

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DYNAMIC AIR INC.,
Petitioner,

v.

M-I DRILLING FLUIDS UK LTD.,
Patent Owner.

Cases IPR2016-00262 & IPR2016-00263
Patent 7,186,062 B2

Before PHILLIP J. KAUFFMAN, WILLIAM V. SAINDON, and
RICHARD E. RICE, *Administrative Patent Judges*.

SAINDON, *Administrative Patent Judge*.

FINAL WRITTEN DECISION

Finding Claims 1–10 and 12–39 Unpatentable
35 U.S.C. § 318(a); 37 C.F.R. § 42.73

CONFIDENTIAL – BOARD AND PARTIES ONLY

I. INTRODUCTION

We have jurisdiction under 35 U.S.C. § 6. The evidentiary standard is a preponderance of the evidence. *See* 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73, and addresses two proceedings, both of which involve U.S. Patent No. 7,186,062 B2 (Ex. 1004, “the ’062 patent”).¹

Petitioner requested an *inter partes* review of claims 1–29 of the ’062 patent in IPR2016-00262. IPR2016-00262, Paper 1 (“Petition ’262” or “Pet. ’262”). Patent Owner did not file a Preliminary Response. Upon consideration of Petition ’262, we instituted an *inter partes* review on all challenged claims on all challenged grounds (IPR2016-00262, Paper 7, “Dec. on Inst. ’262”). During trial, Patent Owner filed a Response (IPR2016-00262, Paper 31, “PO Resp. ’262”) and Petitioner filed a Reply (IPR2016-00262, Paper 43, “Pet. Reply ’262”).² An oral hearing was held (IPR2016-00262, Paper 52, “Tr.”³).⁴

¹ Exhibits in both proceedings are generally identical. If no proceeding number is identified for a given Exhibit or Paper, we cite to a document in IPR2016-00262, and it can be assumed that the same information exists in a similar, if not identical, document in IPR2016-00263.

² Petitioner also filed a confidential version of its Reply, IPR2016-00262, Paper 42, at the request of Patent Owner. *See* IPR2016-00262, Paper 40 (Petitioner’s Motion to Seal). We will cite to the public, redacted version unless otherwise noted.

³ The Transcript for both proceedings is identical.

⁴ At the conclusion of the oral hearing, counsel for Patent Owner informed the panel that confidential information was inadvertently disclosed during the hearing, and represented that everyone at the hearing was subject to the proposed protective order, such that none of the information had yet been

Petitioner requested an *inter partes* review of claims 30–49 of the ’062 patent in IPR2016-00263. IPR2016-00263, Paper 1 (“Petition ’263” or “Pet. ’263”). Patent Owner did not file a Preliminary Response. Upon consideration of Petition ’263, we instituted an *inter partes* review on all challenged claims on some challenged grounds (IPR2016-00263, Paper 7, “Dec. on Inst. ’263”). During trial, Patent Owner filed a Response (IPR2016-00263, Paper 31, “PO Resp. ’263”) and Petitioner filed a Reply (IPR2016-00263, Paper 43, “Pet. Reply ’263”).⁵ An oral hearing was held (IPR2016-00263, Paper 51, “Tr.”).

Reviewing the arguments and evidence before us, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1–10 and 12–49 are unpatentable. We determine that Petitioner has not shown by a preponderance of the evidence claim 11 is unpatentable.

A. Related Matters

The parties represent that the ’062 patent is at issue in a federal district court case pending in the U.S. District Court for the District of Minnesota (0:14-cv-04857). See Pet. ’262, 1; Paper 6, 2. Petitioner also has filed petitions challenging Patent Owner’s U.S. Patent Nos. 6,702,539,

publicly disclosed. On that representation, we offered to issue the transcript under seal, and to let the parties file a motion to keep it under seal. No such motion has been filed.

⁵ Petitioner also filed a confidential version of its Reply, Paper 41, at the request of Patent Owner. See Paper 40 (Petitioner’s Motion to Seal). We will cite to the public, redacted version unless otherwise noted.

6,709,217 (“the ’217 patent”), 7,033,124, and 7,544,018, which are also at issue in the pending litigation. Pet. ’262, 1; Paper 6, 3.

B. The ’062 Patent

The ’062 patent is directed to “conveying drill cuttings employing a compressed conveyance gas to induce movement of the non-free flowing drill cuttings in a vessel without employing a non-pneumatic means for causing movement of the drill cuttings in the vessel.” Ex. 1004, Abstract. As stated in the ’062 patent specification, “the present invention is based on the surprising discovery that it is possible to transport a material in the form of a thick heavy paste by means of pneumatic conveying from a relatively large vessel.” *Id.* at 1:66–2:2. The specification further states that, conventionally, “it has been supposed that pneumatic conveying systems were only suitable for relatively free flowing material or conveying of small batches of wet sticky materials.” *Id.* at 2:2–5. “Thus, according to the present invention there is provided a method apparatus and system for conveying a non-free flowing paste comprising loading the paste into a vessel and applying a compressed gas to the vessel to cause the material to flow out of the vessel.” *Id.* at 2:6–10. “The non-free flowing paste may be a thick and/or heavy paste or clay like material, e.g. oil rig drill cuttings.” *Id.* at 2:11–12.

Figure 1 of the '062 patent is reproduced below.

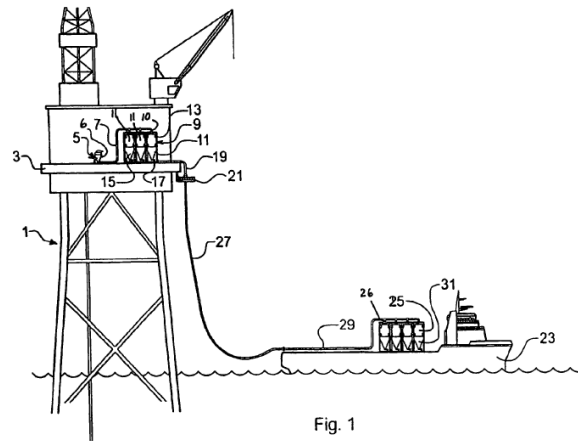


Figure 1 is a diagrammatic elevation view illustrating offshore oil rig 1 with pressure vessel 5, into which screened drill cuttings from the drilling process are loaded. *Id.* at 3:26–28, 56–59. Pressure vessel 5 includes an upper material inlet, lower conical portion 6, and a lower material outlet. *Id.* at 3:59–62. The specification discloses that “the entire vessel may be similar to that manufactured and sold by Clyde Materials Handling Limited.” *Id.* at 3:63–67. As illustrated in Figure 1, pipe 7 connects pressure vessel 5 to container assembly 9 comprising a number of vessels 11 (described as “ISO^[6] container sized vessels”), from which material may be discharged via hose 27 to container assembly 25 on supply boat 23. *Id.* at 4:13–22.

According to the specification, altering the cone angle of the lower conical portion of a vessel can facilitate movement of sticky materials that otherwise tend to collect around the sides of the vessel. *Id.* at 2:42–55. The specification states:

⁶ International Standards Organization.

If the included cone angle is changed below a certain or critical value, then the flow changes from core flow to so-called mass flow. In the case of mass flow, the material descends as a mass in a uniform way towards the outlet with all the material moving. Accordingly the combination of the use of a vessel designed to achieve mass flow and the application of a compressed gas above the surface of the material is such that it is possible to push the contents of the vessel through the outlet so as fully to empty the vessel.

Id. at 2:51–60. The specification also distinguishes “[c]onventionally known pressure vessels [] expected to withstand a maximum pressure of 2 bar” from the apparatus of “a preferred embodiment [that] includes a vessel adapted to be pressurised by compressed gas to between 4 and 8 bar.” *Id.* at 3:18–21.

C. Challenged Claims

In IPR2016-00262, Petitioner challenges claims 1–29, of which claims 1, 14, 15, 17, 18, 19, 20, and 25 are independent. Claim 1 is reproduced below.

1. A method for conveying non-free flowing drill cuttings comprising:
loading said non-free flowing drill cuttings into a vessel;
providing a compressed conveyance gas to the vessel to induce movement of said non-free flowing drill cuttings in said vessel, without employing a non-pneumatic means for inducing said movement; and
upon provision of the compressed gas, discharging at least a portion of said non-free flowing drill cuttings from the vessel.

In IPR2016-00263, Petitioner challenges claims 30–49, of which claims 30 and 41 are independent. Claim 30 is reproduced below.

30. An apparatus adapted for use on an oil well drilling rig for conveying non-free flowing drill cuttings comprising:
a first pressure vessel for receiving said non-free flowing drill cuttings;
said first pressure vessel being adapted to allow a compressed conveyance gas to be introduced therein to induce movement of said non-free flowing drill cuttings in said vessel, without employing a non-pneumatic means for inducing said movement.

D. Prosecution History

During the prosecution of the application leading to the related '217 patent, the parent of the '062 patent, the Examiner issued an Office Action rejecting the claims as anticipated by U.S. Patent No. 6,152,656 to Curtis et al. ("Curtis"), and stating that "[Curtis] disclose[s] the transport of semisolid material such as sludge . . . pneumatically from a conical supply hopper." Ex. 2017, 223. Subsequently, the applicant conducted an interview with the Examiner at which Curtis was discussed. *Id.* at 284. After filing amendments to the specification and the drawings and conducting a telephone interview with the Examiner, the applicant sought reconsideration of the issues raised in the Office Action. *Id.* at 306.

On October 2, 2003, the Examiner mailed a Notice of Allowance. *Id.* at 313. In an Examiner's Amendment, which the applicant authorized in a September 29, 2003, telephone interview, the Examiner inserted the

limitation “as the sole means for inducing movement of said paste [in⁷] said vessel” in application claims 1, 23, 24, 31, 32, 33, 34, and 39. *Id.* at 318–322. The Examiner also stated: “Regarding the ‘sole means’ limitation(s), heat addition, aerating action (i.e. chopping up of material, applying a screw conveyor, etc.), or the addition of a fluidizing agent are precluded. The conveyance gas is not a fluidizing agent.” *Id.* at 322. Notably, Curtis disclosed pulsed-jet bin aerators arranged in zones adjacent the conical interior wall of the hopper that created pulsed jets of air to prevent packing of material at the bottom of the hopper. *Id.* at 230, 233 (Curtis, Fig. 7, 6:59–64).

During the prosecution of the application leading to the present ’062 patent, the sole Office Action was a rejection of application claims 1–49 on the basis of obviousness-type double patenting over claims 1–30 of the ’217 patent. Ex. 2019, 629. The Examiner stated that, “[a]lthough the [claims in the ’217 patent and the present application] are not identical, they are not patently distinct from each other because the instant apparatus claim(s) are too close in scope with the patented method claim(s).” *Id.* Applicant did not traverse the rejection and filed a terminal disclaimer, whereupon the application issued. *Id.* at 739, line item 1.

⁷ The word “from” was inadvertently used in the Examiner’s Amendment. Applicant corrected the error on October 24, 2003. *Id.* at 332–333.

E. Prior Art and Instituted Grounds

In IPR2016-00262, we instituted trial on the question of whether claims 1–29 of the '062 patent are unpatentable under 35 U.S.C. § 103 on the following grounds:

References	Claims Challenged
Pneumatic Conveying, ⁸ Macawber, ⁹ Macawber Coal Ship, ¹⁰ Ciaffone, ¹¹ Laster, ¹² Dietzen I, ¹³ Dietzen II, ¹⁴ and Toth ¹⁵	1–29
Dietzen I, Ciaffone, Macawber, Macawber Coal Ship, Pneumatic Conveying, Laster, Dietzen II, and Toth	1–29

Petitioner also relies on the declaration of John W. Carson, Ph.D. Ex. 1033.

In IPR2016-00263, we instituted trial on the question of whether claims 30–49 of the '062 patent are unpatentable on the following grounds:

Reference(s)	Basis	Claims Challenged
Ciaffone	§ 102	30, 32–34, 36–38, and 41–45

⁸ R.D. Marcus et al, *Pneumatic Conveying of Solids: A theoretical and practical approach* (1990) (Ex. 1009).

⁹ *The System that Gives Pneumatic Conveying a Good Name*, Macawber Engineering Ltd. (Feb. 1985) (Ex. 1007).

¹⁰ *Coal Fired Ships Reappear*, 88:9 Compressed Air 21–24 (Sept. 1983) (Ex. 1008).

¹¹ US 3,601,068, issued Aug. 24, 1971 (Ex. 1006).

¹² US 4,332,530, issued June 1, 1982 (Ex. 1014).

¹³ US 5,402,857, issued Apr. 4, 1995 (Ex. 1012).

¹⁴ US 6,179,071 B1, issued Jan. 30, 2001 (Ex. 1013).

¹⁵ US 5,647,514, issued July 15, 1997 (Ex. 1017)

Reference(s)	Basis	Claims Challenged
Macawber, Macawber Coal Ship, Pneumatic Conveying, Ciaffone, Laster, Dietzen I, and Dietzen II	§ 103	30–49
Dietzen I, Ciaffone, Laster, Dietzen II, and Pneumatic Conveying	§ 103	30–49

Petitioner also relies on the declaration of John W. Carson, Ph.D. Ex. 1044.

II. ANALYSIS

A. Claim Construction

We interpret the claims of an unexpired patent using the broadest reasonable interpretation in light of the specification of the patent. 37 C.F.R. § 42.100(b).

1. “adapted to”

This term appears in claims 11, 17–19, and 30–49. Petitioner proposes “adapted to” means “capable of.” Pet. ’262, 10; Pet. ’263, 10. We agree, insofar as these limitations require structure to have qualities or features allowing it to meet the claim language. For example, claim 17 would require a vessel that actually can “withstand a pressure of about 4 bar to about 8 bar.” In other words, the “adapted to” language distinguishes from those structures that are not physically capable of meeting the limitation. Patent Owner argues that Petitioner’s construction is overly broad. PO Resp. ’262, 17–19; PO Resp. ’263, 16–19. Reviewing Patent Owner’s arguments, however, is not clear to us what Patent Owner disputes to be the effective difference. We determine that no explicit construction of “adapted to” is necessary.

2. “*non-free flowing drill cuttings*”

Petitioner proposes in its Petition that “non-free flowing drill cuttings” and “non-free flowing oil well drill cuttings” mean “a screened mixture of liquid and earth extracted material that exhibits some resistance to flow.” Pet. ’262, 12; *see also id.* at 10–12 (setting forth its full argument).¹⁶ Patent Owner did not file a Preliminary Response, and we determined in our Decision on Institution to adopt Petitioner’s proposed construction. Dec. on Inst. ’262, 7–8. In its Response, Patent Owner argues that “non-free flowing drill cuttings” and “non-free flowing oil well drill cuttings”¹⁷ mean “material generated by the drilling of an oil well including a mixture of earth and drilling fluid or oil that does not generally flow freely by gravitational force.” PO Resp. ’262, 12; *see also id.* at 11–16 (setting forth its full argument).

Patent Owner argues that Petitioner’s proposed construction “ignores the context of the ’062 patent” because the “exhibits some resistance to flow” aspect of Petitioner’s construction adds nothing, given that Petitioner’s expert testifies that all materials have some resistance to flow. *Id.* at 11. Further, Patent Owner argues that Petitioner’s construction renders the “non-free flowing” portion of the claims superfluous. *Id.* According to Patent Owner, the “non-free flowing” portion of the claims can be

¹⁶ Petitioner also asserts that the claims are indefinite under 35 U.S.C. § 112. Pet. 10–12. The scope of *inter partes* review is limited to grounds that could be raised under Sections 102 and 103. 35 U.S.C. § 311(b). Accordingly, no such ground was a part of this trial.

¹⁷ For ease of reference, we will refer to “non-free flowing drill cuttings” and “non-free flowing Oilwell drill cuttings” both as “non-free flowing drill cuttings.”

accommodated by considering whether the material flows as a result of gravity. *Id.* at 11–14. In its Reply, Petitioner abandons its initial proposed construction, and asserts that “[t]he patents should be read consistent with the specification, which describes all drill cuttings after the shaker house as non-free flowing drill cuttings.” Pet. Reply ’262, 10; *see also* Tr. 36:13–14 (Petitioner’s counsel abandoning its prior construction in favor of the new one “after having gone through discovery”). Petitioner argues that Patent Owner’s attempt to characterize “non-free flowing” on the basis of a gravity test “has no support in the specification or literature.” Pet. Reply 11; *id.* at 9–13 (setting forth its full argument).

Reviewing the arguments and evidence before us, we agree with Patent Owner that Petitioner’s initial construction, now abandoned, was too broad. Specifically, Petitioner’s abandoned construction did not account for the fact that the mixture comes from a particular origin (drilling of an oil well) and that the “some resistance to flow” aspect was also too broad given the particular materials involved. However, Patent Owner’s proposed construction, which would require a gravity test, is not supported by the ’062 patent. Instead, we effectively adopt a combination of Patent Owner’s proposed construction and Petitioner’s, for the reasons explained below.

The ’062 patent describes the material conveyed therein in several different ways, but it is always referring to the same material. The labels that the ’062 patent gives to this material are: “thick heavy paste” (Ex. 1004, 1:29, 1:46–47, 1:64, 2:1, 3:11), “drill cuttings” (*id.* at 1:65, 2:12; *see also id.* at 1:45 (simply, “cuttings”)), “non-free flowing paste” (*id.* at 2:7–8, 11), and “thick and/or heavy paste or clay like material” (*id.* at 2:11–12). These labels are often equated to one another: “cuttings . . . in the form of a

very thick heavy paste” (*id.* at 1:45–47), “thick heavy paste . . . e.g. drill cuttings” (*id.* at 1:64–65), “non-free flowing paste . . . e.g. oil rig drill cuttings” (*id.* at 2:11–12). As such, the ’062 patent considers screened drill cuttings to be a thick heavy paste as well as a non-free flowing paste and, thus, considers a thick heavy paste to be a non-free flowing paste. The ’062 patent does not discuss “non-free flowing drill cuttings,” or relate it to gravity. However, given that the ’062 patent considers “drill cuttings” to be “non-free flowing paste,” the “drill cuttings” are already “non-free flowing” according to the ’062 patent. Thus, when the claims add “non-free flowing” to “drill cuttings,” we find that they do not provide a further limitation, but rather just provide an extra description that a person of ordinary skill in the art would already understand is present if they were to read the specification. The ’062 patent is simply providing many ways to describe the same thing. There is no persuasive evidence that a person of ordinary skill in the art would understand “non-free flowing” to otherwise be a term of art. Indeed, Patent Owner’s expert, Dr. Brown, points to the exact same physical material samples to provide examples of “drill cuttings,” “non-free flowing paste,” and “non-free flowing drill cuttings.” *Compare* Ex. 2014 ¶ 53 with Ex. 2056 ¶ 53 *with* Ex. 2059 ¶ 53 *with* Ex. 2060 ¶ 53 (each using the same picture to describe the material).¹⁸

Patent Owner argues that Petitioner’s construction renders the words “non-free flowing” meaningless, and reads out that requirement. PO Resp. ’262, 11–12. Considering “drill cuttings” and “non-free flowing drill cuttings” to be synonymous is not improper in this context because the

¹⁸ Ex. 2056 is in IPR2016-00256; Exhibit 2060 is in IPR2016-00264.

specification already describes “drill cuttings” as “non-free flowing.” Adding the phrase “non-free flowing” on to “drill cuttings” does nothing to change what is claimed. This is not a matter of reading out a claim requirement, but rather just construing what “non-free flowing drill cuttings,” as a whole, means in the first instance. For example, the ’062 patent does not bifurcate between “drill cuttings” and “non-free flowing drill cuttings” such as to identify a difference. Likewise, the ’062 patent does not describe different structures to handle these different materials, or different methods to accommodate transferring them, if they were indeed different. Even further, there are not separate claims directed to “drill cuttings” and “non-free flowing drill cuttings” in the ’062 patent, such as to bring up an issue of claim differentiation. Instead, we have a claim term that appears only in the claims, but when read in light of the specification simply recites a truism: the drill cuttings conveyed by the pneumatic vessel in the ’062 patent are a non-free-flowing material.

Construing “non-free flowing drill cuttings” to mean the same material disclosed in the ’062 patent specification is consistent with our constructions of similar phrases in related patents having essentially the same disclosures. In IPR2016-00256, involving a sibling of the ’062 patent and having effectively the same specification, we adopted a modified version of Patent Owner’s proposed construction of “drill cuttings”—a “screened material generated by the drilling of an oil well including a mixture of earth and drilling fluid or oil.”¹⁹ In IPR2016-00264, involving a

¹⁹ We added the word “screened” because the purpose of the claimed invention is to convey the drill cuttings after they have been thickened by the screening process.

parent of the '062 patent and having effectively the same specification, we adopted the same construction for “non-free flowing paste,” of which the '062 patent tells us “drill cuttings” are an example.

We do not adopt Patent Owner’s proposed construction, which involves adding some sort of gravity test to the material to determine whether or not they are non-free flowing drill cuttings. According to '062 patent, the invention is to convey materials “in the form of thick, heavy pastes,” also known as non-free flowing paste, or screened drill cuttings. Ex. 1004, 1:27–30, 43–47, 63–65, 2:6–8, 11–12. The '062 patent, therefore, defines the relevant material, e.g., drill cuttings, by where it comes from (oil rig drill cuttings) and the way in which it arrives at the pressure vessel (after screening), and not by any particular gravity test. *See* Ex. 2054 ¶ 19 (Patent Owner’s declarant, Mr. Lauder, testifying that “the material coming out of the shaker house, consisting of the cuttings and the remaining amount of drilling fluid, is referred to as drill cuttings and are often non-free flowing”).²⁰ Thus, we are not persuaded that the claim requires a gravity test, as none is mentioned or alluded to in the specification, and is not needed given the way that the relevant material is described in the specification.

²⁰ Mr. Lauder’s testimony here is consistent with similar testimony in related proceedings. IPR2016-00264, Ex. 2055 ¶ 10 (Mr. Lauder testifying that, “[t]he coming out of the shaker house is referred to as drill cuttings and often has the consistency of a thick, heavy paste, or as claimed in the ‘217 patent, non-free flowing, heterogeneous, multicomponent, earth extracted paste”); IPR2016-00256, Ex. 2051 ¶ 10 (Mr. Lauder testifying “[t]he material coming out of the shaker house is referred to as drill cuttings, just like they are referred to in the ‘539 patent”).

Patent Owner's argument that the claims require a gravity test, notwithstanding its lack of support in the specification, is based on the testimony of Petitioner's expert, Dr. Carson, taken out of context, and also on the unsupported testimony of its expert, Dr. Brown. PO Resp. '262, 12–14. As to the testimony of Dr. Carson, Patent Owner points out that one of his colleagues once used the term “free-flowing” in a paper. *Id.* at 12 (citing Ex. 1016). During cross examination relating to this paper (which was on powders, not paste-like materials), Dr. Carson agreed that “it is possible” “to define non-free flowing in terms of gravity.” Ex. 2021, 88:17–21.²¹ Even if it is *possible* to define “non-free flowing” in terms of gravity in some context, that does not mean it is possible to define it in all contexts, let alone this particular context.²² Or, if possible, that such a definition is reasonable. Thus, we do not find the testimony of Dr. Carson to support Patent Owner's requirement for a gravity test.

As to Dr. Brown, Patent Owner relies on his testimony that a person of ordinary skill in the art “would understand that these pastes would not

²¹ Notably, Dr. Carson does not testify with respect to pastes, drill cuttings, or anything related to the claimed material at hand. Patent Owner distinguishes pastes and drill cuttings from powders when arguing that the prior art powder-conveying pressure vessels could not be expected to convey pastes or drill cuttings. *See, e.g.*, PO Resp. 40 (arguing that “granular solids [are] distinct from the [] non-free flowing drill cuttings [of the claim]”).

²² Exhibit 1016 is directed to the flow ability of powder, not pastes, and states that “the term *free flowing*, so commonly used, becomes meaningless unless the specific equipment handling the material is specified.” Ex. 1016, 62. To the extent this teaching applies to drill cuttings, what it shows is that what is “free flowing” on one piece of equipment may not on be so another, and supports Petitioner's argument that adding a gravity test would render the term indefinite. Pet. Reply 11.

generally flow as a result of gravity.” PO Resp. ’262, 13 (citing Ex. 2014 ¶¶ 80–81, 84). Dr. Brown’s cited testimony is as follows:

The ’062 Patent goes further to establish that drill cuttings or “thick heavy paste material[s]” are different from “relatively free flowing material” or “small batches of wet sticky materials.” Ex. 1004 at 2:2-5. Because the material conveyed in the ’062 Patent is contrasted with “relatively free flowing material,” the ’062 Patent’s use of the term “non-free flowing” is consistent with what a person of ordinary skill in the art would understand it to mean, and that is “does not generally flow freely by gravitational force.”

Ex. 2014 ¶ 84.

Dr. Brown’s testimony does not provide any evidence in support of his conclusion that the ’062 patent’s contrast between “thick heavy paste” and “free flowing material” has something to do with gravity. Similarly, his testimony that “‘non-free flowing’ is used to describe a material that ‘does not generally flow freely by gravitational force’” lacks supporting evidence or explanation. *Id.* ¶ 81; 37 C.F.R. § 42.65(a). We do not find his testimony persuasive.

In conclusion, we find Patent Owner’s explanations for why a person of ordinary skill in the art would consider the difference between non-free flowing drill cuttings and non-non-free flowing drill cuttings²³ to involve a gravity test is unpersuasive. Instead, we find that the ’062 patent conveys to a person of ordinary skill in the art that non-free flowing drill cuttings are the materials described in the specification, which are also called “drill

²³ Although the term “non-non-free flowing drill cuttings” is awkward, we see no basis in the record before us to support a finding that something that fails to fall into the category of non-free flowing drill cuttings must necessarily be free flowing.

cuttings,” “thick heavy paste,” and “non-free flowing paste.” The specification sufficiently explains what drill cuttings are, such that we do not need to incorporate some sort of gravity test to determine what is or is not a non-free flowing drill cutting. According to the ’062 patent, a screened drill cutting is a non-free flowing drill cutting. *See* Ex. 1004, 1:43–46, 1:64–65, 2:11–12. Therefore, we construe “non-free flowing drill cuttings” to mean a “screened material generated by the drilling of an oil well including a mixture of earth and drilling fluid or oil.”

3. *“means for transporting”*

This term appears in claims 39, 40, 46, and 47. Petitioner proposes the term is a means-plus-function limitation having a function of “transporting [the] pressure vessel to a discharge station” and corresponding structure of “a ship, crane, and road vehicle.” Pet. ’263, 12 (citing Ex. 1004, Fig. 1, Fig. 6, 5:8–11, 5:59–63, 6:17–31). Patent Owner proposes a similar construction. PO Resp. ’263, 20 (using the term “boat” instead of “ship”). The constructions are effectively identical. Our Decision does not turn on which proposed construction we choose; we adopt the Patent Owner’s proposed construction.

4. *“means for transferring”*

This term appears in claims 44 and 45. Petitioner proposes the term is a means-plus-function limitation having a function of “transferring the non-free flowing drill cuttings from a second vessel to a third vessel” and corresponding structure of “a conduit, pipe, or flexible hose.” Pet. ’263, 12–13 (citing Ex. 1004, Fig. 1, Fig. 6, 5:8–11, 5:59–63, 6:17–31). Patent Owner proposes a similar construction, but with more exemplary corresponding

structures. PO Resp. '263, 21 (also including “compressed gas[/air],” “a connector,” and “a hose”). Petitioner’s Reply does not discuss the construction of “means for transferring.” Our Decision does not turn on which proposed construction we choose; we adopt Patent Owner’s proposed construction because it is a slightly broader reasonable interpretation.

5. “*without employing non-pneumatic means*”

This limitation appears in all independent claims. Neither party proposes a claim construction for this limitation. We construe the limitation because it is relevant in our nexus analysis below.

In order to understand the scope of this limitation, we turn to the prosecution history. “The prosecution history gives insight into what the applicant originally claimed as the invention, and often what the applicant gave up in order to meet the Examiner’s objections.” *Lemelson v. General Mills, Inc.*, 968 F.2d 1202, 1206, (Fed. Cir. 1992); *see also Standard Oil Co. v. American Cyanamid Co.*, 774 F.2d 448, 452, (Fed. Cir. 1985) (“[T]he prosecution history (or file wrapper) limits the interpretation of claims so as to exclude any interpretation that may have been disclaimed or disavowed during prosecution in order to obtain claim allowance.”).

As we explained above, the '062 patent is a child of the '217 patent. The original claims of the '217 patent were rejected as anticipated by Curtis, which had pulsed-jet aerators in the cone of the pressure vessel. Ex. 2017, 232, 3:7–11, 6:59–64. After a telephone interview, during which the Examiner and Patent Owner “[d]iscussed [a] proposed amendment” (*id.* at 284), the Examiner proposed an Examiner’s Amendment adding that the conveyance gas was “the sole means for inducing movement [of the

material]” (*see, e.g., id.* at 322). The Examiner set forth the scope of the “sole means” limitation: “heat addition, aerating action (i.e. chopping up of material, applying a screw conveyor, etc.), or the addition of a fluidizing agent are precluded. The conveyance gas is not a fluidizing agent.” *Id.* Amending the claims to include the “sole means” limitation, along with the Examiner’s accompanying explanation of its scope, are clearly and unmistakably the reasons for issuance of the ’217 patent. *See Edwards Lifesciences LLC v. Cook Inc.*, 582 F.3d 1322, 1327 (Fed. Cir. 2009) (prosecution history “provides evidence of how the [PTO] and the inventor understood the patent” (quoting *Phillips v. AWH Corp.*, 415 F.3d 1303, 1317 (Fed. Cir. 2005) (en banc) (alteration in original))).

The application that was issued as the ’062 patent is a direct continuation of the application that issued as the ’217 patent. The claims in the ’062 patent application did not have the “sole means” limitation required by the Examiner for allowance of the ’217 patent. Instead, the claims included the “without employing non-pneumatic means” limitation. The ’062 patent application received an obviousness-type double patenting rejection in the first Office Action, where the Examiner stated “[a]lthough the [claims in the ’217 patent and the present application] are not identical, they are not patently distinct from each other because the instant apparatus claim(s) are too close in scope with the patented method claim(s).” Ex. 2019, 629. Patent Owner did not traverse that rejection and filed a terminal disclaimer; the claims were thereafter allowed.

Our understanding of the prosecution history of the ’062 patent is that the Examiner did not consider the “without employing” limitation to be meaningfully broader than the “sole means” limitation, or the Examiner

would have re-instated the Curtis rejection. Instead, the Examiner stated the claims were “not patently distinct.” Ex. 2019, 629. In other words, the Examiner considered the claims in the ’062 patent to *also* have “precluded” “heat addition, aerating action (i.e. chopping up of material, applying a screw conveyor, etc.), or the addition of a fluidizing agent.” Ex. 2017, 322. Patent Owner acquiesced to the Examiner’s statement that the claims are not patentably distinct by not traversing the double patenting rejection and filing a terminal disclaimer to secure allowance of the claims. Ex. 2019, 651 (“please find enclosed a TERMINAL DISCLAIMER in response to the double patenting rejection”). *See Biogen Idec, Inc. v. GlaxoSmithKline LLC*, 713 F.3d 1090, 1097 n.6 (Fed. Cir. 2013) (disclaimer arose where the applicants “let[] stand an examiner’s narrow characterization of a claim term” and “adopt[ed] ... that characterization to overcome the examiner’s ... rejection”); *TorPharm Inc. v. Ranbaxy Pharm., Inc.*, 336 F.3d 1322, 1330 (Fed.Cir.2003) (“Whether the patentee chooses to dispute the examiner’s view of matters is relevant to claim interpretation, for there a court may need to ascertain exactly what subject matter was actually examined and allowed by the PTO.”). Thus, the prosecution history of the ’062 patent simply continues the prosecution history of the ’217 patent, and leaves intact the Examiner’s and Patent Owner’s understanding regarding the scope of the amendment responsible for allowance. Accordingly, we construe the “without employing” limitation the same as the “sole means” limitation of the ’217 patent: *heat addition, aerating action (i.e. chopping up of material, applying a screw conveyor, etc.), or the addition of a fluidizing agent are precluded. The conveyance gas is not a fluidizing agent.*

B. Ciaffone Anticipation Ground

Petitioner asserts that claims 30, 32–34, 36–38, and 41–45 are anticipated by Ciaffone. Pet. '263 26–33.

1. Ciaffone

Ciaffone discloses a system and process for pneumatically conveying wet and bulky waste material over long distances, without the need for bins, hoppers, hydraulic rams, screw feeders, conveyor belts, and the like between the ejector and the incinerator. Ex. 1006, 1:7–9, 18–20, 30–32, 1:70–2:6. Waste materials that can be conveyed pneumatically, as disclosed in Ciaffone, include screenings, grit, sludge cake, skimming, and refuse. *Id.* at 1:71–73. Figure 2 of Ciaffone, which is reproduced below, depicts a preferred embodiment.

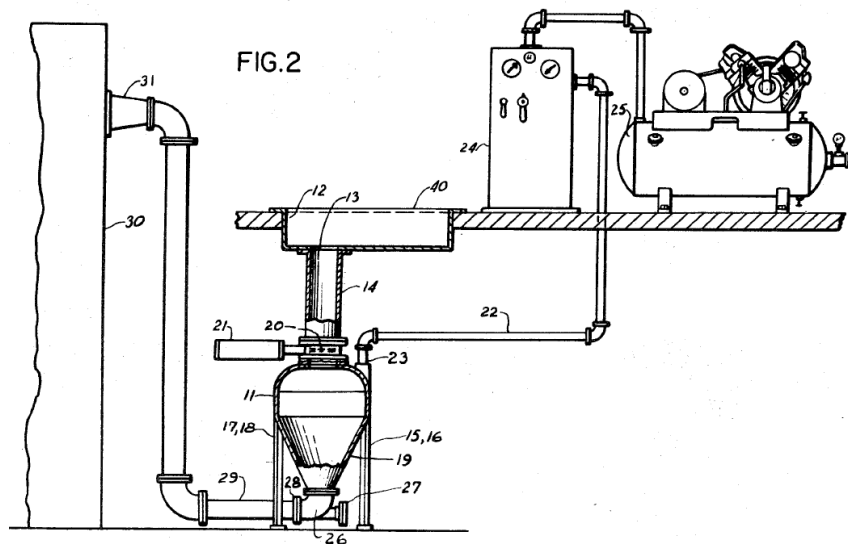


Figure 2 illustrates pneumatic ejector 11, inlet chute 14, pressure air line 22, conical section 19, and discharge pipe 29. *Id.* at 2:55–3:3. In operation, “[t]he pressure within the vessel is allowed to build up to an

appropriate level so as to overcome the force represented by the mass of the waste material whereupon this compacted mass is blown out through the discharge pipe.” *Id.* at 3:32–36. The pressure may range from about 5 to 100 psi, which, according to Dr. Carson, equates to about 0.3 to 6.89 bar. Ex. 1031 ¶ 48 (citing Ex. 1006, 3:66–67); *see also* Ex. 1003, 3:18–21 (contrasting the conventional pressure vessels of 2 bar with the disclosed invention pressure vessels of 4 to 8 bar).

2. Anticipation Analysis

Petitioner addresses independent claims 30 and 41 in a first claim chart (Pet. ’263, 28–30) and dependent claims 32–34, 36–38, and 42–45 in a second claim chart (*id.* at 30–33).

As to independent claims 30 and 41, Petitioner asserts that Ciaffone discloses a first pressure vessel for receiving material, the vessel using a compressed gas to induce movement of the material without employing a non-pneumatic means for inducing movement of the material. *Id.* at 28–29. Petitioner asserts that the materials envisioned to be conveyed by Ciaffone include “wet and bulky waste materials” such as “screenings, grit, sludge cake, skimming, hospital waste, refuse, garbage, bark, plastic and the like.” *Id.* at 30 (citing Ex. 1006, 1:7–10, 30–32, 70–75). Petitioner asserts that Ciaffone’s ability to convey these materials means that it is likewise capable of conveying non-free flowing drill cuttings. *Id.* at 26–27, 30. Petitioner cites, as additional support, the testimony of Dr. Carson, who testifies, “Ciaffone describes conveying materials that would perform the same as screened drill cuttings.” Ex. 1044 ¶ 113. Petitioner directs us to case law that specifies that the risk in defining claims functionally rather than

structurally is that “[w]here all structural elements of a claim exist in a prior art product, and that prior art product is capable of satisfying all functional or intended use limitations, the claimed invention is nothing more than an unpatentable new use for an old product.” *Bettcher Indus. v. Bunzl USA, Inc.*, 661 F.3d 629, 654 (Fed. Cir. 2011); *In re Schreiber*, 128 F.3d 1473, 1478 (Fed. Cir. 1997) (explaining that “choosing to define an element functionally, i.e., by what it does, carries with it a risk” in that “a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art.” (citation omitted)). Here, Petitioner asserts that the pressure vessel of Ciaffone is “capable of satisfying all functional or intended use limitations” by showing Ciaffone capable of conveying material similar to drill cuttings (“wet and bulky waste materials,” Ex. 1006, 1:20) and operating at similar pressures (“5 to 100 pounds per square inch,” *id.* at 3:66–68).²⁴

Although we considered this sufficient for purposes of institution, we do not consider Petitioner to have shown by a preponderance of the evidence that independent claims 30 and 41 are anticipated by Ciaffone. Primarily, an allegation that Ciaffone can convey similar materials to that claimed is not sufficient here to show that Ciaffone can necessarily convey the same material as that claimed. Simply put, we do not have sufficient evidence before us showing how similar these materials really are. Petitioner has not shown, by a preponderance of the evidence, that a material with the particular properties associated with non-free flowing drill cuttings could be

²⁴ Dr. Carson testifies that 5 to 100 psi equates to 0.3 to 6.89 bar, which is comparable to the pressures disclosed in the ’062 patent specification, 4 to 8 bar. Ex. 1044 ¶ 50; Ex. 1004, 3:18–20.

conveyed in Ciaffone. As such, Petitioner has not shown sufficiently that the pressure vessel in Ciaffone is “adapted to allow a compressed conveyance gas . . . to induce movement of said non-free flowing drill cuttings,” i.e., structurally configured in a way that allows it to induce movement of the cuttings, as required by independent claims 30 and 41.

Patent Owner in its Response argues that the materials in Ciaffone “are significantly different than non-free flowing drill cuttings.” PO Resp. ’263, 24–25 (citing Ex. 2059 ¶ 155). Patent Owner’s only evidence in support of this statement is the testimony of its expert, Dr. Brown, but Dr. Brown does not explain or offer evidence in support of his opinion. We do not credit his testimony. Nevertheless, it is Petitioner’s burden to establish that those materials disclosed in Ciaffone have the same properties as non-free flowing drill cuttings, such as to show that Ciaffone, without modification, would convey them as required by the claims.

In its Reply, Petitioner argues that claims 30 and 41 are anticipated because “a person of skill in the art would expect this equipment to successfully convey the drill cuttings.” Pet. Reply ’263, 15. Petitioner here also references its argument that a person of ordinary skill in the art would have “a strong expectation that drill cuttings could be pneumatically conveyed using prior art systems such as those of Ciaffone.” *Id.* at 8. However, even if a person of ordinary skill in the art had an expectation of success that the structure in Ciaffone could convey drill cuttings, that still is not evidence that the structure in Ciaffone would necessarily be capable of doing so. A test that answered in the affirmative would be, for example, the evidence required to show anticipation.

In view of the above, we find that Petitioner has failed to establish by a preponderance of the evidence that Ciaffone discloses an “apparatus adapted for . . . conveying non-free flowing drill cuttings comprising . . . [a] first pressure vessel being adapted to . . . induce movement of said non-free flowing drill cuttings in said vessel.” Although Ciaffone describes a conical pressure vessel capable of sufficient pressure, what we do not know is anything about the cone angle, or the other factors involved in designing a vessel to convey materials. See Ex. 1009, 279 (instructing that “there are three basic design parameters which can influence blow vessel performance: (a) cone angle; (b) vessel volume; and (c) vessel pressure”). We understand that Ciaffone describes materials that include similar properties to non-free flowing drill cuttings, but we simply do not have sufficient evidence to meet the high standards of anticipation, to know whether the conveyance of those materials in Ciaffone necessarily imply the same cone angle and other structural configurations that would be required to have a pressure vessel “adapted to” induce movement of non-free flowing drill cuttings.

3. Conclusion for Anticipation Ground

For the reasons explained above, Petitioner has failed to demonstrate by a preponderance of the evidence that Ciaffone describes each limitation of independent claims 30 and 41. This failure applies to the challenged claims that depend therefrom. Therefore, Petitioner has failed to demonstrate by a preponderance of the evidence that claims 30, 32–34, 36–38, and 41–45 are anticipated by Ciaffone.

C. Overview for the Obviousness Grounds

The claims are directed to a method or apparatus for conveying drill cuttings using a pressure vessel that is adapted to receive and then convey the drill cuttings using compressed gas (i.e., positive pressure). Each proceeding addresses a different set of claims, and each proceeding includes two obviousness grounds addressing that group of claims. Although the grounds include slightly different recitations of references, they generally fall into two categories. The first category begins with Pneumatic Conveying or Macawber (hereinafter the “Pneumatic Conveying-led ground”). Pet. ’262, 26–48; Pet. ’263, 36–44. The Pneumatic Conveying-led ground proposes to use an existing positive pressure vessel to convey non-free flowing drill cuttings. The second category begins with Dietzen I (hereinafter the “Dietzen-led ground”), and proposes to modify an existing negative pressure vessel that conveys non-free flowing drill cuttings into a positive pressure system. Pet ’262, 48–59; Pet ’263, 45–58. Before turning to the specifics of these grounds, we review the level of ordinary skill in the art, the scope and content of the prior art, and the differences, in general, between the prior art and the invention.

1. Level of Ordinary Skill

Petitioner asserts that a person of ordinary skill in the art “would have had at least a bachelor’s degree in a science or engineering discipline . . . along with at least 5 years of experience in the design of systems for the handling of bulk solid and fluid materials, including through the use of pneumatic conveyance.” Pet. ’262, 12; *see also id.* (allowing for fewer years of experience with an advanced degree); Ex. 1033 ¶ 28. Patent Owner

proposes a lower level of skill, “at least a bachelor’s degree in mechanical engineering or a similar discipline, at least two years of experience with systems that convey materials, and [knowledge of] the flow and behavior of granular solids, slurries, and pastes.” PO Resp. ’262, 4; *see also id.* (allowing for fewer years of experience with an advanced degree).

Although both parties agree that the level of ordinary skill involves a bachelor’s degree and familiarity with similar subject matter, Petitioner proposes experience in the *design* of systems, whereas Patent Owner merely proposes experience with the systems themselves. We agree with Petitioner that a person of ordinary skill in the art *designs* devices, rather than is merely familiar with them (e.g., an operator or a manufacturer), as proposed by Patent Owner. *See* Ex. 1033 ¶ 28; Ex. 1004, 2:61–63 (indicating that those skilled in the art would understand “that the critical cone angle will vary depending upon the material being conveyed”). Accordingly, we adopt Petitioner’s proposed level of ordinary skill.

2. *Scope and Content of the Prior Art*

The claims are directed generally to pneumatic conveyance of drill cuttings. The asserted prior art generally falls in four categories. The first category describes the features of pneumatic conveying devices manufactured by Macawber to move materials having poor flow characteristics (Pneumatic Conveying, Macawber, and Macawber Coal Ship). The second category, consisting only of Ciaffone, describes another pneumatic conveying device. These first two categories are similar in that they describe conical vessels that use positive pressure to convey difficult-to-convey materials. The third category (Dietzen I and II) describes existing

methods of conveying drill cuttings, using negative pressure conveying device. The fourth category (Laster, Toth) describe parameters of existing vessels. These references are described in detail below.

a. Pneumatic Conveying

Pneumatic Conveying describes high-pressure feeding devices. Ex. 1009, 273–308. “Common to all such high pressure feeding devices is the ‘blow vessel’ designed to meet both the requirements as a material feeder and the relevant design codes for pressure vessels.” *Id.* at 273. As taught by Pneumatic Conveying, “[b]low vessels are essentially conical bottomed pressure vessels fitted with the necessary valves and fittings to suit the particular feeding requirements.” *Id.* “[T]here are three basic design parameters which can influence blow vessel performance: (a) cone angle; (b) vessel volume; and (c) vessel pressure.” *Id.* at 279. Pneumatic Conveying states that “[t]he increased use of blow vessels for feeding materials with ‘bad’ flow properties necessitates the selection of a suitable cone angle.” *Id.* According to Pneumatic Conveying, small capacity blow vessels are designed to convey material, including, for example, lumps of coal, as a series of discrete plugs rather than as a continuous stream. *Id.* at 282. Pneumatic Conveying identifies a small capacity blow vessel sold by Simon Macawber SA Ltd, South Africa, that is “designed for materials with ‘bad’ flow characteristics.” *Id.* at 281–282, Fig. 7.32.

b. Macawber

Macawber is a company brochure, published by Macawber Engineering Limited (the “Macawber company”), England, that describes a dense phase pneumatic conveying system called the “Denseveyor.”

Ex. 1007, 2. The brochure describes the Macawber company's extensive materials handling capability:

Macawber's general materials handling capability is extensive. We have evaluated and installed systems to handle soda ash and limestone, for use in the glass industry; vermiculite for making fire resistant plasterboards, sugar, and even waste steel chippings from industrial production lines. Materials such as ultra fine cohesive powders from sub-micron to granular material; from hot knockout zircon foundry sand at 480°C, to high moisture content materials; from chemicals and foodstuffs to fertilisers. The list is endless, in fact at Macawber we call it our A-Z of Materials Handling.

Id. at 2. As described in Macawber, the Denseveyor includes a conically-shaped pressure vessel. *Id.* at 5.

c. Macawber Coal Ship

Macawber Coal Ship describes use of the Macawber company's Denseveyor for handling coal and ash on a modern steamship. Ex. 1008, 21. The physical characteristics of the coal and ash include lumps of coal as large as 3 inches, high levels of fines below 1/8 inch, and high ash content, including "clays, which when coupled with high-moisture contents, form a sticky, difficult-to-handle material that blocks the pneumatic pipeline." *Id.* Macawber Coal Ship discloses that the Denseveyor "could handle, without damage, coal with lumps as large as 3 inches, as well as untreated fines, regardless of moisture content." *Id.* at 22.

d. Ciaffone

Ciaffone is introduced above.

e. Dietzen I

Dietzen I discloses a "method and apparatus for removing drill cuttings from an oil and gas well drilling platform." Ex. 1012, 2:19–21.

Dietzen I explains how the drilling mud that returns after lubricating the drill bit is contaminated with pieces of shale and rock, “which are known in the industry as well cuttings or drill cuttings.” *Id.* at 1:38–45. Typically the drilling mud is separated from the cuttings and reused. *Id.* at 1:46–56. That leaves the cuttings behind, which, according to Dietzen I “is a complex environmental problem.” *Id.* at 1:57–62. Dietzen I states that typical solutions involve simply dumping the cuttings or various washing techniques that involve numerous complications. *Id.* at 2:8–15. The solution in Dietzen I is to capture the drill cuttings in tanks, which are then disposed of at a remote disposal site. *Id.* at 2:48–52 (“The tank is emptied of drill cuttings at a desired remote disposal site by opening the access opening to allow *gravity flow* of the cuttings from the tank interior via the access opening.”) (emphasis added).

During operation of the invention in Dietzen I, the drill cuttings fall from “shale shakers” into a trough. *Id.* at 2:29–30. At the bottom of the trough is a suction line, which suctions the cuttings through a suction line into a holding tank. *Id.* at 30–34. Figure 1 of Dietzen I depicts the disclosed arrangement:

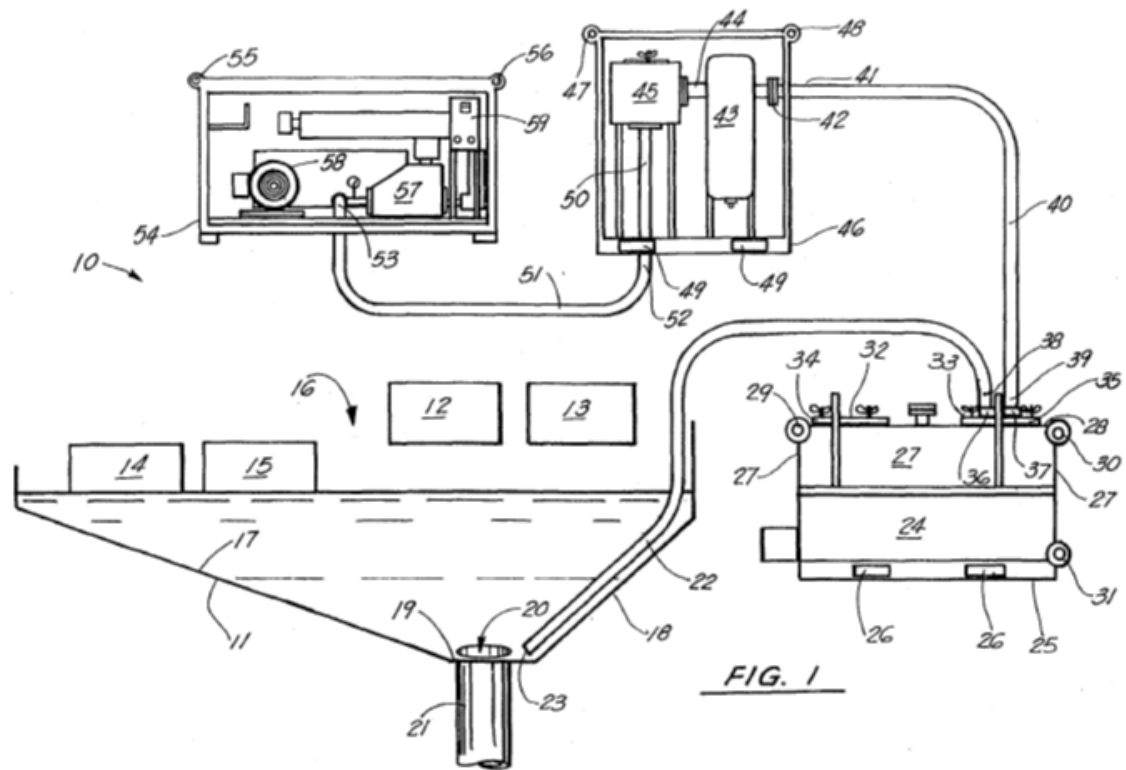


Figure 1 of Dietzen I depicts trough 11 filled with drill cuttings having just fallen from shakers 12–15. *Id.* at 3:30–31. At the bottom of trough 11 is inlet 23 of first suction line 22. *Id.* at 3:40–44. First suction line 22 moves material from the bottom of trough 11 into tank 24, where the drill cuttings will reside until tank 24 is full and then are carried off via a crane. *Id.* at 3:41–46, 56–64. The drill cuttings are poured out via gravity from tank 24 once it reaches the disposal site. *Id.* at 2:48–52. Suction line 22 has negative pressure by way of its connection to suction lines 40 and 51, with suction line 51 connected to blower 57, which ultimately generates the negative pressure. *Id.* at 4:12–15, 28–34.

f. Dietzen II

Dietzen II is similar to Dietzen I in that it uses vacuum (negative) pressure to transfer drill cuttings. Ex. 1013, Abstract. Dietzen II discloses

transferring the waste drill cuttings from holding tanks on the drilling platform to storage tanks on a work boat via a flow line. *Id.* at 2:58–59. Figure 1A of Dietzen II is reproduced below.

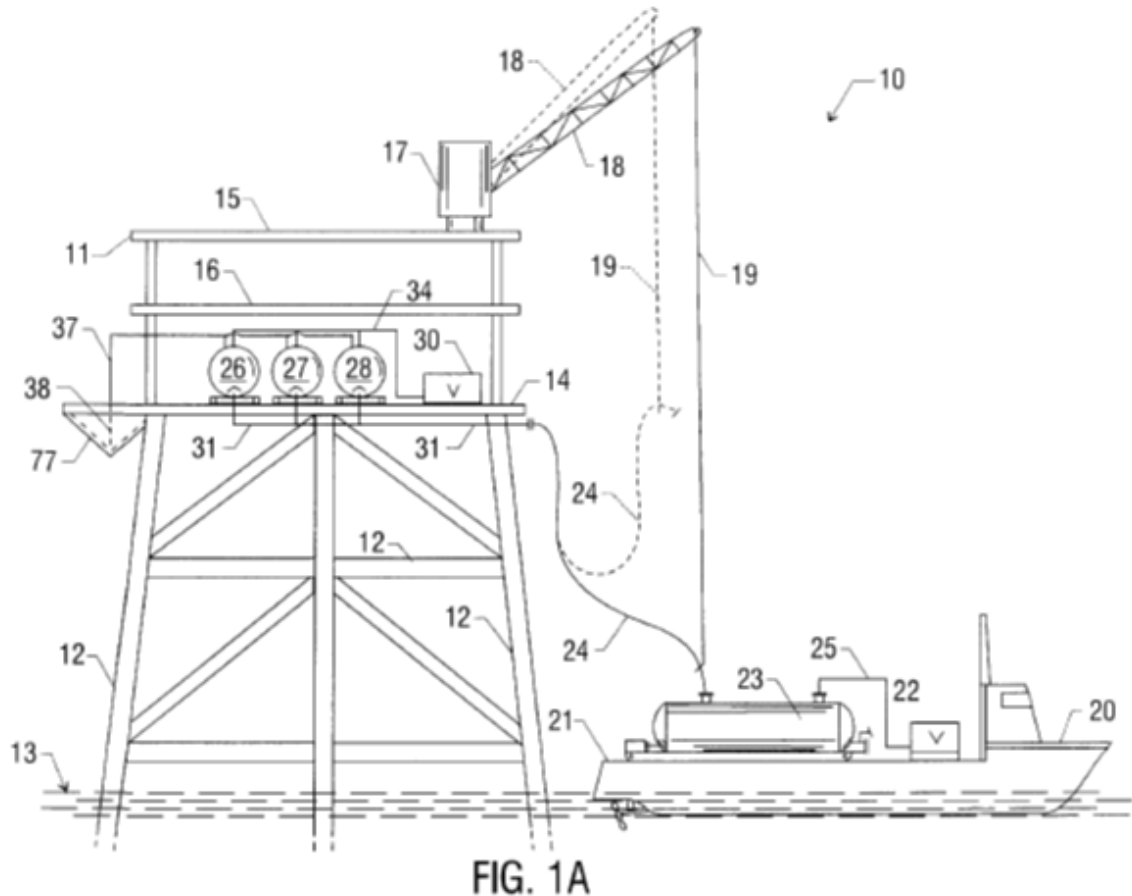


Figure 1A is an elevation view illustrating work boat 20 moored next to offshore oil and gas well drilling platform 11. *Id.* at 4:10–34.

During drilling operations, trough 77 receives drill cuttings removed from the well bore after those cuttings have been subjected to “solids control,” i.e., a shale shaker, where they are subsequently vacuumed into storage tanks 26, 27, and 28 using vacuum unit 30. *Id.* at 4:61–5:1. Suction line 24 can be used to form a removable connection between the tanks on the drilling platform and the boat storage tanks. *Id.* at 4:50–53. The deck of

boat 20 supports vacuum unit 22, vacuum lines 25, and one or more storage tanks 23. *Id.* at 4:34–36.

The storage tanks in Dietzen II are described as a “pressure vessel capable of holding a vacuum,” and are generally cylindrically shaped. *Id.* at 5:23–29. Figure 3 of Dietzen II depicts one such vessel:

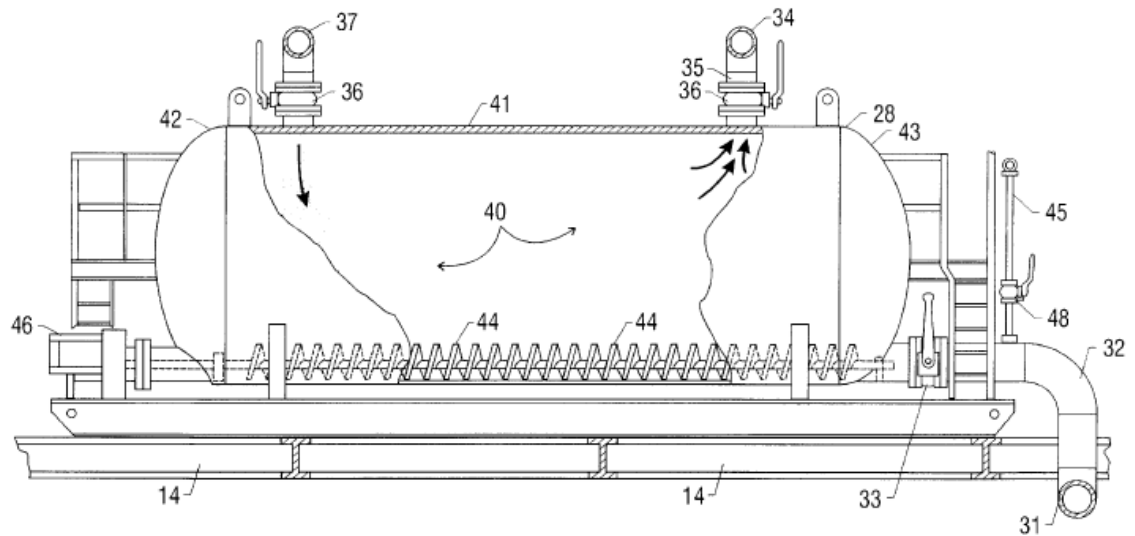


FIG. 3

Figure 3 of Dietzen II depicts a side cross-section of pressure tank 28.

In Figure 3, drill cuttings are introduced into tank 28 via section header 37, which in turn receives suction from suction line 35. *Id.* at 5:6–8, 17–22. The drill cuttings are deposited into tank 28 and fall to the bottom, where auger 44 pushes the cuttings to discharge line 32. *Id.* at 5:29–31. Discharge line 32 is connected via header 31 to hose 24, which connects rig 11 to boat 20, illustrated in Figure 1A. *Id.* at 5:31–34, 6:1–3. Drill cuttings move from rig 11 to boat 20 via vacuum pressure applied by vacuum unit 22 on boat 20. *Id.* at 6:34–40; *see also* Fig. 11 (depicting schematically an arrangement of the various tanks, valves, pipes, vacuums, and other devices associated with rig 11 and boat 20). Accordingly, auger 44 in tank 28 moves

drill cuttings to the opening of discharge line 32, where they are then vacuumed to boat 20. Dietzen II also states that valve 48 attached to discharge line 32 can be opened to apply positive pressure to the discharge line “to assist the flow of cuttings.” *Id.* at 5:14–16.

g. Laster

Laster discloses a pneumatic pumping apparatus for pumping thick, difficult-to-pump slurry fluids, such as drilling mud. Ex. 1014, 1:11–13. Specifically, Laster addresses the problem of transferring waste drilling mud that has become “very thick”:

In the oil field industry, and especially associated with drilling platforms, drilling rigs and the like, it is known to use a thick viscous fluid known as drilling mud during the proper procedures for drilling wells. . . . The mud used in drilling is quite thick and difficult to pump or move when it is used up. . . . [U]nwanted mud which is often polluted or too filthy to reclaim must be pumped to a holding pond or pit which is known in the art as a “reserve pit.”

Pumps which are known in the art for the pumping of drilling mud . . . suffer in that they are inadequate or inefficient in pumping mud as the mud thickens. *This is particularly a problem when the weather is quite cold and the mud becomes very thick* and difficult if not impossible to transmit from the rig cellar to the reserve pit using conventional pumps. It is not unknown for an oilman or other drilling rig personnel to hand empty the rig cellar using a shovel and bucket when the drilling mud in the cellar becomes so thick that conventional pumps are ineffective in discharging the cellar of the mud and trash which collect there within. It is to this problem that the present invention is directed.

Id. at 1:20–48 (emphasis added). Laster teaches that “a desired buildup of pressure can be achieved using a sump tank of suitable pressure requirements and a source of compressed air sufficient to move any fluid

even, heavy viscous drilling mud, slurries, oil, and the like.” *Id.* at 2:27–31. Laster discloses a sump tank having wall thicknesses to withstand pressures of 0–200 psi. *Id.* at 3:31–34.

h. Toth

Toth discloses a shipping container for transporting dry bulk products. Ex. 1017, Abstract. More importantly, Toth recognizes that “freight container[s] must be designed and built to internationally recognized standards such as those issued by . . . ISO.” *Id.* at 1:28–31. Size is one aspect of the standard. *Id.* at 1:33–36.

3. Differences Between the Prior Art and Challenged Claims

In conducting our obviousness analysis, it is instructive in this instance to consider first the differences between the prior art and the ’062 patent in the words of the inventors. This is because the ’062 patent makes clear that its invention is not the device, but rather a new application for an old device. Specifically, the patent states that “the entire vessel may be similar to that manufactured and sold by Clyde Materials Handling Limited.” Ex. 1004, 3:63–67; *id.* at 6:14–16 (stating that “transfer rates from the rig [using buffer storage] are much higher than is possible if a *standard pneumatic conveyer system (such as the Clyde system) is used alone.*” (emphasis added)). The entire body of the patent focuses on a method of using a device, and not the particular configuration of the device itself.

The patent discusses two potential physical differences over conventional pressure vessels: the cone angle and the maximum pressure. *Id.* at 2:48–51 (“even for the sort of material with which this invention is

concerned, it is possible to change the nature of the flow out of the vessel by altering the cone angle of the lower conical portion of the vessel”), 3:18–21 (comparing the maximum pressure of conventional pressure vessels—2 bar—versus those of the preferred embodiment—4 to 8 bar). However, both of these factors—cone angle and maximum pressure—were well understood by a person of ordinary skill in the art as variables to consider when designing a pressure vessel to convey a particular material. *Id.* at 2:61–63 (“It is well known that the critical cone angle will vary depending upon the material being conveyed as such [sic] would be well understood by those skilled in the art.”); Ex. 1009, 279 (a textbook explaining that “there are three basic design parameters which can influence blow vessel performance: (a) cone angle; (b) vessel volume; and (c) vessel pressure.”). The ’062 patent does not explain how to modify (if necessary) a pressure vessel to achieve the desired cone angle or vessel pressure, indicating that a person of ordinary skill in the art knows how to do that. *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384 (Fed. Cir. 1986) (“[A] patent need not teach, and preferably omits, what is well known in the art.”) (citing *Lindemann Maschinenfabrik GMBH v. Am. Hoist & Derrick Co.*, 730 F.2d 1452, 1463 (Fed. Cir. 1984)); *In re Epstein*, 32 F. 3d 1559, 1568 (Fed. Cir. 1994). Accordingly, the difference between the prior art and the claimed invention is not in discovering a structure for a pressure vessel to convey the claimed materials. The invention instead holds itself out as a discovery that one can convey the claimed materials with this type of vessel. Ex. 1004, 1:66–2:2 (“the present invention is based on the surprising discovery that it is possible to transport a material in the form of a thick heavy paste by means of pneumatic conveying”). Modifications necessary to effect that

goal (e.g., variations in cone angle and air pressure) are a matter of ordinary skill. *See, e.g.*, Ex. 1009, 279.

At a high level, the differences between the claimed invention and the prior art are distinct for each of the two obviousness grounds. For the Pneumatic Conveying-led obviousness grounds, the vessels are positive pressure but there is no explicit recitation that these vessels convey non-free flowing drill cuttings. That ground relies on Dietzen I and II for teaching that screened drill cuttings (which are not free-flowing) can be conveyed using pneumatic means, albeit using negative pressure. For the Dietzen-led obviousness grounds, the pressure vessels are for conveying non-free flowing drill cuttings, but they run on negative pressure rather than positive pressure. That ground relies on other references to teach a positive pressure conveyance vessel. We now turn to the specifics of these grounds.

D. Dietzen-Led Obviousness Ground: Claims 1–29

The evidence Petitioner asserts in the Dietzen-led obviousness ground against claims 1–29 of the '062 patent is identical to the evidence Petitioner asserts against claims 1–30 of the '271 patent.²⁵ Pet. '262, 48–59. Further, claims 1–29 of the '062 patent encompass effectively the same subject matter as claims 1–30 of the '217 patent, with two differences that do not affect the outcome.

²⁵ In IPR2016-00264, Petitioner asserted that claims 1–30 of the '217 patent were unpatentable as obvious in view of Dietzen I, Ciaffone, Macawber, Macawber Coal Ship, Pneumatic Conveying, Toth, Laster, Dietzen I and Dietzen II. Although Toth is not listed in the Dietzen-led ground against claims 1–29 of the '062 patent, it was discussed and relied upon in Petitioner's analysis. Pet. '262, 57.

First, the '217 patent is directed to “paste,” whereas the '062 patent is directed to “drill cuttings.” *Compare, e.g.*, Ex. 1002, 6:21 (“non-free flowing paste”) *with* Ex. 1004, 6:48 (“non-free flowing drill cuttings”). As explained in our claim construction section above, the '062 patent specification instructs that screened drill cuttings are paste. Both of these terms are labels describing the same material and there is no effective difference between the two for purposes of this Decision. Thus, our analysis does not differ between the two proceedings based on this claim term.

Second, the '217 patent has a negative limitation that the “sole means for inducing movement” of the material is “a compressed conveyance gas,” whereas the '062 patent has a negative limitation of using “a compressed conveyance gas . . . without employing a non-pneumatic means for inducing said movement.” *Compare, e.g.*, Ex. 1002, 6:22–24 (“providing a compressed conveyance gas to the vessel as the sole means for inducing movement of said paste in said vessel”) *with* Ex. 1004, 6:49–52 (“providing a compressed conveyance gas to the vessel to induce movement of said non-free flowing drill cuttings in said vessel, without employing a non-pneumatic means for inducing said movement”). As we explained in our claim construction section above, we do not find a meaningful distinction between these two negative limitations in terms of the ultimate outcome of the obviousness grounds in this proceeding. The '062 patent, like the '217 patent, prohibits non-pneumatic means for inducing movement, such as aeration or fluidization.²⁶

²⁶ We note that this is the same distinction described by the Examiner in allowing the '217 patent claims—aeration or fluidization (breaking up or entraining particles) are distinct from conveyance (pushing the plug of

Thus, our analysis of Petitioner's Dietzen-led ground against claims 1–29 of the '062 patent would be the same as our analysis of Petitioner's Dietzen-led ground against claims 1–30 of the '217 patent. Petitioner's ground relies on the same factual basis and reasoning against claims 1–29 of the '062 patent as it did against similar claims 1–30 of the '217 patent. *Compare* Pet. '262, 48–59 with IPR2016-00264, Paper 1, 47–59. In view of the above, it is appropriate for us to incorporate by reference our findings and analysis in the Final Written Decision in IPR2016-00264 regarding claims 1–30 of the '217 patent, and apply it to claims 1–29 of the '062 patent. Further, we have reviewed Patent Owner's arguments regarding claims 1–29 of the '062 patent. PO Resp. '262, 58–70. Our analysis of Petitioner's ground in view of Patent Owner's arguments and evidence in our Final Written Decision in IPR2016-00264 is equally applicable in this proceeding, and we incorporate it herein. For the same reasons expressed therein, we determine that Petitioner has established by a preponderance of the evidence that the subject matter of claims 1–10 and 12–29 of the '062 patent are unpatentable as obvious, but not claim 11 (directed to the vessel being adapted to fit in an ISO container frame).

E. Dietzen-Led Obviousness Grounds: Claims 30–49

Petitioner asserts that the subject matter of claims 30–49 would have been obvious to a person of ordinary skill in the art. Pet. '263, 45–58. Petitioner addresses the claims in various groups: independent claims 30 and 41 (*id.* at 52) and dependent claims 32 (*id.* at 52–53), 33, 34, 42, and 43

material). See Ex 2019, 322 (specifying that a conveyance medium is distinct from a fluidizing or aeration medium).

(*id.* at 53–55), 31, 35, 48, and 49 (*id.* at 55), 32, 36, 44, and 45 (*id.* at 55–56), 37 and 38 (*id.* at 56–57), 39 and 40 (*id.* at 57), 46 and 47 (*id.* at 57–58).

1. Petitioner’s Ground for Independent Claims 30 and 41

With respect to independent claims 30 and 41, Petitioner first directs our attention to Dietzen I. Pet. ’263, 48. Dietzen I and Dietzen II are pneumatic conveying systems for screened drill cuttings. Petitioner asserts that, although Dietzen I describes conveying screened drill cuttings using negative pressure, a person of ordinary skill in the art would have known that “a positive pressure system can create a larger pressure differential than a negative pressure system,” and would have considered modifying Dietzen I to use positive pressure systems. *Id.* (citing Ex. 1044 ¶ 160); Ex. 1044 ¶ 160 (Petitioner’s expert, Dr. Carson, explaining that “[i]t is a simple matter of physics that a positive pressure system can create a larger pressure differential than a negative pressure system”); Ex. 1015, 27 (“There is a limit on the available conveying line pressure drop with negative pressure systems and so they are not capable of achieving such high tonnages or of conveying over such long distances as the equivalent positive pressure systems”).

As evidence of what a person of ordinary skill in the art understood with respect to positive pressure systems, Petitioner directs us to a number of references, including Macawber, Macawber Coal Ship, Ciaffone, Laster, and Pneumatic Conveying. *Id.*; *see also id.* at 48–53 (describing the teachings of these references). Pneumatic Conveying describes the conveyance of “materials with ‘bad’ flow properties.” Ex. 1009, 279, 281. Macawber and Macawber Coal Ship use pneumatic conveyance devices to convey high

moisture content materials (Ex. 1007, 2) and “clays . . . coupled with high-moisture contents that form a sticky, difficult-to-handle material” (Ex. 1008, 21).²⁷ Laster states that pneumatic conveyance can be used to convey “drilling mud, and like thick, difficult to pump slurry fluids.” Ex. 1014, 1:11–23, 1:20–29. Ciaffone uses positive pressure to convey “wet and bulky waste materials” such as “screenings, grit, sludge cake, [and] skimming.” Ex. 1006, 1:7–10, 1:30–32, 1:70–75. Petitioner’s synthesis of the above teachings is that “[i]t would have been obvious to persons of ordinary skill in the art of materials handling to use a positive pressure system . . . instead of the negative pressure systems taught by Dietzen I.” Pet. ’263, 48. Petitioner asserts that there would have been an expectation of success in using a positive pressure system such as Ciaffone to convey drill cuttings in place of the negative pressure system in Dietzen I. *Id.* at 49–52. Essentially, Petitioner asserts that it would have been recognized that a negative pressure system is weaker than a positive pressure system; thus, using a positive pressure system would have to convey screened drill cuttings if a weaker negative pressure system could convey them. *See id.*

2. Analysis of Claims 30 and 41 of the Dietzen-Led Ground

At a high level, independent claims 30 and 41 both recite structures for introducing a material into a vessel having a conical portion, and then applying a compressed gas to cause the material to flow out of the vessel, “without employing a non-pneumatic means” for inducing movement of the material. As to these limitations, Petitioner directs us to Ciaffone, which

²⁷ Although these references are not part of the asserted ground, we consider them to extent they provide insight into the level of ordinary skill in the art.

Petitioner alleges “describes a positive pressure pneumatic conveyance system having all [of] the (conventional) features required [to perform the process claimed] in the ’062 patent.” Pet. ’263, 52. Petitioner asserts that the sole means for conveying material in Ciaffone is the compressed conveyance gas. *Id.* (citing Ex. 1044 ¶ 172).

Having reviewed Petitioner’s assertions and evidence above, we find that a person of ordinary skill in the art would have had a reason to look to positive pressure conveyance vessels to replace the negative pressure conveyance vessels in Dietzen I and II. We have reviewed Patent Owner’s arguments to the contrary, but do not find them persuasive. See PO Resp. ’263, 58–62. Patent Owner argues that “Petitioner fails to provide any motivation as to why the POSITA would consider pneumatic conveyance nor why the POSITA would have a reasonable expectation of success.” *Id.* at 60. We disagree, because as Petitioner has pointed out, positive pressure systems are stronger than negative pressure systems. Ex. 1044 ¶ 160; Ex. 1015, 27. If one is conveying difficult-to-handle materials, it makes sense to consider stronger conveying systems. Indeed, Dietzen II suggests using positive pressure “to assist the flow of cuttings” already in the tubes; the implication is that if the negative pressure is not strong enough, the positive pressure would be. Ex. 1013, 5:14–16. Thus, there is a reason to combine, with rational underpinnings.

In addition, Petitioner has shown a reasonable expectation of success. Specifically, Dietzen I and II convey drill cuttings through tubes using negative pressure. Patent Owner attempts to characterize the auger of Dietzen II as the means for conveying the drill cuttings, but fails to address the fact that there are vacuums that are described as conveying materials

through the tubes. We acknowledge that there is an auger, but as shown in Dietzen II, we find the purpose of the auger is to convey the material from the bottom of a horizontal tank *to the suction tube*, where it is then suctioned along the tube; there is no auger in the tube to convey the material. As to Dietzen I, there is no auger; the drill cuttings are suctioned from the bottom of a trough into the storage tank where they are left. Positive pressure pneumatic conveyance systems are known to convey difficult-to-handle materials. *See, e.g.*, Ex. 1006, 1:18–32 (describing difficult materials to convey), 1:70–75 (“[w]e have now surprisingly found that it is possible to use air pressure to pneumatically convey [such] materials”); Ex. 1008, 21 (“conveying ‘clays . . . coupled with high-moisture contents [that] form a sticky, difficult-to-handle material’”); Ex. 1009, 279 (describing the design parameters of positive pressure vessels used “for feeding materials with ‘bad’ flow properties”); Ex. 1014, 1:11–29 (discussing the difficulty in pumping “thick viscous fluid known as drilling mud”), 2:25–31 (conveying that material with sufficient pressurized air). Given that Dietzen I and Dietzen II convey drill cuttings using their weaker negative pressure system, we are persuaded by Petitioner’s argument that there would be a reasonable expectation of success using a stronger positive pressure system.

Patent Owner argues that the prior art fails to disclose conveying drill cuttings without using a non-pneumatic means. PO Resp. ’263, 60 (citing PO Resp. ’263, 38–53). Specifically, Patent Owner argues that the positive pressure vessels in the prior art use a fluidizing agent, and that Dietzen I and II have a shaking action, i.e., the shale shaker. *Id.* at 37, 38–39. Regarding the shaking action, the materials conveyed in the ’062 patent are those that have been screened, i.e., come off the shale shaker. Ex. 1004, 1:43–45,

3:56–59. This occurs upstream from the pressure vessel, and does not run afoul of the negative limitation in the claims. As we explained in our claim construction section, the '062 patent considers the drill cuttings coming off of the shaker to be non-free flowing drill cuttings. *See also* Tr. 97:20–22 (Patent Owner's counsel stating that, "[w]e would agree that Dietzen I shows the conveyance of non-free flowing drill cuttings, but it uses negative pressure. It doesn't use positive pressure."). Accordingly, we find Dietzen I and II's inclusion of a shale shaker meets the negative limitation of the claims and that they disclose pneumatic transfer of non-free flowing drill cuttings.

Further, we are not persuaded that the positive pressure vessels in the prior art use a fluidizing agent. Patent Owner's argument is premised on the testimony of its expert, Dr. Brown, but his testimony is contradicted by the evidence of record. Dr. Brown testifies that Pneumatic Conveying, Macawber, and Macawber Coal Ship "teach conveyance by fluidization of particles, that is, mixing a stream of gas with the particles." Ex. 2059 ¶ 168. His testimony relies on the passage in Macawber that states it uses "an air ratio of 25:1." *Id.* (citing Ex. 1007, 5). Petitioner points out that Dr. Brown confuses "air ratio" with "fluidization." Pet. Reply '263, 3–6. Petitioner asserts, and we agree, the Macawber's (or any Denseveyor System or similar system's) "dense phase" conveyance does not rely on fluidization. *See id.* For example, Exhibit 1023 compares and contrasts dense phase versus conventional positive pressure conveying systems, specifically pointing out that conventional systems are "fluidized" but that "Denseveyor Systems are not fluidized." Ex. 1023, 4, 5. Exhibit 1023 contrasts the air ratio for conventional, fluidized systems (100:1) with dense phase, non-fluidized

systems (25:1). *Id.* Accordingly, the fact that Macawber discloses “an air ratio of 25:1” does not speak to whether or not the material is fluidized. Indeed, such an air ratio is indicative of dense phase conveying, which is affirmatively not fluidized. We find that Pneumatic Conveying, Macawber, and Macawber Coal Ship do not teach conveyance by fluidization, and thus meet the negative limitations of the claims regarding non-pneumatic means.

3. Objective Evidence of Non-Obviousness

Patent Owner argues that it has submitted persuasive objective evidence of non-obviousness. PO Resp. ’263, 62–68. Patent Owner asserts objective evidence of non-obviousness in the form of commercial success, praise by others, and skepticism by experts. *Id.* With respect to commercial success, Patent Owner argues that its CleanCut system “practices each claim of the ’062 patent.” *Id.* at 62. Patent Owner asserts: “In all of the jobs that use the CleanCut system, at least some of the material conveyed was non-free flowing drill cuttings [from an oil rig.]” *Id.* at 63 (citing Ex. 2054 at ¶¶ 25–26). Patent Owner asserts that the CleanCut system has experienced substantial increases in sales since its introduction in 2002 and that, in 2014, the system “had nearly an 80% market share in the market for pneumatic conveyance of pastes/drill cuttings in the oil industry, a market that did not exist before Patent Owner launched its CleanCut system.” *Id.* at 64–65 (citing Ex. 2054 ¶¶ 73–82).

“The CleanCut system,” according to Patent Owner, “consists of two different pressure vessels, one smaller vessel called the CCB that receives the cuttings from the shaker house and then pneumatically conveys the cuttings through conduits or pipes to the other larger type of pressure vessel

called an ISO-Pump.” *Id.* at 62–63. Patent Owner further describes the CleanCut system as follows:

In the CCB, the drill cuttings are loaded into a feed hopper above the CCB and then will be discharged by gravity into the CCB (Ex. 2024 at 12, 16). In the ISO-Pump, drill cuttings are loaded into the vessel from the CCB using pneumatic conveyance (Ex. 2025 at 12–13).

When the drill cuttings are going to be discharged from the vessel, a compressed conveyance gas is provided to the vessel and it is the sole means for inducing movement of the non-free flowing drill cuttings, no non-pneumatic means are used to induce movement of the cuttings. . . .

Thus, the CleanCut system practice[s] claim 30 (and for similar reasons each claims) of the ’062 patent.

Id. at 63–64. Mr. Lauder testifies that opening “the conveying air valve” introduces the compressed conveyance gas into the pressure vessel:

In the CCB, once the conveying air valve is opened, the “[a]ir will enter the CCB vessel and the drill cuttings will be discharged into conveying pipe.” (Ex. 2024 at 16-17). For the ISO-Pump, once the conveying air valve is opened and the pressure in the tank builds up, “material will begin to discharge from the tank” and “[m]aterial will continue to be discharged in this manner until the weight in the ISO-Pump has reached the original zero position” or until the operator closes the outlet valve to stop the transfer. (Ex. 2025 at 14-15).

Ex. 2053 ¶ 28.

“[T]here is a presumption of nexus for objective considerations when the patentee shows that the asserted objective evidence is tied to a specific product and that product ‘is the invention disclosed and claimed in the patent.’” *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1329 (Fed. Cir. 2016) (quoting *J.T. Eaton & Co. v. Atl. Paste & Glue Co.*, 106 F.3d 1563, 1571 (Fed. Cir. 1997)). Patent Owner, however, carries the burden of

demonstrating that the “thing . . . that is commercially successful is the invention disclosed and claimed in the patent.” *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988).

Petitioner disputes Patent Owner’s evidence that the CleanCut system practices the claimed invention, particularly the limitation requiring a pressure vessel that is made or designed to allow a compressed conveyance for inducing movement of non-free flowing drill cuttings, *without non-pneumatic means*. Pet. Reply ’263, 22–24. Petitioner argues that “[t]he prosecution history excludes the use of other means, such as ‘heat addition, aerating action . . . or the addition of a fluidizing agent’ to assist the top conveying gas in conveying material.” *Id.* at 23 (citing PO Resp. ’263, 39); Tr. 132:2–22.²⁸ Petitioner further argues that “[t]he CleanCut system, however, uses aeration jets, line air, and even oil injection to aid conveyance.” Paper 42 (Petitioner’s Confidential Reply Brief), 23.²⁹ Petitioner points to evidence that the ISO-pump is made and designed with pulse air nozzles in the cone of the vessel to induce movement of non-free flowing drill cuttings:

The ISO-pump Operating & Maintenance Instructions describes pulse air nozzles, called “aeration nozzles,” in the cone of the vessel. PO-2025, 45, 47. The manual states the pulse air will mitigate the effects of materials which have a tendency to bridge and help with problematic drill cuttings such as “Tertiary

²⁸ At the oral argument, Petitioner asserted that the “sole means” limitation was added by an Examiner’s amendment to distinguish the Curtis reference, which, according to Petitioner, discloses “aeration jets in the bottom of the cone to help convey.” Tr. 132:5–10.

²⁹ We cite to Petitioner’s Confidential Reply Brief because the relevant portions on page 23 of Petitioner’s Reply are redacted.

Reactive Clays.” *Id.* at 60. *These nozzles “break up/fluidize” the material. Id.*

Id. at 23 (emphasis added). Petitioner also points to evidence that “[t]he CCB relies on the same pulsing aeration nozzles” (*id.* at 23 (citing Ex. 2024, 12, 13)), and that these nozzles perform the same function in the CCB as the ISO-pump (*id.* (citing Ex. 1110, 209)). Additionally, Petitioner points to evidence that “air is introduced into the conveyance line/conduit to help move discrete slugs of drill cuttings along the pipes.” *Id.* at 23–24 (citing Ex. 1110, 148–49, 209–11; Ex. 1108, 119–20).

At the oral argument, Patent Owner acknowledged that the CleanCut system utilizes “what is known as cone air, which are the jets that shoot in on the side of the cone portion of the vessel.” Tr. 143:1–3. Patent Owner asserted that “what those do is help to move the material away from the wall.” *Id.* at 143:3–4. Patent Owner argued that the “[t]he claims call for the use of compressed air to move the material,” and further: “That’s all that is. It is additional compressed air to move the material.” *Id.* at 143:5–8.

In rebuttal, Petitioner argued:

The exchange in the prosecution history distinguishes between conveying air and these other means that aerate or chop up or break up the material. That is what those things are doing. They are helping to discharge and they are not the conveying air. When they describe the sole means and they describe pneumatic means, those are terms they are using to refer to conveying air.

Tr. 153.

We agree with Petitioner that the CleanCut system does not practice the claimed invention. The cone air of the CleanCut commercial embodiment, also referred to as “Pulse Air,” is a fluidizing agent or an aeration action agent. As explained in the operator’s manual, “Pulse Air will

break up / fluidise the material and detach it from the walls of the cone.”

Ex. 2025, 60. The manual further clarifies that “Pulse Air” is not the same as the conveyance gas, or “Top Air.” *Id.* The pulse air nozzles or jets in the CleanCut system are designed to provide a *physical* breaking up and fluidizing of material, to detach it from the walls of the cone, and thereby to assist in the discharge of material that is difficult to handle “under normal operation without the continuous use of pulse air.” Ex. 2025, 60. The pulse air nozzles or jets in the CleanCut system are indistinguishable from the pulsed-jet bin aerators in Curtis, which the Examiner and Patent Owner distinguished by adding the “sole means” limitation to the claims during prosecution of the ’217 patent and, as we discussed in our claim construction section, is succeeded in the ’062 patent by the “without non-pneumatic means” language. Ex. 2025, 53–60 (describing the CleanCut Pulse Air System); Ex. 2017, 230, 233 (Curtis, Fig. 7, col. 6, lines 59–64; describing pulsed-jet bin aerators 112, 114, and 116). The breaking up and fluidization of the material is outside the scope of the claims. Ex. 2017, 322. We find that neither the ISO-pump nor the CCB is made or designed to allow a compressed conveyance gas to be introduced therein to convey the material without a non-pneumatic means.

“Evidence of commercial success is only relevant to the obviousness inquiry ‘if there is a nexus between the claimed invention and the commercial success.’” *In re Affinity Labs of Texas, Inc.*, 2017 WL 1749679 *11, No. 2016-1092, 2016-1172 (Fed. Cir. May 5, 2017) (quoting *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1312 (Fed. Cir. 2006)). Here, Patent Owner has not shown a nexus between the claimed invention and the

asserted commercial success because its CleanCut product does not practice the claimed invention.

That Patent Owner's CleanCut system does not practice the claimed invention is also fatal to its arguments based on praise by others and skepticism by experts. *See In re Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011) (citing *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010)) (stating that "[f]or objective evidence . . . to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention.") (emphasis omitted) (internal quotation marks omitted).

4. *Conclusion for Claims 39 and 41 of the Dietzen-led Obviousness Ground*

In summary, we find the prior art to disclose pneumatic conveyance of non-free flowing drill cuttings using negative pressure (Dietzen I and II). We find that a person of ordinary skill in the art would have had reason to consider using positive pressure, which is stronger and already used in a different form in Dietzen II, and would have reconfigured Dietzen I to use a positive pressure conical conveyance vessel. We find that a person of ordinary skill in the art, once considering conveyance of a material using positive pressure, would know how to configure the vessel appropriately (pressure, cone angle, size, mass flow), as taught in *Pneumatic Conveying*. Accordingly, we find that the proposed combination is predictable and has a reasonable expectation of success. Patent Owner's evidence of non-obviousness is not commensurate in scope with the claimed inventions, because Patent Owner's commercial embodiment does not meet the "without non-pneumatic means" limitation of the claims. Based on the foregoing, we

determine that Petitioner has established by a preponderance of the evidence that the subject matter of claims 30 and 41 of the '062 patent would have been obvious.

5. Dependent Claims 32–40 and 42–49

Dependent claim 32 requires a conduit; Petitioner asserts, and we agree, that the prior art teaches a conduit to convey the material out of the vessel. Pet. '263, 52–53 (citing Ex. 1044 ¶ 140; Ex. 1007; Ex. 1008).

Dependent claims 33, 34, 42, and 43 require a second pressure vessel, similar to the first pressure vessel, that receives the cuttings from the first vessel. Petitioner asserts, and we agree, that this is “the same process described by Dietzen II,” and that it would have been obvious to use positive pressure vessels in the proposed combination rather than the negative pressure vessels in Dietzen II. *Id.* at 53–55. In other words, Dietzen II describes using a series of pressure vessels, some on the rig, and some on a boat, and describes conveying drill cuttings between the various vessels, processing stations, and the shore. *See, e.g.*, Ex. 1013, Fig. 11. Thus, when modifying Dietzen I to include a positive pressure vessel system, it would also have been obvious to use the entire series of pressure vessels, as taught in Dietzen II (but using the positive pressure vessels) to achieve the same effect for the same benefits.

Dependent claims 31, 35, 48, and 49 require that the pressure vessels have a cone angle selected to enable mass flow. Petitioner asserts that “POSITAs knew how to choose a cone angle that would provide mass flow.” Pet. '263, 55. Specifically, Petitioner directs us to Pneumatic Conveying as evidence that a person of ordinary skill in the art knew the importance of

mass flow as well as how to achieve it, and also directs our attention to the '062 patent itself, which states that it is well known that cone angle is an important consideration for the conveyance of materials. *Id.* (citing Ex. 1009, 279–282, 410–420; Ex. 1004, 2:61–64). Patent Owner argues with respect to claims 31, 35, 48, and 49 that the prior art does not disclose mass flow. PO Resp. '263, 61. Petitioner has persuasively shown, however, that a person of ordinary skill in the art was well aware of the desirability of mass flow and how to achieve it. For example, the Pneumatic Conveying textbook dedicates an entire section on the flow of the materials from a pneumatic conveying device, and includes a discussion of how to encourage mass flow. Ex. 1009, 279–280, 410–420. We find that a person of ordinary skill in the art has a desire for mass flow, to avoid the deleterious effects of funnel flow, and knows how to achieve it using the known variables involved.

Dependent claims 32, 36, 44, and 45 again require conduits between pressure vessels. We agree with Petitioner that “discharge conduits are fundamental to pneumatic conveying systems.” Pet. '263, 55–56 (citing Ex. 1006, 3:1–3; Ex. 1009, 281; Ex. 1044 ¶ 183).

Dependent claims 37 and 38 require that the pressure vessel be able to withstand a pressure from about 4 bar to about 8 bar. Petitioner asserts, and we agree, that persons of ordinary skill in the art would have known to build a pressure vessel “able to withstand whatever pressures were required to convey the materials.” Pet. '263, 56–57 (citing Ex. 1044 ¶ 184; Ex. 1014, 3:31–34).

Dependent claims 39, 40, 46, and 47 require means for transporting pressure vessels to a discharge station and to discharge the vessels at that

location. Petitioner asserts, and we agree, that oil rigs were equipped with cranes to move items on and off a rig, that skips and boats were used to transport drill cuttings, and that conveyance gas was used to transport the drill cuttings between the various vessels. *Id.* at 57–58. For example, we find that Dietzen II describes conveying drill cuttings from pressure vessels on a ship to pressure vessels on a boat, to further pressure vessels on the boat, and then to discharge, via pressure, the drill cuttings into the disposal facility on land or on a barge. Ex. 1013, Fig. 11, 6:20–33, 64–67. Patent Owner argues with respect to claims 39, 40, 46, and 47 that the prior art cited “fail[s] to teach the vessel fitting within an ISO container frame.” PO Resp. ’263, 61–62. The claims do not require an ISO container frame, however, such that the argument is not commensurate in scope with the claims.

In light of the above, we determine that Petitioner has established by a preponderance of the evidence that the subject matter of dependent claims 32–40 and 42–49 are unpatentable.

F. Pneumatic-Conveying-Led Obviousness Grounds

In view of our determination that claims 1–10 and 12–49 are unpatentable over the Dietzen-led grounds, we do not address Petitioner’s additional grounds that these claims would have been unpatentable in view of the Pneumatic Conveying-led grounds. Petitioner’s ground as it applies to claim 11, regarding the ISO frame limitation, fails to remedy the above-noted deficiency because it relies on the same reasoning we found unpersuasive before. See Pet. ’262, 42–43.

III. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–10 and 12–49 of U.S. Patent No. 7,186,062 B2 are unpatentable;

FURTHER ORDERED that claim 11 of U.S. Patent No. 7,186,062 B2 is not unpatentable;

FURTHER ORDERED that each of the parties is authorized to file, within five (5) business days from the date of entry of this Decision, a motion to seal portions of this Decision and/or the transcript of the oral argument that includes a proposed redacted version of this Decision and/or the transcript and an explanation as to why good cause exists to maintain under seal each redacted portion;

FURTHER ORDERED that any opposition to a motion to seal portions of this Decision and/or the transcript must be filed within three (3) business days from the date of entry of the motion;

FURTHER ORDERED that no reply to an opposition is authorized; and

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

IPR2016-00262 & IPR2016-00263

Patent 7,186,062 B2

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