's everywhere, the answer is
22 no.

Ex. 2015 at 8 (p. 28, ll. 15-22). Even if such connections were “ubiquitous in the art,” that does not mean or suggest that there was a reason to take one of those connectors and combine it with the Bebak’s release adapter. Petitioners have not provided even a single reason a POSA would have been motivated or prompted to use such a connection in Bebak.

171. Additionally, Petitioners’ proposed combination is illogical and would not work. Ground 4 builds upon Ground 1, which relies solely on Bebak. Thus, in the Ground 4 combination Bebak’s release adapter is still relying on hydraulic actuation and thus has no electrical capability and is not released using electricity. As HTB makes clear and as a POSA would have appreciated, the HTB electrical concentric connections are wireline hardware and used in applications where a string of electrically operated downhole tools are placed in series in the same tool string. This eliminates the need to manually wire each end of each tool at the wellsite by

instead allowing the service company to simply thread the tools together, thereby automatically establishing electrical conductivity through all of the tools. The concentric electrical connections of HTB can also help protect the electrical connection from the wellbore environment. Ex. 1009 at 3 (“The electric bulkhead protects the electrical connections from all types of corrosive wellbore fluids.”)

172. First, Bebak expressly teaches away from using wireline deployment because it limits where the pump motor can be placed. Ex. 1007 at 1:17-25. Bebak instead relies on coiled tubing. Ex. 1007 at 1:30-31. Petitioners fail to explain why a POSA would have been motivated to modify Bebak to rely on a wireline cable head adapter when Bebak expressly teaches away from the use of wireline with its release adapter.

173. Second, Bebak’s release adapter does not rely on electricity and the only component in Bebak’s system that relies on electricity is the downhole pump. Adding concentric electric connections within the collet/profile of Bebak would actually make the release adapter more difficult to assemble and wire up. In Bebak, the wires 35 are suspended through the release adapter 17 and connected directly to connector 37 of the pump. Thus, there is a single direct connection point between wires 35 and connector 37. If concentric connectors were added as proposed by Petitioners, then a wire would have to be run from the power supply to the concentric electrical connection of the collet and another wire would have to be run from the

concentric electrical connection of the profile 51 to the top of the ESP. Thus, adding concentric connections would increase the complexity of assembling the release adapter into the system for no apparent reason.

174. Third, while Petitioners cite HTB for its teaching about “protecting” electrical connections from corrosion, Petitioners proposed modifications would not actually improve the protection of the electrical connection in Bebak. In Bebak, the electrical connection is between wires 35 and connector 37, which is beneath the collet and profile in the release adapter. But Petitioners are not proposing adding concentric connections where wires 35 and connector 37 connect—they are proposing needlessly adding concentric connections within the collet and profile. Not only would this *not* improve electrical connection protection within Bebak’s release adapter, it would actually create a new point of vulnerability where the two concentric connections connect to one another.

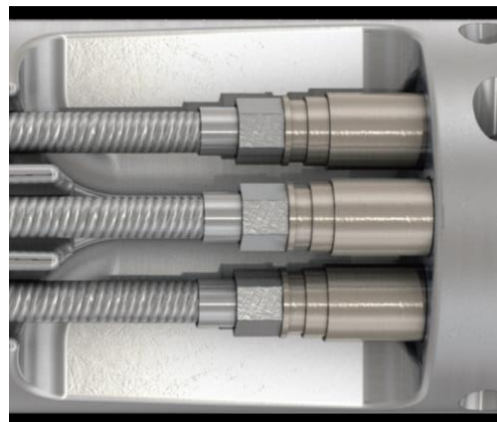
175. Fourth, Petitioners completely disregard that concentric electrical connections have limited electrical capacity, making them incompatible with the release adapter of Bebak. The sole purpose of running wires 35 through release adapter 17 in Bebak is to supply power to an ESP, which requires significantly more power than the logging and perforating tools that the HTB adapter is designed for. Specifically, ESPs require specialized high voltage, high current power cables to operate, which are not compatible or interchangeable with the electrical connections

disclosed in HTB. Indeed, the HTB products are rated for 600 VDC max and 2 A max (Ex. 1009 at 3), while ESPs require nominal AC voltage (RMS) of at least 460Vrms but more commonly 5,000 Vrms³ and with a current of up to 200 A. *See e.g.*, Ex. 2025 at 2; Ex. 2019 at 16, 21, 23-24, 25-27, 28; Ex. 2018 at 9; Ex. 2036 at 1; Ex. 2008 at 1-2; Ex. 2026 at 3. Simply put, the electrical connectors disclosed in HTB are incapable of delivering the substantial amount of power required to operate a downhole pump as required by the release adapter of Bebak.

176. ESPs would also be understood to require 3-phase power (AC) and thus need a 3-conductor cable. Ex. 2019 at 16, 18; Ex. 2018 at 7; Ex. 2035 at 5-6; Ex. 2036 at 1; Ex. 2008 at 1. Examples of 3-phase power connectors are shown below:



Ex. 2024



Ex. 2025

³ As with long power transmission lines on the surface, ESP power cables utilize high voltage to reduce transmission losses.



Exhibit 2026

The adapter of HTB only has single conductor concentric connections for DC power, which means it is incapable of delivering the necessary power. Consequently, Petitioners not only fail to show that a POSA would have been motivated to combine concentric electric connections with Bebak's release adapter, Petitioners also fail to provide any evidence that such connections could plausibly meet the electrical requirements of the pump used with Bebak's release adapter.

VIII. CONCLUSION

177. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code. I further declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Dated: October 12, 2023

By: 
John Rodgers