

PARTIES AND BOARD ONLY

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.

Case IPR2016-00260
Patent 7,033,124 B2

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

RICE, *Administrative Patent Judge*.

FINAL WRITTEN DECISION

Finding All Claims Unpatentable
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

Dynamic Air Inc. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) for *inter partes* review challenging claims 1–20 (“the challenged claims”) of U.S. Patent No. 7,033,124 B2 (Ex. 1003, “the ’124 Patent”). Petitioner supported the Petition with a declaration from John W. Carson, Ph.D. (Ex. 1032). M-I Drilling Fluids UK Ltd. (“Patent Owner”) did not file a Preliminary Response.

We instituted a trial as to all of the challenged claims on the following grounds. Paper 7 (“Institution Decision” or “Inst. Dec.”), 24.

Reference(s)	Basis	Claims Challenged
Ciaffone ¹	§ 102(b)	1, 3–5, 7–9, and 12–16
Dietzen I, ² Dietzen II, ³ Ciaffone, Laster, ⁴ and Pneumatic Conveying ⁵	§ 103(a)	1–20
Macawber, ⁶ Macawber Coal Ship, ⁷ Pneumatic Conveying, and Ciaffone	§ 103(a)	1–20

After institution of the trial, Patent Owner filed a Response to the Petition (Paper 31, “PO Resp.”), to which Petitioner filed a Reply (Paper 41,

¹ US 3,601,068, issued Aug. 24, 1971 (Ex. 1006).

² US 5,402,857, issued Apr. 4, 1995 (Ex. 1012).

³ US 6,179,071 B1, issued Jan. 30, 2001 (Ex. 1013).

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

⁵ R.D. MARCUS ET AL., PNEUMATIC CONVEYING OF SOLIDS: A THEORETICAL AND PRACTICAL APPROACH (1990) (Ex. 1009).

⁶ *The System that Gives Pneumatic Conveying a Good Name*, BULLETIN 912, Macawber Engineering Ltd. (1985) (Ex. 1007).

⁷ *Coal-Fired Ships Reappear*, 88:9 COMPRESSED AIR 5, 21–24 (1983) (Ex. 1008).

“Pet. Reply”). Patent Owner supported the Response with declarations from Mr. Colin Lauder (Ex. 2053) and Dr. Stuart Brown (Ex. 2058). Patent Owner did not move to amend any claim of the ’124 Patent.

We heard oral argument on February 22, 2017. A transcript of the argument has been entered in the record (Paper 51, “Tr.”).

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.

For the reasons explained below, we conclude that Petitioner has demonstrated by a preponderance of evidence that claims 1–20 are unpatentable.

A. Related Proceedings

We understand that Petitioner and Patent Owner are parties to a federal district court case⁸ involving the ’124 Patent. *See* Pet. 1; Paper 6, 2. We also understand that Petitioner has filed a total of six petitions, including the instant Petition, for *inter partes* review of patents involved in that litigation. *See* Pet. 1; Paper 6, 3.

B. The ’124 Patent

The ’124 Patent, titled “Method and Apparatus for Pneumatic Conveying of Drill Cuttings,” is a continuation of U.S. Application No. 10/018,124, now U.S. Patent No. 6,709,217 (“the ’217 Patent”), and claims

⁸ Case 0:14-cv-04857, pending in the U.S. District Court for the District of Minnesota.

priority to a U.K. application filed on June 16, 1999. Ex. 1003, (54), (63), (30), 1:8–16.

As stated in the '124 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 1:65–2:1. 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 2:1–4. “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 2:5–9. “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 2:10–11.

Figure 1 of the '124 Patent is reproduced below.

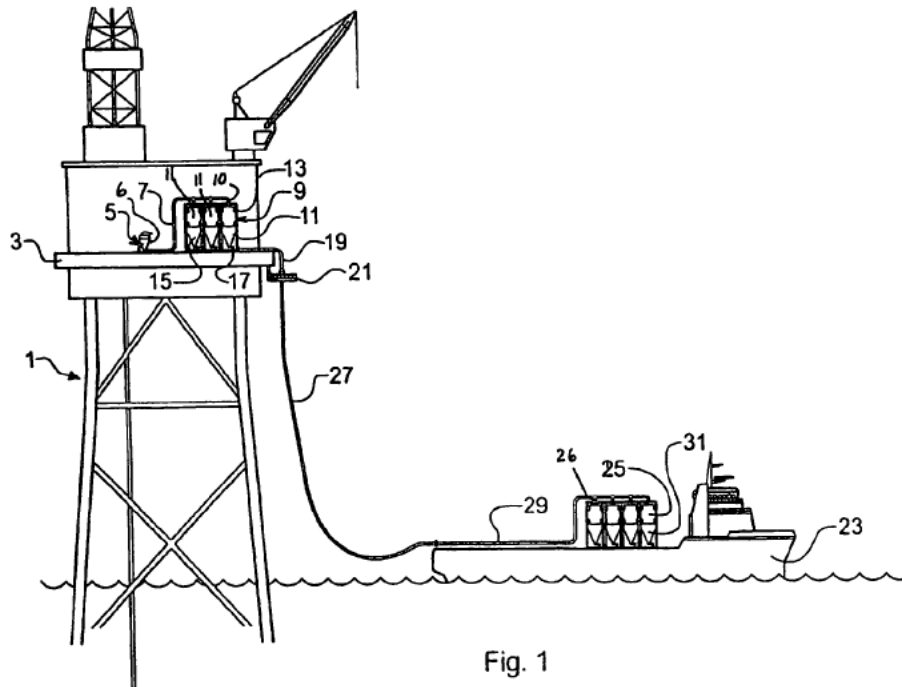


Fig. 1

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 3:25–27, 59–62. Pressure vessel 5 includes an upper material inlet, lower conical portion 6, and a lower material outlet. *Id.* at 3:62–63. The Specification discloses that “the entire vessel [referring to vessel 5] may be similar to that manufactured and sold by Clyde Materials Handling Limited.” *Id.* at 4:1–3. As illustrated in Figure 1, pipe 7 connects pressure vessel 5 to container assembly 9 comprising a number of vessels 11 (described as “ISO^[9] container sized vessels”), from which material may be discharged via hose 27 to container assembly 25 on supply boat 23. *Id.* at 4:17–38.

According to the Specification, altering the cone angle of the lower conical portion of a pressure vessel can facilitate movement of sticky

⁹ International Standards Organization.

materials that otherwise tend to collect around the sides of the vessel. *Id.* at 2:32–61. The Specification contrasts “core flow or funnel flow” and “mass flow”:

Because of the nature of the material being handled in the method of the present invention, there is a tendency for the flow of the material out of the vessel to be less than complete. This is because the type of flow which occurs during discharge is of a form known as *core flow or funnel flow*. When this type of flow occurs, the material directly above the outlet falls through the outlet, e.g. the outlet valve, so that a falling core of material is created directly above the outlet. However, with sticky materials, the material around this core does not move. As the core falls, a depression occurs in the top surface of the material and the material surrounding that depression falls into the core. In the case of a sticky material there is a tendency for material around the core to remain in the vessel.

It has been discovered that 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. 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 2:32–58 (emphasis added). 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.” Ex. 1003, 3:17–20.

C. Prosecution History of Related '217 Patent

During the prosecution of the application leading to the related '217 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 [in¹⁰] 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 discloses pulsed-jet bin aerators arranged in zones adjacent the conical interior wall of the hopper that create 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).

¹⁰ The word “from” was inadvertently used in the Examiner’s Amendment. Applicant corrected the error on October 24, 2003. *Id.* at 332–333.

D. Illustrative Claim

Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. 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 as the sole means for inducing movement of said non-free flowing drill cuttings in said vessel whereby at least a portion of said non-free flowing drill cuttings is discharged from the vessel.

Ex. 1003, 6:58–67.

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, the Board gives claim terms in an unexpired patent their broadest reasonable interpretation in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016). Under that standard, a claim term generally is given its ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. See *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). While our claim interpretation cannot be divorced from the specification and the record evidence, see *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015) (quoting *In re NTP, Inc.*, 654 F.3d 1279, 1288 (Fed. Cir. 2011)), we must be careful not to import

limitations from the specification that are not part of the claim language, *see SuperGuide Corp. v. DirecTV Enterprises, Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004). Any special definition for a claim term must be set forth in the specification with reasonable clarity, deliberateness, and precision. *See In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

1. Claim Preambles

The preambles of independent claims 1 and 12 recite, respectively, “[a]n apparatus adapted for use on an oil well drilling rig for conveying non-free flowing drill cuttings” and “[a] system for conveying non-free flowing oil well drill cuttings.” In the Institution Decision, we determined preliminarily that the preambles are limiting. Inst. Dec. 8. As neither party proposes any change to our interpretation, and our review of the full record developed at trial does not indicate that any change is necessary, we maintain that interpretation.

2. “non-free flowing drill cuttings”

Petitioner contends that the term “non-free flowing drill cuttings” as recited in the bodies of claims 1 and 12 is indefinite and, more particularly, that “[t]he line between what material is ‘free flowing’ versus ‘non-free flowing’ is indefinite.” Pet. 11 (citing Ex. 1032 ¶ 48). Petitioner argues that “[t]o the extent a construction of this term is required . . . , the broadest reasonable construction in view of the specification for ‘non-free flowing drill cuttings’ is a screened mixture of liquid and earth extracted material that exhibits some resistance to flow.” *Id.* at 12.

Patent Owner objects that Petitioner’s construction both “ignores the source of the drill cuttings” and “expands the definition to include any liquid.” PO Resp. 16. “[B]ased on the specification and extrinsic evidence,”

Patent Owner argues, “the source of drill cuttings is the drilling of an oil well, and drill cuttings include a mixture of pieces of the earth formation through which the well is being drilled and the drilling fluid or oil pumped down as lubricant.” *Id.* Patent Owner also argues that “[t]he drill cuttings may also be in the form of a thick heavy paste.” *Id.* “Patent Owner proposes that ‘non-free flowing drill cuttings’ means ‘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.’” *Id.* (citing Ex. 2058 ¶ 89). In support of its construction, Patent Owner asserts: “Because the material conveyed in the ’124 patent is contrasted with ‘relatively free flowing material,’ the ’124 patent’s use of the term ‘non-free flowing’ is appropriately interpreted as material that ‘does not generally flow freely by gravitational force.’” *Id.* at 13–14 (citing Ex. 2058 ¶ 83); *see* Ex. 1003, 2:1–3.

In the Reply, Petitioner argues that the term “non-free flowing drill cuttings” as used in the patent refers to the resultant mixture of cuttings and “drilling mud”¹¹ *after screening* in a shaker house to remove the majority of the drilling mud. Pet. Reply 10 (citing Ex. 1003, 1:30–44, 3:59–62; Ex. 1012, 1:38–55). Petitioner also argues that “[t]he patent has a blanket characterization of drill cuttings as non-free flowing and a paste,” and that “[t]he patent should be read consistent with the specification, which

¹¹ “When drilling for oil in the ocean, the drill bit creates debris, called ‘cuttings,’ comprised of the rock formations through which the well is drilled. *See* Ex. 1003, 1:33–34. The drill bit is lubricated using a material referred to in the industry as ‘drilling mud.’ *See id.*, 1:35–36; Ex. 1032 ‘Carson Decl.’ ¶ 32.” Pet. 6 (emphasis added); *see* Pet. Reply 10.

describes all drill cuttings after the shaker house as non-free flowing drill cuttings.” *Id.* (citing Ex. 1003, 1:44–46, 63–65; 2:10–11).

We agree with aspects of both parties’ proposed claim constructions. We agree with Petitioner that the term “non-free flowing drill cuttings” refers to the resultant mixture of cuttings and drilling mud after screening (which we understand to include similar processing to separate drill cuttings from drilling mud, such as centrifuging). *See* Ex. 1003, 1:42–46, 62–64; 6:15–16; *cf.* Ex. 2053 ¶10; Ex. 2058 ¶ 86. We agree with Patent Owner that the source of the resultant mixture is the drilling of an oil well, and that the mixture includes earth (drill cuttings) and drilling fluid or oil.¹² *See* Ex. 1003, 1:31–46; Ex. 2058 ¶¶ 85–88.

We do not agree with Patent Owner’s proposal to construe “non-free flowing drill cuttings” as drill cuttings that do not generally flow freely by gravitational force. There is insufficient support in the Specification for that proposal. The Specification does not distinguish between different types of screened drill cuttings, for example, screened drill cuttings that generally flow freely by gravitational force and those that do not. While the Specification describes screened drill cuttings in various ways, it is always referring to the same material. For example, the Specification refers explicitly to “thick, heavy pastes which are normally difficult to move and handle” (Ex. 1003, 1:28–29), “[screened] cuttings . . . transported ashore in the form of a very thick heavy paste” (*id.* at 1:42–46), “thick heavy paste material (e.g., drill cuttings)” (*id.* at 1:63–64), “a thick heavy paste” (*id.* at 1:67), “a non-free flowing paste” (*id.* at 2:6–7), “[t]he non-free flowing

¹² *See* Ex 1003, 1:35–38 (calling drilling fluid a special type of oil used as a lubricant”).

paste may be a thick and/or heavy paste or clay like material, e.g. oil rig drill cuttings” (*id.* at 2:10–11), and “a thick heavy paste” (*id.* at 3:9–10). As such, the Specification characterizes screened drill cuttings as 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.

We determine that the broadest reasonable interpretation consistent with the Specification of “non-free flowing drill cuttings” is “screened drill cuttings, i.e., screened material, generated by the drilling of an oil well, including a mixture of earth and drilling fluid or oil.”

3. “*adapted for*” and “*adapted to*”

Claims 1, 4, 5, 8, 9, 12, 13, and 14 recite phrases using the term “adapted [for/to].” For example, claim 8 recites “[t]he apparatus of claim 1 wherein the first vessel is adapted to withstand a pressure of about 4 bar to about 8 bar.” Ex. 1003, 7:27–28. While the phrase “adapted to” can be used broadly to mean “capable of” or “suitable for,” it generally means “made to,” “designed to,” or “configured to.” *In re Man Machine Interface Techs.*, 822 F.3d 1282, 1286 (Fed. Cir. 2016) (citing *In re Giannelli*, 739 F.3d 1375, 1379 (Fed. Cir. 2014) (quoting *Aspex Eyewear, Inc. v. Marchon Eyewear, Inc.*, 672 F.3d 1335, 1349 (Fed. Cir. 2012) (referencing dictionaries))).

In the Institution Decision, we preliminarily rejected Petitioner’s proposed construction that “adapted [for/to]” means “capable of” and determined that “adapted [for/to]” means “made [for/to]” or “designed [for/to].” Inst. Dec. 9. We noted that the Specification appears to use the narrower meaning when distinguishing conventionally known pressure vessels, which are expected to withstand a maximum pressure of 2 bar, from a preferred embodiment having “a vessel *adapted to* be pressurised by

compressed gas to between 4 and 8 bar.” *Id.* at 10 (citing Ex. 1003, 3:17–20 (emphasis added)).

In the Reply, Petitioner does not address directly our claim interpretation in the Institution Decision, but rather argues that “[t]he specification confirms that an *existing, standard, prior art pressure vessel* can be used in the claimed invention.” Pet. Reply 16 (emphasis added) (citing Ex. 1003, 4:1–3, 6–8, 6:21–24). In this regard, Petitioner relies on the statement in the Specification that “*the entire vessel may be similar to that manufactured and sold by Clyde Materials Handling Limited.*” Ex. 1003, 4:1–3 (emphasis added); *see supra* Section I.B. Petitioner further argues that the Specification’s disclosure regarding the Clyde vessel “is inconsistent with a narrow construction.” Pet. Reply 17.

We disagree. The disclosure in the Specification that the pressure vessel for conveying non-free flowing drill cuttings may be “similar to” the Clyde vessel indicates that the vessels have characteristics in common, but does not indicate clearly that the Clyde vessel could be used, without modification, to convey non-free flowing drill cuttings.

For the reasons given above and in the Institution Decision, we maintain our interpretation that “adapted [for/to]” as used in the claims means “made [for/to]” or “designed [for/to].” *See* Inst. Dec. 9.

4. “*mass flow*”

Claims 2, 6, 19, and 20 require “*mass flow* of said non-free flowing drill cuttings” (emphasis added). Patent Owner contends that “mass flow” should be construed to mean that “material descends as a mass in a uniform way towards the outlet with all the material moving.” PO Resp. 17 (citing Ex. 2058 ¶¶ 91–92). We agree. *See* Ex. 1003, 2:32–58 (contrasting mass

flow with core flow or funnel flow, in which a core of material directly above the outlet falls through the outlet but the material around that core does not move). Petitioner does not dispute Patent Owner's proposed construction. We determine that the broadest reasonable interpretation of "mass flow" means that material descends as a mass in a uniform way towards the outlet with all the material moving.

5. *"means for transporting"*

We agree with the parties that the "means for transporting" recitation in each of claims 10, 11, 17, and 18 is a means-plus-function limitation and that the specified function of each limitation is transporting the recited pressure vessel to a discharge station. See Pet. 12; PO Resp. 21–22 (explicitly addressing only claims 17 and 18). Petitioner identifies the corresponding structure described in the Specification as "a ship, crane, and road vehicle." Pet 12 (citing Ex. 1003, Figs. 1, 6, 5:13–16, 6:1–3, 25–39). Patent Owner additionally identifies "a boat" or "a supply boat." PO Resp. 21 (citing Ex. 1003, 4:30, 34, 4:47, 4:59–60, 5:13). We agree with Patent Owner that the corresponding structure is "a boat or ship, a crane, or a road vehicle." PO Resp. 22 (citing Ex. 2058 ¶¶ 94–95). In its Reply, Petitioner does not dispute Patent Owner's contentions with respect to the corresponding structure.

6. *"means for transferring"*

We agree with the parties that the "means for transferring" recitation in claim 15 is a means-plus-function limitation. See Pet. 12; PO Resp. 20. The specified function of claim 15 is "transferring said non-free flowing drill cuttings from said second vessel into a third vessel." Petitioner identifies the corresponding structure as "a conduit, pipe, or flexible hose." Pet. 13 (citing

Ex. 1003, Fig. 5, 2:17–20, 2:66–3:8, 4:30–38). Patent Owner additionally identifies “compressed gas”/“compressed air” and “a connector.” PO Resp. 20 (citing Ex. 1003, 2:9, 27, 3:15–16, 62–63, 5:36, 38, 4:25, 28). We agree with Patent Owner that the corresponding structure is “a conveyance air/gas, a pipe, a conduit, hose, flexible hose, [or] connectors.” PO Resp. 21 (citing Ex. 2058 ¶¶ 97–99). In its Reply, Petitioner does not dispute Patent Owner’s contentions with respect to the corresponding structure.

B. Level of Ordinary Skill in the Art

Petitioner defines the level of ordinary skill in the art as follows:

A person of ordinary skill in the art to which the ’124 patent pertains would have had at least a bachelor’s degree in a science or engineering discipline, such as mechanical, industrial, or chemical engineering, 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. If the person had a graduate degree (master or Ph.D.) in an engineering or related discipline, s/he would have at least 3 years of experience in the design of systems for the handling and transfer of bulk solid and fluid materials, including pneumatic conveyance.

Pet. 13; see Ex. 1032 ¶ 28.

Patent Owner responds that “Petitioner’s proposed level of skill is unreasonably high.” PO Resp. 3–4. Patent Owner defines the person of ordinary skill in the art (“POSITA”) as follows:

Unlike Petitioner’s proposed POSITA, Patent Owner proposes that the person of ordinary skill in the art would have 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 the flow and behavior of granular solids, slurries, and pastes. If the person had an advanced degree in

mechanical engineering or a similar discipline, that person need only a year of study and/or experience with systems that convey materials, and the flow and behavior of [] granular solids, slurries, and pastes.

Id. at 4 (citing Ex. 2058 ¶ 10).

We do not agree with Patent Owner that Petitioner’s definition of the person of ordinary skill in the art is unreasonably high, and we adopt Petitioner’s definition for purposes of our Final Written Decision. While Petitioner’s definition requires five years of design experience at the bachelor’s degree level of education, Patent Owner’s definition does not require any design experience at all. We agree with Petitioner that a person of ordinary skill in the art *designs* devices, and, thus, actively monitors the relevant technical literature, rather than is merely familiar with devices (e.g., an operator or a manufacturer), as proposed by Patent Owner. *See* Ex. 1032 ¶ 28; Ex. 1003, 2:59–61 (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.

C. Asserted Anticipation by Ciaffone

To anticipate a patent claim under 35 U.S.C. § 102, “a single prior art reference must expressly or inherently disclose each claim limitation.” *Finisar Corp. v. DirecTV Group, Inc.*, 523 F.3d 1323, 1334 (Fed. Cir. 2008). Under the principles of inherency, if the prior art necessarily functions in accordance with, or includes, the claim limitations, it anticipates, even though artisans of ordinary skill may not have recognized the inherent characteristics or functioning of the prior art. *In re Cruciferous Sprout*

Litig., 301 F.3d 1343, 1349–50 (Fed. Cir. 2002); *MEHL/Biophile Int’l Corp. v. Milgraum*, 192 F.3d 1362, 1365 (Fed. Cir. 1999) (citation omitted).

Petitioner challenges claims 1, 3–5, 7–9, and 12–16 as anticipated by Ciaffone. Pet. 25–32. For the reasons discussed below, we determine that Petitioner has not established, by a preponderance of the evidence, that Ciaffone anticipates those claims.

1. Overview of Ciaffone

Ciaffone is a United States patent that issued in 1971. Ex. 1006, [45]. Petitioner contends, and Patent Owner does not contest, that Ciaffone is prior art under 35 U.S.C. § 102(b). Pet. 14.

Ciaffone discloses a system and process for pneumatically conveying waste materials 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, hospital waste, refuse, garbage, bark, plastics, and the like. *Id.* at 1:70–73. According to Ciaffone, its system and process overcome problems in the art associated with conveyance of waste materials that are wet and bulky. *Id.* at 1:18–20, 30–32.

Figure 2 of Ciaffone, which is reproduced below, depicts a preferred embodiment. *Id.* at 2:51–54.

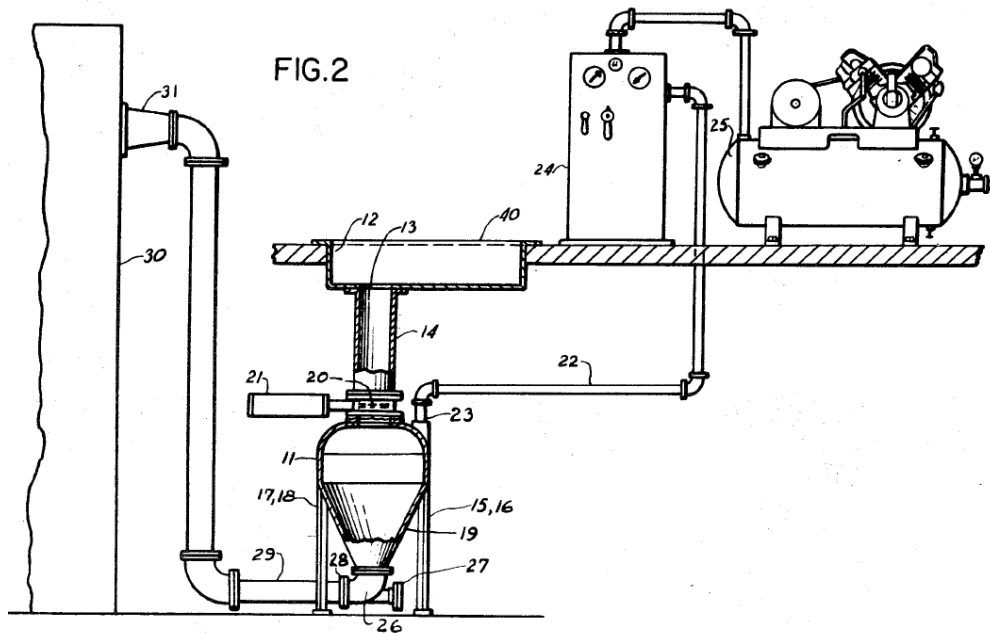


Figure 2 illustrates pneumatic ejector 11, conical section 19 of the ejector, inlet chute 14, pressure air line 22, and discharge pipe 29. *Id.* at 2:55–3:3. As shown in Figure 2, discharge pipe 29 extends horizontally from the bottom of the ejector, rises vertically to the level of the entrance to incinerator 30, and then proceeds horizontally to connect with the incinerator. *Id.* at 3:6–9. Ciaffone discloses that this piping configuration achieves “the most efficient conveyance of the waste material.” *Id.* at 3:9–11. Ciaffone explains this is due to compaction of the waste:

Thus, when the waste is compacted in the ejector and the first horizontal section as well as when it passes through the vertical section it is necessarily present in a compact, tightly knit unit which can be acted upon by the full force of the pressurized air and thereby lifted to the requisite height. I[n] contrast, when the waste is dispersed through greater areas of the discharge pipe, the air is diffused among the separated particles and a concurrent diminution in the applied air pressure conveying the total charge is experienced.

Id. at 3:11–19. Ciaffone further explains the process as follows:

When the waste is compacted in the conical section of the ejector, the inlet valve is closed and air under pressure is forced into the ejector through the air inlet. The 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 to be deposited into the incinerator. Based upon the pressure of air applied, the waste can be lifted and delivered over any reasonable distance to the incinerator; heights of up to about 100 feet and distances of up to 2,000 feet being practical for purposes of this invention.

Id. at 3:29–40. As disclosed in Ciaffone, ejectors can range in size from about 1 to 500 cubic feet. *Id.* at 3:65–66. Ciaffone discloses that the pressure utilized to eject the waste may range from about 5 to 100 psi, which we find equates to about 0.3 to 6.89 bar. See Ex. 1006, 3:66–68; Ex. 1032 ¶ 57. Ciaffone discloses a “four cubic foot experimental ejector,” in which an air pressure of approximately five psi (approximately 0.3 bar) was required to overcome the force represented by the mass of a three cubic foot barrel of waste solids. Ex. 1006, 3:69–4:5.

2. Anticipation Analysis

Petitioner asserts that Ciaffone discloses each limitation of claims 1, 3–5, 7–9, and 12–16. See Pet. 14–15, 25–32; Ex. 1032 ¶¶ 54–58, 117–125. With respect to the limitation of claim 1 requiring “said first pressure vessel being adapted to allow a compressed conveyance gas to be introduced therein as the sole means for inducing movement of said non-free flowing drill cuttings,” and the nearly identical limitation of claim 12, Petitioner relies on the disclosure in Ciaffone of an ejector that utilizes air pressure as the sole means for pneumatically conveying “waste materials, i.e. screenings, grit, sludge cake, skimming, hospital waste, refuse, garbage,

bark, plastics and the like.” Pet. 27–28 (citing Ex. 1006, 1:70–2:5; Ex. 1032 ¶¶ 121–123).

Petitioner’s expert, Dr. Carson, testifies that “[t]he ’124 patent relies entirely on conventional pneumatic conveying equipment and does not identify any new or unique feature that a pneumatic conveyance system requires in order to convey non-free flowing drill cuttings.” Ex. 1032 ¶ 120. Dr. Carson further testifies that “Ciaffone encapsulates every feature described in the ’124 patent, and there is no structure identified in the ’124 [patent] that serves to facilitate conveyance that Ciaffone lacks.” *Id.* Dr. Carson also testifies that “[t]he Ciaffone system would be every bit as capable of conveying screened drill cuttings from an oil rig, including in the form of a paste or sludge, as the system described and claimed in the ’124 patent.” *Id.*

In response, Patent Owner argues that “the first pressure vessel of claim 1[] must be *configured or designed to* ‘allow a compressed conveyance gas to be introduced therein as the sole means for inducing movement of said non-free flowing drill cuttings in said vessel.’” PO Resp. 23–24 (emphasis added) (citing Ex. 2058 ¶ 75). According to Patent Owner, “Petitioner cannot argue Ciaffone is structurally configured for such a purpose, but must rely on an unsupported argument that Ciaffone discloses a vessel that is ‘capable of’ conveying non-free flowing drill cuttings.” *Id.* at 24 (citing Pet. 28–29).

In the Reply, Petitioner argues, as discussed above in Section II.A.3, that “adapted [for/to]” should not be given a narrow construction. Pet. Reply 16–17. Petitioner also argues, relying on *In re Schreiber*, 128 F.3d 1473 (Fed. Cir. 1997), that Patent Owner bears the burden of showing that

the functional limitations of the claims are not an inherent characteristic of the prior art:

Further, when there is “reason to believe that a functional limitation asserted to be critical for establishing novelty may, in fact, be an inherent characteristic of the prior art,” the patent owner should show that the “prior art does not possess the characteristic relied on.”

Pet. Reply 17 (quoting *Schreiber*, 128 F.3d at 1478) (internal quotation and citations omitted).¹³

We are *not* persuaded that Ciaffone anticipates claims 1, 3–5, 7–9, and 12–16. In particular, Petitioner has not persuaded us that Ciaffone expressly discloses a structure that is capable, without modification, of using a compressed conveyance gas to induce movement of non-free flowing drill cuttings.

¹³At the oral argument, Petitioner cited *LaRose Indus., LLC v. Choon’s Design, LLC*, Case IPR2014-00218 (PTAB May 20, 2014) (Paper 9), for the proposition that the *Schreiber* burden-shifting approach applicable in *ex parte* prosecution proceedings is also applicable in *inter partes* review proceedings. Tr. 31:1–7; *see also Schreiber*, 128 F.3d at 1478 (quoting *In re Swinehart*, 439 F.2d 210, 213 (CCPA 1971) (“[W]here the Patent Office has reason to believe 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, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on.”)). Petitioner’s reliance on *LaRose* is misplaced. An issue in that case was whether a reference (“Pugh”) disclosed a flared portion of a pin that was inherently capable of holding a link in a desired orientation. The PTAB panel in *LaRose* did not determine that it was Patent Owner’s burden to disprove inherency, but rather determined based on Petitioner’s arguments and evidence that Pugh’s “overhanging portion 32 discloses the claimed structure and, moreover, that this structure would be capable of holding a link.” *See LaRose*, slip op. at 18.

To the extent Petitioner contends that, because Ciaffone's ejector is made or designed to convey wet and bulky materials that are difficult to handle, such as sewage sludge, the ejector inherently or necessarily is capable of conveying non-free flowing drill cuttings, we disagree. See Pet. 28 (referring to drill cuttings "in the form of a paste or sludge"); Ex. 1032 ¶ 47 (testifying that the terms "sludge" and "paste" are interchangeable). As properly construed, the term "non-free flowing drill cuttings" refers to screened drill cuttings, i.e., screened material generated by the drilling of an oil well including a mixture of earth and drilling fluid or oil." See *supra* Section II.A.2. We are not persuaded that materials broadly characterized as either a "sludge" or a "paste" fall within the scope of "non-free flowing drill cuttings" as we have construed that claim term, and, therefore, we are not persuaded that conveyance of sewage sludge by Ciaffone's ejector is a teaching of a pressure vessel being adapted to allow a compressed conveyance gas to be introduced therein as the sole means for inducing movement of non-free flowing drill cuttings as required by the challenged claims. See *Bettcher Indus., Inc. v. Bunzl USA, Inc.*, 661 F.3d 629, 639 (Fed. Cir. 2011) ("Inherency can be established when 'prior art necessarily functions in accordance with, or includes, the claimed limitations.'" (quoting *In re Cruciferous Sprout Litig.*, 301 F.3d 1343, 1349 (Fed. Cir. 2002))).

Ciaffone describes vacuum-filtered (i.e., dewatered) sludge generated in a sewage treatment plant; as described, the sludge slips on a conveyor belt if the incline of the belt exceeds about 25°–30°. Ex. 1006, 1:36–48. There is no persuasive evidence in the record that the flow properties of such vacuum-filtered sludge (or any other material disclosed in Ciaffone) are the

same as the flow properties of “non-free flowing drill cuttings,” as we have interpreted that term.

Finally, we do not agree that Patent Owner should bear the burden of proving that the functional limitations of the claims are not an inherent characteristic of the prior art. *See* Pet. Reply 17 (citing *Schreiber*, 128 F.3d at 1478). “In an *inter partes* review, the burden of persuasion is on the petitioner to prove ‘unpatentability by a preponderance of the evidence,’ 35 U.S.C. § 316(e), and that burden never shifts to the patentee.” *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). While the Federal Circuit has noted that a burden-shifting framework makes sense in a prosecution context, where the *prima facie* case furnishes a procedural tool of patent examination, that burden-shifting framework does not apply in the adjudicatory context of an *inter partes* review proceeding. *See In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1375 (Fed. Cir. 2016) (citations omitted).

As distinct from the burden of persuasion, “the burden of production can shift from the patent challenger to the patentee” if “the patentee affirmatively seeks to establish a proposition not relied on by the patent challenger and not a necessary predicate for the unpatentability [of the] claim asserted.” *Id.* at 1375–76 (citing *Dynamic Drinkware*, 800 F.3d at 1379). In this *inter partes* review, however, Petitioner is the party seeking to establish that Ciaffone discloses, expressly or inherently, the functional limitations of the claims. Accordingly, shifting the burden of production to Patent Owner would be inappropriate.

For the reasons given, we conclude that Petitioner has *not* shown, by a preponderance of the evidence, that claims 1 and 12 are unpatentable under

35 U.S.C. § 102(b) as anticipated by Ciaffone. We also conclude, for the same reasons, that Petitioner has *not* shown, by a preponderance of the evidence, that dependent claims 3–5, 7–9, and 13–16 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Ciaffone.

D. Asserted Obviousness

A claim is unpatentable for obviousness under 35 U.S.C. § 103(a) if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). A patent claim composed of several elements, however, is not proved obvious merely by demonstrating that each of its elements was known, independently, in the prior art. *Id.* at 418. In analyzing the obviousness of a combination of prior art elements, it can be important to identify a reason that would have prompted one of skill in the art to combine the elements in the way the claimed invention does. *Id.* A precise teaching directed to the specific subject matter of a challenged claim is not necessary to establish obviousness. *Id.* Rather, “any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.” *Id.* at 420. The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations, if in evidence. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

1. Asserted Obviousness of Claims 1–20 over Dietzen I, Dietzen II, Ciaffone, Laster, and Pneumatic Conveying

Petitioner challenges claims 1–20 as obvious over Dietzen I, Dietzen II, Ciaffone, Laster, and Pneumatic Conveying. For the reasons discussed below, we determine that Petitioner has established, by a preponderance of the evidence, that claims 1–20 would have been obvious over Dietzen I, Dietzen II, Ciaffone, Laster, and Pneumatic Conveying.

a. Overview of Dietzen I and Dietzen II

Dietzen I is a United States patent that issued in 1995. Ex. 1012, [45]. Dietzen II, which is related to Dietzen I, issued from a continuation-in-part application filed on March 2, 1999. Ex. 1013, (22). Petitioner contends, and Patent Owner does not contest, that Dietzen I qualifies as prior art under 35 U.S.C. § 102(b) and that Dietzen II qualifies as prior art under 35 U.S.C. § 102(e). Pet. 21–22.

Dietzen I discloses a “method and apparatus for removing drill cuttings from an oil and gas well drilling platform.” Ex. 1012, 2:19–21. The method involves physically separating, on the drilling platform, waste drilling fluid from waste drill cuttings. *Id.* at 2:25–29. The separated waste drilling fluid is recycled for use in the well bore during drilling operations, and the separated waste drill cuttings are collected in a trough and suctioned from the trough to a holding tank on the drilling platform. *Id.* at 2:29–39. Subsequently, the drill cuttings are emptied from the tank at a remote disposal site. *Id.* at 2:48–52.

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. Ex. 1013, 2:58–59. Figure 1A of Dietzen II is reproduced below.

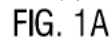


FIG. 1A

Figure 1A is an elevation view illustrating work boat 20 moored next to offshore oil and gas well drilling platform 11. Ex. 1013, 4:10–34. The deck of boat 20 supports vacuum unit 22, vacuum lines 25, and one or more storage tanks 23. *Id.* at 4:34–36. Drilling platform 11 supports one or more tanks for holding cuttings that have been removed from the well bore during drilling. *Id.* at 4:40–44. 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.

b. Overview of Laster

Laster is a United States patent that issued in 1982. Ex. 1014, [45]. Petitioner contends, and Patent Owner does not contest, that Laster qualifies as prior art under 35 U.S.C. § 102(b). Pet. 23.

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 becomes “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 (emphasis added). Laster discloses a sump tank having wall thicknesses to withstand pressures of 0–200 psi. *Id.* at 3:31–34; Pet. 24 (citing Ex. 1032 ¶ 103).

c. Overview of Pneumatic Conveying

Petitioner asserts, and Patent Owner does not contest, that *Pneumatic Conveying* is a textbook published in 1990 that qualifies as prior art under 35 U.S.C. § 102(b). Pet. 19; Ex. 1009.

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*, it is advisable to use small capacity blow vessels for materials that “have ‘bad’ flow characteristics or which have such free flowing characteristics that they tend to ‘flood’ the conveying line.” *Id.* at 281–282. *Pneumatic Conveying* teaches that “small capacity blow vessels are designed on the basis of conveying material 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. Dr. Carson testifies that this blow vessel is the “same Denseveyor system” described in

Macawber and Macawber Coal Ship (Exs. 1007 and 1008, discussed below).
Ex. 1032 ¶¶ 161, 176.

Pneumatic Conveying also teaches that “it is sound practice to design a blow vessel for high operating pressures.” Ex. 1009, 282–283. Pneumatic Conveying states: “There is a relatively small cost differential between a vessel constructed to operate [at] 400 kPa (4 bar) and one constructed to operate at 700 kPa (7 bar).” *Id.* at 283. Pneumatic Conveying further teaches that “[t]he added pressure capacity could provide the user with an opportunity of extending either the capacity or the length of the conveying line without the need to purchase a second blow vessel.” *Id.*

d. Overview of Macawber

Macawber is a company brochure, published by Macawber Engineering Limited, England (the “Macawber company”), 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.

e. Overview of Macawber Coal Ship

Macawber Coal Ship describes use of the Denseveyor (*see supra* Section II.D.1.d) 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.

f. Obviousness Analysis

Petitioner contends that the combination of Dietzen I and II, Ciaffone, Laster, and Pneumatic Conveying teaches the subject matter of claims 1–20. Pet. 44–59. Petitioner asserts that Dietzen I and II teach pneumatically conveying screened drill cuttings, but rely on suction (i.e., negative pressure) as the means of conveyance. *Id.* at 46–51; *see* Ex. 1032 ¶¶ 167, 175. Petitioner reasons that a POSITA would have been motivated to substitute a positive-pressure conveyance system in place of the negative-pressure conveyance system described in Dietzen I and II because “a positive pressure system can create a larger pressure differential than a negative pressure system” and, thus, “negative pressure . . . systems are generally limited to shorter distances and lower material volumes than positive pressure systems.” Pet. 47; *see* Ex. 1032 ¶ 168 (citing Ex. 1015 (DAVID MILLS, PNEUMATIC CONVEYING AND DESIGN (1990)), 27). For those reasons, Petitioner argues that a POSITA would have been motivated to substitute the negative-pressure conveyance system of Dietzen I and II with

Ciaffone's positive-pressure conveyance system as modified based on the teachings of, Laster, Pneumatic Conveying, Macawber, and Macawber Coal Ship. Pet. 47–51.¹⁴

Dr. Carson testifies that, given the use of negative-pressure to convey screened oil rig drill cuttings, as disclosed in Dietzen I and II, a POSITA would have had a reasonable expectation of success in using the positive-pressure equipment described in Ciaffone, Laster, and Pneumatic Conveying to convey non-free flowing drill cuttings. Ex. 1032 ¶¶ 167–176. For example, Dr. Carson testifies:

Dietzen I and II would have also given those of ordinary skill in the art a reasonable expectation of success in using the pneumatic conveying equipment described by Ciaffone and the other pneumatic conveying references I have discussed. Dietzen I and II both confirm that screened drill cuttings can be pneumatically conveyed using negative, or vacuum, pressure. As I already explained, those of ordinary skill in the art would have had a strong expectation that pneumatic conveyance with positive pressure would effectively convey drill cuttings as well. Thus, the success of Dietzen I and II would have given those of ordinary skill in the art further confidence that pneumatic conveyance using the Ciaffone and similar systems would be an effective means for conveying non-free flowing drill cuttings, including in the form of a paste or sludge.

Id. ¶ 175; *see* Pet. 49 (“Dietzen I and II would have given a POSITA a strong expectation of success in using Ciaffone’s pneumatic conveying equipment to convey non-free flowing drill cuttings.”).

¹⁴ According to Petitioner, Macawber and Macawber Coal Ship “describe the efficacy of the same Denseveyor system discussed in Pneumatic Conveying, and the efficacy identified in those references—that the system can convey ‘sticky,’ ‘cohesive,’ and ‘high moisture content materials’—is inherent to the system.” Pet. 50 n.4 (citing Ex. 1007, 2).

Petitioner has provided a sufficient reason with rational underpinning for the asserted combination of Dietzen I and II, Ciaffone, Laster, and Pneumatic Conveying. See *KSR*, 550 U.S. at 418 (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.”) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). As discussed further below, Petitioner also has shown that the combination of Dietzen I and II, Ciaffone, Laster, and Pneumatic Conveying teaches the subject matter of claims 1–20. See Pet. 44–59; Ex. 1032 ¶¶ 163–192. We first discuss independent claims 1 and 12, including Patent Owner’s arguments challenging Petitioner’s rationale for the combination, and then consider Patent Owner’s evidence of secondary considerations, before discussing the dependent claims.

(1) Claims 1 and 12

We determine that Dietzen I, Dietzen II, Ciaffone, Laster, and Pneumatic Conveying teach the limitations of independent claims 1 and 12, including a pressure vessel that is made or designed to allow a compressed conveyance gas to be introduced therein as the sole means for inducing movement of non-free flowing drill cuttings. See Pet. 51–53; Ex. 1032 ¶¶ 164–180. In particular, we determine that a POSITA would have sized, made, and designed a pressure vessel, as taught by Ciaffone, Pneumatic Conveying, and Laster, to allow a compressed conveyance gas to be introduced therein as the sole means for inducing movement of non-free flowing drill cuttings.

Ciaffone teaches a pressure vessel with a conical bottom section for pneumatically conveying wet and bulky waste materials over long distances, without the need for bins, hoppers, hydraulic rams, screw feeders, conveyor belts, and the like. Ex. 1006, 1:7–9, 18–20, 30–32, 1:70–2:6, 2:55–3:3. Ciaffone also teaches that the pressure vessel should be from about 1 to 500 cubic feet in volume and from about 0.3 to 6.89 bar in operating pressure. Ex. 1006, 1:70–2:6, 3:65–68.

Pertinent to designing Ciaffone’s vessel to convey non-free flowing drill cuttings, *Pneumatic Conveying* teaches that “there are three basic design parameters which can influence blow vessel performance: (a) cone angle; (b) vessel volume; and (c) vessel pressure.” Ex. 1009, 279. In accordance with the teachings of *Pneumatic Conveying*, a POSITA would have selected a cone angle for the conical bottom section of Ciaffone’s vessel suitable to convey non-free flowing drill cuttings. *See id.* (teaching that “[t]he increased use of blow vessels for feeding materials with ‘bad’ flow properties necessitates the selection of a suitable cone angle.”). Further, a POSITA would have selected a small-capacity vessel suitable for high operating pressures. *See id.* at 281–283. Laster would have confirmed that positive pressure could be used to convey non-free flowing drill cuttings. *See* Ex. 1014, 2:27–31 (describing positive-pressure equipment for conveying “heavy viscous drilling mud”); Ex. 1032, 174 (Dr. Carson testifying that “Laster would have further provided those of ordinary skill in the art with a more than reasonable expectation that pneumatic conveyance could be used to convey non-free flowing drill cuttings, including in the form of a paste or sludge.”).

We have considered all of Patent Owner’s evidence and opposing arguments, but do not find them to be persuasive. *See* PO Resp. 45–61. First, Patent Owner argues that “the ‘drill cuttings’ disclosed by Dietzen I that are transferred from the trough to the tank are *not* non-free flowing because the drill cuttings fall via gravity into the trough.” *Id.* at 46–47 (citing Ex. 2058 ¶¶ 121–122, 202–203). Further, according to Patent Owner, “Dietzen II confirms that the drill cuttings congeal or set up, as Dietzen II confirms that a volume of material requires an auger.” *Id.* at 47 (citing Ex. 2058 ¶¶ 126–127, 203).

We agree with Petitioner, however, that Dietzen I and II disclose separated waste drill cuttings that are generated by a recycling procedure on a drilling rig in essentially the same manner as described in the ’124 Patent. *See supra* Section II.D.1.a; Pet. Reply 12–13, 15. We see no credible basis for distinguishing the separated waste drill cuttings in Dietzen I and II from “non-free flowing drill cuttings” as we have construed that term. Under our claim interpretation, “non-free flowing drill cuttings” are “screened drill cuttings, i.e., screened material, generated by the drilling of an oil well, including a mixture of earth and drilling fluid or oil.” *See* Section II.A.2. At oral argument, Patent Owner agreed that Dietzen I discloses non-free flowing drill cuttings. Tr. 97:20–22 (“We 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.”).

Patent Owner also argues: “[g]iven that the vacuum system only worked for drill cuttings fresh off the shaker and do[es] not introduce a conveyance gas, the POSITA would not have considered looking beyond the Dietzen I system.” PO Resp. 47 (citing Ex. 2058 ¶ 204). Patent Owner’s

argument, however, does not respond adequately to Petitioner's obviousness rationale that a POSITA would have substituted a positive-pressure conveyance system in place of the negative-pressure conveyance system of Dietzen I and II because negative pressure systems are generally limited to shorter distances and lower material volumes than positive systems.

Patent Owner next argues that a "POSITA would not have considered that pressure differential alone would have overcome the problems in Dietzen II that required an auger." *Id.* (citing Ex. 2058 ¶¶ 127–128). That argument does not address Ciaffone's teaching that a positive-pressure vessel with a conical bottom section can be used to convey materials without the need for bins, hoppers, hydraulic rams, screw feeders, conveyor belts, and the like. *See* Ex. 1006, 1:70–2:6. Further, as explained by Petitioner, Dietzen II uses an auger to augment use of negative pressure for moving settled materials horizontally from the bottom of a vessel. *Pet. Reply* 15; Ex. 2021 ¶¶ 154:6–155:5. In contrast with Dietzen II's relatively low-pressure vacuum system, a positive-pressure system such as taught by Ciaffone, with an operating pressure of up to 6.89 bar, blows materials out of the conical bottom section of the vessel. *See supra* Section II.C.1.

Patent Owner further argues that a "POSITA would have discounted positive pressure given th[at] non-free flowing drill cuttings cannot be fragmented." *PO Resp.* 47 (citing Ex. 2058 ¶¶ 121–122). We find this argument unpersuasive because Ciaffone's blow vessel does not require fragmentation of the material to be conveyed. Rather, Ciaffone teaches compaction of the material in a tightly knit unit that can be acted upon by the full force of the pressurized air, in contrast with dispersion of the waste such that air is diffused among the separated particles resulting in diminution in

the applied air pressure conveying the total charge. Ex. 1006, 3:11–19. Further, Pneumatic Conveying teaches that “small capacity blow vessels are designed on the basis of conveying material as a series of discrete plugs rather than as a continuous stream.” Ex. 1009, 282, Fig. 7.32. Pneumatic Conveying further explains: “As such, the capacity of the vessel is selected such that on discharge a plug is formed which is just long enough to prevent blocking [of the conveying line].” *Id.* Pneumatic Conveying discloses that “[i]f the material to be conveyed is unusually cohesive, a plug forming system will yield good results” and, “[a]s the plugs are relatively impermeable, they remain separated even over long conveying distances.” *Id.* at 346. Based on these teachings, a POSITA would not have understood that it was necessary to fragment non-free flowing drill cuttings, contrary to Patent Owner’s argument.

Patent Owner’s remaining arguments also are unpersuasive. We do not agree, for example, that “[t]he Petition never identifies the particular vessel that forms the basis of [Petitioner’s] obviousness argument or why the POSITA would have chosen such a vessel.” See PO Resp. 50. The Petition sufficiently identifies Ciaffone’s pressure vessel with a lower conical portion and explains that Ciaffone’s vessel “could convey ‘coarse unground screenings, unwashed grit and organic matter, sludge and skimmings’ using nothing more than compressed conveyance gas.” Pet. 48.

We also do not agree that Dietzen II’s disclosure of a negative-pressure conveyance system that includes an auger teaches away from using “purely pneumatic means” for moving non-free flowing drill cuttings. See PO Resp. 51–52. Dietzen II does not mention, much less discourage, utilizing a positive-pressure system, such as taught in Ciaffone, in which

material is blown out of the conical bottom section of the vessel rather than moved by an auger. *See In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004) (requiring, in order to “teach away,” that a reference “criticize, discredit, or otherwise discourage the solution claimed”).

Patent Owner argues that Laster does not disclose non-free flowing drill cuttings and would not have provided a POSITA with an expectation of success. PO Resp. 55–56. Patent Owner characterizes Laster as directed to “fluids.” *Id.* at 55. We disagree because, as explained by Dr. Carson:

Laster is directed to drilling mud that has been used to the point that it has become too “polluted or too filthy to reclaim.” [Ex. 1014, 1:30–33]. One of ordinary skill would understand this statement to be indicating that drilling mud has been so contaminated with drill cuttings that it can no longer be used for drilling operations and must be removed from the site for treatment and/or disposal. Laster says that this mud can get so thick that “[i]t is not unknown for an oilman or other drilling rig personnel to hand empty the cellar rig using a shovel and bucket[”] because the material is too thick “if not impossible to transmit” using conventional impeller-driven pumps. *Id.* at 1:34–48.

Ex. 1032 ¶ 98.

We also disagree with Patent Owner’s argument that Pneumatic Conveying is “directed to pneumatic conveyance of solids, specifically solids in the form of powders.” PO Resp. 39 (citing Ex. 1009, 1, 2; Ex. 2058 ¶ 176). We credit Dr. Carson’s testimony that Pneumatic Conveying identifies hundreds of materials that had been pneumatically conveyed by 1990, including “cellulose acetate (wet),” “edible paste products,” and “papermill wood waste (wet).” Ex. 1032 ¶ 83 (citing Ex. 1009, 3–5). On cross-examination, Dr. Carson credibly testified that “paper mill wood waste (wet)” “could be a paste or a sludge” and that “edible paste products” are

paste. Ex. 2021, 135:16–136:5. Dr. Carson also credibly testified that Pneumatic Conveying “does refer to a cohesive material, of which a sludge and a paste would be considered cohesive.” *Id.* at 134:23–25. As noted above, Pneumatic Conveying discloses that conveying “unusually cohesive” material in a plug forming system “will yield good results” and that the plugs “remain separated even over long conveying distances.” Ex. 1009, 346.

(2) Secondary Considerations

Patent Owner asserts objective evidence of nonobviousness in the form of commercial success, praise by others, and skepticism by experts. PO Resp. 63–69. With respect to commercial success, Patent Owner argues that its CleanCut system “practices each claim of the ’124 patent.” *Id.* at 64. 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 and the CleanCut system is usually deployed on an oil well drilling rig.” *Id.* (citing Ex. 2053 ¶¶ 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 66 (citing Ex. 2053 ¶¶ 51–52, 55).

“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 64. 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, non-free flowing 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 introduced into the pressure vessel and the compressed conveyance gas is “the sole means for inducing movement of said non-free flowing drill cuttings in said vessel.” Ex. 2053 at ¶ 27. . . . No non-pneumatic means are used to induce movement of the drill cuttings from the CCB or ISO-Pump. Thus, the CleanCut system practices claim 1 of the ’124 patent.

Id. at 64–65. 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 ¶ 27.

“[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 gas to be introduced therein as the *sole means* for inducing movement of non-free flowing drill cuttings. Pet. Reply 23–24. 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. 33); Tr. 132:2–22; *see supra* Section I.C.¹⁵ Petitioner further argues that “[t]he CleanCut system, however, uses aeration jets, line air, and even oil injection to aid conveyance.” Pet. Reply 23. 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 Reactive Clays.” *Id.* at 60. *These nozzles “break up/fluidize” the material. Id.*

¹⁵ 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; *see supra* Section I.C.

Id. (emphasis added). Petitioner also points to evidence that “[t]he CCB relies on the same pulsing aeration nozzles” (*id.* (citing Ex. 2024, 12, 13)), and that these nozzles perform the same function in the CCB as the ISO-pump (*id.* at 23–24 (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, 148–149, 209–211; Ex. 1108, 119–120).

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. 153:8–14.

We agree with Petitioner that the CleanCut system does not practice the claimed invention. The pulse air nozzles or jets in the CleanCut system are indistinguishable from the pulsed-jet bin aerators in Curtis, which the Examiner sought to distinguish by adding the “sole means” limitation to the claims during prosecution of the related ’217 Patent. 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); *supra* Section I.C. Further, the pulse air nozzles or jets in the CleanCut system are not made or designed to provide compressed conveyance gas, but rather to break up and fluidize material and 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. As such, we find that neither the ISO-pump nor the CCB is made or designed to allow a compressed conveyance gas to be introduced therein as the sole means for inducing movement of non-free flowing drill cuttings.

“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, LLC*, No. 2016-1092, 2016-1172, 2017 WL 1749679, slip op. at *11, (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 and internal quotation marks omitted).

(3) Claims 2, 6, 19, and 20

Dependent claims 2, 6, 19, and 20 add the limitation that the pressure vessel “has a conical portion defining a cone angle selected to enable mass flow of said non-free flowing drill cuttings.” Petitioner contends that Pneumatic Conveying teaches the limitation added by these dependent claims. *See* Pet. 53, 56. Petitioner argues:

The advantages of achieving mass flow were well known, and a POSITA would have known how to modify Ciaffone (if necessary) to achieve it. [Ex. 1032 ¶ 181]. Pneumatic Conveying shows that POSITAs knew that the cone angle is important to achieving mass flow. Ex. 1009, 280–282; 410–420; [Ex. 1032 ¶ 181]. Further, the ’124 patent acknowledges that POSITAs knew how to choose a cone angle that would provide mass flow. Ex. 1003, 2:46–61.

Id. at 53.

Patent Owner does not agree that Pneumatic Conveying teaches “mass flow of said non-free flowing drill cuttings.” PO Resp. 61 (citing Ex. 2058 ¶¶ 240–242). Patent Owner argues that Pneumatic Conveying’s teachings are limited to stored solids, and “a POSITA would not have been motivated to use a vessel for solids from Pneumatic Conveying to design a vessel for mass flow of pastes or non-free flowing drill cuttings.” *Id.* at 44 (citing Ex. 1009, 411; Ex. 2058 ¶¶ 129, 132, 138, 193–194).

In support of Patent Owner’s argument, Dr. Brown testifies that Pneumatic Conveying does not provide information on “anything close to ‘non-free flowing drill cuttings’ or a ‘thick, heavy paste,’” and, thus, a POSITA “would not look to designs presented in Pneumatic Conveying.” Ex. 2058 ¶ 241. We give little weight to this testimony because, as discussed above, we credit Dr. Carson’s testimony that Pneumatic Conveying identifies hundreds of materials, including paste and cohesive

material. *See supra* Section II.D.1.f(1). We also credit Dr. Carson’s testimony that Pneumatic Conveying explains that pressure vessels increasingly were being used to convey materials with “bad” flow properties, and that “Pneumatic Conveying would have also shown those of ordinary skill in the art that pneumatic conveying with a positive pressure system would be an effective way to transport non-free flowing drill cuttings, including in the form of a paste or sludge.” Ex. 1032 ¶ 176.

Dr. Brown also testifies that the information in Pneumatic Conveying with respect to mass flow concerns granular solids. Ex. 2058 ¶ 242 (citing Ex. 1009, 411). He further testifies that because “the flow behavior of non-free flowing drill cuttings is distinct from that of granular solids . . . a person of ordinary skill in the art would gain no insight in designing a vessel for paste to produce mass flow from a vessel designed to contain granular solids.” *Id.* We give little weight to this testimony because Dr. Brown does not address all of the information in Pneumatic Conveying that is relevant to mass flow, as discussed further below.

In contrast with Dr. Brown, Dr. Carson testifies that Pneumatic Conveying “explains how to design a vessel that provides for ‘mass flow.’” Ex. 1032 ¶ 87 (citing Ex. 1009, 280–822, 410–420). Dr. Carson further testifies: “As explained in Pneumatic Conveying, those of ordinary skill in the art knew that the cone angle is an important variable to adjust in order to achieve mass flow.” *See id.* ¶ 181 (citing Ex. 1009, 280–282, 410–420; Ex. 1046, 68–74, 147–151). Consistent with Dr. Carson’s testimony, the ’124 Patent discloses that “[i]t is well known that the critical cone angle [to achieve mass flow] will vary depending upon the material being conveyed

[and] as such would be well understood by those skilled in the art.”

Ex. 1003, 2:59–61.

We credit the testimony of Dr. Carson over the conflicting testimony of Dr. Brown because Dr. Carson’s testimony addresses the full Pneumatic Conveying disclosure, and is consistent with that disclosure, while Dr. Brown’s testimony does not address the full Pneumatic Conveying disclosure, and is not completely consistent with that disclosure. For example, under the subheading “Factors influencing blow vessel performance,” Pneumatic Conveying teaches that “[t]he increased use of blow vessels for feeding materials with ‘bad’ flow properties necessitates the selection of a suitable cone angle.” Ex. 1009, 279. Pneumatic Conveying further explains that “[v]essels with incorrectly designed cone angles will result in either ‘ratholing’ or ‘bridging’ problems.” *Id.* at 279, Fig. 7.30. These teachings of Pneumatic Conveying are not limited to granular solids, contrary to Dr. Brown’s testimony.

Figure 7.30 of Pneumatic Conveying (*id.* at 280) is reproduced below:

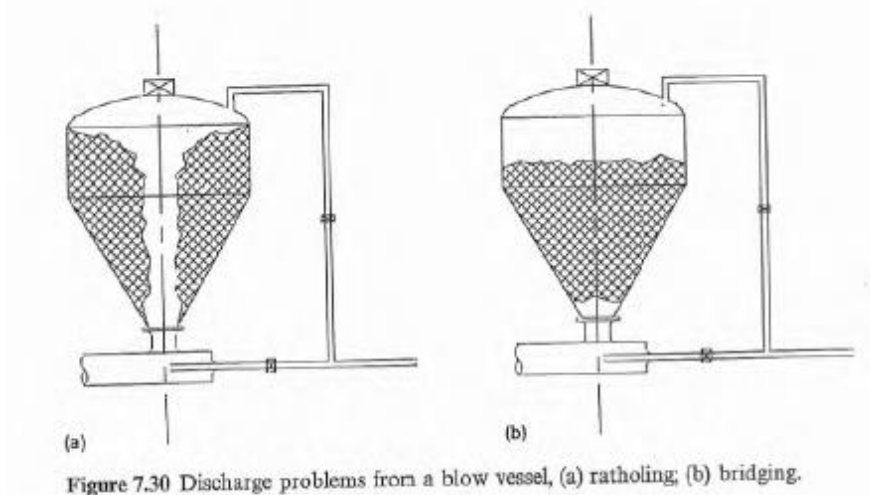


Figure 7.30 comprises two figures, (a) and (b), illustrating the blow vessel discharge problems known as “ratholing” and “bridging,”

respectively. As described in Pneumatic Conveying, “[r]atholing [illustrated in figure (a) on the left above] results in the formation of a blow hole through the material mass and, once formed, it is not possible to transport any more material.” *Id.* at 279. “Bridging problems [illustrated in figure (b) on the right above] result in the product forming a barrier across the outlet of the vessel which prevents any further material flow.” *Id.* The “ratholing” problem described in Pneumatic Conveying is the same problem that the ’124 Patent describes as “core flow” or “funnel flow.” *See supra* Section I.B; Ex. 1003, 2:32–58.

Pneumatic Conveying teaches that “[t]he selection of a suitable cone angle could be aided by the use of the classical silo or hopper design criteria,” but cautions that “these design criteria do not take into consideration that the product is under pressure and in certain situations, gas also percolates through the material.” Ex. 1009, 279. Pneumatic Conveying then states: “At present, much of the cone angle selection criteria are based on empirical data obtained from experience.” *Id.* Again, Pneumatic Conveying provides information relating to cone angle selection that is not limited to granular solids, contrary to Dr. Brown’s testimony.

In a separate chapter, Pneumatic Conveying presents information relating to classical silo or bin design. *Id.* at 409–455. Under the subheading “Common flow problems from a silo bin,” Pneumatic Conveying again discusses the problems of “ratholing” and “bridging.” *Id.* at 410. On the next page, under the subheading “Characteristic flow of granular and powdered products from a storage bin,” Pneumatic Conveying discusses and contrasts two flow situations, “mass flow” and “funnel flow.” *Id.* at 411. As explained under that subheading, “[m]ass flow from a bin

implies that the total volume of the stored solids is in motion.” *Id.* “A mass flow bin is devoid of any channeling, surging, flooding, hang-ups or bridging.” *Id.* The information provided in Pneumatic Conveying relating to classical silo or bin design complements the separate information in Pneumatic Conveying relating to design of blow vessels generally.

For these reasons, we determine that Pneumatic Conveying teaches the limitation recited in claims 2, 6, 19, and 20 that the pressure vessel “has a conical portion defining a cone angle selected to enable mass flow of said non-free flowing drill cuttings.”

(4) Claims 10, 11, 17, and 18

Claims 10 and 11 each additionally recite “means for transporting the [] vessel to a discharge station at which said compressed conveyance gas is introduced into the [] vessel.” Claims 17 and 18 each additionally recite “means for transporting the [] vessel to a discharge station,” and “means at said discharge station for introducing said compressed conveyance gas into the [] vessel.” We are persuaded by Petitioner’s argument and evidence that the combination of Dietzen I and II, Ciaffone, Laster, and Pneumatic Conveying teaches the additional limitations recited in claims 10, 11, 17, and 18. *See* Pet. 58–59; Ex. 1032 ¶¶ 185–187, 190–191.

Patent Owner’s opposing arguments do not respond to the asserted combination of references and are not persuasive. *See* PO Resp. 62–63. In the asserted combination, the recited vessel corresponds to a positive-pressure vessel as taught by Ciaffone, Laster, and Pneumatic Conveying. Using a crane or a ship to transport the vessel to a discharge station as taught by Dietzen I and II would have been nothing more than the combination of familiar elements according to known methods to achieve predictable

results. *See* Pet. 58 (citing Ex. 1032 ¶ 194); Ex. 1012, 3:56–64; Ex. 1013, 6:64–67; *KSR*, 550 U.S. at 416 (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”).

Further, we do not agree that a POSITA would not have used “positive pneumatic pressure alone for unloading of a vessel that would have stored the non-free flowing drill cuttings for a duration of time during transport of the vessel.” *See* PO Resp. 63 (citing Ex. 2058 ¶¶ 30, 127, 249). First, Patent Owner’s argument is not commensurate with the scope of the claims. The claims do not impose a limitation on duration of time (whether short or long) for transport of the vessel. Second, this is essentially a variant of Patent Owner’s argument that a “POSITA would not have considered that pressure differential alone would have overcome the problems in Dietzen II that required an auger.” *See* PO Resp. 47 (citing Ex. 2058 ¶¶ 127–128). As we have determined previously, Patent Owner’s argument does not address Ciaffone’s teaching that a positive-pressure vessel with a conical bottom section can be used to convey materials without the need for bins, hoppers, hydraulic rams, screw feeders, conveyor belts, and the like. *See* Ex. 1006, 1:70–2:6. Further, as explained by Petitioner, Dietzen II uses an auger to augment use of negative pressure for moving settled materials horizontally from the bottom of a vessel. Pet. Reply 15; Ex. 2021 ¶¶ 154:6–155:5. In contrast with Dietzen II’s relatively low-pressure vacuum system, a positive-pressure system such as taught by Ciaffone, with an operating pressure of up to 6.89 bar, blows materials out of the conical bottom section of the vessel. *See supra* Section II.C.1.

For these reasons, we determine that the combination of Dietzen I and II, Ciaffone, Laster, and Pneumatic Conveying teaches the additional limitations recited in claims 10, 11, 17, and 18.

(5) Claims 3–5, 7–9, and 13–16

We are persuaded by, and adopt, Petitioner’s argument and evidence that the combination of Dietzen I and II, Ciaffone, Laster, and Pneumatic Conveying teaches the additional limitations recited in claims 3–5, 7–9, and 13–16. *See* Pet. 53–58; Ex. 1032 ¶¶ 182–189. Patent Owner relies on its arguments with respect to independent claims 1 and 12 and does not argue the separate patentability of claims 3–5, 7–9, and 13–16.

(6) Conclusion

For the foregoing reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1–20 are unpatentable as obvious over Dietzen I and II, Ciaffone, Laster, and Pneumatic Conveying.

2. Asserted Obviousness of Claims 1–20 over Macawber, Macawber Coal Ship, Pneumatic Conveying, and Ciaffone

In view of our determination that claims 1–20 are unpatentable over Dietzen I and II, Ciaffone, Laster, and Pneumatic Conveying, we do not address Petitioner’s additional ground that claims 1–20 would have been unpatentable for obviousness over Macawber, Macawber Coal Ship, Pneumatic Conveying, and Ciaffone.

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1–20 of the ’124 Patent are unpatentable.

This Final Written Decision discusses or cites information that the parties have indicated is confidential, including portions of the transcript of the oral argument filed under seal at the request of the parties. Accordingly, we have entered this decision in the Board's E2E system as "Board and Parties Only." If either Party believes that any portion of this decision or the transcript of the oral argument should be maintained under seal, the Party must file, within five (5) business days from the entry of the decision, a motion to seal portions of the decision or transcript. The motion must include a proposed redacted version of the decision or transcript, accompanied by an explanation as to why good cause exists to maintain under seal each redacted portion. In the absence of a motion to seal by the specified deadline, the full version of this decision and the transcript will become public. Any opposition to a motion must be filed within three (3) business days from the date of entry of the motion; no reply to an opposition is authorized.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–20 of U.S. Patent No. 7,033,124 B2 are unpatentable;

FURTHER ORDERED that each of the parties is authorized to file, within five (5) business days from the date of entry of this Final Written Decision, a motion to seal portions of the decision and/or transcript of the oral argument that includes a proposed redacted version of the decision and/or 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 the decision or transcript must be filed within three (3) business days from the date of entry of the motion; and

FURTHER ORDERED that no reply to an opposition is authorized.

This is a Final Written Decision. Parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2016-00260
Patent 7,033,124 B2

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