

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HUNTING TITAN, INC.,
Petitioner,

v.

DYNAENERGETICS GMBH & CO. KG,
Patent Owner.

Case IPR2018-00600
Patent 9,581,422 B2

Before SCOTT A. DANIELS, CARL M. DEFRANCO, and
ERIC C. JESCHKE, *Administrative Patent Judges*.

DEFRANCO, *Administrative Patent Judge*.

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

DynaEnergetics GmbH & Co. KG is the owner of U.S. Patent No. 9,581,422 B2 (“the ’422 patent”). Hunting Titan, Inc. filed a petition for *inter partes* review of claims 1–15 of the ’422 patent. Paper 1 (“Pet.”). We instituted *inter partes* review of all the challenged claims. Paper 10 (“Inst. Dec.”). DynaEnergetics opposed. Paper 18 (“PO Resp.”). Hunting Titan

replied. Paper 24 (“Pet. Reply”). And DynaEnergetics had the last word in a sur-reply. Paper 27 (“PO Sur-Reply”).

In addition, DynaEnergetics filed a contingent motion to amend. Paper 19 (“Mot. Amend”). Hunting Titan opposed. Paper 25 (“Pet. Opp. to Mot. Amend”). DynaEnergetics replied. Paper 28 (“PO Reply”). Hunting Titan filed a sur-reply. Paper 33 (“Pet. Sur-Reply”). Finally, each party moved to exclude certain evidence of the other party. Paper 32 (“Pet. Mot. Exclude”); Paper 34 (“PO Mot. Exclude”).

We have jurisdiction under 35 U.S.C. § 6. An oral hearing was conducted on May 14, 2019. Paper 41 (“Hr’g Tr.”). After considering the parties’ arguments and supporting evidence, we determine that Hunting Titan has proven by a preponderance of the evidence that claims 1–15 of the ’422 patent are unpatentable. 35 U.S.C. § 316(e). We also determine that Hunting Titan has carried its burden in showing that DynaEnergetics’ proposed substitute claims are not patentable over the prior art of record, and, thus, we deny DynaEnergetics’ motion to amend. Finally, we deny the parties’ respective motions to exclude as moot.

I. BACKGROUND

A. *Related Matters*

The ’422 patent is the subject of two infringement actions. The first infringement action, *DynaEnergetics GmbH & Co. KG v. Hunting Titan, Ltd.*, Civil Action No. 4:17-cv-03784 (S.D. Tex.), was filed December 14, 2017 and is currently stayed pending our review. Paper 40, 1. The second infringement action, *DynaEnergetics GmbH & Co. KG v. Hunting Titan, Inc.*, Civil Action No. 4:19-cv-01611 (S.D. Tex.), was filed May 2, 2019, and later consolidated by the district court with the earlier action. *Id.* Also,

pending before this Office is a reissue application for the '422 patent—U.S. Patent Application No. 16/287,150, filed February 27, 2019. *Id.*

B. The '422 Patent

The '422 patent is directed to a perforating gun assembly used to perforate the cement lining and surrounding rock formation of an oil well bore so as to form a flow path for oil into the wellbore from the surrounding rock formation. Ex. 1001, 1:15–44. As described, the key feature of the perforating gun assembly is a “wirelessly-connectable” detonator assembly that can be “positioned or placed into [the] perforating gun assembly with minimal effort,” that is, “without the need of manually and physically connecting, cutting or crimping wires as required in a wired electrical connection.” *Id.* at 3:26–38. Indeed, DynaEnergetics acknowledges that “[c]onnecting a detonator using electrical contacts rather than manual wiring . . .” is the entire essence of the invention claimed in the '422 patent.” PO Sur-Reply 7–8 (citing Ex. 1001, 2:24–34).

C. The Challenged Claims

Of the challenged claims, claims 1, 5, and 12 are independent. Claim 1 recites a “wireless detonator assembly,” while claim 5 recites a “perforating gun assembly” that includes the limitations of the wireless detonator assembly of claim 1. Claim 12 recites a “method of assembling a perforating gun assembly” that includes many, if not all, of the limitations of both claims 1 and 5.

More specifically, each of the independent claims recites a “wireless” or “wirelessly-connectable” detonator assembly that is positioned within a perforating gun assembly “without using a wired electrical connection,” but rather forms the wireless electrical connection “merely by the contact” of the

detonator assembly with the perforating gun assembly. Ex. 1001, 8:39–61, 9:10–37, 10:12–36. Due to the overlapping nature of the independent claims, DynaEnergetics singles out claim 1 as “[r]epresentative.” PO Resp.

7. As reproduced below, claim 1 recites:

1. *A wireless detonator assembly* configured for being electrically contactably received within a perforating gun assembly *without using a wired electrical connection*, comprising:

a shell configured for housing components of the detonator assembly;

more than one electrical contact component, *wherein at least one of the electrical contact components extends from the shell* and further wherein the electrical contact component comprises an electrically contactable line-in portion, an electrically contactable line-out portion, and an electrically contactable ground portion, the ground portion in combination with the line-in portion and the line-out portion being configured to replace the wired electrical connection to complete an electrical connection merely by contact;

an insulator positioned between the line-in portion and the line-out portion, wherein the insulator electrically isolates the line-in portion from the line-out portion; and

means for selective detonation housed within the shell, [and]

wherein the detonator assembly is configured for electrically contactably *forming the electrical connection merely by the contact*.

Ex. 1001, 8:39–61 (emphases added).

D. The Asserted Grounds of Unpatentability

Hunting Titan asserts sixteen grounds of unpatentability, two based on anticipation under 35 U.S.C. § 102 and fourteen based on obviousness under 35 U.S.C. § 103. Pet. 4–5. To begin, Hunting Titan challenges claims 1–15

as anticipated by Schacherer.¹ In the alternative, Hunting Titan challenges claims 1–15 (or a subset thereof) either as anticipated by Lanclos² or as obvious over Schacherer and/or Lanclos in combination with various other references. *Id.* Because the first ground—anticipation by Schacherer—is dispositive as to all the challenged claims, we need not reach the other asserted grounds. *See SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”).

Hunting Titan supports its petition with the testimony of Robert Parrott, an expert retained for purposes of this proceeding. *See* Exs. 1006, 1025, 1026. DynaEnergetics supports its opposition with the testimony of two experts—Robert Schaaf (Ex. 2003) and John Rodgers, Ph.D. (Exs. 2004, 2027). DynaEnergetics also submits the declaration of Frank H. Preiss, the first named inventor on the ’422 patent and “vice president and GM” for DynaEnergetics. Ex. 2001 ¶ 1.

II. ANALYSIS

A. *Level of Skill in the Art*

The parties agree that a person of ordinary skill in the art (“POSITA”) would have had a B.S. or M.S. degree in mechanical or electrical engineering and two-to-five years of experience designing and operating perforating tools for well-bores. *See* Pet 12; PO Resp. 14. We accept this skill level as an undisputed fact.

¹ U.S. Patent 9,689,223 B2, iss. June 27, 2017 (Ex. 1002, “Schacherer”).

² U.S. Patent 9,080,433 B2, iss. July 14, 2015 (Ex. 1003, “Lanclos”).

B. Claim Construction

Hunting Titan proposes a construction for each limitation of the claims. *See, e.g.*, Pet. 16–17, 21–22, 26, 30–31, 33–35, 41, 45–46, 52–53. DynaEnergetics submits that, in our institution decision, we “preliminarily but correctly determined that no term required an express construction in this proceeding,” aside from two terms—“wireless” and “selective.” PO Resp. 14. Actually, what we said was “[f]or purposes of deciding whether to institute,” we needed to construe only those two terms. Inst. Dec. 4. Thus, upon institution of trial, DynaEnergetics had an obligation to dispute Hunting Titan’s proposed constructions in the petition, as well as our constructions in the institution decision, to the extent it disagreed with them. In its response, DynaEnergetics disputes neither. PO Resp. 14–15.

Having considered the full record, we do not perceive a need to construe any claim limitation differently from Hunting Titan’s proposed constructions.³ For instance, we note that Hunting Titan’s construction of “wireless” (*see* Pet. 16–17) is perfectly consistent with the ’422 patent’s express definition of that same term—

As used herein, the term “wireless” means that the detonator assembly itself is not manually, physically connected within the perforating gun assembly as has been traditionally done with wired connections, but rather merely makes electrical

³ We apply the “broadest reasonable construction” standard per 37 C.F.R. § 42.100(b) (2017), in effect as of filing date of the instant petition. A recent amendment to this rule does not apply here because the petition was filed before the effective date of that amendment. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b), effective November 13, 2018).

contact through various components as described herein to form the electrical connections.

Ex. 1001, 3:53–58; *see also id.* at 3:33–38 (“The detonator assembly electrically contactably forms an electrical connection without the need of manually and physically connecting, cutting or crimping wires as required in a wired electrical connection.”), 3:64–4:3 (“The detonator assembly 10 . . . is configured for being electrically contactably received within a perforating gun assembly 40 without using a wired electrical connection, that is without connecting one or more wires directly to the detonator assembly 10.”), 4:54–58 (“That is, the detonator assembly 10 is wirelessly connectable only by making and maintaining electrical contact of the electrical contacting components to replace the wired electrical connection and without using a wired electrical connection.”). As such, we adopt Hunting Titan’s proposed construction of “wireless” for purposes of this decision.

We also view Hunting Titan’s proposed construction of “shell” as consistent with the ’422 patent’s express definition of that term. *See* Pet. 21–22. Each of the independent claims recites “a shell configured for housing components of the detonator assembly.” The ’422 patent describes the “shell” as “a housing or casing” for components that include “detonator head plug,” “fuse head,” “electronic circuit board,” and “explosive components.” Ex. 1001, 4:4–7. As such, Hunting Titan construes the claimed “shell” as encompassing “a shell, housing, or casing for housing any component of the detonator assembly, including but not limited to a detonator head plug, a fuse head, an electronic circuit board, or explosive component[s].” Pet. 22 (citing Ex. 1006 ¶ 21). DynaEnergetics does not dispute that proposed construction (PO Resp. 14–15), and the ’422 patent

fully supports it (Ex. 1001, 4:4–7). Thus, we adopt Hunting Titan’s proposed construction of “shell” for purposes of this decision.

We have considered Hunting Titan’s proposed construction of certain other claim terms and determine they are likewise fully supported by the record. *See* Pet. 26 (“electrical contact”), 30–31 (“extends from the shell”), 33–35 (“line-in,” “line-out,” and “ground” portions), 41 (“insulator”), 45–46 (“means for selective detonation”), 52–53 (“merely by the contact”). DynaEnergetics neither disputes these proposed constructions nor submits any of its own. *See* PO Resp. 14–15. Because Hunting Titan’s proposed constructions are fully supported by the record, we adopt them to the extent needed for our analysis here.

C. Anticipation by Schacherer

Hunting Titan addresses independent claims 1, 5, and 12 concurrently, explaining how each claim limitation is disclosed by Schacherer, either expressly or inherently. *See* Pet. 12–55. In response, DynaEnergetics argues that Schacherer lacks four limitations of “[r]epresentative claim 1,” which it also the “Claimed Detonator Assembly” (or “CDA”). PO Resp. 7, 26. According to DynaEnergetics, the missing limitations include:

- 1) “A *wireless* detonator assembly;”
- 2) “A *shell* configured for housing components of the detonator assembly;”
- 3) “Wherein at least one of the electrical contact components *extends from the shell*;” and
- 4) “An *insulator* positioned between the line-in portion and the line-out portion.”

Id. at 26 (emphases added); *see also id.* at 19–20 (asserting essentially the same).

1. Uncontested Limitations

At the outset, we note that DynaEnergetics neither refutes nor responds to Hunting Titan’s showing that Schacherer teaches a “detonator assembly” for “being . . . received within a perforating gun assembly,” as recited in the preamble of claim 1. *Compare* Pet. 16–20, *with* PO Resp. 19–20, 24–29. Nor does DynaEnergetics contest that Schacherer’s detonator assembly includes “electrical contact components” having “line-in,” “line-out,” and “ground” portions, as also recited by claim 1. *Compare* Pet. 26–29, 33–38, *with* PO Resp. 19–20, 24–39. Finally, DynaEnergetics does not dispute that Schacherer discloses “means for selective detonation” of the detonator assembly. *Compare* Pet. 45–49, *with* PO Resp. 19–20, 24–39.

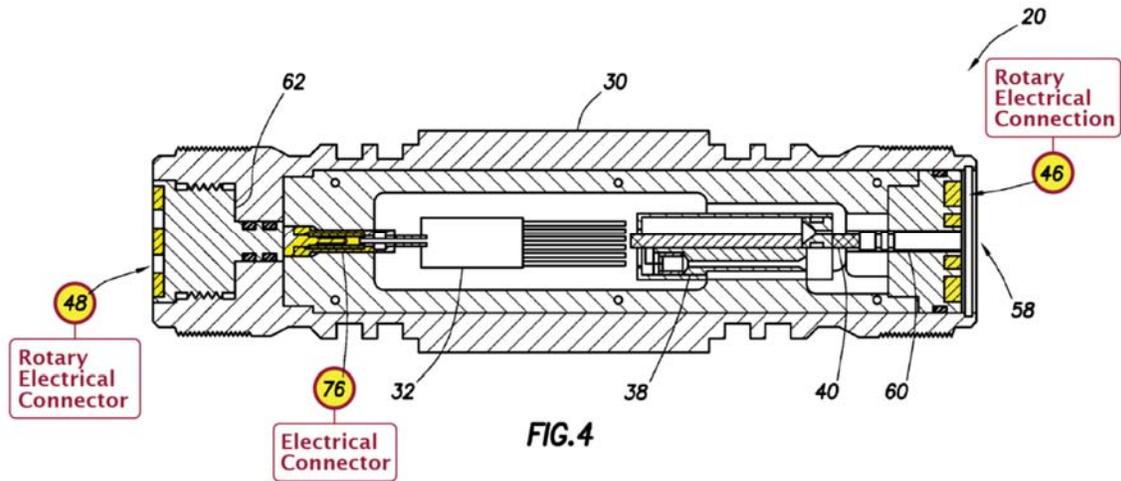
The record fully supports Hunting Titan’s showing of how Schacherer discloses these uncontested limitations. *See* Pet. 16–20, 26–29, 33–38, 45–49. And because DynaEnergetics does not contest Schacherer’s disclosure of these limitations, we consider the fact of their disclosure effectively admitted. *See In re Nuvasive, Inc.*, 841 F.3d 966, 974 (Fed. Cir. 2016) (“Although the Board did not make findings as to whether any of the other claim limitations (such as fusion apertures or anti-migration teeth) are disclosed in the prior art, it did not have to: Nuvasive did not present arguments about those limitations to the Board. . . . The Board, having found the only disputed limitations together in one reference, was not required to address undisputed matters.”); *see also* Paper 11, 5 (emphasizing that “any arguments for patentability not raised and fully briefed in the response will be deemed waived”). In sum, we conclude that Hunting Titan has met its burden of proving that Schacherer discloses a “detonator assembly” that is (1) “received within a perforating gun,” (2) has “more than one electrical

contact component, wherein at least one of the electrical contact components . . . comprises an electrically contactable line-in portion, . . . line-out portion and . . . ground portion,” and (3) has “means for selective detonation,” as recited in representative claim 1.

2. “A wireless detonator assembly”

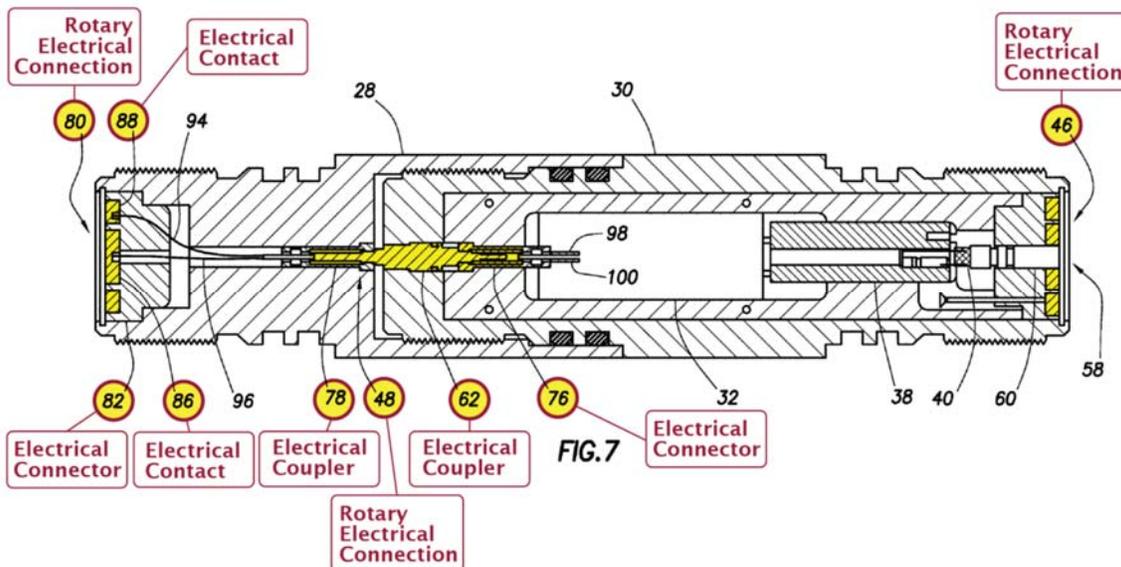
Turning now to the limitations in dispute, we begin with Hunting Titan’s argument that Schacherer’s detonator assembly is “wireless,” in other words, that the detonator assembly forms an electrical connection with the perforating gun assembly “merely by the contact” of the two assemblies with each other and “without using a wired electrical connection,” as recited by representative claim 1. Pet. 16–20, 52–54; Pet. Reply 2–6. According to Hunting Titan, “Schacherer explicitly states that electrical connection is *made on contact through the rotary electrical connections 46 and 48* when the connectors 30 are connected to adjacent components [of the perforating gun assembly], completing the electrical connection merely by contact.” Pet. 53 (citing Ex. 1002, 5:39–42, 5:62–63) (emphasis added). We agree.

From our review, Schacherer discloses two embodiments in which electrical contacts are provided at opposite ends of the detonator assembly so as to make electrical contact with corresponding electrical contacts in the perforating gun assembly. Ex. 1002, Figs. 4, 7. For instance, Figure 4 of Schacherer, reproduced below, depicts a first embodiment of Schacherer’s electrical contacts 46, 48 on each end of connector 30 that houses the detonator assembly.



As annotated by Hunting Titan, Schacherer's Figure 4 above illustrates an embodiment in which electrical contacts 46, 48 are flush mounted at each end of connector 30. See Pet. 18–20, 26–29 (relying on Figure 4 of Schacherer to address the “wireless” and “electrical contact” limitations).

Figure 7 of Schacherer, reproduced below, depicts a slightly different embodiment of electrical contact 48 on the left-end of Schacherer's connector 30.



As annotated by Hunting Titan, Schacherer's Figure 7 above illustrates a *male-to-female* electrical connection between connector 30, which houses the detonator assembly, and connector 28, which connects with the perforating gun assembly. *See id.* (relying on Schacherer's Figure 7 to address the "wireless" and "electrical contact" limitations). More specifically, *male* electrical contact 62 protrudes from the left-end of connector 30 and mates with corresponding female electrical contact 78 in connector 28 of Schacherer's perforating gun assembly. *See also* Ex. 1002, Fig. 5 (depicting connector 30 of Schacherer's detonator assembly within connector 28 of Schacherer's perforating gun assembly).

In either case, the electrical contacts on opposing ends of Schacherer's detonator assembly are no different than the "electrical contact components" of the claimed "wireless detonator assembly" in that both form an electrical connection between the detonator assembly and the perforating gun assembly "merely by [] contact" and "without using a wired electrical connection," as required by representative claim 1. Indeed, both Schacherer and the '422 patent rely on a spring-loaded pin within the perforating gun assembly to make electrical contact with a corresponding end of the detonator assembly, thereby foregoing the need to physically connect any wires. *Compare* Ex. 1001, 6:31–33, Figs. 4, 5 (describing "contact-initiating pin 38" for "wirelessly electrically contacting" the claimed detonator assembly), *with* Ex. 1002, 5:61–63, Figs. 5, 7 (describing "electrical contacts 90, 92 in the form of spring-loaded pins which make sliding electrical contact with the respective contacts 86, 88" of Schacherer's detonator assembly). Thus, in our view, the electrically-contactable ends of Schacherer's detonator assembly meet the "wireless" limitation of

representative claim 1, as well as the “without using a wired electrical connection” and “merely by the contact” limitations elsewhere in the claim.

DynaEnergetics, in turn, argues that Schacherer’s detonator assembly is not “wireless” because “Schacherer provides for the electric and ballistic transfer by incorporating an electrically *wired* detonator (38).” PO Resp. 25–26; *see also* PO Sur-Reply 13–15 (“the detonator assembly of Schacherer (38) was wired”). But, in arguing that Schacherer’s detonator assembly is “wired,” DynaEnergetics oversimplifies what constitutes Schacherer’s detonator *assembly* and ignores the express language of the claim.

As claimed, the “detonator *assembly*” is “electrically contactably received within a perforating gun *assembly*” and forms an electrical connection “merely by the contact” of the two assemblies when connected together. The specification of the ’422 patent likewise provides:

the detonator assembly itself is not manually, physically connected within the perforating gun assembly as has been traditionally done with wired connections, but rather merely makes electrical contact through various components as described herein to form the electrical connections.

Ex. 1001, 3:53–58 (emphasis added); *see also id.* at 4:54–58 (essentially the same). Thus, consistent with the claim language and specification, the “wireless” and “merely by the contact” limitations speak expressly to how one *assembly* forms an electrical connection with the other *assembly*—through bodily contact as opposed to connection of physical wires.

That said, nowhere does the ’422 patent preclude the use of wired connections *internal to* the detonator assembly. Nonetheless, DynaEnergetics faults Schacherer for using a wired connection between

subcomponents of the detonator assembly. PO Resp. 26; *see also* Ex. 2004 ¶ 55. Figures 7 and 9 of Schacherer, reproduced below, depict the subcomponents of Schacherer’s detonator assembly.

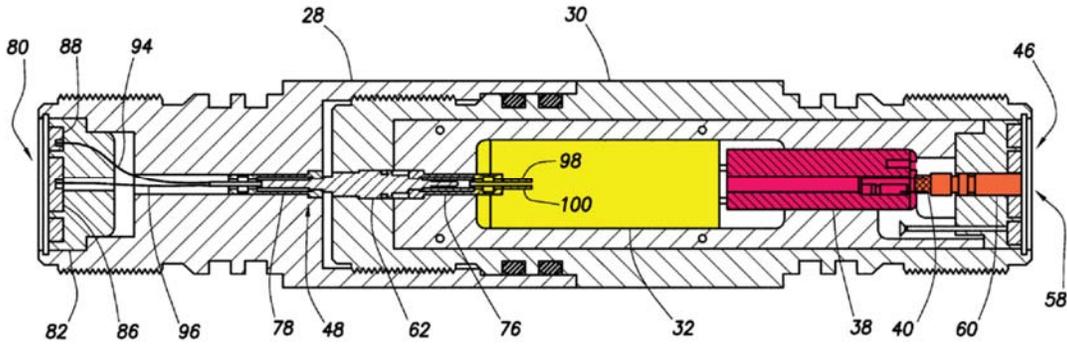


FIG. 7

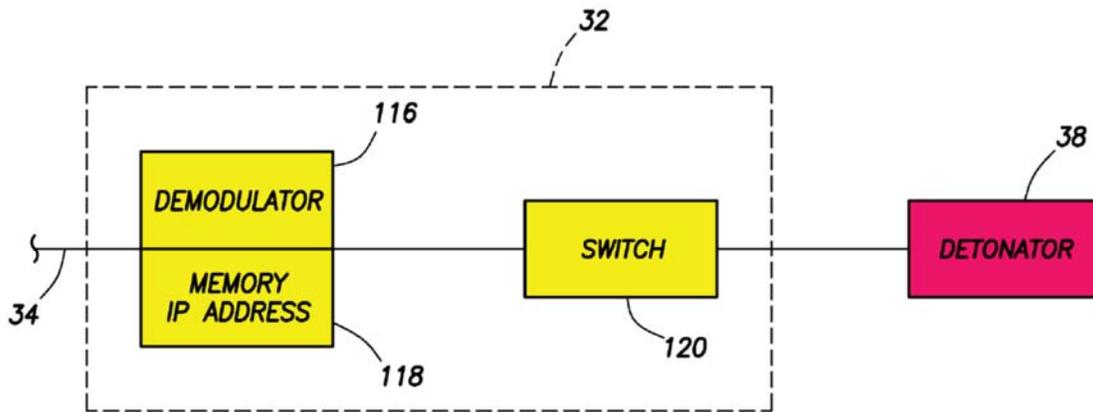


FIG. 9

As annotated by Hunting Titan, Schacherer’s Figure 7 above illustrates an inner capsule (opposite cross-hatching from connector 30) for housing selective firing module 32 (yellow) and detonator 38 (red). Pet. 47–49 (citing Ex. 1002, 2:60–64, 3:1–4, 6:67–7:4, 7:21–33). And, as shown in Hunting Titan’s annotation of Schacherer’s Figure 9 above, the two subcomponents are “electrically connected” by conductive wire 34. Ex.

1002, 7:15–33. The inner capsule, in turn, is positioned within connector 30. *See id.*, Fig. 2 (showing inner capsule threaded into connector 30).

What DynaEnergetics fails to acknowledge is that the claimed “wireless,” “without using a wired connection,” and “merely by the contact” limitations pertain solely to how the detonator *assembly as a whole* forms an electrical connection with the perforating gun *assembly as a whole*, irrespective of how any subcomponents within each assembly are connected. Rather than acknowledge the plain language of the claim, DynaEnergetics distorts the testimony of Hunting Titan’s expert to argue, first, that Schacherer’s “detonator assembly” is limited solely to “detonator 38,” and, then, that its internal wired connection to detonator 38 proves it is not wireless. PO Resp. 26 (citing Ex. 2006, 101:1–5). When viewed in proper light, however, the testimony of Hunting Titan’s expert clarifies that Schacherer’s detonator assembly encompasses more than simply detonator 38.

For instance, in discussing Figure 5 of Schacherer, Hunting Titan’s expert testifies that the “detonator assembly” is “where 38 is pointing.” Ex. 2006, 101:1–19. In doing so, though, he explains that the detonator assembly includes not only detonator 38 but also “upstream” components where the “detonator assembly receives directly its electrical signal,” namely, “Item No. 62.” *Id.* He further testifies that the detonator assembly includes “circuitry” through which “the electrical signal pass[es] from 62 [to] 76 to 38 to the actual detonator.” *Id.* at 103:7–9. That intervening circuitry is Schacherer’s selective firing module 32. Ex. 1002, Fig. 7 (depicting selective firing module 32 between detonator 38 and electrical coupler 62). Thus, contrary to DynaEnergetics’ characterization, the

evidence shows that Schacherer's detonator assembly comprises not only actual detonator 38, but also other subcomponents that include selective firing module 32, explosive charge 40, and mating electrical couplers 62 and 76.⁴ *See* Ex. 1002, 5:25–56, Fig. 5; Ex. 1006 ¶¶ 14, 22.

Neither DynaEnergetics nor its expert explains why a wired connection residing entirely within, and internal to, Schacherer's detonator assembly precludes the assembly from being “wireless” so long as its electrical connection with the perforating gun assembly is “merely by the contact” of the two assemblies and “without using a wired electrical connection,” as recited by representative claim 1. There is no support, intrinsic or otherwise, for DynaEnergetics' argument that those limitations somehow implicate the connection of subcomponents housed within the detonator assembly itself. Rather, the claims require only the absence of a wired connection between the detonator *assembly* and the perforating gun *assembly*, regardless of any physically wired connections residing within those assemblies. As discussed above, Schacherer's detonator assembly achieves an electrical connection with the perforating gun assembly merely by contact of one with the other. Thus, we conclude that Schacherer is a “wireless” detonator assembly in the manner recited by claim 1.

3. “a shell”

Claim 1 further requires “a shell configured for housing components of the detonator assembly.” As discussed above, we construe “shell” to

⁴ To the extent there is any discrepancy in the testimony of Hunting Titan's expert, it is the result of DynaEnergetics' own failure to distinguish between Schacherer's actual detonator and its detonator assembly while pursuing this line of questioning. *See* Ex. 2006, 101:1–103:9.

mean “a shell, housing, or casing for housing any component of the detonator assembly, including but not limited to a detonator head plug, a fuse head, an electronic circuit board, or explosive components.” *See supra* Section II.B. With that construction in mind, Hunting Titan posits alternative teachings in Schacherer of a shell for housing the subcomponents of the detonator assembly. Pet. 22–25. For example, Figure 4 of Schacherer, reproduced below, depicts an inner capsule (blue) that serves as a shell for Schacherer’s detonator assembly. *See id.* at 24.

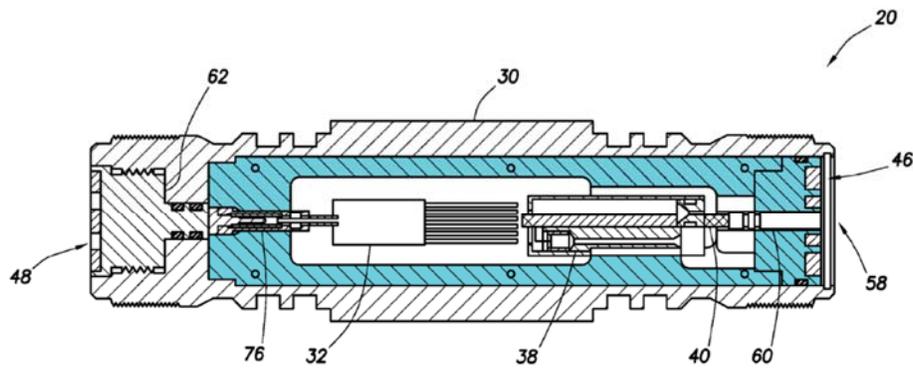


FIG. 4

As annotated by Hunting Titan, Schacherer’s Figure 4 above shows inner capsule (blue) housing such subcomponents as “selective firing module 32,” “electrical detonator 38,” and “explosive components 40.” Ex. 1002, 5:25–51, 6:65–7:4, 7:18–20.

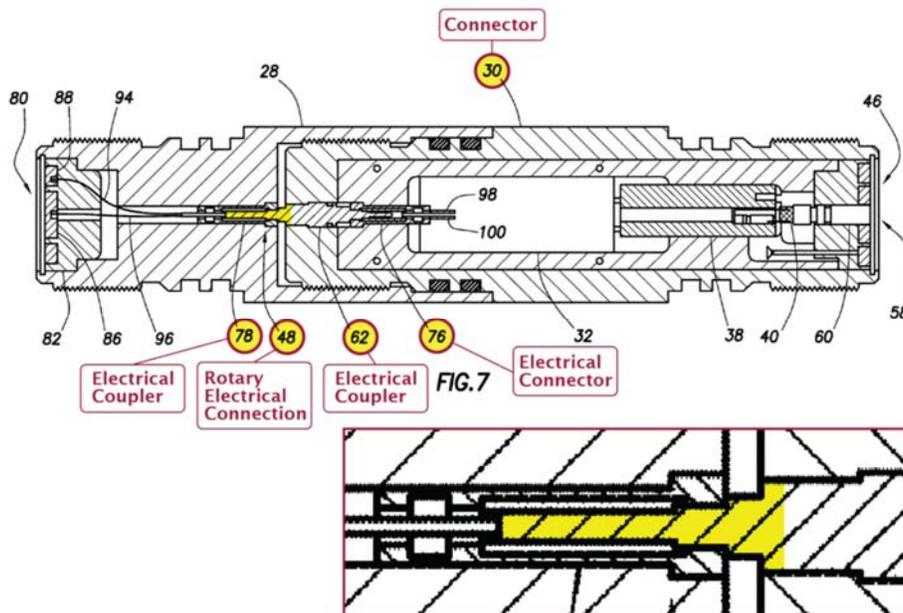
Alternatively, Hunting Titan points to Figures 5 and 7 of Schacherer, reproduced below, to illustrate another configuration of Schacherer’s shell. Pet. 23–24.

“a much smaller, modular piece that ‘plugs’ into a larger gun system in an entirely wireless manner.” *Id.* at 27–28; Ex. 2004 ¶¶ 59–60 (DynaEnergetics’ expert repeating the same). But DynaEnergetics’ argument fails for the simple reason that the claims recite nothing about the size of the shell.

Aside from faulting its size, neither DynaEnergetics nor its expert explains why Schacherer’s “sub” does not meet the claimed “shell.” *See* PO Resp. 26–29; Ex. 2004 ¶¶ 60–62. Nowhere does the claim language, or for that matter the specification of the ’422 patent, preclude a tandem sub from being a shell so long as it “hous[es] components of the detonator assembly” and is “received within a perforating gun assembly,” which is all claim 1 requires of the shell. Indeed, the ’422 patent provides that “the detonator shell 12 is configured as a housing or casing, typically a metallic, which houses at least a detonator head plug 14, a fuse head 15, an electronic circuit board 16 and explosive components.” Ex. 1001, 4:4–7. That description matches exactly the structure and function of Schacherer’s inner capsule (as highlighted in blue in annotated Figure 4 above), as well as the outer capsule, i.e., connector 30 (as highlighted in blue in annotated Figures 5 and 7 above). Ex. 1006 ¶¶ 21–23. Regardless of what they are called, Schacherer’s connector 30 and associated inner capsule serve as a “shell” for housing the subcomponents of a detonator assembly and being received within a perforating gun assembly, as required by claim 1. Thus, we reject DynaEnergetics’ argument as nothing more than semantics. In the end, we find persuasive Hunting Titan’s argument and evidence that Schacherer teaches the claimed “shell.”

4. “wherein at least one of the electrical contact components extends from the shell”

Another disputed limitation of claim 1 recites “wherein at least one of the electrical contact components extends from the shell.” Hunting Titan relies on Figure 7 of Schacherer, reproduced below, to address this limitation. Pet. 31–32.



As annotated by Hunting Titan, Schacherer’s Figure 7 above illustrates electrical coupler 62 (yellow) embedded within, *and extending from*, connector 30 that houses the subcomponents of Schacherer’s detonator assembly. *See id.* at 31. DynaEnergetics does not dispute that Schacherer’s connector 30 includes electrical contact components, but argues that such components “would be electrical coupler (76), not coupler (62)” because “[t]hat element is where the detonator assembly would receive the electrical signal (‘line-in’).” PO Resp. 31. According to DynaEnergetics, a skilled artisan would “inevitably conclude” that Schacherer’s electrical coupler 76

alone “represents the wireless electrical contact component of the detonator assembly.” *Id.* at 33.

We disagree. As shown in annotated Figure 7 above, the electrical contact component in Schacherer’s detonator assembly includes both electrical coupler 62 and electrical connector 76, both of which are sealed within connector 30, i.e., the shell. Hunting Titan’s expert confirms as much. Ex. 1006 ¶¶ 35–37. Importantly, when connector 30 “is threaded into the connector 28” of the perforating gun assembly, an electrical signal can be transmitted from the perforating gun to selective firing module 32 residing within Schacherer’s detonator assembly. Ex. 1002, 5:54–56.

DynaEnergetics’ assertion that only coupler 76 forms the line-in portion of Schacherer’s detonator assembly contradicts Schacherer’s plain disclosure that electrical coupler 62 together with electrical contact 76 form not only the male-to-female electrical connection 48 with the perforating gun assembly 26, 28, but also the “line-in” to selective firing module 32. Nowhere does the claim language or specification of the ’422 patent suggest that the “electrical contact component” must be a single, unitary structure. Nor does DynaEnergetics’ expert ever explain why *only one part* of the male electrical contact taught by Schacherer is relevant when the “line-in” to the selective firing module clearly encompasses multiple parts. As such, we find more persuasive Hunting Titan’s showing that Schacherer’s electrical couplers 62 *and* 76 meet the “extends from the shell” limitation of claim 1. Pet. 30–32; Pet. Reply 11–14.

5. “an insulator positioned between the line-in portion and the line-out portion”

We are also persuaded by Hunting Titan’s showing that Schacherer discloses “an insulator” for electrically isolating the line-in and line-out portions from each other, as required by representative claim 1. Pet. 41–44; Pet. Reply 14–20. Although Hunting Titan acknowledges that Schacherer does not expressly disclose “an insulator” as claimed, it argues that Schacherer’s detonator assembly “inherently includes insulators between electrical contacts” in order to function safely and properly. Pet. 44; Pet. Reply 15. In furtherance of that argument, Hunting Titan presents credible expert testimony that a skilled artisan would have recognized that Schacherer’s detonator assembly would not function as described if the various electrical components were not electrically insulated. Ex. 1006 ¶¶ 51–52.

DynaEnergetics argues that Schacherer does not disclose the claimed insulator because,

[e]ven accepting Hunting Titan’s assumption that a POSA would recognize the presence of an insulator . . . there is absolutely no indication of which wires are represented in this coupler (62) (are these line-in, line-out, or ground?) or how these electrical connections actually transfer the signals to the selective firing module.

PO Resp. 35–36; *see also id.* at 38–39 (“Hunting Titan relies on a theory that the claimed insulator may exist within individual components of Schacherer . . . but ignores that the claimed insulator must be between the line-in portion and the line-out portion of a detonator assembly . . . which electrically isolates those portions from each other.”).

We disagree that Hunting Titan overlooks the importance of insulating the “line-in” from the “line-out” portions in arguing that Schacherer inherently meets the “insulator” limitation. Hunting Titan’s expert testifies specifically that a skilled artisan would have understood that “the line-in contacts on one end of the connector 30 taught by Schacherer ’223 would be insulated from the line-out contact on the other and of connector 30, and further insulated through the body of rotary electrical connection 46 and electrical coupler 62.” Ex. 1006 ¶ 50. To show an insulator is “necessarily present,” *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991), Hunting Titan’s expert explains that a skilled artisan would have understood that “an insulator must be positioned between the line-in portion and the line-out portion in order to prevent the lines from short-circuiting and failing to operate as intended.” *Id.* ¶ 54. Thus, contrary to DynaEnergetics’ assertions, Hunting Titan specifically explains the location of Schacherer’s line-in and line-out portions and the necessity of insulating them from each other.

Moreover, according to Hunting Titan’s expert, a skilled artisan working with an explosive detonator certainly would have understood that the lines “must be electrically insulated/isolated from each other in order to be separate . . . [o]therwise all lines short to each other and become in effect the same single conductor.” *Id.* ¶ 54. Neither DynaEnergetics nor its expert ever explains how Hunting Titan’s expert misinterprets that understanding of a skilled artisan, which includes the very real concern of short-circuiting and detonating prematurely in the absence of an insulator between the line-in and line-out portions.

In the end, when accounting for the undisputed level of skill in the art—an advanced degree in electrical engineering and five years of experience working with perforating guns—we find that a skilled artisan clearly would have understood that any and all electrical contacts within Schacherer’s detonator assembly are necessarily electrically insulated from each other in order that the detonator assembly may function properly and safely. *See* Ex. 1006 ¶¶ 47–52. We find it difficult to imagine any circumstance in which a skilled artisan would overlook the inherent necessity of insulating electrical contacts within a detonator assembly where, as DynaEnergetics’ own expert admits, “[s]afety is paramount in the design and operation of these highly energetic systems and extensive precautions are taken to protect personnel handling guns prior to installing them in the wellbore.” Ex. 2004 ¶ 25. That testimony, along with the evidence discussed above, persuades us that Schacherer inherently meets the “insulator” limitation of representative claim 1. *See* Pet. 41–44.

6. *Conclusion*

In sum, the record reflects that a skilled artisan would have understood Schacherer as disclosing each and every limitation of claim 1. *See* Pet. 12–55; Pet. Reply 2–20. As with claim 1, Hunting Titan provides a persuasive showing of where each limitation of claims 5 and 12 resides in Schacherer. *See id.* DynaEnergetics does not argue independent claims 1, 5, and 12 separately, relying on claim 1 as “[r]epresentative.” PO Resp. 7. Thus, we conclude that Hunting Titan has demonstrated by a preponderance of the evidence that independent claims 1, 5, and 12 are unpatentable as anticipated by Schacherer.

Hunting Titan also points to content within Schacherer that meets the limitations of the dependent claims. *See* Pet. 55–59, 61–62, 65–66, 68–70, 72–79. DynaEnergetics does not argue the dependent claims separately from the independent claims. *See* PO Resp. 39 (“Because Schacherer does not anticipate any independent claims, Schacherer does not anticipate dependent claims 2–4, 6–11, or 13–15”); PO Sur-Reply 6–20. Because DynaEnergetics does not dispute Hunting Titan’s showing of how Schacherer discloses the dependent limitations, we consider the fact of their disclosure effectively admitted. *See In re Nuvasive, Inc.*, 841 F.3d 966, 974 (Fed. Cir. 2016) (“Although the Board did not make findings as to whether any of the other claim limitations (such as fusion apertures or anti-migration teeth) are disclosed in the prior art, it did not have to: Nuvasive did not present arguments about those limitations to the Board. . . . The Board, having found the only disputed limitations together in one reference, was not required to address undisputed matters.”); *see also* Paper 11, 5 (warning that “any arguments for patentability not raised and fully briefed in the response will be deemed waived”). Even absent such admission, the record fully supports that Schacherer discloses the dependent limitations. *See* Pet. 55–59, 61–62, 65–66, 68–70, 72–79. Thus, because Hunting Titan has demonstrated by a preponderance of evidence that Schacherer discloses each and every limitation of claims 1–15, we conclude they are unpatentable as anticipated by Schacherer.

D. Motion to Amend

As a contingency, DynaEnergetics moves to amend the ’422 patent to add proposed substitute claims 16–22 in the event original claim 5–11 are determined unpatentable. Mot. Amend 1. According to DynaEnergetics, the

proposed substitute claims retain all the limitations of the original claims while adding the following limitations:

- (1) “a perforating gun housing;”
- (2) “a carrying device positioned within the perforating gun housing to hold at least one shaped charge,” and
- (3) “a detonator assembly contained entirely within the perforating gun housing.”

Id. at 2, 12; PO Reply 3–4. In our view, none of those additional limitations renders the proposed substitute claims novel or non-obvious over the prior art of record. Instead, each of those limitations is taught by the prior art, either as admitted in the ’422 patent itself or as disclosed by Schacherer.

1. “*a perforating gun housing*” having “*a detonator assembly contained entirely within the perforating gun housing*”

Beginning with the proposed limitations reciting “a perforated gun housing” and “a detonator assembly contained entirely within the perforating gun housing,” we are not persuaded that DynaEnergetics’ simple addition of a “housing” for the already-claimed perforating gun, as well as its addition of containing the claimed detonator assembly “entirely within the perforating gun housing,” renders the otherwise anticipated claim patentable. *See* Mot. Amend 12–14; PO Reply 3–6. In our view, both of those proposed additions were commonly known to skilled artisans at the time.

For instance, the ’422 patent itself acknowledges the existence of prior art perforating guns “which typically include at least the following components: *a housing or outer gun barrel within which is positioned . . . a detonator, a detonating cord, one or more charges* which are held in an inner tube, strip or carrying device.” Ex. 1001, 1:45–52 (emphasis added). That clear disclosure in the ’422 patent amounts to an admission that a

skilled artisan would have understood that a perforating gun's housing (also known as the outer gun body or barrel) may contain not only explosive charges but also a detonator assembly for detonating those charges. *See In re Cohen*, 767 Fed. Appx. 985, 987–988 (Fed. Cir. 2019) (unpublished) (affirming Board's finding that statement in "Background of the Invention" section of patent as to what was "typical" in the prior art at the time constituted "applicant-admitted prior art").

Consistent with that admission, Schacherer similarly teaches that "each perforating gun compris[es] an outer gun body (e.g., outer housing 26), at least one perforating charge (e.g., explosive components 24) which rotates relative to the outer gun body, and a selective firing module 32 which causes detonation of the perforating charge." Ex. 1002, 8:53–58; *see also id.* at 1:46–52 (essentially the same). Indeed, Schacherer uses the terms "outer gun body" and "outer housing" interchangeably when speaking of the contents of the perforating gun. *Id.* at 2:35–38 ("the outer housings 26 are outer gun bodies"). Thus, DynaEnergetics cannot reasonably dispute that Schacherer's perforating gun includes an outer housing.

2. *"a carrying device positioned within the perforating gun housing to hold at least one shaped charge"*

Schacherer discloses "explosive components 22, 24," which are mounted to "eccentric weight 42" and "bearings 44" and "positioned in the outer housing 26" of the perforating gun. Ex. 1002, 3:60–4:4, Fig. 2. The eccentric weight and bearings amount to a carrying device that permits rotation of the explosive component, i.e., shaped charge, within the barrel of Schacherer's perforating gun. *Id.*; *see also* Ex. 1026 ¶¶ 50–51 (Hunting Titan's expert confirming same). DynaEnergetics does not dispute

Schacherer's teaching of this proposed amendment to the claims. And we are persuaded that Hunting Titan has carried its burden in demonstrating that this proposed amendment does not overcome the anticipatory nature of Schacherer. *See* Pet. Opp. to Mot. Amend 5.

3. *“a detonator assembly contained entirely within the perforating gun housing”*

To the extent that DynaEnergetics contends that the proposed limitation of the detonator assembly being “contained entirely within the perforating gun housing” means that the detonator assembly must be fully enclosed by the gun's housing, we note that Figures 2, 4, and 5 of Schacherer illustrate detonator assembly 32, 38, 40, 60 residing entirely within an inner capsule that, in turn, is threaded or positioned within connector 30. Ex. 1002, Figs. 2, 4, 5; *see also id.* at 3:66–4:4 (“Each of the connectors 30[] is threaded into a respective end of the outer housing 26.”). As a result, when assembled, Schacherer's outer housing 26 and outer connector 30 together serve as a perforating gun housing for encapsulating not only perforating charges 24, but also detonator assembly 32, 38, 40, 60. *See id.*, Figs. 2, 4, 5. Indeed, Schacherer refers to the combination of housing 26 and connector 30 as “explosive assemblies 20” (*id.* at 8:10–13), states that “explosive assemblies 20 are perforating guns” (*id.* at 2:35–36), and explains that “explosive assemblies 20 can be transported to a well location with each explosive assembly being already assembled” (*id.* at 3:30–43). Those disclosures support that outer housing 26 and connector 30 act as a single housing for “transporting the explosive assemblies 20 from the remote location 110 to the well location 112.” *Id.* at 8:4–14, Fig. 8.

Thus, we are persuaded that Schacherer discloses holding the detonator assembly “entirely within” the perforating gun housing.⁵

4. *Conclusion*

In sum, we are persuaded that Hunting Titan has carried its burden in showing that DynaEnergetics’ proposed amendments do not overcome the anticipatory nature of Schacherer’s disclosure. As such, we deny DynaEnergetics’ contingent motion to amend.

E. *Motions to Exclude*

DynaEnergetics moves to exclude the declarations of Hunting Titan’s expert (Exs. 1006, 1026) “because his opinions are conclusory, unreliable, and fail to disclose the underlying facts and data.” PO Mot. Exclude 3. Although DynaEnergetics seeks to exclude virtually the entire declaration, the only portions of the declaration that DynaEnergetics discusses with any particularity relate to obviousness, in particular, whether Hunting Titan shows that a skilled artisan would have had a “motivation to combine” the asserted references. *See id.* at 4–5 (discussing paragraphs 71, 82, 95, 127–128 of Exhibit 1002), 7–8 (discussing paragraphs 151–161, 175–176, 179, 185–188, 210–212, 227–228 of Exhibit 1026); *see also* Paper 38, 1–3

⁵ We also find persuasive Hunting Titan’s assertion that making Schacherer’s outer housing 26 extend continuously over the length of connector 30, rather than only over its ends (as shown in Fig. 2), would have been an “obvious modification” within the purview of Schacherer and the general knowledge of a skilled artisan. Ex. 1026 ¶ 44. In our view, a skilled artisan would have deemed such a modification to be nothing more than applying a well-known technique for positioning a detonator assembly within a perforation gun housing without requiring any change to the gun’s operation. *See* Ex. 1026 ¶¶ 38, 40–42, 44, 53–55; Ex. 1028 ¶¶ 22, 27, 33, Fig. 2A; Ex. 1027, Figs. 1–3.

(discussing paragraphs 95, 123–129, 157–158, 175–176, 227–228 of Exhibit 1026). Our decision today addresses only Hunting Titan’s anticipation challenge based on Schacherer, while rendering no findings or conclusions as to Hunting Titan’s numerous obviousness challenges. As such, we do not rely on any portion of the expert testimony that DynaEnergetics pinpoints as in need of exclusion. Nor do we rely on Exhibit 1031 that DynaEnergetics also seeks to exclude. Thus, we deny the motion as moot.

Hunting Titan, in turn, moves to exclude portions of DynaEnergetics’ Exhibits 2001, 2003–2005, and 2027, and the entirety of Exhibits 2008–2018, 2023, 2026, and 2028. Pet. Mot. Exclude 1. We do not give persuasive weight to the evidence Hunting Titan seeks to exclude, and to the extent we do, it is in Hunting Titan’s favor. Thus, we deny as moot Hunting Titan’s motion to exclude.

III. ORDER

Accordingly, it is hereby:

ORDERED that Hunting Titan has demonstrated by a preponderance of the evidence that claims 1–15 of the ’422 patent are *unpatentable*;

FURTHER ORDERED that DynaEnergetics’ Contingent Motion to Amend (Paper 19) is *denied*;

FURTHER ORDERED that Hunting Titan’s Motion to Exclude Evidence (Paper 32) is *denied*;

FURTHER ORDERED that DynaEnergetics’ Motion to Exclude Pursuant to 37 C.F.R. § 42.64(c) (Paper 34) is *denied*; and

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

IPR2018-00600
Patent 9,581,422 B2

FOR PETITIONER:

Jason A. Saunders
Gordon T. Arnold
Christopher P. McKeon
ARNOLD & SAUNDERS, LLP
jsaunders@arnold-iplaw.com
garnold@arnold-iplaw.com
cmckeon@arnold-iplaw.com

FOR PATENT OWNER:

Barry J. Herman
Preston H. Heard
WOMBLE BOND DICKINSON (US) LLP
barry.herman@wbd-us.com
preston.heard@wbd-us.com

Lisa J. Moyles
Jason M. Rockman
MOYLES IP, LLC
lmoyles@moylesip.com
jrockman@moylesip.com