

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

REFLEX USA LLC,
Petitioner,

v.

LONGYEAR TM, INC. and GLOBALTECH CORPORATION PTY LTD.,
Patent Owner.

Case No. IPR2023-00642
Patent No. 10,830,013

**PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO.
10,830,013
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.100 *et seq.***

LIST OF EXHIBITS

Exhibit	Description
1001	U.S. Patent No. 10,830,013 (the “’013 Patent”)
1002	File History for U.S. Patent No. 10,830,013 (the “’013 File History”)
1003	WO 2008/113127 (“Beach-127”)
1004	U.S. Patent Pub. No. 2008/0001775 (“Wiese”)
1005	WO 2012/012839 (“Klass-839”)
1006	U.S. Patent No. 3,305,033 (“Pickard”)
1007	U.S. Patent Pub. No. 2006/0210409 (“Sumner”)
1008	WO 2013/126955 (“Hejleh”)
1009	WO 2007/109848 (“Beach-848”)
1010	U.S. Patent No. 10,465,463 (the “’463 Patent”)
1011	File History for U.S. Patent No. 10,465,463 (the “’463 File History”)
1012	U.S. Patent No. 11,466,529 (the “’529 Patent”)
1013	File History for U.S. Patent No. 11,466,529 (the “’529 File History”)
1014	Chart: Patent Office’s Evaluation of Beach-127 Against the Challenged Claims
1015	U.S. Patent Pub. No. 2013/0099935 (“Ujereh”)
1016	U.S. Patent No. 4,928,088 (“Jorion”)
1017	Central Mine Equipment Company (CMECO) Product Catalog (2013)
1018	WO 2010/091471 (“Jacobs”)
1019	New Oxford Am. Dict. 3rd (2010) (hermetic)
1020	SPIE, Free-space optical transmission improves land-mobile communications, Henniger et al. (2007)
1021	OPTICAL COMMUNICATIONS, 2nd ed., Gagliardi et al. (1995), Ch. 1
1022	Declaration of Dr. Johnathan P. Rodgers
1023	Curriculum Vitae of Dr. Johnathan P. Rodgers

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I. INTRODUCTION

Reflex USA LLC (“Petitioner”) petitions for *inter partes* review seeking cancellation of claims 1-4, 14-15, 19-22, and 24-25 (“Challenged Claims”) of U.S. Patent No. 10,830,013 (Ex. 1001, “’013 patent”), assigned to Longyear TM, Inc. and Globaltech Corporation Pty Ltd. (collectively, “the Patent Owner”).

The ’013 Patent relates to a core barrel head assembly with an integrated sample orientation system, for down hole drilling operations. ’013 Patent, Abstract, Title, 1:19-20. The claims are directed to a specific assembly configuration: one that incorporates a “first interior cavity”; another “selectively sealed interior cavity” that “is sized and shaped to enclose” an “electronic instrument” that “obtain[s] core orientation data”; and a “window that extends from an exterior surface into optical communication with the sealed interior cavity.” *Id.*, cl. 1. According to the ’013 Patent, this system “advantageously enables obtaining drill hole survey readings” while streamlining equipment handling and usage, thereby promoting efficiency. *Id.*, 3:7-17, 3:38-41.

Yet the claimed configuration of the ’013 Patent was not novel: WO 2008/113127 (“Beach-127”) discloses, or else renders obvious, the assembly of Claim 1. Indeed, the file histories of patents in the same family as the ’013 Patent show a mutual understanding between both the Patent Office and the Patent Owner

that Beach-127 satisfies all limitations of Claim 1.¹ Specifically, during prosecution of the '013 Patent's parent patent (Appl. No. 16/017,334, which issued as U.S. Patent No. 10,465,463, Ex. 1010 (the "'463 Patent")), the Examiner argued (and the Patent Owner did not dispute) that Beach-127 discloses "a selectively sealed interior cavity spaced distally from the first interior cavity"—a limitation required by Claim 1 of the '013 Patent. *See* Ex. 1011 at 54-55; *see also id.* at 36 (conceding Examiner's argument). Further, during prosecution of the '013 Patent's child patent (Appl. No. 17/082,877, which issued as U.S. Patent No. 11,466,529, Ex. 1012 (the "'529 Patent")), the Examiner likewise argued (and the Patent Owner again did not dispute) that Beach-127 discloses numerous other features including all other limitations recited in Claim 1 of the '013 Patent. *See* Ex. 1013 at 191-93; *id.* at 77 (conceding Examiner's argument). Accordingly, the intrinsic record demonstrates that Beach-127 anticipates Claim 1. While that should end the inquiry, in case any doubt remained as to whether Beach-127 discloses "a window that extends from the exterior surface into optical communication with the sealed

¹ As explained in Section IX, *infra*, the Examiner's statements regarding Beach-127's disclosure, made during prosecution of the '463 Patent and '529 Patent, collectively demonstrate that the Patent Office clearly erred in allowing Claim 1 of the '013 Patent.

interior cavity,” that feature would have been obvious to a skilled artisan at the time of the invention. In particular, using an “optically transmissive window” within a downhole assembly’s housing was well known at the time of the invention. Ex. 1022, ¶¶ 38-44, 77-89. It was further known that such a technique could avoid the need to disassemble the drilling equipment, enabling faster data transfer from the equipment, reducing environmental exposure of the electronics, and enabling more efficient operations. *Id.*, ¶¶ 40-42, 79-82, 89.

For example, U.S. Patent Pub. No. 2008/0001775 (Ex. 1004, “Wiese”) acknowledged the desirability for “[f]aster and more reliable methods for downloading information accumulated downhole and/or bi-directional communication to surface computers.” *Id.*, [0004]. To that end, Wiese proposed equipping the bottom hole assembly with “a window at the housing, the window being transmissive to the signal of at least one transceiver of a tool . . . such that the signal is receivable outside of the housing through the antenna.” *Id.*, [0005]. Here, Wiese’s disclosure of “antenna” includes devices capable of transmitting optical signals. *Id.*, [0015] (“For example[, w]here infrared (IR) is the signal type, a light emitting diode (LED) would be the ‘antenna’ to transmit the IR signal” through the window.).

In addition, WO 2012/012839 to Klass et al. (Ex. 1005, “Klass-839”), also not before the Examiner, similarly disclosed transmitting optical signals

(specifically, multi-colored lights) through a window in the exterior of a downhole tool, to visually indicate to an operator whether the retrieved core sample is oriented correctly. *See* Ex. 1005, 9-11, Figs. 5, 7. The remaining limitations of the challenged claims were similarly well-known. Accordingly, the Challenged Claims would have been obvious based on the prior art relied upon in this Petition.

II. STANDING, MANDATORY NOTICES, AND FEE AUTHORIZATION

Grounds for Standing: Pursuant to 37 C.F.R. § 42.104(a), Petitioner certifies that the '013 Patent is available for IPR and that Petitioner is not barred or estopped from requesting an IPR challenging the '013 Patent on the grounds identified in this petition.

Real Party in Interest: Petitioner identifies Reflex USA LLC and Imdex Limited as real parties in interest.

Related Matters: As to the related Australian Patent Application, No. 2019257536, which claims priority to the same provisional U.S. Patent application as does the '013 Patent (Appl. No. 61/982,052), and is thus in the same family as the '013 Patent, Petitioner has initiated Australian Opposition proceeding, Ref. No. 195256.

Lead and Back-Up Counsel: Petitioner designates Scott Weidenfeller (Reg. No. 54,531, sweidenfeller@cov.com) of Covington & Burling LLP, One CityCenter, 850 Tenth Street, NW, Washington, DC 20001-4956 (postal and hand

delivery), telephone: (202) 662-5923, facsimile: (202) 778-5923 as lead counsel and Peter Chen (Reg. No. 39,631, pchen@cov.com) of Covington & Burling LLP, 3000 El Camino Real, 5 Palo Alto Square, Palo Alto, CA 94306 (postal and hand delivery), telephone: (650) 632-4720, facsimile: (650) 632-4800, as back-up counsel.

Service Information: Please address correspondence to counsel at the address above. Petitioners consent to electronic service to: Reflex-IPR-Covington@cov.com and the email addresses listed above. Service information is provided in the designation of counsel above.

Fee Authorization: The Office is authorized to charge \$41,500 (\$19,000 request fee and \$22,500 post-institution fee) for the fees set forth in 37 C.F.R. § 42.15(a) (as well as any additional fees that might be due) to Deposit Account No. 60-3160.

III. SUMMARY OF CHALLENGE

Petitioner requests IPR of claims 1-4, 14-15, 19-22, and 24-25 of the '013 Patent under 35 U.S.C. § 103 based on the following grounds:

- ***Ground I:*** Claims 1, 3-4, 19-22, and 24-25 would have been obvious over Beach-127 alone or in view of Wiese.
- ***Ground II:*** Claim 2 would have been obvious over Beach-127 alone or in view of Wiese, further in view of Pickard.

- **Ground III:** Claims 14-15 would have been obvious over Beach-127 in view of Wiese and Klass-839.

The '013 Patent was filed on September 30, 2019 and claims priority to U.S. Provisional Application No. 61/982,052, filed on April 21, 2014. Each of the asserted references is available as prior art under 35 U.S.C. § 102, as shown below:

Exhibit	Reference	Date(s)	Availability as Prior Art
Ex. 1003	WO 2008/113127 (“Beach-127”)	September 25, 2008 (published)	§ 102(a) and (b)
Ex. 1004	U.S. Pub. No. 2008/0001775 (“Wiese”)	January 3, 2008 (published)	§ 102(a) and (b)
Ex. 1005	WO 2012/012839 (“Klass-839”)	February 2, 2012 (published)	§ 102(a) and (b)
Ex. 1006	U.S. 3,305,033 (“Pickard”)	February 21, 1967 (issued)	§ 102(a) and (b)

IV. OVERVIEW OF THE '013 PATENT

The '013 Patent “relates to down hole surveying in drilling operations.” Ex. 1001 at 1:19-20. In particular, the claims of the '013 Patent are directed to a core barrel head assembly that includes an “electronic instrument” that is enclosed within a “selectively sealed interior cavity” and “is configured to obtain core orientation data,” where the sealed interior cavity has a “window” that permits optical communication (e.g., to an external device). Ex. 1001, cl. 1. Claim 1, the sole independent claim, recites:

1. A core barrel head assembly having an exterior surface and comprising:

a first interior cavity;

a selectively sealed interior cavity spaced distally from the first interior cavity and having a closed proximal end;

a threaded proximal end portion for coupling to a wire line retrieval portion of a head assembly;

a base portion, wherein the first interior cavity extends distally from the threaded proximal end portion to the base portion;

a window that extends from the exterior surface into optical communication with the sealed interior cavity proximate the closed proximal end of the sealed interior cavity;

at least one electronic instrument that is configured to obtain orientation data,

wherein the at least one electronic instrument comprises at least one digital and/or electro-mechanical sensor in a core orientation data recording tool;

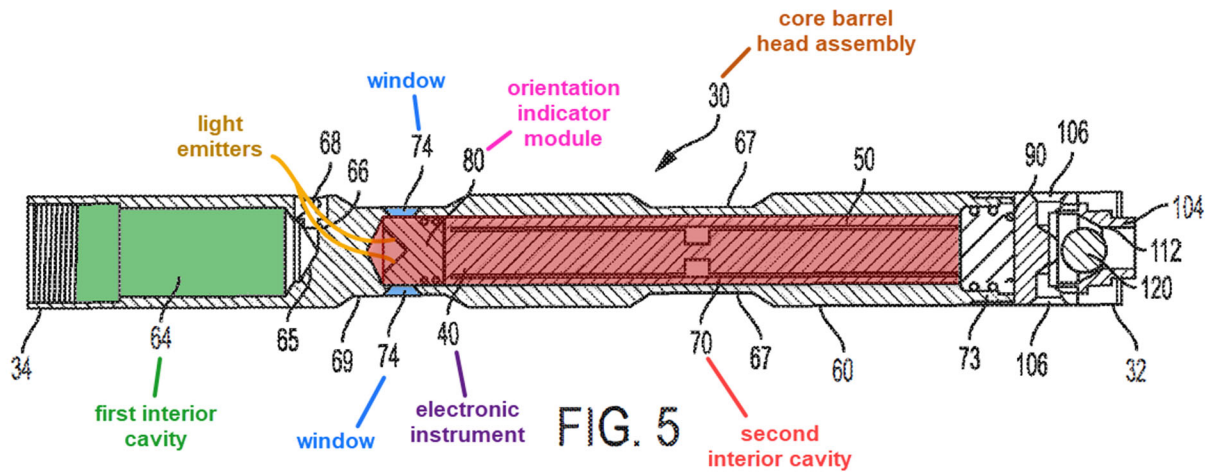
a transmitter configured to transmit core orientation data,

wherein the sealed interior cavity is sized and shaped to enclose the at least one electronic instrument.

Ex. 1001, cl. 1.

The '013 Patent illustrates, in Fig. 5 (below), a core barrel head assembly

that corresponds to claim 1, and includes additional features specified in dependent claims, as discussed further below.²



A. Prosecution History

The patent application that resulted in the '013 Patent was filed on September 30, 2019. Ex. 1002, 2. The Examiner issued an Office action rejecting the pending claims on the basis of nonstatutory double patenting, as being patentably indistinct from the parent '463 Patent. *See* Ex. 1002, 72-73. The Patent Owner responded to the Office action by filing a terminal disclaimer, thereby obviating the double patenting rejection. *Id.*, 38. The Examiner issued the Notice

² Following issuance of the '013 Patent, Patent Owner amended Fig. 5 during prosecution of the child '529 Patent, to indicate additional features. *See* Ex. 1013, 67, 76.

of Allowability on July 9, 2020. *Id.*, 13.

Prosecution History of Related Patents

The prosecution histories of other patents within the same family as the '013 Patent—namely, the '463 Patent and the '529 Patent—are relevant to this Petition.

During the respective prosecutions for the applications that issued into the '463 Patent and '529 Patent, the Examiner rejected the respective pending claim sets over Beach-127. *See* Ex. 1011, 54-57; *see also* Ex. 1013, 191-93. Importantly, those pending claims recite the same limitations of challenged Claims 1-3 and 19-22 of the '013 Patent. Collectively, Examiner's rejections reflect the Office's position that Beach-127 discloses all limitations of Claim 1, as well as dependent claims 2-3 and 19-22. Further, in responding to these rejections, the Patent Owner did not dispute that Beach-127 discloses the relevant limitations; instead, the Patent Owner overcame the rejections, and ultimately secured issuance of the '463 and '529 Patents, by amending the pending claim sets. *See* Ex. 1011 at 36 (conceding Examiner's argument); Ex. 1013 at 77 (same). Thus, the Patent Owner acquiesced to the argument that Beach-127 discloses all limitations of Claim 1, as well as dependent claims 2-3 and 19-22, of the '013 Patent. This relevant information from the related patents' file histories is detailed in the comparative chart submitted herewith as Ex. 1014. As reflected there, the intrinsic record demonstrates that Beach-127 anticipates Claim 1 of the '013 Patent, along

with several dependent claims of the '013 Patent.³

In addition, during prosecution of the child '529 Patent, the Patent Owner amended the specification and the drawings. Such amendments are instructive regarding the '013 Patent, indicating inaccuracies in the specification of the earlier-issued '013 Patent.

The Patent Owner's specification amendments, in relevant part, indicate that:

- Element 32 is the “*distal* end,” and element 34 is the “*proximal* end,” of core barrel head assembly 30.
- Element 132 is the “*distal* end,” and element 134 is the “*proximal* end,” of core barrel head assembly 130.
- Light emitters are element 88 (rather than 82).
- The orientation indicator module is element 80 (rather than 82).

Ex. 1013 at 59-62.

v. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art (“POSA”) of the '013 Patent at the time

³ As discussed further in Section IX, notwithstanding the Examiner's analysis of Beach-127 during these related prosecutions, discretionary denial of this Petition is not warranted in this case.

of the alleged invention would have had a bachelor's degree in petroleum, mining, mechanical, or electrical engineering (or a closely related field), and at least two years' experience in designing and developing electromechanical downhole tools, including working with sensors and electronics.

VI. CLAIM CONSTRUCTION

A. “window” (claims 1, 14, 20)

Claim 1 specifies “a window that extends from the exterior surface into optical communication with the sealed interior cavity . . .” Ex. 1001, cl. 1. In the context of the '013 Patent, the term “window” should be construed to require a solid material that is transmissive to a communication signal.

The intrinsic record supports this construction. For example, the specification consistently uses the term “port” to specifically refer to an open void or aperture on the exterior of the tube that may permit fluid passage into the interior cavity. *See, e.g.*, Ex. 1001, 6:54-57 (“Proximate the base portion of the second interior cavity, a port 66 is defined that extends from the exterior surface of the elongate tube body into fluid communication with the first interior cavity.”); *see also id.*, 8:53-56, 9:64-10:3, 10:34-38 (similar descriptions for “port 106,” “port 167,” and “port 186,” respectively.). On the other hand, the specification uses the term “*window*”—not “port”—to refer to structures that allow data transfer via line-of-sight transmission from within an interior cavity to a remote device. *Id.*, 14:47-

58. Notably, during prosecution of the parent '463 Patent, the Patent Owner amended the specification to specify that such data transmission is through a “window,” replacing the word “aperture.” *See* Ex. 1011, 30.

Consistent with these disclosures, dependent claim 2 specifies “a *port* . . . extending from the exterior surface into fluid communication with the first interior cavity,” further suggesting that the term “*window*” in claim 1 is structurally different.

Nevertheless, Petitioner submits that this term need not be construed for this IPR, because the prior art teaches the claim limitation under either interpretation, as explained for Limitation 1[e], *infra*. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (claim terms need only be construed “to the extent necessary to resolve the controversy”).

B. “selectively sealed” (claim 1)

Claim 1 specifies “a selectively sealed interior cavity . . .” Ex. 1001, cl. 1. Petitioner seeks to clarify that, under a plain meaning, “selectively sealed” should be construed to require the capability of being both sealed and unsealed, as a product design feature. Consequently, “a *selectively* sealed interior cavity,” properly construed, would not cover an interior cavity that is designed to be permanently sealed. Otherwise, a construction covering permanently-sealed cavities would effectively render superfluous the inclusion of the word

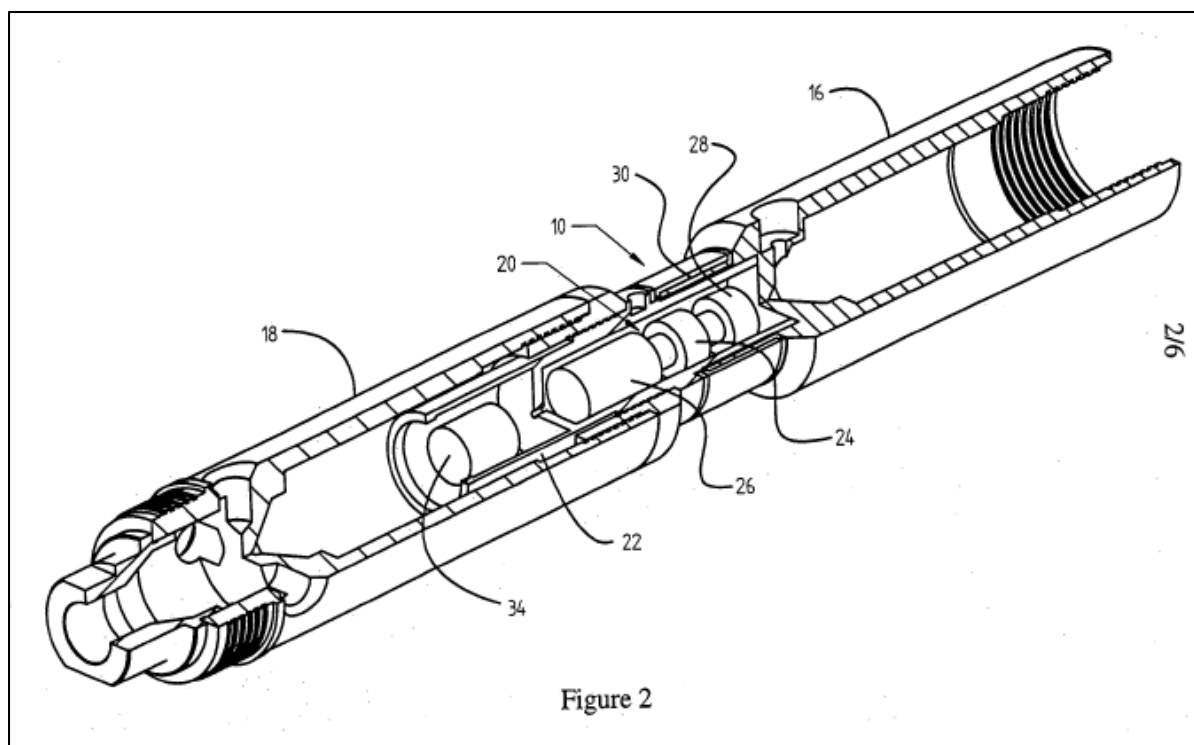
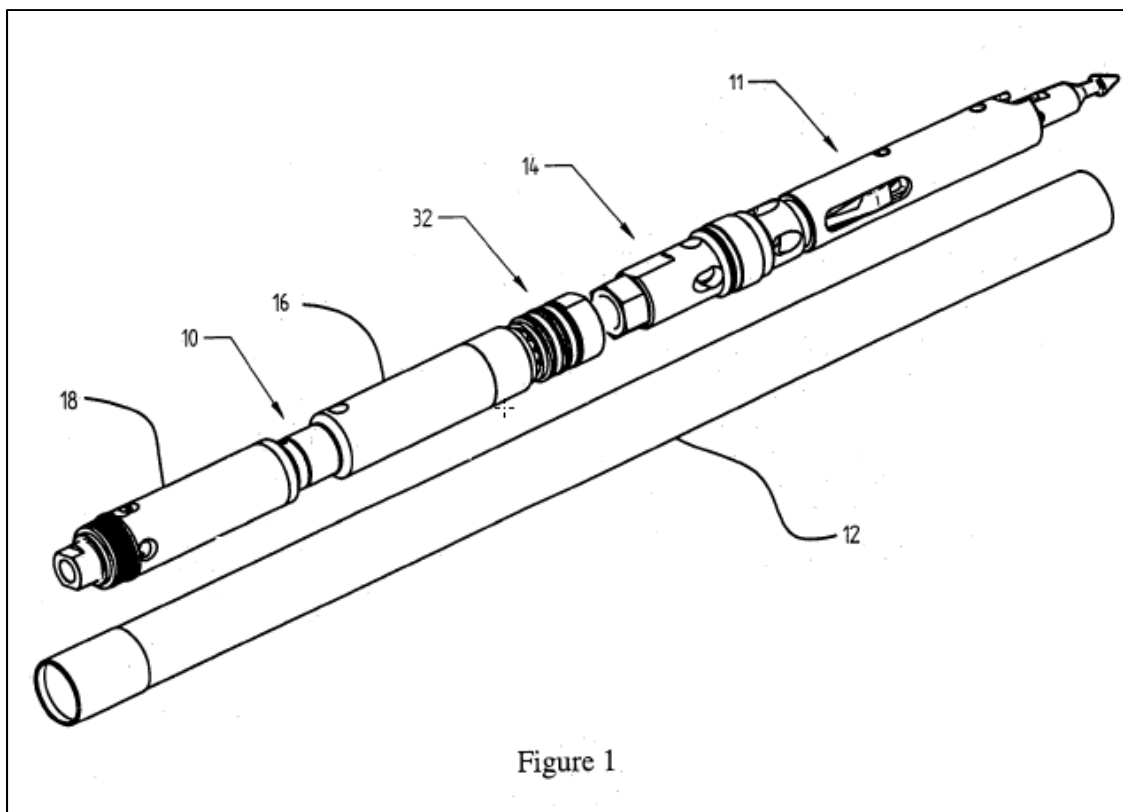
“selectively.” Notably, the claims of the child ’529 Patent specify “a sealed interior cavity,” *see* Ex. 1012, cl. 1, further demonstrating that “a *selectively* sealed interior cavity” entails a different claim scope.

Nevertheless, Petitioner again submits that this term need not be construed for this IPR, because the prior art teaches the claim limitation under either interpretation, as explained for Limitation 1[b], *infra*. *See Nidec*, 868 F.3d at 1017.

VII. OVERVIEW OF THE PRIOR ART

A. Beach-127

Beach-127, entitled “A Core Orientation Tool,” was published on September 25, 2008, and qualifies as prior art to the ’013 Patent under at least 35 U.S.C. § 102(a) and (b). Figure 2 illustrates an embodiment of Beach-127’s core orientation tool, which is coupled to an overall core barrel assembly (Figure 1). Figures 1 and 2 of Beach-127 are reproduced below, respectively.

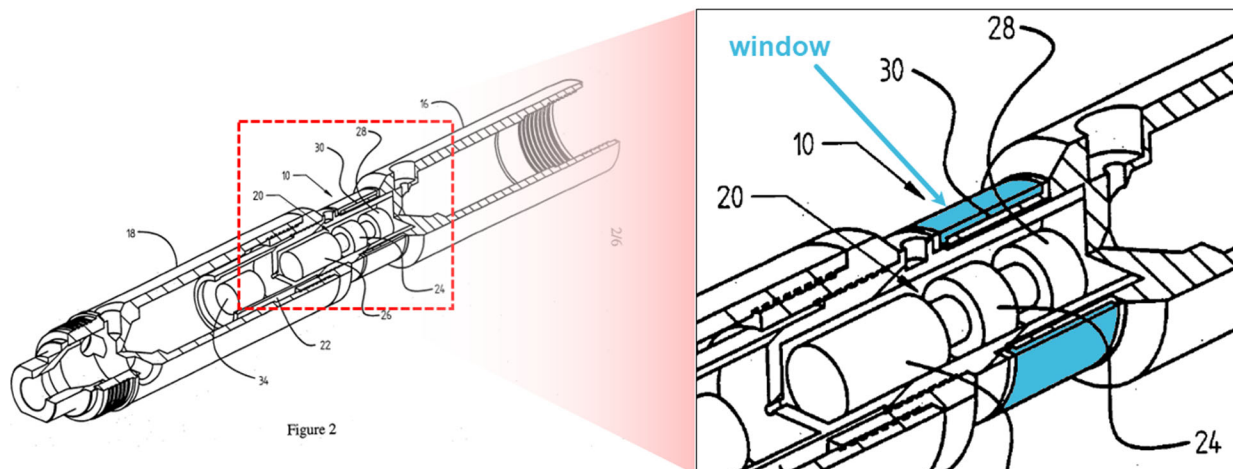


Ex. 1003-Beach-127, Figs. 1-2.

As shown in Figure 2, Beach-127's "core orientation tool 10" includes "an electronic core orientation device or system 20 housed within a body 22 that is coupled to and between the core tube cap 18 and the adaptor 16." *Id.*, 11:9-33. The opposite end of adaptor 16, in turn, is coupled to the "backend assembly 14." *Id.*, 11:18-22. Further, "[t]he system 20 comprises multiple sensors and transducers for sensing various events and orientation data of the tool 10 and core drill." *Id.*, 12:7-9. Specifically, Beach-127 explains that "device 20 is configured to log one or more first indications of orientation of the tool (i.e., core orientation) upon receiving of a trigger signal," which is sent by "a trigger system 24 . . . upon detecting one or more downhole events." *Id.*, 11:33-12:2.

Beach-127 discloses that "system 20 may further comprise a transceiver 28 coupled to an antenna 30 to communicate with a hand-held computer or other like device." *Id.*, 12:24-27; *see also id.*, 17:29-36 ("the transceiver 28 in the tool 10 communicates via wireless communication with the hand-held computer" or other "remote unit"). A POSA would have acknowledged Beach-127's disclosures of "an electronic core orientation device or system 20" that "is housed *within a body 22*," but still communicates via a transceiver with a remote device, as indicating that the body 22 has a window transmissive to the communication signal. Ex. 1022, ¶¶ 75-76 (citing Ex. 1003, 11:9-33, 17:29-36). Consistent with that understanding, as

indicated below, Figure 2 shows a window (below, colored blue), which is situated directly above “antenna 30” and extends to the exterior surface of the assembly:

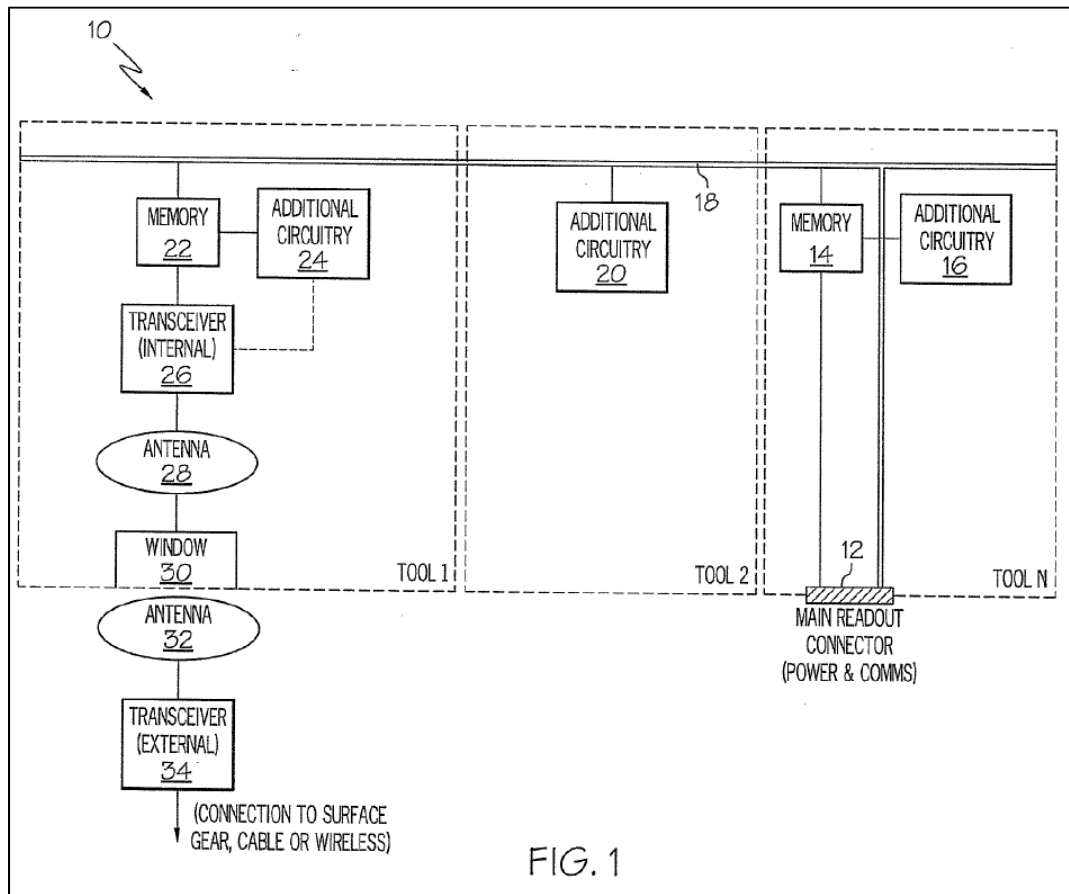


Ex. 1003, Fig. 2 (annotated).

B. Wiese

Wiese, entitled “Apparatus and Method for Memory Dump and/or Communication for MWD/LWD Tools,” was published on January 3, 2008, and is prior art under at least 35 U.S.C. § 102(a) and (b). Wiese describes known issues with transmitting data recorded by downhole drilling tools. Ex. 1004, [0002]. Such issues include the time required to access and download data, and potential contamination and damage to tools that must be opened or disassembled to access the data. *See, e.g., id.*, [0003], [0010]. Wiese seeks “[f]aster and more reliable methods for downloading information accumulated downhole,” and proposes including “a window at the housing” of a downhole assembly to wirelessly transmit data “through the window.” *Id.* [0004]-[0005]. Wiese’s Figure 1 schematic,

reproduced below, depicts the “window 30” of “tool 1,” as a means of permitting data transfer from the internal antenna 28 or transceiver 26 to external antenna 32 and transceiver 34:



Id., Fig. 1, [0015]-[0016].

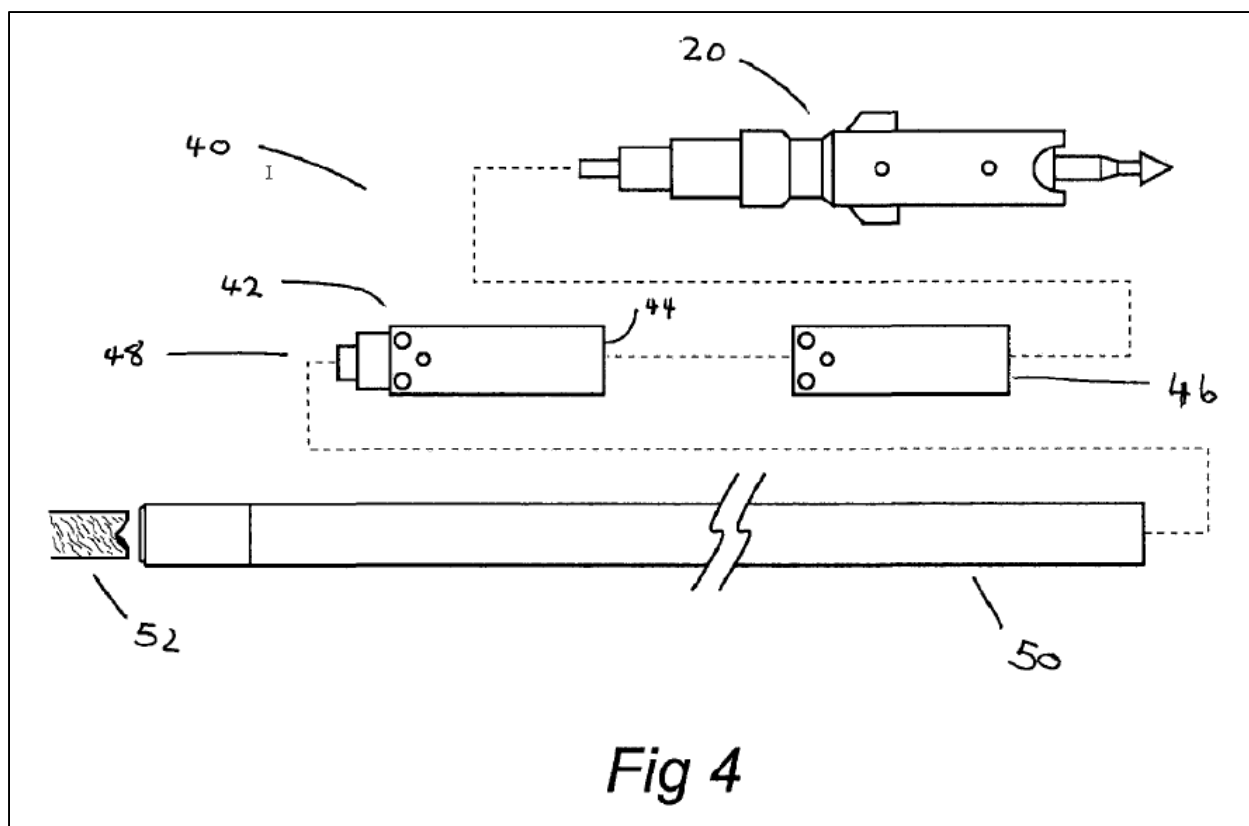
Wiese explains that “each of the lines indicating connection on Fig. 1 may be wired or wireless connections utilizing” various signal types, including “optical signal . . . as appropriate in the specific application.” *Id.*, [0014]. The “window is pressure sealed to the housing, and transmissive to the selected signal type.” *Id.*, [0015]. Wiese further explains that:

The term antenna is broadly used herein to include not only electromagnetic signal propagation but also to mean a device capable of transmitting and receiving the signal contemplated. For example[, w]here infrared (IR) is the signal type, a light emitting diode (LED) would be the “antenna” to transmit the IR signal. Further, while the antenna is illustrated as a separate component from that of the transceiver, it is to be understood that the antenna may form a part of the transceiver in some embodiments.

Id.

C. Klass-839

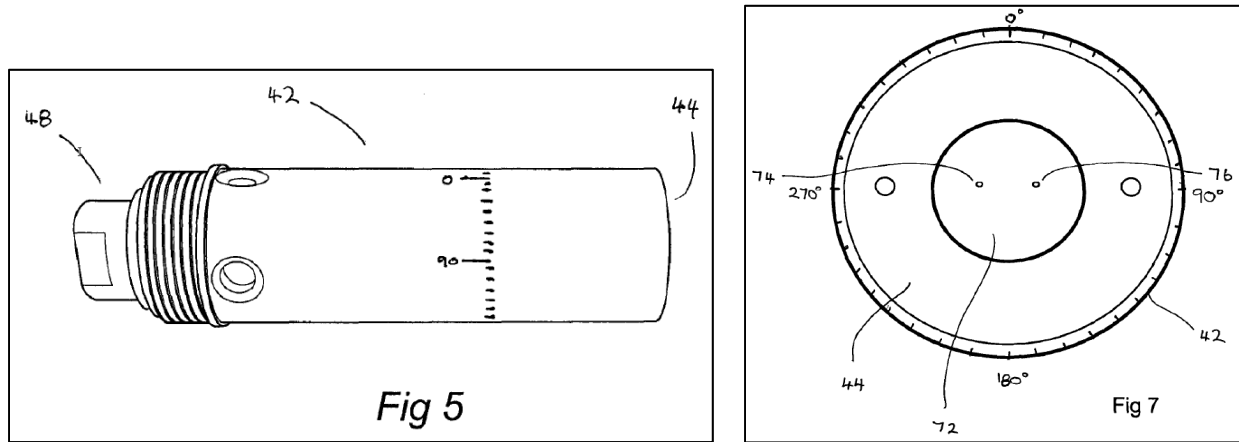
Klass-839, entitled “Core Sample Orientation System, Device, and Method,” was published on February 2, 2012, and qualifies as prior art under at least 35 U.S.C. § 102(a) and (b). Similar to Beach-127, Klass-839 discloses a downhole core sample assembly having a “hermetically sealed core sample orientation data gathering device” which, in turn, “includes a communication means arranged to communicate obtained core sample data” to a remote device. Ex. 1005, 3. Figure 4, reproduced below, shows the core sample data gathering device (42), in the context of the overall assembly (40).



Id., Fig. 4.

For Klass-839's assembly, "[c]ommunication between the orientation data gathering device and the remote orientation data electronic communication device is by wireless communication, such as infra red communication" (*id.*, 5), whereby "a transmitter...use[s] line of sight data transfer through a window, such as by infra red data transfer" (*id.*, 10). Further, in certain embodiments, the data gathering device has "one or more visual indicators to show an operator one or more required directions of rotation of a recovered sample assembly," and "once a required orientation has been established, the remote device "may interrogate the orientation

data gathering device.” *Id.*, 4. Klass-839 discloses such an embodiment with respect to Figures 5 and 7.



Id., Figs. 5, 7.

Klass-839 explains:

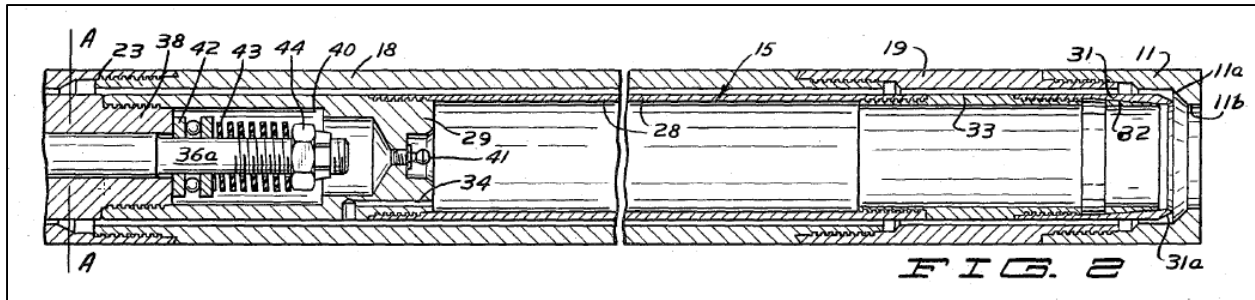
The end 44 for connecting to the greaser unit 46 includes a window (not shown in figure 5 - see figure 7). One or more LED lights [74 and 76] are provided sealed within the device 42 behind the window. A coloured light indication is given to indicate which way (clockwise or anti-clockwise) the device 42 must be rotated to obtain a desired orientation of the core sample still within the inner tube assembly that is connected to the core sample orientation data gathering device 42. For example, a red light may be given to indicate to rotate the device (and thus the core sample) anticlockwise or to the left, and a green light may be given to indicate to rotate the device clockwise or to the right. A combined red and green indication, or a white light indication, or other indication can be given, such as flashing lights, to indicate that the core sample is correctly orientated and ready for marking.

Id., 9-10; *see also id.*, 11 (referring to LEDs 74 (red) and 76 (green) in Figure 7).

As Klass-839 explains, these techniques “provide the advantage of a fully operating downhole tool/device without having to disconnect or disassemble any part of the tool/device from the inner tube and/or from the backend assembly,” while still being able “to determine core sample orientation and/or to gather data recorded by the device/tool.” *Id.*, 14. This “means that there is less risk of equipment failure and drilling downtime, as well as reduced equipment handling time through not having to separate the sections in order to otherwise obtain core sample orientation,” and thus “reliability and efficiency of core sample collection and orientating is improved.” *Id.*

D. Pickard

U.S. Patent No. 3,305,033 (Ex. 1006, “Pickard”), entitled “Core Barrel,” issued on February 21, 1967, and qualifies as prior art under at least 35 U.S.C. § 102(a) and (b). Pickard is likewise directed to an assembly for use in exploratory mining and drilling. Ex. 1006, 1:10-70. Pickard’s proposed core barrel design features a threadable “grease fitting 41” mounted into a port that feeds into an elongated bore 40 (at the end of cap 29), to allow selective passage of grease into the bore. This design is reflected in Figure 2:



Id., Fig. 2.

VIII. APPLICATION OF PRIOR ART TO THE CHALLENGED CLAIMS

A. Ground I: Obviousness by Beach-127 alone or in view of Wiese

1. Claim 1

a) Limitation 1[pre]: “A core barrel head assembly having an exterior surface and comprising:”

To the extent the preamble is limiting, Beach-127 discloses it. Beach-127 discloses a “core orientation tool” that is coupled to “an inner barrel assembly and core tube.” Ex. 1003, 9:27-29. In Figure 1 below, “[t]he core orientation tool is shown in association with an inner barrel assembly 11 which comprises a core tube 12 for receiving a core being cut by a core drill, and a backend assembly 14 that is attached to the core tube 12 for lowering and retrieving the core tube 12 from the core drill. *Id.*, 11:9-16, Fig. 1. Further, the “tool 10 is coupled at one end to a conventional core tube cap 18” and coupled at the opposite end to an “an adaptor 16.” *Id.*, 11:16-22. In turn, the adaptor is coupled to “backend assembly 14.” *Id.*

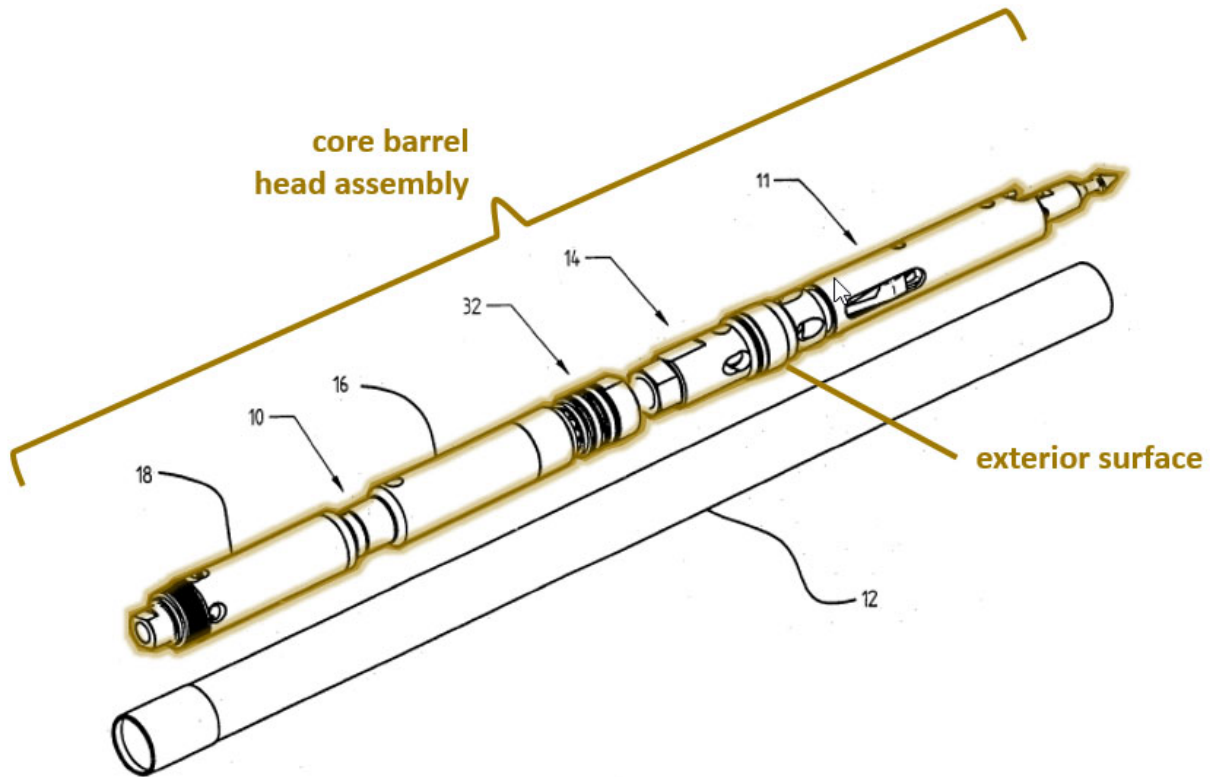


Figure 1

Id., Fig. 1 (annotated). As reflected above, the assembly spanning from the core tube cap 18 to the inner assembly 14 is “core barrel head assembly,” and has an “exterior surface.” Ex. 1022, ¶ 93 (explaining that “head” refers to this being the upper portion of the larger assembly).

Figure 2, below, shows in further detail a cutaway portion of the above assembly, spanning from the core tube cap 18 to the adaptor 16. As seen, the core orientation tool 10 “comprises an electronic core orientation device or system 20 housed within a body 22 that is coupled to and between the core tube cap and the adaptor 16.” Ex. 1003, 11:30-33.

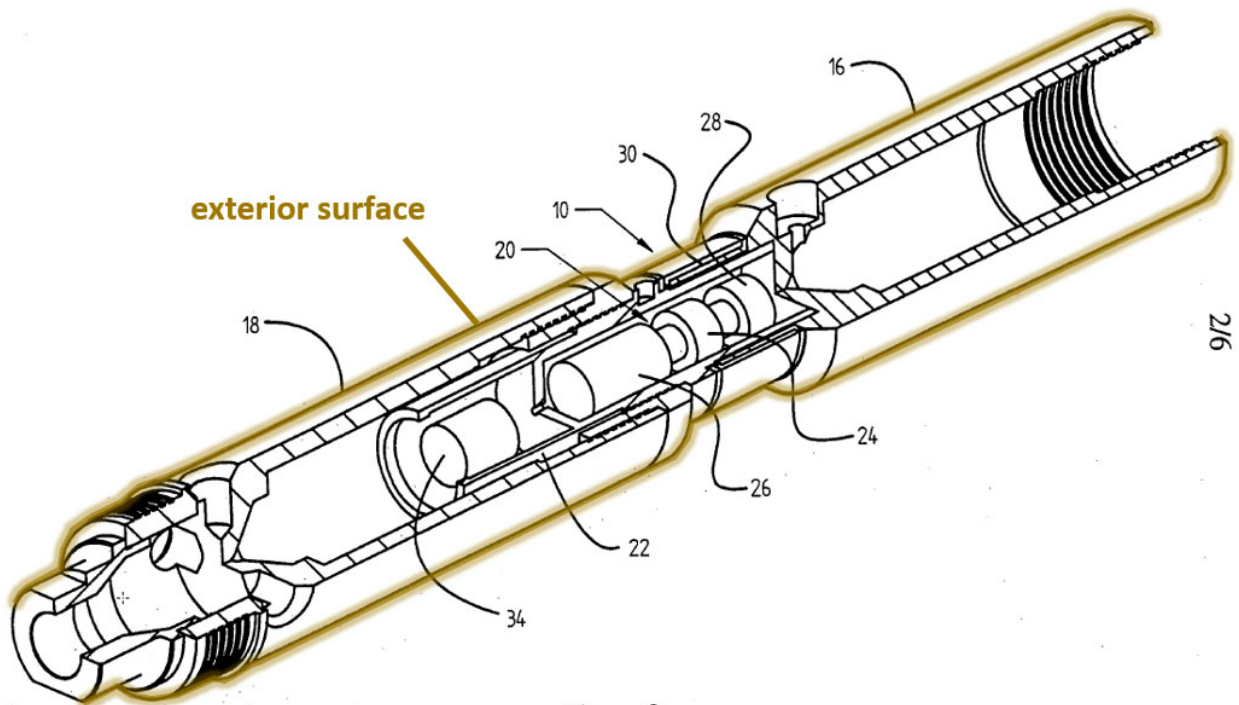


Figure 2

Id., Fig. 2 (annotated). Ex. 1022, ¶ 94.

Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s acquiescence, that Beach-127 discloses the preamble. *See* Ex. 1014, 1.

b) Limitation 1[a]: “a first interior cavity;”

Beach-127 discloses “a first interior cavity.” As discussed above, and as shown in Figures 1 and 2, Beach-127’s core barrel head assembly includes an adaptor 16. Beach-127 explains that “adaptor 16 [is] used to couple an opposite end of the tool 10 to the remainder of the backend assembly 14.” Ex. 1003, 11:20-22, Figs 1-2. Specifically, the adaptor couples to backend assembly 14 by way of a bearing 32. *See id.*, 15:5-9.

As reflected in the cutaway view of Figure 2 (below), adaptor 16 forms an interior cavity (annotated in green):

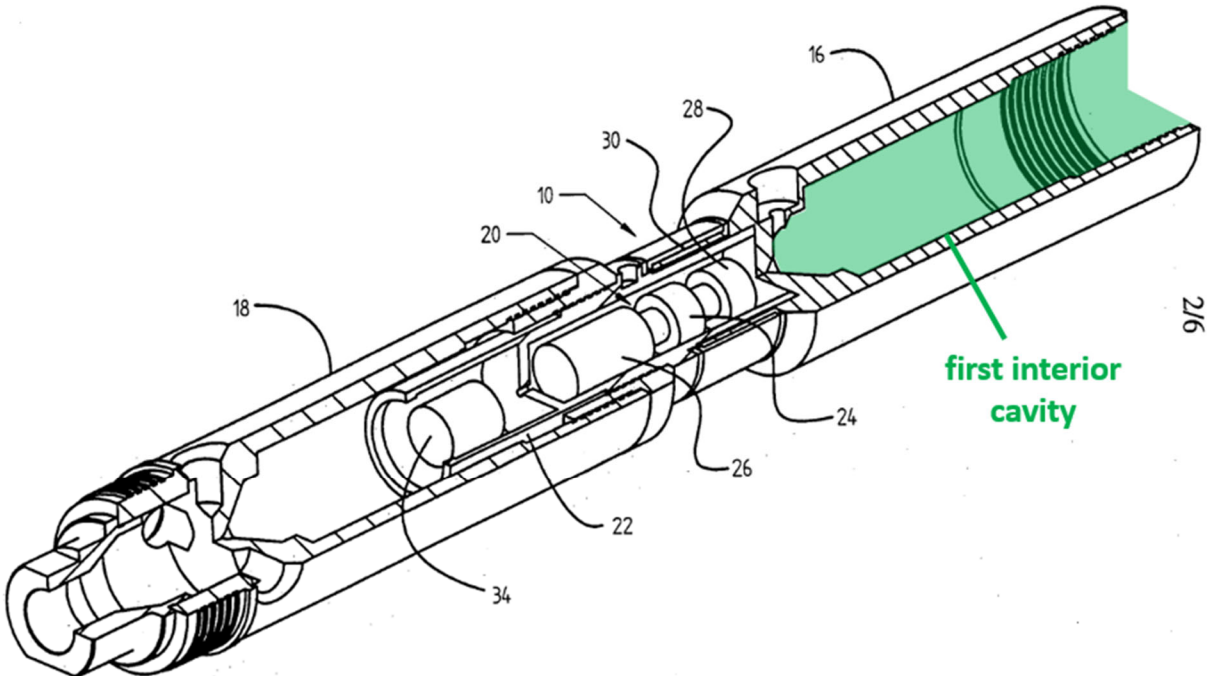


Figure 2

Id., Fig. 2 (annotated). Ex. 1022, ¶¶ 98-99.

Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 1.

c) Limitation 1[b]: “a selectively sealed interior cavity spaced distally from the first interior cavity and having a closed proximal end;”

Beach-127 discloses this limitation. As discussed above, Beach-127’s assembly includes a core tube cap 18, which is coupled to the core orientation tool 10 at one end. *See* Ex. 1003, 11:18-22, Figs. 1-2.

As reflected in the cutaway view of Figure 2 (below), the core tube cap 18 and body 22 collectively form a “sealed interior cavity” (annotated in red):

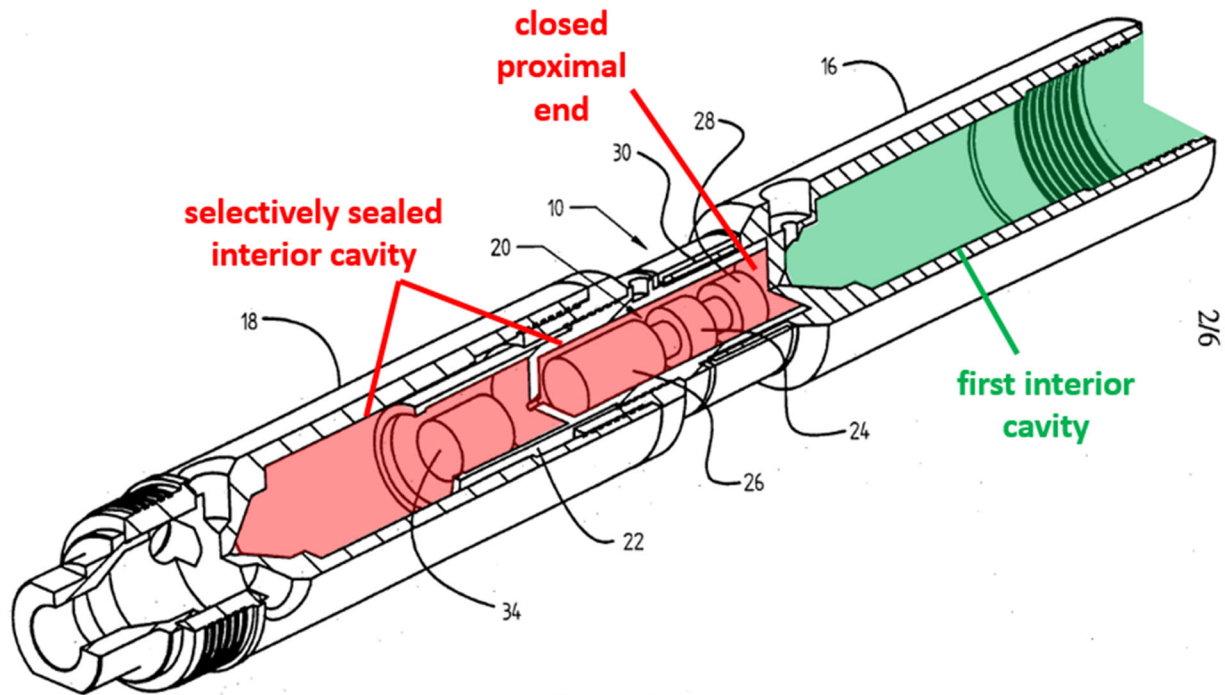


Figure 2

Id., Fig. 2 (annotated); Ex. 1022, ¶¶ 102-03.

As seen in Figure 2, this “sealed interior cavity” terminates (*i.e.*, is “closed”) at the right-hand side of the tool 10 when coupled to the adaptor 16—that is, at the “opposite end” of the tool relative to where the core tube cap is coupled. *See id.*, 9:27-33, Fig. 2. In Beach-127’s assembly, this closed end is the “proximal end,” using the “inner barrel assembly” (also referred to as the “head assembly”) as the

point of reference.⁴ *See id.*, Fig. 1; Ex. 1022, ¶ 103. Accordingly, Beach-127's sealed interior cavity has a "closed proximal end." Further, as reflected in Figure 2, given that this proximal end of tool 10 is "coupled" to adaptor 16, *id.*, 11:18-22, the sealed interior cavity is also "spaced distally from the first interior cavity" (green above).

Finally, the "sealed interior cavity" above is formed in part by core tube "cap" which, as shown in Figure 2, is threadably coupled to the other side of tool 10. Based on Beach-127's disclosure, such a cap has the capability of being sealed or unsealed. Ex. 1022, ¶ 104. Accordingly, Beach-127 discloses that this cavity is indeed a

⁴ For context, the '013 Patent specification uses the terms "proximal" and "distal" inconsistently. As discussed in Section IV.A, during prosecution of the child '529 Patent, the Patent Owner amended the specification "to ensure that the terms 'proximal' and 'distal' are used consistently." Ex. 1013, 76, 59-62. Considering those amendments, the specification consistently uses the term "proximal end" with the head assembly as the point of reference, such that the "distal end" is nearer to the drill bit end of the drill string. *See, e.g.*, '529 Patent, 6:46-48 ("The core barrel head assembly 30 has a distal end 32 that is operatively oriented toward the drill bit end of the drill string and an opposed proximal end 34"); Figs. 1, 5.

“*selectively* sealed interior cavity,” under the plain meaning of that term. *See* Section VI.B, *supra*.⁵ Ex. 1022, ¶ 104.

Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 1-2.

d) Limitation 1[c]: “a threaded proximal end portion for coupling to a wire line retrieval portion of a head assembly;”

Beach-127 discloses this limitation. Specifically, Beach-127 discloses that “the adaptor 16 [is] used to couple an opposite end of the tool 10 to the remainder of the backend assembly 14.” Ex. 1003, 11:18-22. To achieve that coupling, as shown in Figure 2, the adaptor has a “threaded end portion”:

⁵ Alternatively, if “selectively sealed interior cavity” were construed broadly—i.e., not requiring the added capability of being unsealed—Beach-127 would still meet this limitation for the reasons shown and described above.

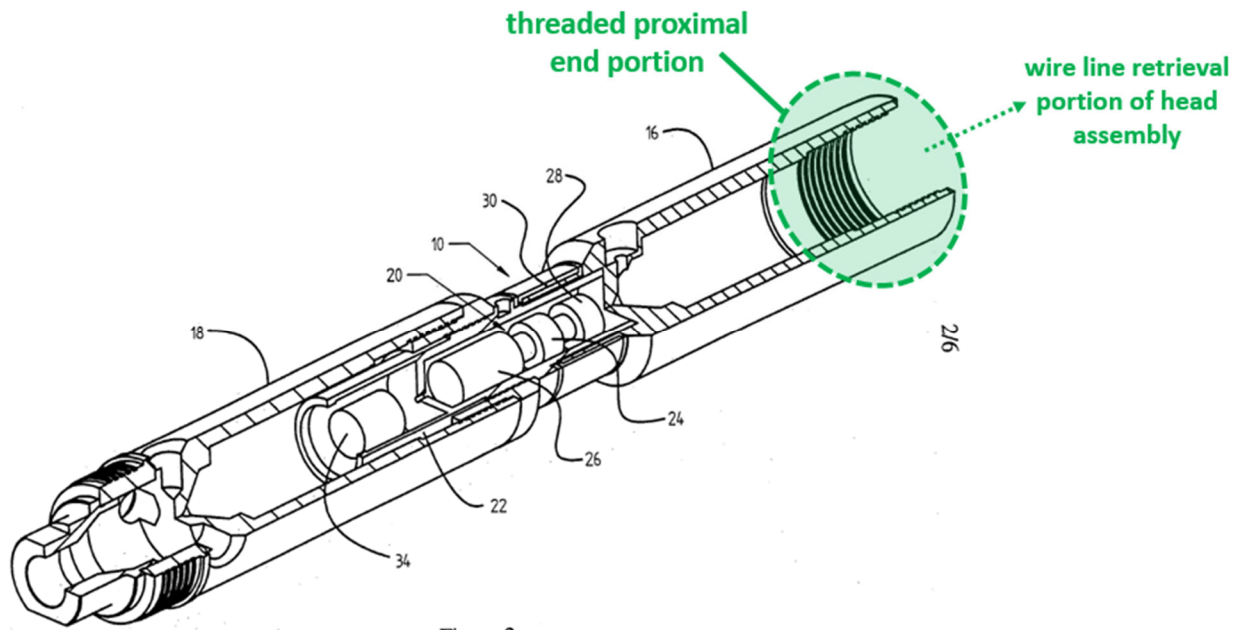


Figure 2

Id., Fig. 2 (annotated).

For context, Beach-127 incorporates by reference WO 2007/109848 (Ex. 1009, “Beach-848”), for its corresponding disclosure of “devices, systems, and methods for orientating a core sample.” Ex. 1003, 1:21-31. Consistent with Figure 2 of Beach-127, Beach-848 explains at length how “helical threads” are used as “coupling mechanisms” in core barrel head assemblies. *See* Ex. 1009, 6:31-33, 8:5-24, 10:36-11:4.

Further, as discussed for Limitation 1[b], *supra*, the threaded end portion of Figure 2 is “proximal” according to the convention of the ’013 Patent (*i.e.*, with respect to the head assembly), and is thus a “threaded *proximal* end portion.” Ex. 1022, ¶¶ 106-08.

Finally, the adaptor's threaded proximal end portion is “for coupling to a wireline retrieval portion of a head assembly,” as that term would be understood from the '013 specification as well as the understanding of a skilled artisan in the field. *See* Ex. 1001, 5:63-67, 6:45-48, Figs. 1, 5-6; Ex. 1022, ¶ 109. Specifically, as indicated in Figure 1 below, for Beach-127's “core barrel head assembly” (*see* Limitation 1[pre]), the “wireline retrieval portion” includes “backend assembly 14” along with its “bearing 32,” as well as “inner barrel assembly 11:”

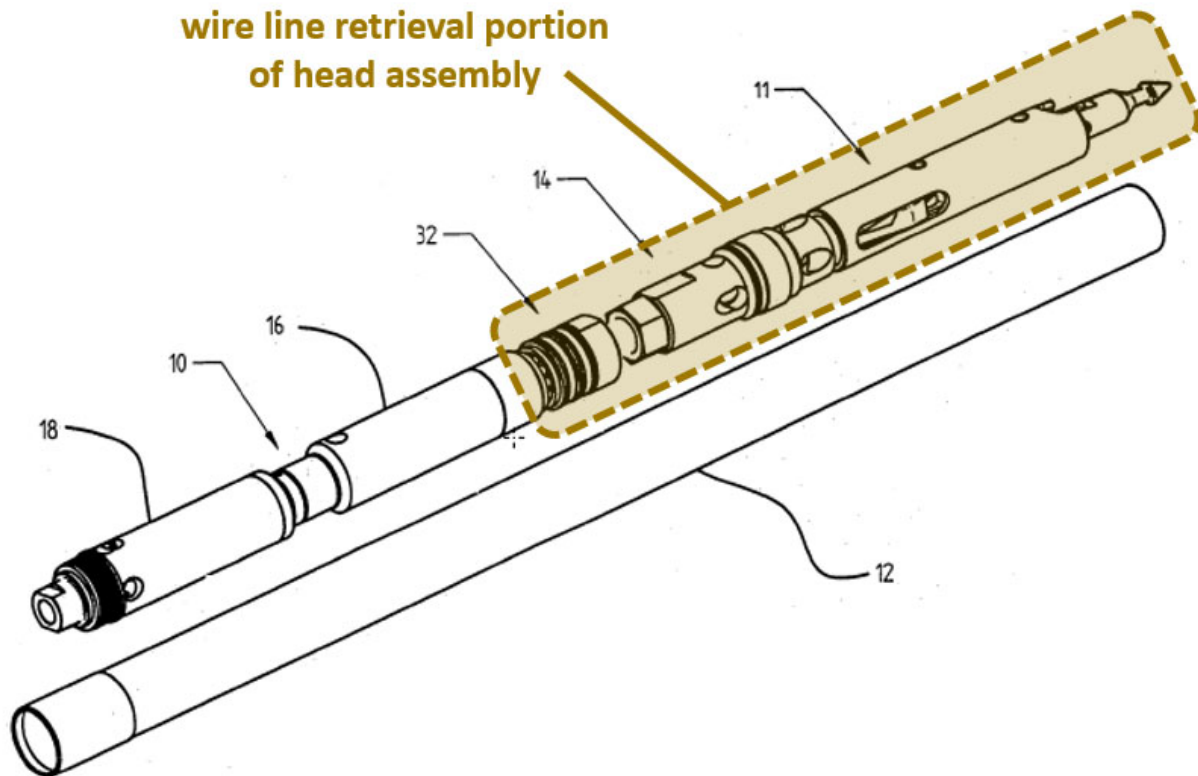


Figure 1

Ex. 1003, Fig. 1 (annotated); *see also id.*, 11:11-22, 15:5-9; Ex. 1022, ¶¶ 109-10.

Further, the intrinsic record demonstrates the Office's finding, and the Patent

Owner's acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 2.

- e) **Limitation 1[d]: “a base portion, wherein the first interior cavity extends distally from the threaded proximal end portion to the base portion;”**

Beach-127 discloses this limitation. The below annotation of Figure 2 indicates the “base portion” of Beach-127's “adaptor 16:”

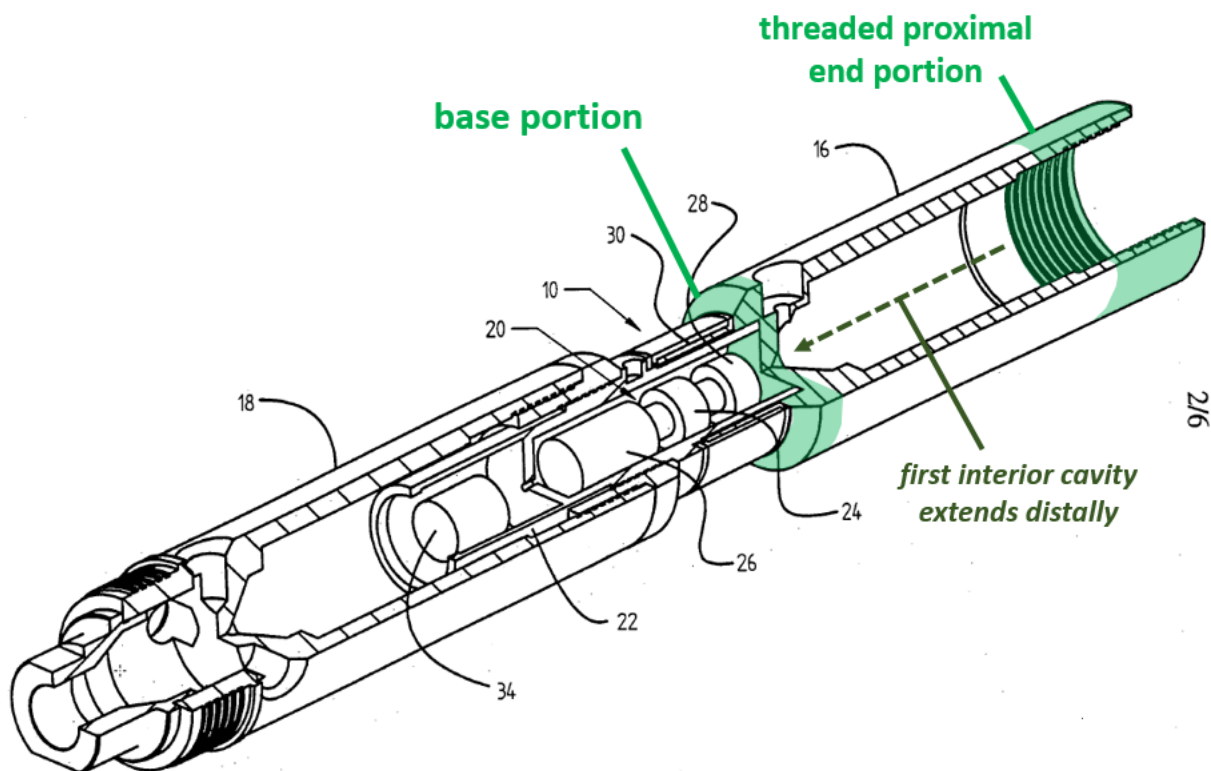


Figure 2

Id., Fig. 2 (annotated).

As shown above, the “base portion” is at the opposite end of adaptor 16 relative to the “threaded proximal end portion” discussed for Limitation 1[c]. *See* Section VIII.A.1(d), *supra*. This opposite end of adaptor 16 is its “distal” end, according to the convention of the '013 Patent. Ex. 1022, ¶¶ 112-13. As such, the

“first interior cavity” formed by adaptor 16 (Section VIII.A.1(b), *supra*) “extends distally from the threaded proximal end portion to the base portion,” as required. Ex. 1022, ¶ 113.

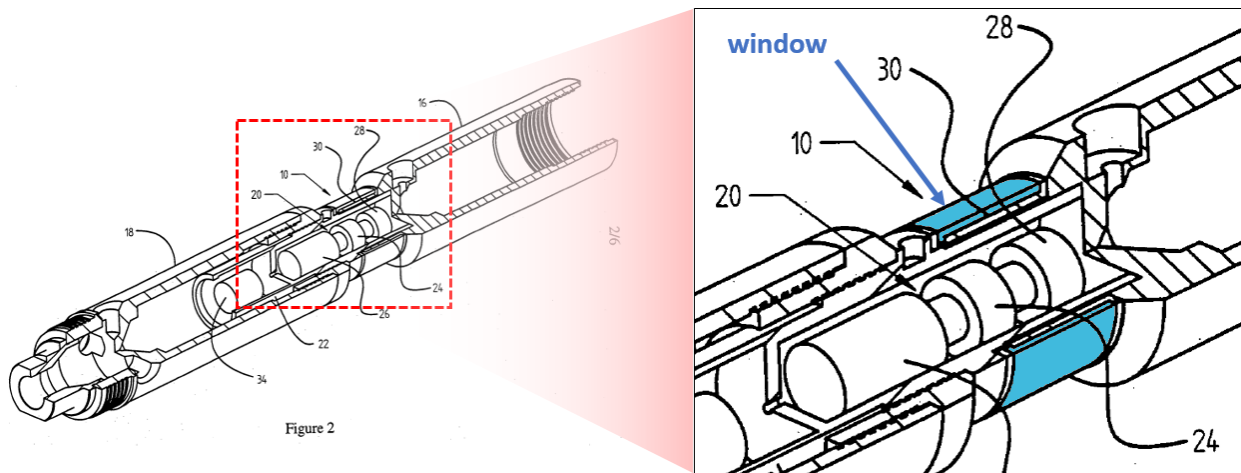
Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 2.

f) Limitation 1[e]: “a window that extends from the exterior surface into optical communication with the sealed interior cavity proximate the closed proximal end of the sealed interior cavity;”

This limitation is disclosed by Beach-127, or else a POSA would have been motivated to implement this feature based on Beach-127 alone or in view of Wiese.

As discussed above for Limitation 1[b], Beach-127’s sealed interior cavity is formed, in part, by “a body 22.” *See* Section VIII.A.1(c), *supra*. Specifically, Beach-127 teaches that “[t]he tool 10 comprises an electronic core orientation device or system 20 *housed within a body 22* that is coupled to and between the core tube cap 18 and the adaptor 16.” Ex. 1003, 11:30-33. Beach-127 explains that “[t]he orientation system 20 may further comprise a transceiver 28 coupled to an antenna 30 to communicate with a hand-held computer or other like device.” *Id.*, 12:24-28; *see also id.*, 17:29-31 (the “hand-held computer” is one example of “a remote unit”). Beach-127 also explains that “the transceiver 28 in the tool 10 communicates via wireless communication with the hand-held computer.” *Id.*, 17:33-36.

Based on these teachings, along with the cutaway view of Figure 2, a POSA would have appreciated that Beach-127's assembly housing includes a "window" that is "proximate the closed proximal end of the sealed interior cavity" identified for Limitation 1[b]. *See* Ex. 1022, ¶¶ 116-18. The claimed "window" is indicated (in blue) in the below annotation of Figure 2:



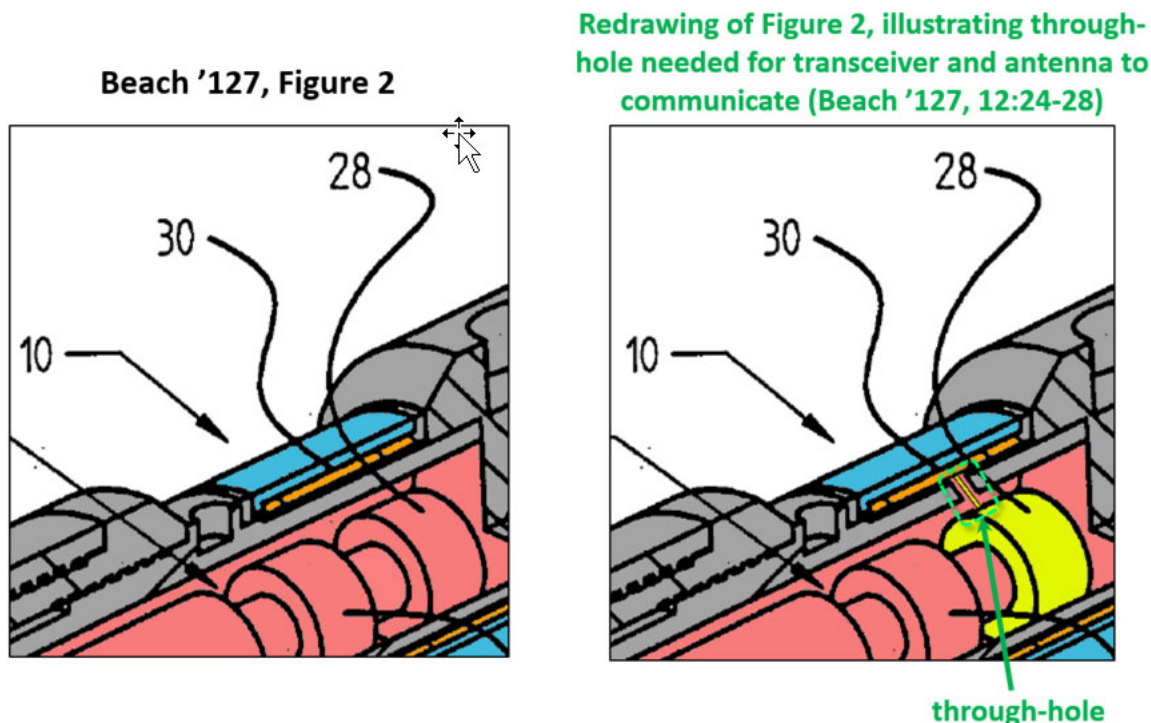
Ex. 1003, Fig. 2 (annotated).

As seen above, Beach-127's "window" is depicted as "extending from the exterior surface" of the core barrel head assembly—specifically, from the outer surface of the body 22.⁶ The window is also situated directly above the "antenna 30"

⁶ As shown in Figure 2, Beach-127 discloses a "window" even if that term were narrowly construed to require a solid material transmissive to a communication signal. *See* Section IV.A., *supra*; Ex. 1022, ¶ 118.

of Beach-127's electronic system, which in turn, is taught as being communicatively coupled to the transceiver 28 residing within the sealed interior cavity. *See id.*, 12:24-28. From these disclosures, a POSA would have appreciated that, in Beach-127's Figure 2 core barrel assembly, the window is the feature that permits data transmission from the electronic system 20 (*i.e.*, within the assembly), to the handheld computer or other remote unit (*i.e.*, external to the assembly). Ex. 1022, ¶ 119.

While not explicitly shown in Figure 2, a POSA would have further appreciated that Beach-127's teaching that transceiver 28 is communicatively "coupled to . . . antenna 30" (*see* Ex. 1003, 12:24-28) implies that a through-hole would be present in body 22 in the region under antenna 30, in order to permit reliable communication between the transceiver and antenna. Ex. 1022, ¶¶ 120-21. The inherently-present through-hole, while not shown in the cutaway rendering of Figure 2 (below, left), is illustrated in the following redrawing of Figure 2 (below, right):



Ex. 1022, ¶ 121.

The through-hole for communicative coupling between the antenna and transceiver demonstrates that the “sealed interior cavity” identified for Limitation 1[b] extends to and incorporates both components. *Id.*, ¶ 122. With the antenna situated directly below the window, the “window” in Beach-127 Figure 2 therefore extends from the exterior surface *into communication with the sealed interior cavity*, as required. *Id.*

Consistent with this understanding, during prosecution of the child '529 Patent, the Office found that Beach-127 discloses “a window (illustrated in Fig. 2[]) that extends from the exterior surface into optical communication with the sealed interior cavity,” as recited herein. *See* Ex. 1013 at 192 (emphasis in original).

Further, the Examiner’s Figure 2 annotation identified the “window” as being proximate the “closed proximal end” of the “sealed interior cavity,” which is “adjacent [the] base portion.” *Id.* Patent Owner did not dispute the Office’s findings regarding how Beach-127 discloses this limitation. *See* Ex. 1013 at 77; Ex. 1014, 2-3. Accordingly, the intrinsic record demonstrates Patent Owner’s acquiescence that Beach-127 discloses this limitation. Ex. 1022, ¶ 124.

(1) Obviousness based on Beach-127, particularly in view of Wiese.

Even if Beach-127 were interpreted as *not* disclosing “a window that extends from the exterior surface into optical communication with the sealed interior cavity,” it would have been obvious to a POSA to implement that feature.

First, a POSA would have appreciated that optical communication techniques—*e.g.*, infrared (IR) or visible light—were, at the time of the ’013 Patent priority date, common and straightforward methods for transferring data from downhole equipment to surface equipment. Ex. 1022, ¶ 126. As Dr. Rodgers explains, at the time of the alleged invention, it was known that communicating wirelessly using *optical* signals had advantages over other wireless signal types, in terms of efficiency, latency, and data transmission capacity, and that such benefits would have translated to the downhole assemblies. *See id.* Thus, it would have been obvious to implement Beach-127’s Figure 2 embodiment such that its “window . . .

extends from the exterior surface into *optical* communication with the sealed interior cavity,” based on the knowledge and skill of a POSA. *Id.*, ¶ 127.

Moreover, the Wiese reference describes a configuration that transfers data via optical signals from a downhole assembly to an external device, through “a window at the housing” of the assembly. Ex. 1004, [0005], [0015]. As indicated below, Wiese discloses, in Figure 1, a “schematic tool 10” including a “tool 1,” which features an internal transceiver 26 (yellow) communicably coupled to an internal antenna 28 (orange), and a window 30 (blue):

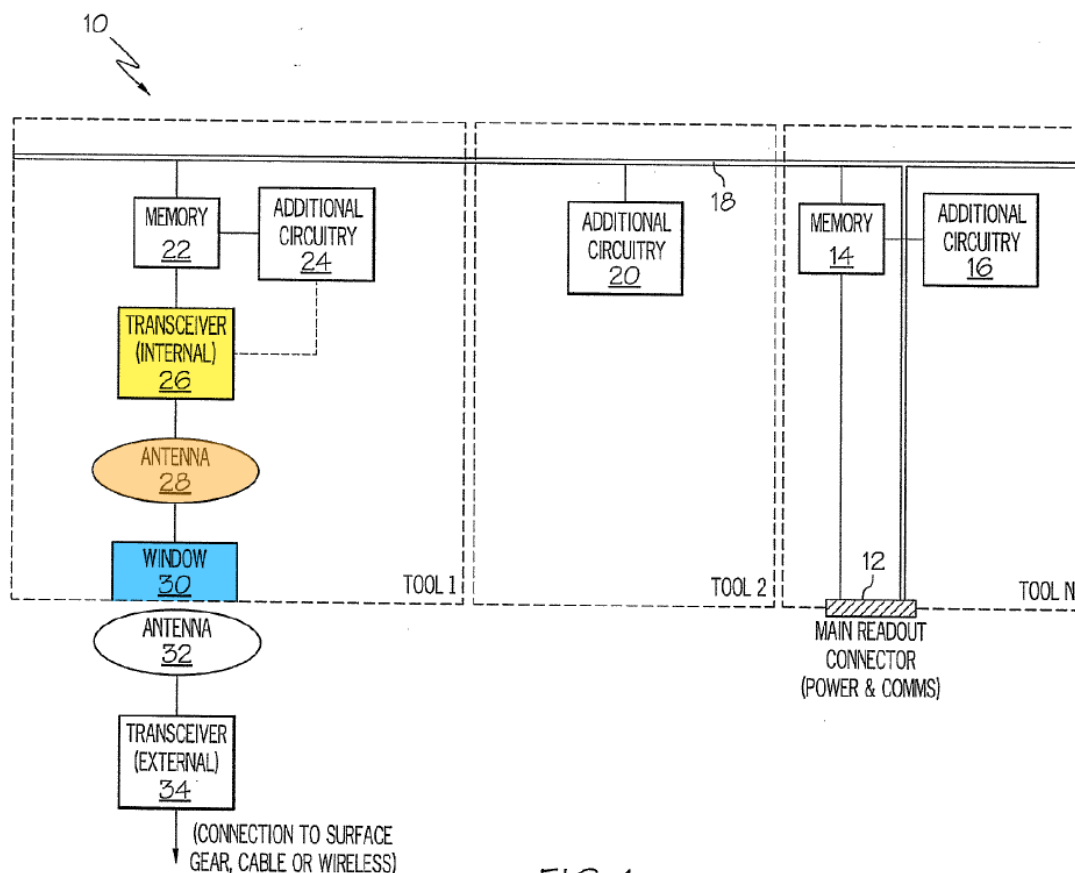


FIG. 1

Id., Fig. 1 (annotated).

Wiese describes its “window” as being “transmissive” to the relevant transceiver signal, “such that the signal is receivable outside of the housing through the window” to external antenna 32 and external transceiver 34. *Id.*, [0005], [0015], Fig. 1. Wiese further notes that “each of the lines indicating connection in Fig. 1 may be wired or wireless connections utilizing,” *inter alia*, an “optical signal,” [0014], and that “[f]or example[, w]here infrared (IR) is the signal type, a light emitting diode (LED) would be the ‘antenna’ to transmit the IR signal.” *Id.*, [0015]. The “window is *pressure sealed* and transmissive to the selected signal type” such that, for infrared signals “for example, the window 30 may be glass or other material transmissive to IR light.”⁷ *Id.* Finally, Wiese notes that “while the antenna is illustrated as a separate component from that of the transceiver, it is to be understood that the antenna may form part of the transceiver in some embodiments.” *Id.*

Further, Wiese provides a teaching, suggestion, or motivation for implementing “a window that extends from the exterior surface” of a downhole assembly “into optical communication with the sealed interior cavity” in the manner shown above: whereas conventional downhole assemblies required being opened at

⁷ Wiese—like Beach-127—thus discloses a “window” even if that term were construed to require a solid material transmissive to a communication signal, as discussed above. *See* Section VI.A, *supra*.

surface locations—and were thus time-consuming and subject to damage and/or contamination, *id.*, [0003], [0010], Wiese’s configuration provided a “[f]aster and more reliable method[] for downloading information accumulated downhole . . .” *Id.*, [0004].

Accordingly, it would have been obvious to implement Beach-127’s Figure 2 configuration with “a window that extends into optical communication with the sealed interior cavity” as taught in Wiese, to provide a reliable, efficient way to transfer the orientation data obtained Beach-127’s electronic device or system 20, to

the remote unit.⁸ Ex. 1022, ¶¶ 128-33. Specifically, it would have been obvious to implement Beach-127's assembly as shown in Figure 2, with the "antenna 30" taking the form of an LED array (such as infrared LED array), as taught in Wiese. *Id.*, ¶ 133. In such an implementation, the LED array "antenna" would still need to be communicatively coupled to transceiver 28, which resides in the sealed interior cavity, but the communication link would be optical. *Id.* Beach-127's window

⁸ While Wiese mentions that its drilling tools are "ubiquitously used in the hydrocarbon exploration and production (E&P) industry," Ex. 1004, [0002], it does not restrict its proposed tool to particular downhole drilling applications. At the time of the alleged invention, a POSA would have appreciated that features of downhole equipment for use in the oil and gas exploration may just as well apply to downhole equipment for use in core mineral exploration. Ex. 1022, n.5.

Accordingly, a POSA would have looked to such references for improving core mineral exploration equipment. *Id.* The Patent Owner itself has acknowledged this common ground with respect to the subject matter of the Challenged Claims. *See* WO 2013/126955 to Hejleh et al., Ex. 1008, [0003] ("As part of mining/oil & gas exploration activities, as well as extracting rock samples for construction/ civil engineering, there is a need to obtain underground 'core' samples for analysis by geologists.")

would thus “extend[] into optical communication with the sealed interior cavity,” as required. *Id.* Dr. Rodgers shows two exemplary illustrations demonstrating how applying Wiese’s teachings to Beach-127’s assembly would satisfy this limitation. *Id.*, ¶¶ 134-36.

It would have been straightforward for a POSA to implement Beach-127’s assembly according to Wiese’s teachings. As Dr. Rodgers explains, in the context of downhole equipment, configurations having LED arrays, and optically transmissive windows for external communication, were well within the level of ordinary skill in the art. *Id.*, ¶ 137. Moreover, Wiese explicitly discloses a schematic for a downhole tool that includes a transceiver, an antenna, and a pressure-sealed “window at the housing” of the tool (*see* Ex. 1004, [0005], [0015])—three key components likewise featured in “tool 10” of the Beach-127 Figure 2 assembly (*see* Ex. 1003, 12:24-27, 17:29-36, Fig. 2). A POSA would have thus recognized that Wiese’s teaching of implementing the downhole assembly’s “antenna” as an LED array could have been readily applied to Beach-127’s assembly. *Id.*, ¶ 138. Doing so would have constituted nothing more than the application of known techniques (*e.g.*, using an LED array as an “antenna” for downhole equipment—whether separate from, or integrated with, the downhole transceiver, as collectively taught in Wiese) to a known device ready for improvement (*e.g.*, Beach-127’s assembly, which already includes an “antenna 30” and a transmissive window) to obtain

predictable results (*e.g.*, facilitating optical communication from Beach-127's downhole assembly to the remote unit, efficiently and reliably, using a simple configuration). *See KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."). Ex. 1022, ¶ 139. Moreover, the choice of an optical signal, as opposed to other segments of the electromagnetic spectrum, would have been obvious to try as one of a limited number of solutions for transmitting data externally from the downhole assembly, and a POSA would have had a reasonable expectation of success in implementing these modifications to Beach-127, for the reasons described above. *Id.*; *KSR*, 550 U.S. at 420.

g) Limitation 1[f]: "at least one electronic instrument that is configured to obtain orientation data,"

Beach-127 discloses this limitation. Beach-127 explains that the core orientation tool 10 "comprises an electronic core orientation device or system 20 housed within a body 22 that is coupled to and between the core tube cap and the adaptor 16." Ex. 1003, 11:30-33. The electronic device/system 20 (an electronic instrument) is indicated below:

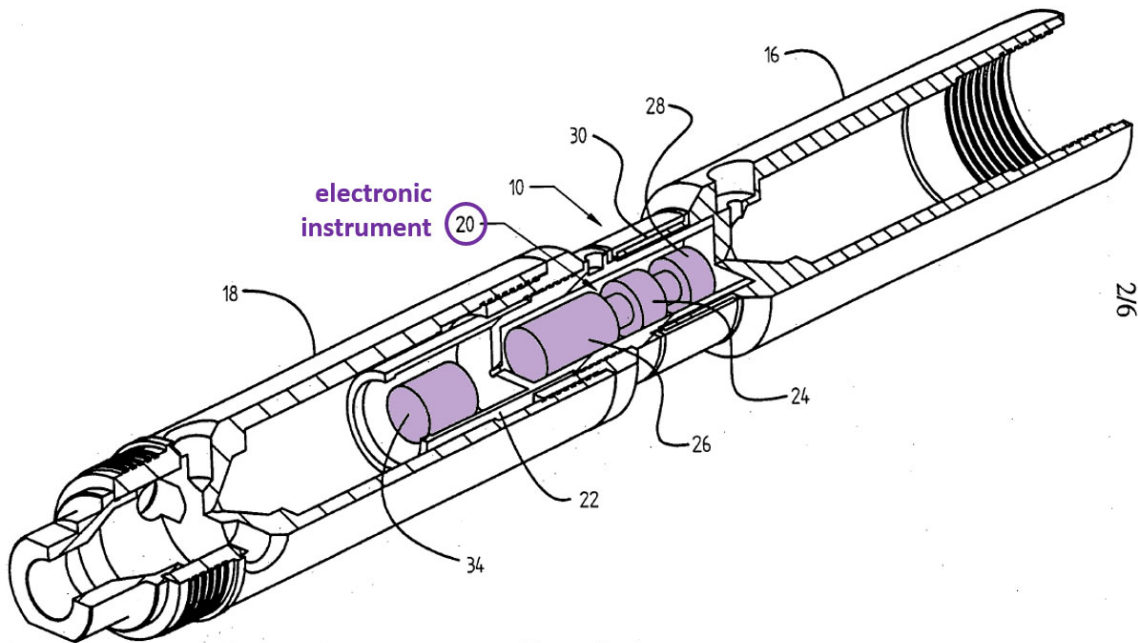


Figure 2

Id., Fig. 2 (annotated); Ex. 1022, ¶ 140.

Beach-127 explains that “device 20 is configured to log one or more first indications of orientation of the tool (*i.e.*, core orientation) upon receiving of a trigger signal.” Ex. 1003, 11:33-36; *see also id.*, 2:26-3:2, 3:14-16, 6:28-30, 7:33-35, 8:15-17. Specifically, “[t]he first indications of orientation may comprise one or a combination of borehole dip, borehole azimuth, core orientation, core dip and core azimuth.” *Id.*, 7. Beach-127’s electronic instrument is thus “configured to obtain orientation data.” Ex. 1022, ¶¶ 141-42.

Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 3.

h) Limitation 1[g]: “wherein the at least one electronic instrument comprises at least one digital and/or

electro-mechanical sensor in a core orientation data recording tool;”

Beach-127 discloses this limitation. Beach-127 teaches that its “‘electronic orientation device’ is intended to denote an electronic device or system that utilises electronic sensors and transducers such as but not limited to accelerometers, inclinometers, gyroscopes and magnetometers.” Ex. 1003, 10:19-23. As Beach-127 explains:

The system 20 comprises multiple sensors and transducers for sensing various events and orientation data of the tool 10 and core drill. The sensors may comprise for example accelerometers, gyroscopes, physical switches, magnetometers, vibration sensors, inclinometers, inductive RPM sensors, flow sensors and pressure sensors.

Id., 12:7-24; *see also id.*, 14:35-15:1 (“[S]ensors may be provided in the module 26 or trigger system 24 to sense the speed, direction, or change in speed or direction of rotation of the core drill.”). A POSA would have appreciated that such sensors are “electromechanical sensors,” and may optionally be “digital” rather than analog. Ex. 1022, ¶¶ 143-44; that is, there are “digital and/or electromechanical sensors,” as required. With respect to Figure 2, Beach-127’s teachings indicate that such sensors include gyroscope 34, along with other sensors incorporated within orientation module 26 and trigger system 24:

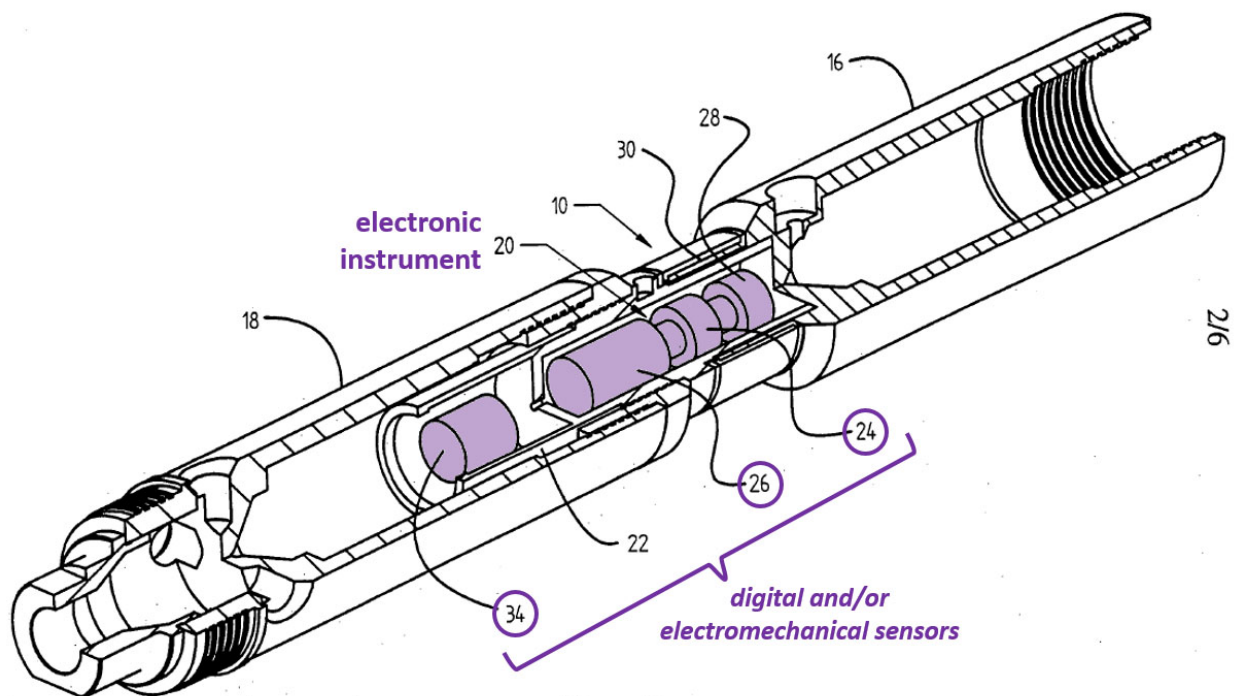


Figure 2

Ex. 1003, Fig. 2 (annotated).

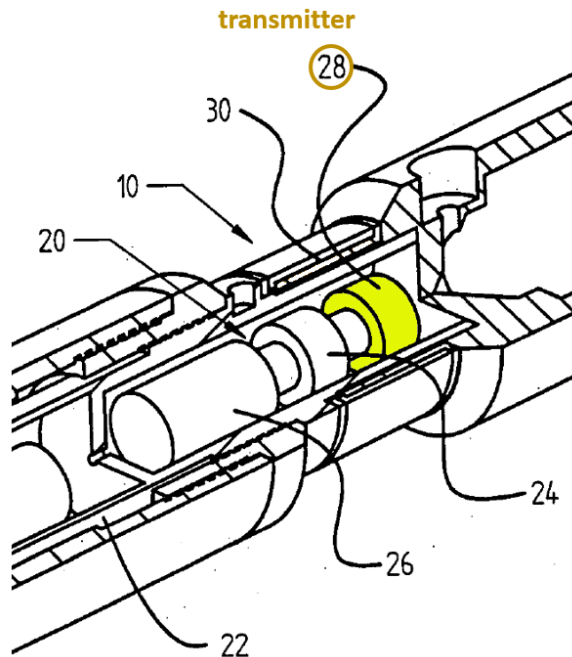
In addition, as discussed for Limitation 1[f], Section VIII.A.1(g), Beach-127's electronic instrument 20 is "configured to log" orientation data. *See* Ex. 1003, 11:33-36. Specifically, Beach-127 indicates that the electronic instrument's sensors may perform such logging, *see, e.g., id.*, 16:13-14 ("the tool 10 may comprise a gyroscope or similar device for logging azimuth and dip"), and that its "memory device . . . stor[es] logged data." *Id.*, 14:23-25. Accordingly, electronic instrument 20 "comprises at least one digital and/or electromechanical sensor in a *core orientation data recording tool.*" Ex. 1022, ¶¶ 144-46.

Further, the intrinsic record demonstrates the Office's finding, and the Patent Owner's acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 3-4.

i) Limitation 1[h]: “a transmitter configured to transmit core orientation data,”

Beach-127 discloses this limitation. As discussed for Limitation 1[e], Beach-127’s Figure 2 assembly includes “a transceiver 28 coupled to an antenna 30 to communicate with a hand-held computer or other like device.” Ex. 1003, 12:24-27; *see also id.*, 17:29-36 (“transceiver 28 in the tool 10 communicates via wireless communication” with “a remote device such as a hand-held computer”). Beach-127 makes clear that the data sent to the remote device is core orientation data. *Id.*, 17:14-15, 33-37. Thus, in Figure 2, transceiver 28 is the required “transmitter configured to transmit core orientation data”:⁹

⁹ Alternatively, a POSA could also consider that in Beach-127, transceiver 28 and antenna 30 (implemented as an LED array, per Wiese’s teaching), collectively form the claimed “transmitter.” *See*, Ex. 1020, n.6.



Id., Fig. 2 (annotated); Ex. 1022, ¶¶ 147-49.

Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 4.

j) Limitation 1[i]: “wherein the sealed interior cavity is sized and shaped to enclose the at least one electronic instrument.”

Beach-127 discloses this limitation. As discussed for Limitation 1[b], Beach-127’s core tube cap 18 and body 22 collectively form a “sealed interior cavity.” *See* Section VIII.A.1(c). Further, as discussed for Limitation 1[f], the “electronic core orientation device or system 20” residing within the “sealed interior cavity” is the claimed “electronic instrument.” *See* Section VIII.A.1(g). As reflected below,

Beach-127’s “sealed interior cavity” is “sized and shaped to enclose the[] electronic instrument.”¹⁰

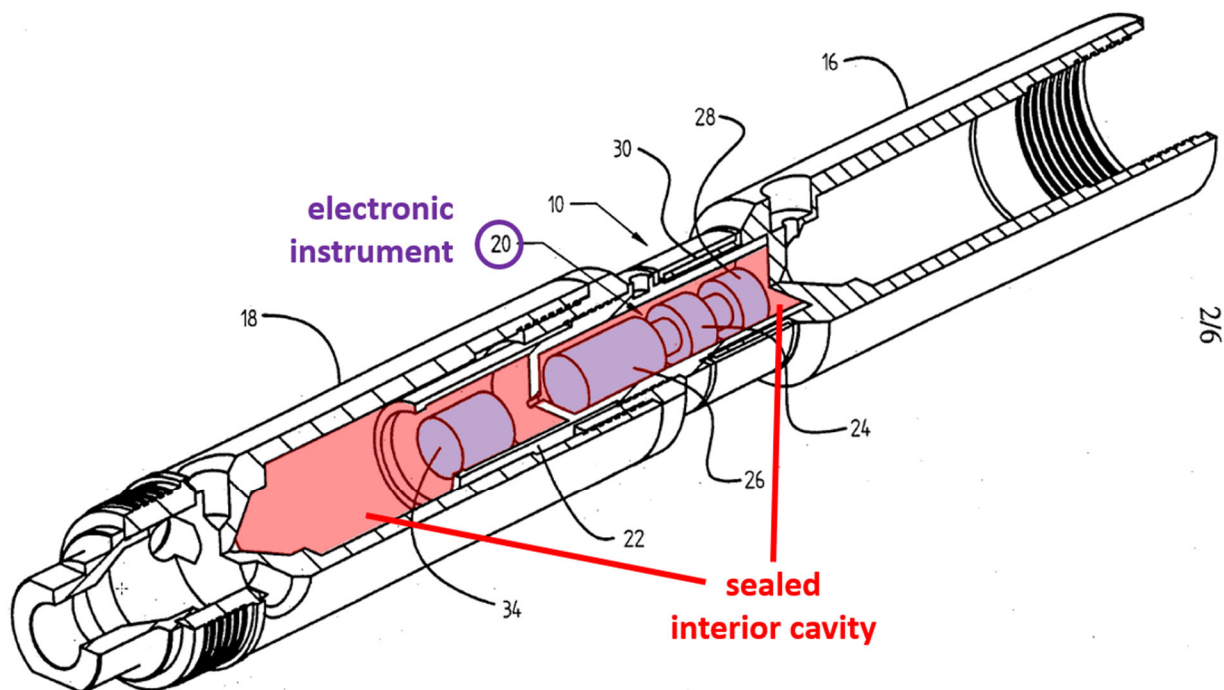


Figure 2

Ex. 1003, Fig. 2 (annotated); Ex. 1022, ¶¶ 150-52.

Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 4.

¹⁰ As discussed for Limitation 1[e], a POSA would have understood that, in Beach-127, the “sealed interior cavity” encompasses antenna 30 (implemented as an LED array, per Wiese’s teachings), which is part of electronic instrument 20. *See* Ex. 1003, 12:24-27; Ex. 1020, n.7.

2. Claim 3

- a) **“The core barrel head assembly of claim 1, wherein the sealed interior cavity is sized and shaped to hermetically enclose the transmitter.”**

Beach-127 discloses the added feature of Claim 3. As explained for Limitation 1[i], Beach-127’s assembly includes a “sealed interior cavity that is sized and shaped to enclose the electronic instrument”—*i.e.*, device 20. *See* Section VIII.A.1(j). Further, as explained for Limitation 1[h], device 20 includes a transceiver 28, which forms a “transmitter configured to transmit core orientation data.” *See* Section VIII.A.1(i). Accordingly, the “sealed interior cavity” is sized and shaped to “enclose the transmitter.”¹¹

¹¹ As discussed for Limitation 1[e], a POSA would have understood that, in Beach-127’s assembly, the “sealed interior cavity” encompasses antenna 30 (implemented as an LED array, per Wiese’s teachings). Ex. 1020, n.8.

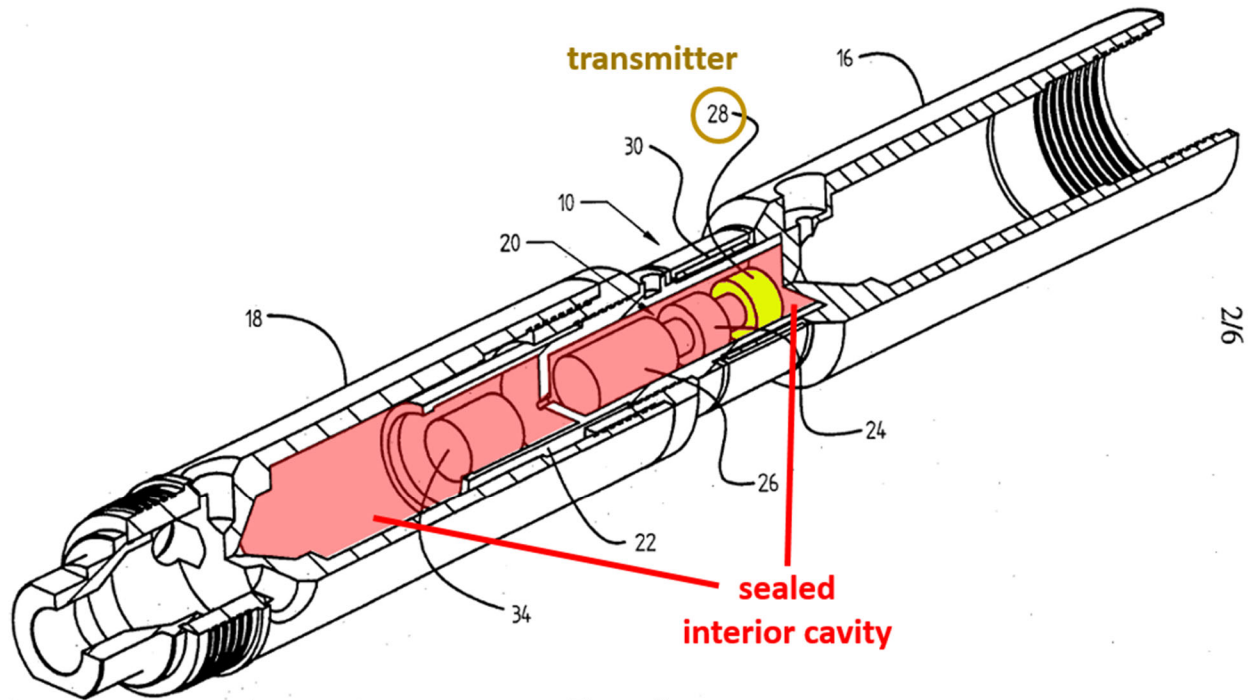


Figure 2

Ex. 1003, Fig. 2 (annotated); Ex. 1022, ¶ 153.

Further, as shown above, the “interior cavity” becomes “sealed” when core tube cap 18 is threaded into engagement with body 22 of the electronic device 20. A POSA would have appreciated that, in this context, engagement between cap 18 and body 22 results in a *hermetic* seal according to the plain meaning of that term—*i.e.*, a seal that is “complete and airtight.” Ex. 1022, ¶ 154; Ex. 1019. For example, Published International Application. WO 2007/109848 (Ex. 1009, “Beach-848”), incorporated by reference in Beach-127 for its disclosure of a core orientation assembly, Ex. 1003, 1:21-31, explains that “the helical nature of the thread” used to engage “cap 74” with “body 28” results in a “tight and sealing contact.” Ex. 1009, 10:36-11:4. Indeed, at the time of the alleged invention, it was “standard practice”

in core barrel head assemblies to achieve a hermetic seal using threaded coupling. *See* Ex. 1017 at 248 (“All flush thread screens and casings are . . . hermetically sealed at both ends as a standard practice.”).

Accordingly, a POSA would have appreciated that, in Beach-127’s assembly, “the sealed interior cavity is sized and shaped to *hermetically* enclose the transmitter,” as required. Ex. 1022, ¶¶ 154-56. Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 6.

3. Claim 4

a) “The core barrel head assembly of claim 1, further comprising an orientation indicator module comprising a light emitter.”

The Beach-127 assembly, as implemented per Wiese’s teachings, satisfies the added feature of Claim 4.

As explained for Limitation 1[e], it would have been obvious to implement Figure 2 of Beach-127, particularly in view of Wiese’s teaching, such that “antenna 30” could take the form of an LED array such as an infrared array. *See* Ex. 1004, [0015] (“[w]here infrared (IR) is the signal type, a light emitting diode (LED) would be the ‘antenna’ to transmit the IR signal.”); Section VIII.A.1(f)(1). Thus, a “light emitter” (an LED) would be present in the Beach-127/Wiese assembly. Ex. 1022, ¶ 157.

Further, “orientation indicator module” is not a standard term of art, and the ’013 Patent does not ascribe a specific definition for the term. *Id.*, ¶ 158. Nonetheless, under the plain meaning of that term, in the Beach-127/Wiese assembly, one or more components associated with “core orientation device or system 20” could be considered to form an “orientation indicator module.” *Id.* Specifically, the “orientation indicator module” could comprise the LED array as a whole (which provides optical indications of orientation data through the window), along with transceiver 28 communicatively coupled to the LED array, and “trigger system 24” (which “issues the trigger signal” to activate sensors or transducers to log orientation data “upon sensing particular events or sequences of events”). *See id.*; *see also* Ex. 1003, 12:7-36.

Accordingly, the Beach-127/Wiese assembly would have included “an orientation indicator module comprising a light emitter,” as required. Ex. 1022, ¶ 159.

4. Claim 19

- a) “The core barrel head assembly of claim 1, wherein the exterior surface defines a plurality of female planar stops.”**

Beach-127 discloses the added feature of Claim 19. As shown in Figure 2, the assembly’s exterior surface includes several “planar stops”—flat (planar) segments along an otherwise rounded exterior surface of the assembly:

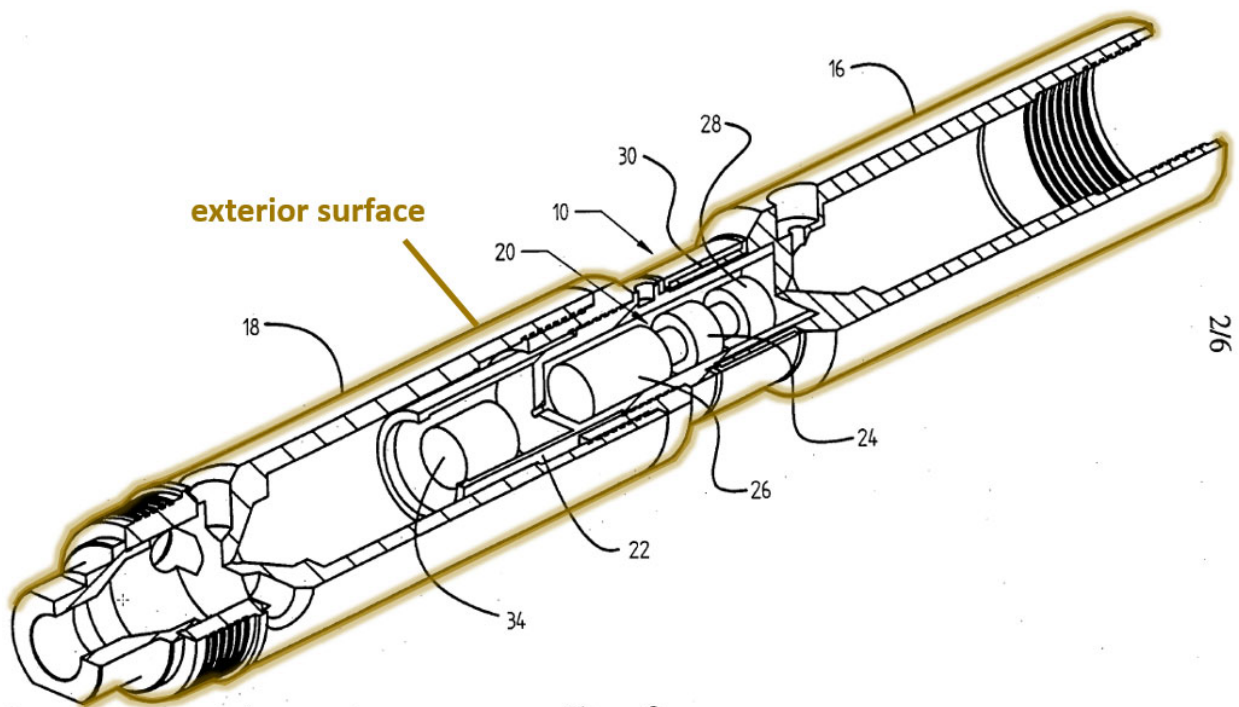
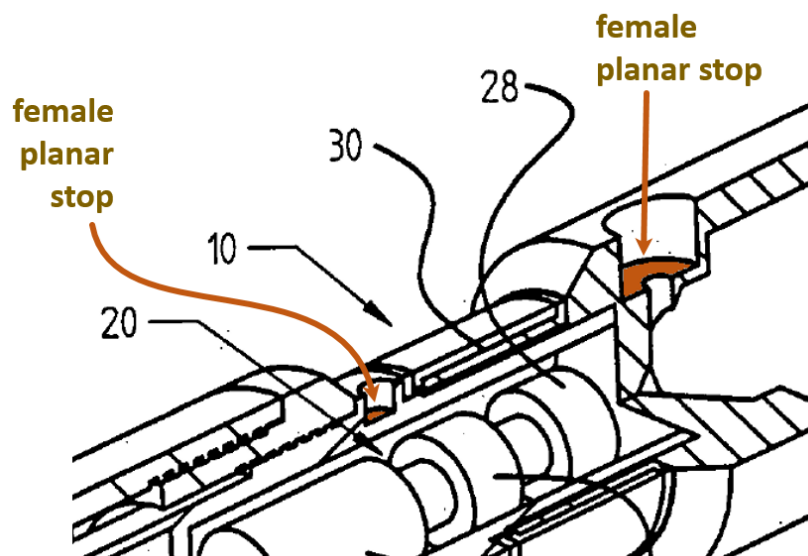


Figure 2



Ex. 1003, 12:7-36, Fig. 2 (annotated).

Structurally, the planar stops shown above are “female” in that the surfaces are recessed relative to surrounding portions of the cylindrical exterior surface. *See* Ex. 1022, ¶¶ 160-61. Further, the intrinsic record demonstrates the Office’s finding,

and the Patent Owner's acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 7.

5. Claim 20

- a) **“The core barrel head assembly of claim 1, wherein the at least one electronic instrument is programmed to obtain orientation data when the at least one electronic instrument senses no relative movement of the at least one electronic instrument.”**

Beach-127 discloses the added feature of Claim 20. For example, Beach-127 teaches that its device or system 20 (*i.e.*, its electronic instrument) “comprises multiple sensors and transducers for sensing various events and orientation data of the tool 10 and core drill,” including “vibration sensors.” Ex. 1003, 12:7-15. The instrument further includes “a trigger system 24 to issue the trigger signal upon sensing particular events or sequences of events,” such that “the orientation data is not logged until the trigger system 24 provides the trigger signal.” *Id.*, 12:15-36.

In operation, “the trigger system 24 may be configured to issue the trigger signal when sensors in the module 26 detect,” *inter alia*, “a change in direction of motion from a downhole direction to an uphole direction,” *id.*, 13:4-8, or “cessation of drilling,” *id.*, 13:24. Beach-127 explains that, “on cessation of drilling[,] the sensor”—which “may comprise an inductive RPM sensor, accelerometer or gyroscope”—“will subsequently detect a change in the speed of rotation and *more particularly a zero speed of rotation.*” *Id.* 15:1-9. Beach also explains that

“gyroscope 34 will only need to track changes in the orientation of the tool 10 *after drilling has stopped*,” as opposed to during “high vibration periods,” thereby minimizing “loss of accuracy.” *Id.*, 17:4-12. These disclosures demonstrate that electronic instrument 20 is programmed to obtain orientation data when it “senses no relative movement,” as required. Ex. 1022, ¶¶ 163-67. Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 8.

6. Claim 21

- a) **Limitation 21[a]: “The core barrel head assembly of claim 20, wherein the at least one electronic instrument is programmed to obtain orientation data when the at least one electronic instrument senses no vibrations,”**

Beach-127 discloses the added feature of Limitation 21[a]. As explained for Claim 20, Beach-127 discloses how the electronic instrument is programmed to obtain orientation data, specifically at moments where zero movement is sensed. *See* Ex. 1003 (explaining that “trigger system 24 may be configured to issue the trigger signal when sensors in the module 26 detect,” *inter alia*, “a change in direction of motion from a downhole direction to an uphole direction,” *id.*, 13:4-8, or “cessation of drilling,” *id.*, 13:24); *see also id.*, 12:12-21 (“Some of the sensors and transducers send information to the trigger system that analyses the information to determine when to provide the trigger signal,” and that other “sensors and transducers are not

activated and/or the orientation data is not logged until the trigger system 24 provides the trigger signal.”); *id.*, 15:1-9 (“[O]n cessation of drilling[,] the sensor will subsequently detect a change in the speed of rotation and *more particularly a zero speed of rotation.*”); *id.*, 17:4-12 (“gyroscope 34 will only need to track changes in the orientation of the tool 10 *after drilling has stopped*”). When Beach’s electronic instrument senses no relative movement, as disclosed above, the instrument would likewise sense no vibrations, as vibrations entail movement. Ex. 1022, ¶ 168. Accordingly, Beach-127’s disclosures demonstrate that electronic instrument 20 is programmed (through trigger system 24) to obtain orientation data when the at least one electronic instrument senses no vibrations.” *Id.*, ¶¶ 168-69. Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 9.

a) Limitation 21[b]: “and wherein the at least one electronic instrument is programmed to not obtain orientation data when the at least one electronic instrument determines that the core barrel head assembly is in motion while descending down or ascending up the hole and during drilling.”

For the reasons discussed for Claim 20 above, Beach-127 further discloses the added feature of Limitation 21[b]. For example, “trigger system 24 may be configured to issue the trigger signal when sensors in the module 26 detect . . . a change in direction of motion from a downhole direction to an uphole direction,” Ex. 1003, 13:4-8, upon “cessation of drilling,” *id.*, 13:24, or when “a change in the speed

of rotation and more particularly a zero speed of rotation,” is detected, *id.*, 15:1-9. Further, Beach-127 teaches that—outside such moments of no drilling or other movement—*i.e.*, when the assembly is “in motion while descending down or ascending up the hole and drilling”—trigger system 24 does *not* issue the trigger signal. *See id.*, 12:15-36 (explaining that “orientation data is *not logged until* the trigger system 24 provides the trigger signal.”). Accordingly, in Beach-127’s assembly, the “electronic instrument is programmed not to obtain orientation data when the at least one electronic instrument determines that the core barrel head assembly is in motion while descending down or ascending up the hole and during drilling,” as required. Ex. 1022, ¶¶ 170-71. Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 9-10.

7. Claim 22

- a) “The core barrel head assembly of claim 1, wherein the at least one electronic instrument is programmed to obtain orientation data based on a predetermined time interval scheme.”**

Beach-127 discloses the added feature of Claim 22. Beach-127 explains that “[t]he logging of information by the electronic device 20 may occur at a predetermined frequency for a predetermined period of time”—for example, it “may log orientation data every 10 seconds for a two minute period after receipt of the initial trigger signal.” Ex. 1003, 26:13-18; *see also id.*, 19:35-20:6 (further describing

“cyclically provid[ing] trigger signals for a prescribe[d] period of time”). Further, “[t]he trigger system 24 may trigger the sensors in the module 26 to record one, or a combination of readings of orientation . . . (c) prior to the trigger by selecting a pre recorded reading where multiple readings are taken at predetermined intervals.” *Id.*, 19:25-33. Beach-127 discloses that “[t]he time triggers may comprise one or a combination of: (a) a single trigger at a specified delay time relative to a time the device was initialized by an operator or triggered by a physical event; [or] (b) multiple continuous triggers at preset intervals commencing at a specified delay time relative to the time the device was initialized by an operator or triggered by a physical event and from which one or more data sets are selected.” *Id.*, 19:15-23. Ex. 1022, ¶¶ 172-74.

Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s acquiescence, that Beach-127 discloses this limitation. *See* Ex. 1014, 11.

8. Claim 24

- a) Limitation 24[a]: “The core barrel head assembly of claim 1, wherein the at least one electronic instrument is programmed to: record orientation data relating to**

an orientation of the at least [one]¹² electronic instrument in a borehole; and,”

Beach-127 discloses the added feature of Limitation 24[a]. For example, Beach-127 discloses that “tool 10 [is] able to log”—*i.e.*, record—“*in situ* orientation data relating to the core and the borehole from which the core is extracted at a time shortly before or at core breakage,” with the aid of “trigger system 24 to issue the trigger signal upon sensing particular events or sequences of events that are expected to occur when a core is broken from the ground.” Ex. 1003, 12:30-36; *see also id.*, 2:16-19 (describing “core orientation tool for providing an indication of *in situ* orientation of a core sample extracted from a borehole by a core drill the tool”), and 6:20-22 (describing “logging *in situ* orientation data of a core sample extracted from the ground by a core drill”). Ex. 1022, ¶ 175.

b) Limitation 24[b]: “receive an interrogation command from an external communication device.”

It would have been obvious to a POSA to implement the added feature of Limitation 24[b] into Beach-127’s assembly, in view of Beach-127’s own teachings. Beach-127 discloses “transferring data from the electronic device 20 to the device 120 by an intervening hand held telemetry device (hand held computer) that interrogates the device 20 to obtain for example the tool face orientation data at the

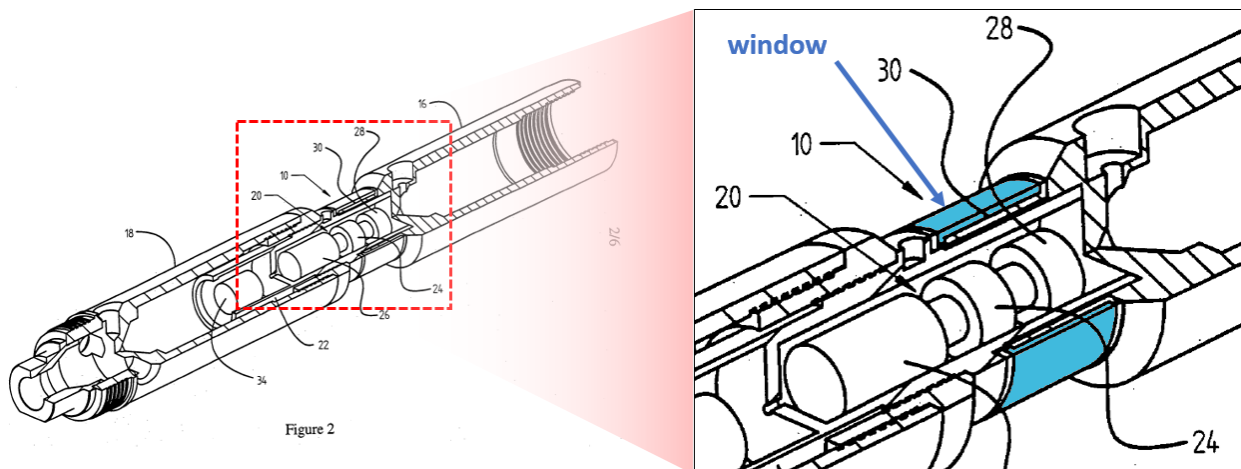
¹² Petitioner reserves the right to challenge this claim for indefiniteness.

time the trigger signal is provided by a triggering system 26,” which will provide a bearing that “can be physically marked on the scale 138.” *See* Ex. 1003, 21:31-22:14. Accordingly, as to the Figure 2 assembly, it would have been obvious to a POSA to program the remote (external) unit to transmit, and electronic instrument 20 to receive, an interrogation command, in order to establish the communication link needed for transferring data externally from the downhole assembly. Ex. 1022, ¶¶ 176-77. As Dr. Rodgers explains, using an interrogation command for this purpose would have been routine and straightforward for a POSA to implement in the Figure 2 assembly, as Beach-127’s own teachings demonstrate. *Id.*

9. Claim 25

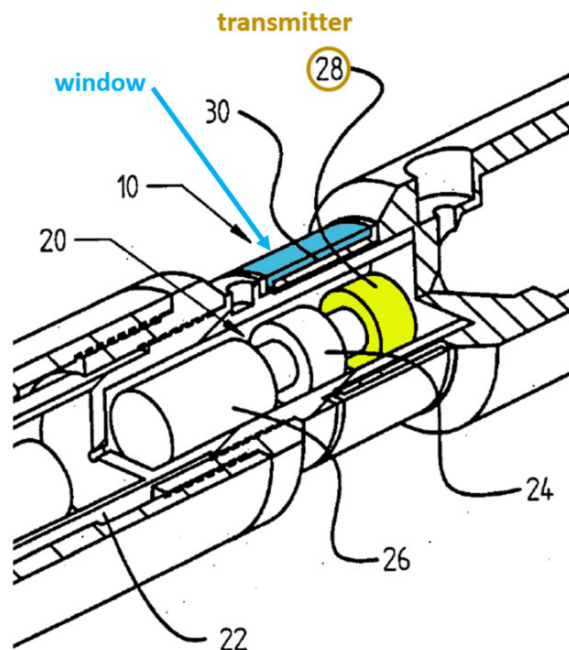
- a) **“The core barrel head assembly of claim 1, wherein the transmitter is configured to transmit core orientation data to a remote device through the window.”**

Beach-127 discloses the added feature of Claim 25. As explained for Limitation 1[e], the Beach-127 assembly includes a transmissive “window”:



Ex. 1003, Fig. 2 (annotated); Section VIII.A.1.(f), *supra*.

Beach-127 explains that “[t]he orientation system 20 may further comprise a transceiver 28 coupled to an antenna 30 to communicate with a hand-held computer or other like device.” *Id.*, 12:24-28; *see also id.*, 17:29-31 (the “hand-held computer” is one example of “a remote unit”). Beach-127 further explains that “transceiver 28 in the tool 10 communicates via wireless communication with the hand-held computer.” *Id.*, 17:33-36. As explained for Limitation 1[h], a POSA would have recognized that transceiver 28 (alone or combined with the antenna) is a transmitter. Section VIII.A.1.(i), *supra*. More specifically, a POSA would have recognized such a transmitter is configured to transmit core orientation data to the remote device (hand-held computer) through the window of Beach-127’s assembly:



Ex. 1003, Fig. 2 (annotated); Ex. 1022, ¶¶ 178-80.

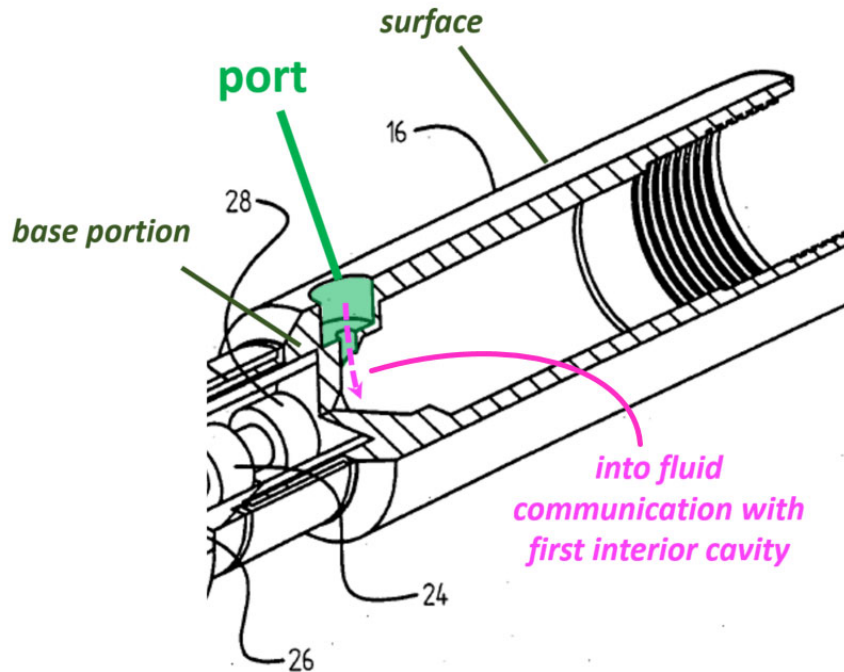
B. Ground II: Obviousness by Beach-127 in view of Wiese and Pickard

1. Claim 2

As discussed below, Claim 2 would have been obvious based on Beach-127 in view of Wiese and Pickard.

- a) Limitation 2[a]: “The core barrel head assembly of claim 1, further comprising: a port positioned proximate the base portion and extending from the exterior surface into fluid communication with the first interior cavity; and”**

Beach-127 discloses the added feature of Limitation 2[a]. As shown below, “adaptor 16,” which is “used to couple an opposite end of the tool 10 to the remainder of the backend assembly 14,” features a “port . . . extending from the exterior surface” of the assembly.



Ex. 1003, 11:16-22, Fig. 2 (annotated); *see also id.*, Fig. 1 (also showing “port” in adaptor 16).

As shown in Figure 2, the port includes a complete void, or through-hole, extending into the “first interior cavity” (*see* Limitation 1[b], Section VIII.A.1.(c)), such that lubricant (fluid) can pass between the assembly’s exterior and the “first interior cavity.” The port thus “extend[s] from the exterior surface into fluid communication with the first interior cavity.” Ex. 1022, ¶¶ 182-84. Finally, as seen above, the “port” is situated near—*i.e.*, “proximate to,”—the adaptor 16’s “base portion” (*see* Limitation 1[d], Section VIII.A.1(e)). *Id.*, ¶¶ 184-85. Further, the intrinsic record demonstrates the Office’s finding, and the Patent Owner’s

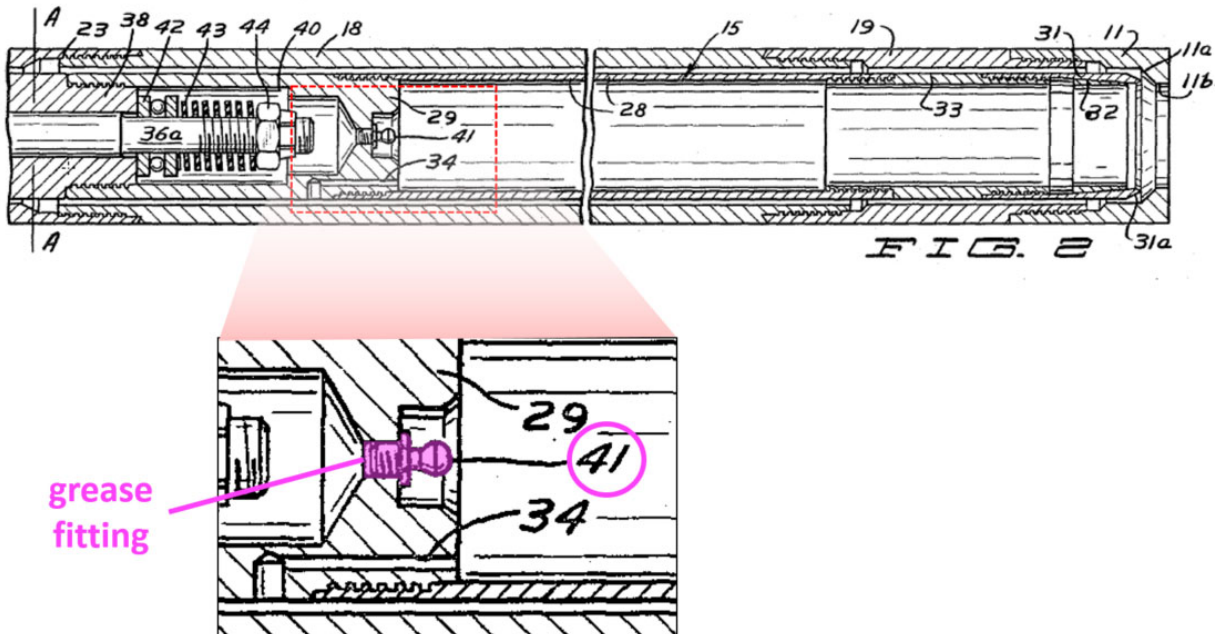
acquiescence, that Beach-127 discloses the added feature of Limitation 2[a]. *See* Ex. 1014, 5.

- b) **Limitation 2[b]: “a grease fitting mounted in the port to allow for selective passage of grease or other lubricant to and from the exterior surface of the barrel head assembly into communication with the first interior cavity.”**

It would have been obvious to a POSA to implement the added feature of Limitation 2[b] based on Beach-127 in view of Wiese and Pickard.

As discussed for Limitation 2[a], Beach-127 discloses “a port... extending from the exterior surface into fluid communication with the first interior cavity.” *See* Section VIII.B.1(a). While not explicitly shown in Figure 2, it would have been obvious to a POSA to mount a “grease fitting . . . in the port to allow for selective communication with the first interior cavity.” For decades prior to the alleged invention, grease fittings were standard components used in various mechanical systems involving lubricants—including in core barrel assemblies for exploratory mining and drilling. Ex. 1022, ¶¶ 187-89; Ex. 1007. As Dr. Rodgers explains, a POSA would have appreciated that downhole assemblies featuring moving components typically require lubrication to reduce friction. *Id.*, ¶ 189. In this context, the grease fitting functions as a conduit for injecting lubricant into spaces needing friction control—specifically, it permits selective passage of such lubrication to one or more internal spaces within the downhole assembly. *Id.*

U.S. Pat. No. 3,305,033 to “Pickard” et al. (Ex. 1006, “Pickard”) demonstrates this. Pickard, which issued 1967, is directed to a core barrel assembly for hard rock mining. *See* Ex. 1006, 1:10-70. Pickard’s assembly features a “grease fitting 41” shown in Figure 2:



Id., Fig. 2 (annotated).

The “grease fitting 41 is threaded into the opposite end of the bore 40,” which is situated at the end of the “cap 29.” *Id.*, 4:34-35; *see also id.*, 4:7-45. Accordingly, the grease fitting 41 is mounted into a port that feeds into the bore (left of the fitting in Figure 2); a POSA would have understood that fitting 41 enables the selective passage of grease into the cavity housing the spring and bearings, which require lubrication. Ex. 1022, ¶¶ 190-91. Pickard’s “grease fitting” disclosure is echoed by 2013 product catalog for core barrel head assemblies. *Id.*, ¶ 192 (citing Ex. 1017).

Referring to Beach-127, adaptor 16 is used to mechanically couple two key moving parts of the assembly: the tool 10, and the remainder of the backend assembly 14:

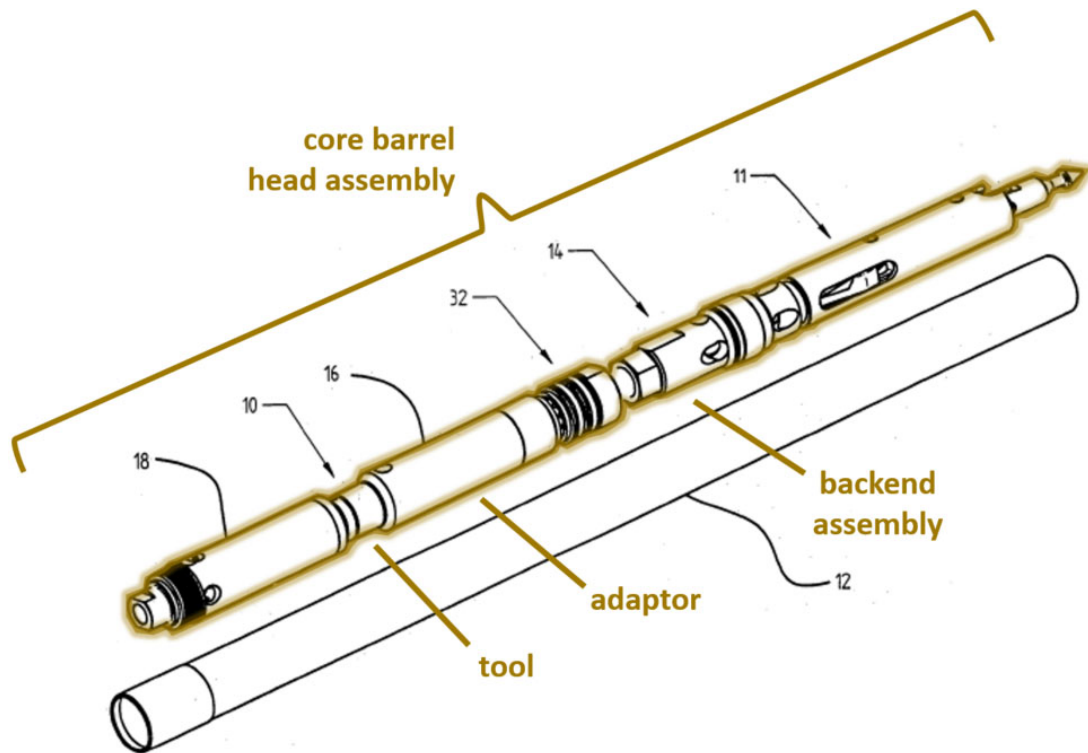


Figure 1

Ex. 1003, 11, 16-22, Fig. 1 (annotated).

Since adaptor 16 also features a port that extends into fluid communication with the first interior cavity, a POSA would have understood that the port functions as an access point for delivering lubrication to the spring and bearing 32 of the Beach '127 assembly, thereby minimizing friction. See Ex. 1022, ¶¶ 193-95

(explaining that Beach-127's Figure 2 port design already contemplates mating with a grease fitting).

Accordingly, assuming it is not implicitly included, it would have been obvious to mount a "grease fitting" into Beach-127's "port" as taught above in Pickard, to facilitate injection of lubrication into Beach's assembly; in other words, to permit "selective passage of grease or other lubricant to and from the exterior surface" of the assembly, and "into communication the first interior cavity" defined by adaptor 16. Dr. Rodgers shows an exemplary illustration demonstrating how applying Pickard's teaching to Beach-127's assembly would satisfy this limitation. *Id.*, ¶¶ 196-98.

Moreover, it would have been straightforward for a POSA to implement Beach-127's assembly using a grease fitting as shown and described in Pickard; the Beach-127's port design is *already configured* to mate with such a grease fitting. *Id.*, ¶ 198. Further, grease fittings had long been ubiquitous in mechanical systems involving lubricants, including downhole assemblies for hard rock mining in particular, as exemplified by Pickard. *Id.*; Ex. 1006, 4:7-45, Fig. 2. A POSA would have therefore recognized that Pickard's grease fitting could be readily incorporated into the port of the Beach-127 assembly. Ex. 1022, ¶ 198.

This modification would have constituted nothing more than the application of a known technique (*e.g.*, using a grease fitting in a port to allow selective passage

of lubricant in a downhole assembly, as disclosed in Pickard) to a known device ready for improvement (*e.g.*, Beach-127's assembly, which already includes a port that extends into fluid communication into a first interior cavity) to obtain predictable results (*e.g.*, permitting injection of lubricant into Beach-127's first interior cavity, and, in turn, lubricating the adjoining bearing 32 in order to curb undesirable friction). *See KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."). Ex. 1022, ¶ 199; *see also* Ex. 1017 at 180-219. Moreover, a POSA would have had a reasonable expectation of success in implementing Beach-127's assembly with Pickard's grease fitting, for the reasons described above. *See KSR*, 550 U.S. at 420.

Further, it would have obvious to implement the grease fitting into the port of the Beach-127/Wiese combination discussed for Claim 1 above. *See* Section VIII.A.1.(f)(1), *supra*. Accordingly, combination of Beach-127 in view of Wiese and further in view of Pickard would have satisfied Claim 2. Ex. 1022, ¶ 200.

C. Ground III: Obviousness by Beach-127 in view of Wiese and Klass-839

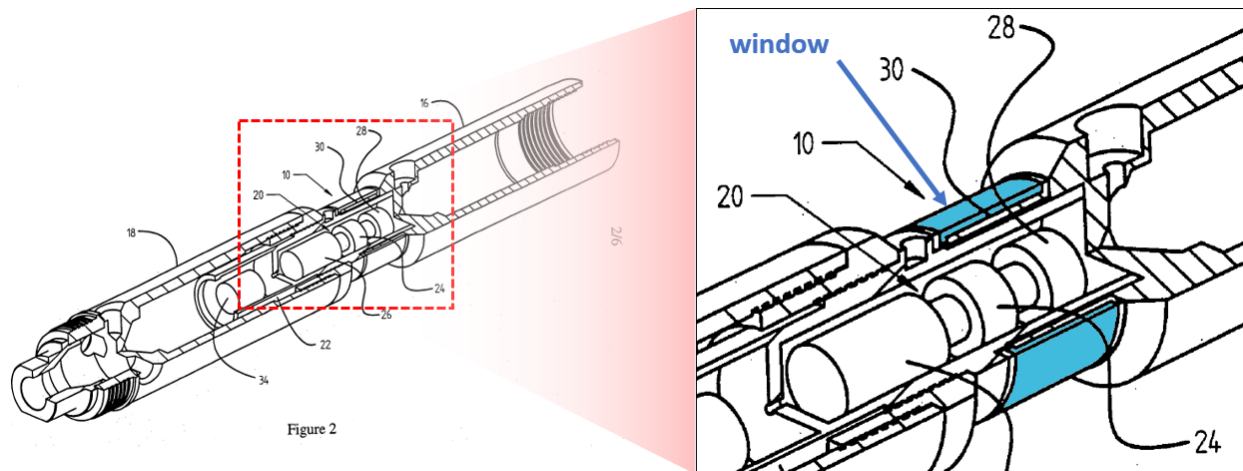
As discussed below, Claims 14 and 15 would have been obvious based on Beach-127 in view of Wiese and Klass-839.

1. Claim 14

- a) Limitation 14[a]: “The core barrel head assembly of claim 4, wherein the light emitter underlies the window,”**

The Beach-127 assembly, as implemented in view of Wiese’s teachings, would have satisfied the further requirement that “the light emitter underlies the window.”

As discussed for Limitation 1[e] and Claim 4, it would have been obvious to implement Beach-127’s assembly, particularly in view of Wiese’s teaching, by implementing the “antenna 30” as an LED array, such as an infrared array. *See* Ex. 1004, [0015] (“[w]here infrared (IR) is the signal type, a light emitting diode (LED) would be the ‘antenna’ to transmit the IR signal.”). Thus, Beach-127/Wiese assembly would have included a “light emitter” (an LED). Ex. 1022, ¶¶ 202-03. Further, the Beach-127/Wiese assembly would otherwise have the same structural configuration shown in Figure 2 of Beach-127, in which antenna 30 underlies the window (annotated blue):



Ex. 1003, Fig. 2 (annotated).

Accordingly, the Beach-127/Wiese assembly would have satisfied the added feature of Limitation 14[a].

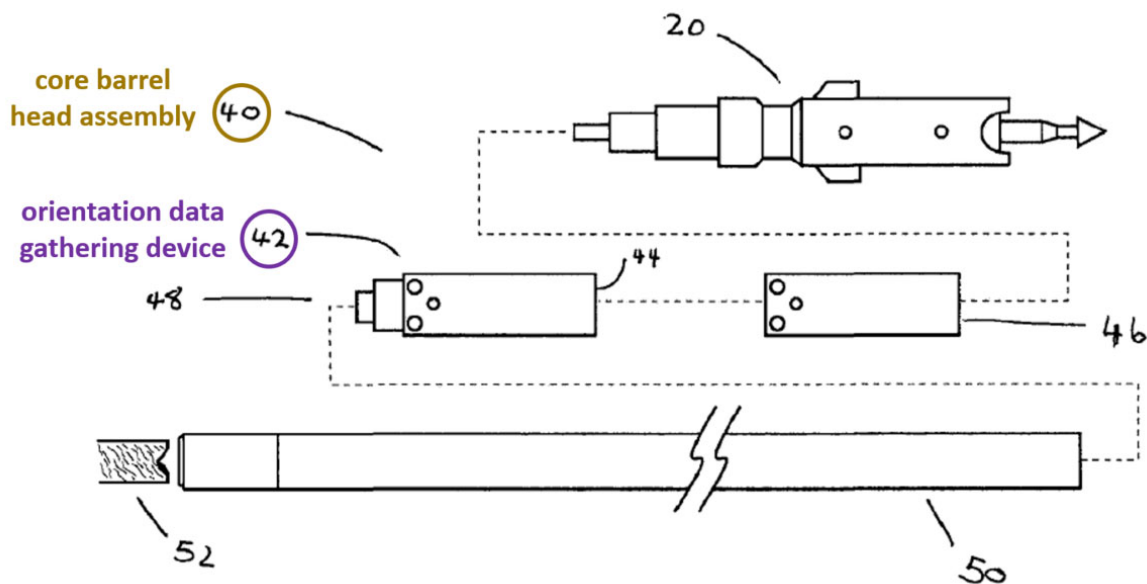
- b) Limitation 14[b]: “and wherein following retrieval of the core barrel head assembly from down a borehole, the light emitter is configured to provide a visual indication that a desired rotational orientation of the core barrel head assembly has been achieved.”**

It would have been obvious to POSA to implement the added feature of Limitation 14[b] based on Beach-127 in view of Wiese and Klass-839.

As described for Limitation 1[e], it would have been obvious to a POSA to implement the Beach-127 assembly according to Wiese’s teaching to implement the “antenna” as an infrared LED array, thereby providing *optical* communication through Beach-127’s window to the remote unit. *See* Section VIII.A.1.(f)(1).

Nonetheless, it also would have been obvious to further modify the Beach-127/Wiese assembly in view of the teachings of Klass-839.

Klass-839 discloses a core barrel head assembly using *multiple forms* of optical signals to transfer orientation data externally. *See* Ex. 1005. As shown in Figure 4, the Klass-839 assembly (40) includes a core orientation data gathering device (42):



Id., Fig. 4 (annotated).

As Klass-839 explains, data gathering device (42) uses “wireless communication, such as infra red communication” to communicate with the remote device via “line of sight data transfer through a window.” *Id.*, 5, 10. The data gathering device may also feature “one or more visual indicators to show an operator one or more required directions of rotation of a recovered sample assembly.” *Id.*, 4.

As shown in Figures 5 and 7 below, Klass-839 discloses that the data gathering device (42) includes multiple “LED lights,” 74 and 76, “sealed within the device 42 behind [a] window [72],”¹³ and which emit different colored lights through the window to indicate which direction (if any) to rotate the retrieved device to obtain a desired core sample orientation:

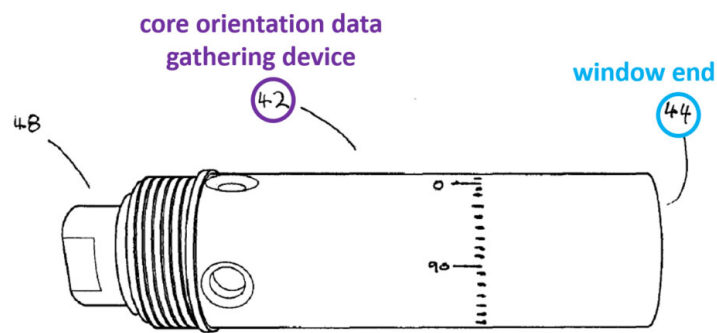
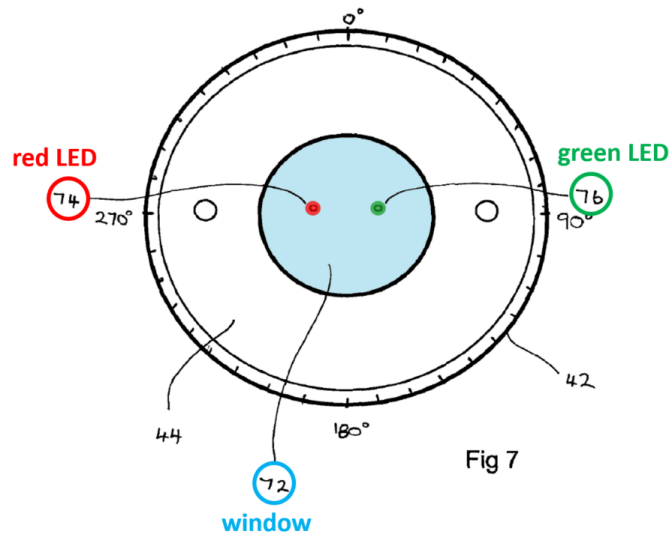


Fig 5

¹³ Based on this disclosure, Klass '839—like Beach-127 and Wiese—discloses a “window” even if that term were narrowly construed to require a solid material transmissive to a communication signal. *See* Section VI.A, *supra*.



Id., 9-10, Figs. 5, 7 (annotated).

In particular, Klass-839 discloses that, using its red and green LED lights (74 and 76, respectively):

A coloured light indication is given to indicate which way (clockwise or anti-clockwise) the device 42 must be rotated to obtain a desired orientation of the core sample still within the inner tube assembly . . . For example, a red light may be given to indicate to rotate the device (and thus the core sample) anticlockwise or to the left, and a green light may be given to indicate to rotate the device clockwise or to the right. A combined red and green indication, or a white light indication, or other indication can be given, such as flashing lights, to indicate that the core sample is correctly orientated and ready for marking.

Ex. 1005, 9-11. Thus, Klass-839's LEDs are "configured to provide a visual indication"—*e.g.*, combined red and green or flashing lights—that a desired rotational orientation of core barrel head assembly has been achieved." Ex. 1022,

¶¶ 205-11. Further, these colored light indications are provided “[a]fter core retrieval” to the surface (*see* Ex. 1005, 7); that is, “following retrieval of the core barrel head assembly from down a borehole.” Ex. 1022, ¶ 211.

According to Klass-839, this configuration likewise “provide[s] the advantage of a fully operating downhole tool/device without having to disconnect or disassemble any part of the tool/device from the inner tube and/or from the backend assembly,” while still being able “to determine core sample orientation and/or to gather data recorded by the device/tool.” Ex. 1005, 14. This “means that there is less risk of equipment failure and drilling downtime, as well as reduced equipment handling time through not having to separate the sections in order to otherwise obtain core sample orientation,” and thus “reliability and efficiency of core sample collection and orientating is improved.” *Id.* Klass-839 thus provides a teaching, suggestion, or motivation for equipping a downhole assembly with multiple forms of optical communication emanating from within a sealed interior cavity, externally through a transmissive window—not only an infrared signal to a remote device, but also multi-colored lights to visually indicate to the operator whether and how to rotate the core sample. Ex. 1022, ¶ 212-13.

Accordingly, it would have been obvious to further modify the Beach-127/Wiese assembly (discussed for Limitation 1[e]) based on Klass-839’s teaching of including colored LEDs in addition to an infrared signal, to reliably and efficiently

transfer the orientation data from Beach-127's electronic device 20 externally—to both a remote unit and to the operator handing the core sample upon retrieval. *Id.*, ¶ 214. That is, it would have been obvious to implement Beach-127's assembly with the “antenna 30” as an LED array that emits both colored lights and infrared light, according to the combined teachings of Wiese and Klass-839. Dr. Rodgers shows exemplary illustrations demonstrating how a POSA could have applied the combined teachings of Wiese and Klass-839 to Beach-127's assembly. *Id.*, ¶¶ 215-18.

Further, it would have been straightforward for a POSA to implement Beach-127's Figure 2 according to the collective teachings of Wiese and Klass-839 as described above. Downhole assemblies having LED arrays—including those that emit infrared signals or visible light—along with optically transmissive windows for external communication, were all well within the level of ordinary skill in the art. *Id.*, ¶ 219. Moreover, Klass-839 discloses a core barrel head assembly whose electronic device 42 includes a transmitter and an optically transmissive “window 72,” like the assemblies of both Beach-127 and Wiese, but further includes “LED lights” configured to visually indicate to the operator whether and how to rotate the retrieved device “to obtain a desired orientation of the core sample.” *See* Ex. 1005, 9-11. Given commonalities among these references, a POSA would have recognized that Wiese's teaching of implementing the downhole assembly's “antenna” as an

LED array, and Klass-839's teaching of further including multi-colored LED lights to provide visual indications through the window, could be readily applied to Beach-127's assembly. Ex. 2200, ¶ 220. As Dr. Rodgers explains, a POSA would have readily appreciated that when incorporating Klass-839's LED lights into Beach-127's assembly, Beach-127's existing trigger system 24 could have been configured to illuminate (per Klass-839's teachings) the red and green LEDs as needed to visually indicate whether and how rotation is needed. *Id.*, ¶ 221.

Implementing the Beach-127 assembly according to the collective teachings of Wiese and Klass-839 would have constituted nothing more than the application of known techniques (*e.g.*, using: (1) an LED array as an “antenna” for downhole equipment—whether separate from, or integrated with, the downhole transceiver—as collectively taught in Wiese; and (2) colored lights to provide visual indications from within a core barrel assembly device through a window, as taught in Klass-839) to a known device ready for improvement (*e.g.*, the Beach-127 assembly, which already includes an “antenna 30” and a transmissive window) to obtain predictable results (*e.g.*, providing external optical communication from Beach-127's assembly to the remote unit and to the equipment operator, and doing so efficiently and reliably, using a simple configuration). *See KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”).

Ex. 1022, ¶¶ 222-23. Moreover, these modifications would have been obvious to try as one of a limited number of solutions for transmitting signals to an external device and to an operator from the downhole assembly, and a POSA would have had a reasonable expectation of success in implementing these modifications to Beach-127, for the reasons described above. *See KSR*, 550 U.S. at 420.

2. Claim 15

- a) **“The core barrel head assembly of claim 14, wherein the light emitter is further configured to provide a visual indication that further rotation of the core barrel head assembly is required to reach the desired rotational orientation.”**

For the reasons explained for Limitation 14[b], the Beach-127 assembly, as implemented in view of the collective teachings of Wiese and Klass-839, would have further satisfied the added feature that “the light emitter is further configured to provide a visual indication that further rotation of the core barrel head assembly is required to reach the desired rotational orientation.” *See* Section VIII.C.14(b), *supra*. Specifically, when Klass-839’s disclosed operation is applied to Beach-127, “a red light may be given to indicate to rotate the device (and thus the core sample) anticlockwise or to the left, and a green light may be given to indicate to rotate the device clockwise or to the right.” *See* Ex. 1005, 9; Ex. 1022, ¶ 225. Accordingly, Claim 15 would have been obvious to POSA based on Beach-127 in view of Wiese and Klass-839.

IX. DISCRETIONARY DENIAL IS NOT APPROPRIATE

This Petition relies primarily on the Beach '127 reference. That reference was before the Patent Office during prosecution of the '013 Patent, as it was cited in an IDS, but the file history does not reflect any substantive analysis of Beach-127 against the challenged claims. *See generally* Ex. 1002. The prosecution histories of other patents in '013 Patent's family, however, show that both the Office and the Patent Owner recognized that Beach-127 discloses nearly all of the limitations of the challenged claims here, including all limitations of independent Claim 1. The Examiner examining the parent '463 Patent and the child '529 Patent cited and relied upon Beach-127 during the respective prosecutions of those patents, and asserted that it disclosed many claim limitations that are identical to those recited in the claims of the '013 Patent. *See* Ex. 1014 (citing Exs. 1011 and 1013). The Examiner's failure to rely substantively on Beach-127 during prosecution of the '013 Patent was therefore a material error by the PTO. Accordingly, the Board should not deny this Petition under 35 U.S.C. §325(d) and *Advanced Bionics*. In any event, all proposed Grounds of this Petition combine Beach-127 with one or more prior art references *not* before the Patent Office during prosecution, further demonstrating that discretionary denial is inappropriate here.

In *Advanced Bionics*, the PTAB set forth a two-part test for evaluating discretionary denial arguments under §325(d): “(1) whether the same or substantially

the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if either condition of first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.” See *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020) (precedential).

In applying this test, the PTAB considers the “*Becton, Dickinson*” factors.¹⁴ Among these are “the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection,” *Becton, Dickinson*, Paper No. 8 at 17-18; see also *Edwards Life Sciences Corp. v. Colibri Heartinvalve, LLC*, IPR2020-01649 (Paper No. 8) at 20-21 (declining to exercise discretionary denial where prior art references were not substantively considered during prosecution). This factor bears on whether, pursuant to part two of the *Advanced Bionics* test, the petitioner demonstrated that the Patent Office materially erred. See *Advanced Bionics*, 9-10. “For example, if the record of the Office’s previous consideration of the art is not well developed or silent, then a petitioner

¹⁴ *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 (Dec. 15, 2017) (precedential as to § III.C.5, first paragraph) (“*Becton, Dickinson*”).

may show the Office erred by overlooking something persuasive.” *Advanced Bionics*, 10. Further, “[a]n example of a material error may include misapprehending or overlooking specific teachings of the relevant prior art where those teachings impact patentability of the challenged claims.” *Id.*, 8, n.9.

Here, the intrinsic record demonstrates that the Examiner either failed to consider Beach-127 substantively during prosecution of the ’013 Patent, or else that he misapprehended or overlooked its disclosures in doing so. The ’013 Patent Examiner did not issue any prior art rejections, and the file history is silent in all other respects with regard to whether the Examiner substantively evaluated Beach-127 against the then-pending claims. *See generally*, Ex. 1002. However, the same Examiner *did* issue prior art rejections based on Beach-127 during the respective prosecutions of the parent ’463 Patent and the child ’529 Patent—which share essentially the same specification, and whose claims are directed to the same subject matter, as the ’013 Patent at issue here. Those prior art rejections, shown in the ’463 and ’529 File Histories, reflect the Examiner’s substantive evaluation of Beach-127. *See generally* Ex. 1014 (column 2). This intrinsic record is highly probative to the §325(d) analysis for the ’013 Patent: as reflected in the comparison chart in provided Ex. 1014, the record demonstrates the Examiner’s assessment that Beach-127 discloses virtually all limitations of challenged Claim 1 of the ’013 Patent, along with the added features of dependent Claims 2-3 and 19-22.

Notably, the record further shows that when confronted with the Examiner's assessment regarding the scope of Beach-127's disclosures, the Patent Owner did not dispute it. *See generally* Ex. 1014 (column 3). Instead, the Patent Owner secured allowance of the respective '463 and '529 Patents over Beach-127 by amending the then-pending claims to recite additional limitations not included in challenged Claim 1 of the '013 Patent. Thus, the record shows that the Patent Owner acquiesced in the Examiner's assessments regarding Beach-127 and, in turn, that Beach-127 discloses all limitations of challenged Claim 1. Based on the *Examiner's own substantive analysis* of Beach-127, the Patent Office clearly erred in allowing Claim 1 of the '013 Patent to issue in the first place.

Nevertheless, the Board need not engage in step two of the *Advanced Bionics* analysis. All proposed Grounds include at least one prior art reference *not* before the Office during prosecution of the '013 Patent: none of Wiese, Klass-839, or Pickard were before the Patent Office during prosecution of the '013 Patent. Indeed, for all proposed Grounds, Petitioner relies on Wiese's disclosure of an optically transmissive window sealed against the housing of a downhole assembly, which facilitates a "[f]aster and more reliable method[] for downloading information accumulated downhole" Ex. 1004, [0004]; *see, e.g.*, Section VIII.A.1.(f)(1), *supra*. Petitioner further relies on the declaration of Dr. Rodgers, Ex. 1022, which—like Wiese, Klass-839, and Pickard—was likewise not before the Patent Office

during prosecution. Accordingly, notwithstanding the Office’s demonstrable error regarding Beach-127, the *Advanced Bionics* analysis should cease at step one, because Petitioner is not relying on the “same or substantially the same art,” nor is Petitioner relying on “the same or substantially the same arguments previously . . . presented to the Office.” *See Advanced Bionics*, 8. For this additional reason, discretionary denial is unwarranted.

35 U.S.C. § 325(d) therefore does not apply to this challenge.¹⁵

x. CONCLUSION

Petitioner respectfully requests institution of *inter partes* review and cancellation of the challenged claims of the ’013 Patent.

¹⁵ Discretionary denial is similarly not appropriate under 35 U.S.C. § 314 and *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019 (PTAB Mar. 20, 2020), because there is no pending litigation involving the ’013 Patent.

Date: February 28, 2023

Respectfully submitted,

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CERTIFICATION UNDER 37 C.F.R. § 42.24(D)

I certify that the foregoing complies with the type-volume limitation of 37 C.F.R. § 42.24 and contains 13,944 words based on the word count indicated by the word-processing system used to prepare the paper, and excluding those portions exempted by § 42.24(a).

Date: February 28, 2023

/Scott C. Weidenfeller/

Scott C. Weidenfeller

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6 and 42.105, I hereby certify that on February 28, 2023, I caused a true and correct copy of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 10,830,013 and supporting exhibits to be served on the Patent Owner's counsel of record via Federal Express to the following address:

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Date: February 28, 2023

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