

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

A.C. DISPENSING EQUIPMENT INC.,
Petitioner,

v.

PRINCE CASTLE LLC,
Patent Owner.

Case IPR2014-00511
Patent 8,534,497 B2

Before LINDA M. GAUDETTE, DONNA M. PRAISS, and
MITCHELL G. WEATHERLY, *Administrative Patent Judges*.

GAUDETTE, *Administrative Patent Judge*.

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

I. INTRODUCTION

A.C. Dispensing Equipment Inc. (“Petitioner”) filed a Corrected Petition (Paper 4, “Pet.”) on April 1, 2014, requesting institution of an *inter partes* review of claims 1–12 of U.S. Patent No. 8,534,497 B2 (Ex. 1001, “the ’497 patent”). Prince Castle LLC (“Patent Owner”) filed a Preliminary Response (Paper 9, “Prelim. Resp.”). Based on these submissions, we instituted this trial on August 11, 2014, pursuant to 35 U.S.C. § 314. Paper 10 (“Dec. on Inst.”).

After institution, Patent Owner filed a Response (Paper 19, “PO Resp.”), and Petitioner filed a Reply to the Patent Owner Response (Paper 21, “Reply”).

Patent Owner also filed a Motion to Exclude under 37 C.F.R. §§ 42.62 and 42.64. Paper 22 (“PO Mot.”). Petitioner filed an Opposition to the motion (Paper 25, “Pet. Opp.”) and Patent Owner filed a Reply (Paper 27, “PO Reply”).

Oral argument was held on April 16, 2015, and a transcript (Paper 32, “Tr.”) has been entered into the record.

We have jurisdiction under 35 U.S.C. § 6(c). This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

For the reasons discussed below, we determine Petitioner has not met its burden to prove, by a preponderance of the evidence, that claims 1–12 of the ’497 patent are unpatentable.

A. *The ’497 Patent (Ex. 1001)*

The ’497 patent, titled “Dispensing Method and Apparatus Utilizing a Sensor to Determine a Time that a Dispensing Valve Is Open,” is directed to dispensing liquid “from a bulk container by empirically determining the

liquid surface height and opening a dispensing valve for a time period that is calculated using a volume of liquid specified to be dispensed and the empirically-determined liquid surface height.” Ex. 1001, Abst. In a preferred embodiment, “the time that the valve must be kept open to dispense a user-requested volume of liquid is determined by evaluating a polynomial that effectively correlates a signal obtained from [a] load cell . . . to the time required to open the valve . . . to dispense a requested volume.” *Id.* at 5:26–30.

B. Illustrative Claims

Claims 1 and 11, which are the only independent claims of the ’497 patent, are illustrative of the claims at issue:

1. A method of dispensing a user-specified volume of liquid from a container, the method comprising:

opening a valve connected to the container to dispense the user-specified volume of liquid through the valve, a length of time that the valve is required to be open being determined from a weight impressed on a load cell by the container;

said length of time being determined by evaluating a polynomial having coefficients, the coefficients of the polynomial operating on a value, which is representative of a signal obtained from the load cell.

11. A method of dispensing a user-specified volume of liquid from a container coupled to a load cell, configured to generate a signal representing a weight impressed on the load cell by the container and its content, the container being coupled to a pinch valve that is both manually operable and computer operable, the method comprising:

manually opening the pinch valve to dispense a first volume of liquid; and

after the first volume of liquid is dispensed, opening the pinch valve by a computer to dispense a second, user-requested volume of liquid, the time that the valve is required to be open to dispense the second volume of liquid being determined after the first volume of liquid is dispensed, by evaluating a polynomial having coefficients, the coefficients of the polynomial operating on a value, which is representative of a signal obtained from the load cell.

C. The Prior Art

The pending grounds of unpatentability in this *inter partes* review are based on the following prior art:

Reference	Publication	Date
Wang	Chinese Patent Publication 101446833	June 3, 2009
Pascoe	Australian Patent 728,683	January 18, 2001
Gardos	U.S. Patent No. 5,816,445	October 6, 1998
Hernandez	U.S. Patent No. 5,377,868	January 3, 1995

D. Pending Grounds of Unpatentability

We instituted the instant *inter partes* review on the following grounds of unpatentability:

Claims	Basis	References
1–8, 10	§ 103(a)	Pascoe and Wang
11	§ 103(a)	Pascoe, Wang, and Gardos
9	§ 103(a)	Pascoe, Wang, and Hernandez
12	§ 103(a)	Pascoe, Wang, Gardos, and Hernandez

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are given their “broadest reasonable construction in light of the specification of the patent in which it appears.” 37 C.F.R. § 42.100(b). A “heavy presumption” exists that a claim term should be construed in light of its ordinary and

customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002); *see also In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). A claim term will not be accorded its ordinary meaning, however, “if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history.” *CCS Fitness, Inc.*, 288 F.3d at 1366. “Although an inventor is indeed free to define the specific terms used to describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). In the absence of such a definition, limitations are not to be read from the specification into the claims. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

In the Decision to Institute, we adopted Petitioner’s proposed constructions of various claim terms of the ’497 patent. For purposes of this proceeding, Patent Owner does not dispute our claim construction of the following terms, which are present in one or both of independent claims 1 and 11. *See* PO Resp. 11.

Claim Term	Interpretation
Polynomial	mathematical expression of one or more algebraic terms each of which consists of a constant multiplied by one or more variables raised to a nonnegative integral power (as $a+bx +cx^2$)
Value[,] which is representative of a signal obtained from the load cell	number derived from a load cell output
Pinch valve	valve that pinches a tube to prevent liquid from flowing through

Claim Term	Interpretation
Manually opening the pinch valve to dispense a first volume of liquid	manually causing the pinch valve to open allowing liquid to exit without an automatically determined time to close, wherein the first volume corresponds to the amount of liquid that exits
Opening the pinch valve by a computer to dispense a second, user-requested volume of liquid	opening and closing the pinch valve according to a program executed by a computer to dispense a volume of liquid specified by a user input

Dec. on Inst. 5–6. We maintain these constructions in this decision, based on our analysis of the record developed at trial.

Patent Owner requests that we also construe additional claim terms as follows:

1. “opening a valve” as “opening a valve for a pre-determined period of time” and “opening a pinch valve” as “opening a pinch valve for a pre-determined period of time” (PO Resp. 13);
2. “evaluating a polynomial having coefficients” as “calculating the result of a polynomial selected to have coefficients correlated to the user-specified volume” (*id.* at 18); and
3. “determined” as “[e]stablished or ascertained definitively, as after consideration, investigation, or calculation” (*id.* at 20).

Petitioner contends these terms should be given their ordinary meaning, and should not be construed as limited, respectively, to a particular time period that the valve stays open, to coefficients correlated to a user-specified volume, and to require a calculation. Reply 2–3.

In its Preliminary Response, Patent Owner presented the same proposed constructions for the claim terms “opening a valve” and “evaluating a polynomial having coefficients.” *Compare* Prelim. Resp. 8–13

with PO Resp. 13–19. We did not adopt these proposed constructions in our Decision to Institute, because we were not persuaded that they represented the broadest reasonable interpretation of the claim language. Dec. on Inst. 6–7. Patent Owner contends that, because we did not adopt its proposed constructions for these terms, or otherwise expressly interpret these claim terms, we “implicitly adopted constructions that are improperly broad.” PO Resp. 11.¹

We determine that, for purposes of this decision, it is unnecessary for us to construe these additional claim terms. As indicated in the analysis below, even if the disputed claim terms are given the broader constructions advanced by Petitioner, Petitioner has not met its burden to prove, by a preponderance of the evidence, that claims 1–12 of the ’497 patent would have been unpatentable based on the grounds on which trial was instituted.

B. Principles of Law

To prevail in its challenges to the patentability of the claims, Petitioner must prove unpatentability by a preponderance of the evidence.

¹ Patent Owner contends the broadest reasonable interpretation standard is not appropriate for an IPR adjudicatory trial, and “reserves the right to challenge the authority and propriety” of 37 C.F.R. § 42.100(b) which provides that, in an *inter partes* review, “[a] claim in an unexpired patent shall be given its broadest reasonable construction in light of the specification of the patent in which it appears.” PO Resp. 11–12. We note that subsequent to the Oral Argument in this case, the Court of Appeals for the Federal Circuit issued an opinion in which it rejected a patent owner’s argument that the Board should not have applied the broadest reasonable interpretation standard in construing claims in an IPR proceeding, stating “[t]here is no indication that the AIA was designed to change the claim construction standard that the PTO has applied for more than 100 years.” *In re Cuozzo Speed Techs., LLC*, No. 2014-1301, 2015 WL 4097949, at *6 (Fed. Cir. July 8, 2015).

35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). A claim is unpatentable 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 said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). 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 ordinary skill in the art; and (4) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 18 (1966).

An invention “composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR*, 550 U.S. at 418. Petitioner must also show that there was a reason to combine those elements to achieve the claimed invention with a reasonable expectation of success. *See PAR Pharm., Inc. v. TWi Pharms., Inc.*, 773 F.3d 1186, 1193 (Fed. Cir. 2014). To make that determination, we can look to “interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art.” *Id.* We can also look to the nature of the problem to be solved. *In re Gartside*, 203 F.3d 1305, 1319 (Fed. Cir. 2000) (holding that suggestion to combine “may come from, *inter alia*, the teachings of the references themselves and, in some cases, from the nature of the problem to be solved”).

We analyze the instituted grounds of unpatentability in accordance with these principles.

C. Level of Ordinary Skill in the Art

Petitioner contends “[a] person of ordinary skill in the art of the ‘497 patent is someone who, prior to September 20, 2010, has a Bachelor’s degree in mechanical engineering, has familiarity with fluid mechanics and has worked as an engineer in the field of liquid dispensing equipment.” Pet. 8 (citing the Declaration of Julio Militzer, Ph.D. (“the Militzer Declaration”), Ex. 1007 ¶ 13). Patent Owner agrees with this definition. PO Resp. 9. In light of the parties’ agreement, we adopt Petitioner’s definition of the level of ordinary skill in the art (Pet. 8) for purposes of this proceeding.

D. Patent Owner’s Motion to Exclude Evidence

Patent Owner filed a motion to exclude the Militzer Declaration (Ex. 1007). As the movant, Patent Owner has the burden to establish that it is entitled to the requested relief. 37 C.F.R. § 42.20.

Patent Owner contends “Dr. Militzer does not meet Petitioner’s own definition of a person of ordinary skill in the art” (PO Mot. 1 (quoting PO Resp. 10)), because “[t]here is no indication that Dr. Militzer ‘has worked as an engineer in the field of liquid dispensing equipment’” (*id.* at 2 (citing Ex. 1007 ¶¶ 2–8)). Patent Owner, thus, contends Dr. Militzer is not qualified “to conduct an obviousness analysis as one of ordinary skill in the art in this matter.” *Id.* at 5; *see also id.* at 1 (“Dr. Militzer fails to provide and reliably apply the requisite scientific, technical or otherwise specialized knowledge, skill, expertise, training or education to testify to the opinions presented. F.R.E. 702; 37 C.F.R. § 42.62.”).

Petitioner argues that “Dr. Militzer has been teaching mechani[cal] . . . engineering and fluid mechanics to university students for over forty years” and is “well versed in the basic principles that anyone of ordinary skill in the field of fixed-volume dispensing would be expected to know.” Pet. Opp. 1.

In its Reply, Patent Owner argues that Dr. Militzer’s opinions are incorrect and cites this as evidence that Dr. Militzer is not qualified to testify as an expert under FRE 702. PO Reply 1–3.

Federal Rule of Evidence 702 permits a witness qualified as an expert by knowledge, skill, experience, training, or education to testify in the form of an opinion if: (a) the expert’s knowledge will help the trier of fact to understand the evidence or to determine a fact in issue, (b) the testimony is based upon sufficient facts or data, (c) the testimony is the product of reliable principles and methods, and (d) the witness has applied the principles and methods reliably to the facts of the case. To testify as an expert under FRE 702, a person need not be a person of ordinary skill in the art, but rather “qualified in the pertinent art.” *Sundance, Inc. v. DeMonte Fabricating Ltd.*, 550 F.3d 1356, 1363–64 (Fed. Cir. 2008); *see SEB S.A. v. Montgomery Ward & Co.*, 594 F.3d 1360, 1372–73 (Fed. Cir. 2010); *Mytee Prods., Inc. v. Harris Research, Inc.*, 439 Fed. App’x 882, 886–87 (Fed. Cir. 2011) (non-precedential) (upholding admission of the testimony of an expert who “had experience relevant to the field of the invention,” despite admission that he was not a person of ordinary skill in the art).

Although Dr. Militzer has never worked as an engineer in the field of liquid dispensing equipment, he testified that he has been “a Professor of Mechanical Engineering at Dalhousie University in Halifax, Nova Scotia,

Canada since 1998,” his “area of specialization is Thermo-fluid, which includes disciplines like Thermodynamics, Heat Transfer and fluid Mechanics,” and that as part of his teaching, he “developed a series of laboratory experiments to demonstrate fundamental concepts and measure relevant flow characteristics.” Ex. 1007 ¶¶ 2–3. We agree with Petitioner that Dr. Militzer is qualified to testify about “the fundamentals of load cells, curve fitting and the relationship between head and fluid velocity at a nozzle” and that his testimony would assist the Board in understanding the mechanics and dynamics in Pascoe, Wang, and Hernandez. Pet. Opp. 3.

The arguments advanced by Patent Owner in section A of its Reply (PO Reply 1–3) go to the weight to be given to Dr. Militzer’s testimony, not to its admissibility. See 37 C.F.R. § 42.65(a). It is within our discretion to assign the appropriate weight to the testimony offered by Dr. Militzer. See, e.g., *Yorkey v. Diab*, 601 F.3d 1279, 1284 (Fed. Cir. 2010) (holding the Board was well within its discretion to give more weight to one item of evidence over another “unless no reasonable trier of fact could have done so”); *In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d at 1368 (“[T]he Board is entitled to weigh the declarations and conclude that the lack of factual corroboration warrants discounting the opinions expressed in the declarations.”). We are capable of determining the appropriate weight to be accorded Dr. Militzer’s testimony without risk of being prejudiced, confused, or misled. See Section III.E.4. *infra*.

For the above reasons, Patent Owner’s motion is *denied*.

E. Alleged Obviousness of Claims 1–12

Independent claims 1 and 11 recite methods of dispensing a user-specified volume of liquid from a container via opening a valve connected to

the container. Ex. 1001, 10:25–35, 10:64–11:13. Claims 1 and 11 require the use of a load cell coupled to the container to generate a signal caused by the weight of the container impressed on the load cell. *Id.* at 10:30–31, 34–35, 65–67. Both claims recite that the length of time the valve is held open (or “valve open time”) is determined “by evaluating a polynomial having coefficients, the coefficients of the polynomial operating on a value, which is representative of [the] signal obtained from the load cell.” *Id.* at 10:32–35, 11:10–13. The claims require determining valve open time prior to opening the valve to dispense liquid from the container, i.e., “predictive control.” Tr. 14:20–25, 26:18–23.

Petitioner’s obviousness challenges as to each of independent claims 1 and 11 are based, in general, on contentions that: (1) Pascoe discloses a method as claimed with the exception of “evaluating a polynomial” to predetermine valve open time (*see* Pet. 14); (2) Wang discloses that accurate dispensing of liquid from a container can be achieved by using a polynomial equation to predetermine valve open time based on the amount of liquid in the container (*see id.*); and (3) one of ordinary skill in the art would have been motivated to predetermine valve open time in Pascoe’s method using a polynomial equation as taught by Wang to achieve improved accuracy (*see id.* at 18). *See generally id.* at 13–21 (as to claim 1), 23–27 (as to claim 11).

Patent Owner argues, *inter alia*, that Petitioner has not met its burden to prove, by a preponderance of the evidence, that claims 1–12 would have been obvious because: (1) Pascoe does not predetermine valve open time (*see* PO Resp. 32); (2) Wang does not disclose a polynomial with coefficients correlated to volume (*see id.* at 37); and (3) Petitioner’s

motivation to combine Pascoe and Wang is based on improper hindsight reasoning (*see id.* at 46–47). *See generally id.* at 31–47.

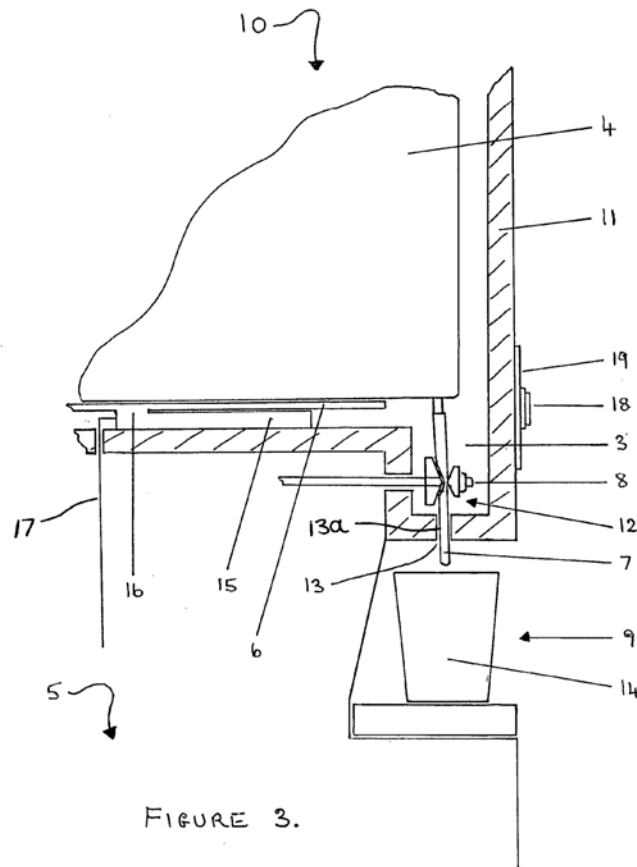
We find Patent Owner’s third argument persuasive, and, for this reason, conclude that Petitioner failed to meet its burden to prove that independent claims 1 and 11 of the ’497 patent are unpatentable.² Because Petitioner’s obviousness challenges as to dependent claims 2–10 and 12 rely on the same proposed combination of Pascoe and Wang (*see generally* Pet. 21–23, 27–29), we likewise conclude Petitioner failed to meet its burden to prove that dependent claims 2–10 and 12 of the ’497 patent are unpatentable.

1. The Applied Prior Art

a. Pascoe (Ex. 1002)

Pascoe relates to an apparatus for dispensing pre-determined portions of liquids, sauces, and creams. Ex. 1002, 4:3–4. Pascoe Figure 3, reproduced below, illustrates a cross-sectional view of an exemplary embodiment of Pascoe’s invention. *Id.* at 6:31.

² Based on our determination that Petitioner has not met its burden to show unpatentability, we find it unnecessary to address Patent Owner’s first two arguments, as well as its arguments relating to its objective indicia of non-obviousness (PO Resp. 50–53). We also determine it is unnecessary to address Patent Owner’s arguments concerning Gardos (*id.* at 47–50), as this reference is relied on by Petitioner in its challenge as to claim 11 solely for a teaching that, at the time of the invention of the ’497 patent, one of ordinary skill in the art was aware that the opening and closing of a pinch valve could be accomplished either manually or automatically (*see* Pet. 25).



In the embodiment illustrated in Pascoe Figure 3, liquid dispenser apparatus 10 includes refrigerated chamber 3 separated from atmospheric conditions by bulkhead 11, and milk supply 4 supported on platform 6 of a load cell in refrigerated chamber 3. *Id.* at 7:30–32, 8:16–17. Platform 6 is connected at position 16 to base 15 of the load cell, base 15, in turn, being firmly attached to the floor of refrigerated chamber 3. *Id.* at 7:30–32.

“Platform 6 may be of any structure or shape suitable to support a variety of milk supply designs and prevent lateral movement of the same.” *Id.* at 8:6–7. Tube 7 extends from milk supply 4 through valve means 8 to dispensing area 9 that is external to refrigerated chamber 3. *Id.* at 7:17–18. Push buttons 18 mounted on panel 19 on the front of dispenser 1 are used to select pre-determined portions of milk. *Id.* at 8:11–12. Push buttons 18 are in

electrical connection with a pre-programmed micro controller (not shown), positioned at bottom rear 5 of dispenser 1, which is also in electrical connection with tap valve actuator 8. *Id.* at 8:4–5, 12–14. In use, actuation of one of push buttons 18 initiates a pre-determined portion program of the micro-controller to open tap valve actuator 8 so as to release milk “for a period suitable to reduce the weight of [milk] in [milk supply 4] by a pre-determined amount,” *id.* at 10:12–16, the weight of milk supply 4 being continuously monitored by the load cell, which relays electrical signals through wire connection 17 to the micro controller, *id.* at 8:2–4.

b. Wang (Ex. 1003)

Wang describes “a method for quantitatively acquiring a liquid,” Ex. 1003, 4:8, i.e., dispensing a liquid from a container. According to Wang, “the regular way to quantitatively acquir[e] a liquid is to take out the liquid in a certain way from a storage container with [a] constant [cross-section], use a liquid level sensor to detect the liquid level in the container, and then obtain the volume of the acquired liquid according to the product of the change of the liquid level and the cross-sectional area of the container.” *Id.* at 4:13–16. According to Wang, there are two types of level sensors: contact (e.g., floating ball and pressure) and contactless (e.g. ultrasound and optical fiber). *Id.* at 4:16–19. According to Wang, contact level sensors are not highly precise, and are subject to error due to liquid level fluctuation in storage containers subject to vibration. *Id.* at 4:19–26. Wang further discloses that contactless liquid level sensors have slightly better precision, but are still subject to error due to interference from the atomization that occurs above some liquids. *Id.* at 4:26–30. Wang’s method is said to circumvent the imprecisions associated with liquid level sensors by applying

the principle “that for a liquid stored in a container with a fixed size, the time to discharge a certain amount of liquid in a natural state of gravity action is constant as long as the starting height is the same, the discharge is via a valve with the fixed position and opening size, and the same initial state” is used. *Id.* at 4:40–44.

Wang’s method is described as a two-step process in which “the discharge characteristic equation of a liquid discharged from a storage container is obtained through fitting by conducting experiments,” *id.* at 5:6–7, and “quantitative liquid acquisition is realized according to the discharge characteristic equation of the liquid,” *id.* at 6:1–2. Step 1 includes four subparts:

(1) Measure the density of the liquid to be acquired, and the cross-sectional area of the storage container with a constant section is S;

(2) Place the liquid to be acquired into the storage container, make the liquid level reach the limit level of the container, guide the outputs from the weighing sensor and floating ball liquid level sensor into a control system, when the liquid level is stabilized, read the value of the floating ball liquid level sensor h_0 into the control system, and open the outlet valve to continuously discharge the liquid into a temporary container placed on the weighing sensor, and the tared real time weights $m_1, m_2, \dots, m_n$ are recorded at every time interval of t ;

(3) Use the ordinary least square method to perform cubic curve fitting on the n groups of data

$$\left(\frac{m_1}{\rho S}, \Delta t \right), \left(\frac{m_2}{\rho S}, 2\Delta t \right), \dots, \left(\frac{m_n}{\rho S}, n\Delta t \right)$$

to obtain the equation:

$$t(h) = k_3 h^3 + k_2 h^2 + k_1 h + k_0$$

Wherein: k_0 , k_1 , k_2 and k_3 – polynomial coefficients obtained through the fitting with the ordinary least square method

h – the liquid column height of the acquired liquid with the mass of m or volume of V in the storage container, which is obtained from

$$h = \frac{m}{\rho S} \text{ or } h = \frac{V}{S}$$

t – the time required for adding a liquid with the mass of m from the liquid level h_0

(4) Derive the liquid discharge characteristic equation of the valve opening time T required for acquiring the liquid with

$$T(H, V) = t(h_0 - (H - \frac{V}{S})) - t(h_0 - H)$$

a volume of V from any liquid level H :

Wherein: t – the cubic function relationship obtained in (3)

H – the liquid level in the storage container prior to the quantitative acquisition

V – the volume of the quantitatively acquired liquid

S – the cross-sectional area of the storage container with a constant section

h_0 – the liquid level read by the liquid level sensor in (2).

Id. at 5:9–39. The liquid discharge characteristic equation derived in Step 1 is embedded into a control system. *Id.* at 6:4. In Step 2, a control unit reads level H of the liquid in the storage container, and determines the time T the valve must remain open to achieve a desired acquisition volume V of the liquid. *Id.* at 6:5–7.

Wang describes two examples, *id.* at 6:39–9:44, involving quantitative addition of 800 ml of 45% caustic soda solution, *id.* at 6:39, 9:11, using the

same dispensing apparatus, *id.* at 9:16–17, which is described as including a liquid storage container with a constant cross section, *id.* at 6:43, a liquid level sensor, *id.* at 6:45, and a programmable controller that receives a signal from a level sensor and controls opening and closing of a solenoid valve, *id.* at 7:13–15. Example 1 uses Wang’s method in which valve open time is predetermined using a polynomial equation. *Id.* at 6:39–9:9. Example 2 uses a conventional method in which liquid level is continuously monitored using a level sensor and the valve is closed when the target liquid level is reached. *Id.* at 9:11–44. Wang measures actual quantity dispensed in each Example and compares it to the desired liquid volume of 800 ml. *Id.* at 8:34–7, 9:23–39. Based on these measurements, Wang determines that the error using the conventional method is “far greater” than the error using the inventive method. *Id.* at 9:42–44.

2. *The Arguments*

Petitioner contends “Pascoe discloses the same arrangement of a container, valve and load cell as described in the ’497 patent.” Pet. 13. Petitioner contends Pascoe uses a micro-processor to monitor continuously the weight of the container during dispensing of a liquid therefrom, *see* Reply 6, and controls the period of time to keep the valve open based on the measured container weight, so that a requested amount of liquid flows out of the container, Pet. 14, 17. Petitioner argues “Pascoe calls for ‘a predetermined portion programme of said micro-processor that controls means to open said valve means,’” but does not disclose the control algorithm, Pet. 17 (citing Ex. 1002, 5:2–4); Reply 6, and, therefore, “leaves to those of ordinary skill the task of how to determine the period of time to keep the valve open.” Pet. 14; *see also* Ex. 1007 ¶ 25 (“[O]ne of ordinary

skill would need to rely on knowledge, experience or the prior work of others to complete this aspect of the Pascoe apparatus.”).³

Petitioner contends that, in the field of liquid dispensers, Wang discloses there are two approaches to dispensing a specified volume: (1) a conventional approach that uses input from a continuously monitoring liquid level sensor to shut the valve off when the desired volume has been dispensed, and (2) an approach that predetermines the valve open time on the basis of the liquid level before beginning to dispense the specified volume. Pet. 18. Petitioner contends Wang teaches the latter approach provides greater accuracy. *Id.*

Petitioner contends Wang’s second approach involves “fitting a polynomial expression to the experimental data to obtain a formula, based on the height “h” of liquid in the storage container, for the period of time “t” needed to keep a valve open to dispense a predetermined amount of liquid.” Pet. 19 (citing Ex. 1003, 5:19–39). According to Petitioner, “[c]urve fitting is a commonly practiced approach to converting experimental data to a mathematical equation to show a relationship between the variables.” *Id.* (citing Ex. 1007 ¶ 17). Petitioner contends “[o]ne of ordinary skill in the art would have recognized that height and weight were equivalent means of

³ We note the parties disagree over whether Pascoe uses a particular type of control method. *Compare* Reply 6 (“Pascoe does not disclose the control algorithm used in the programme” and, therefore, does not disclose a particular control method.) *with* PO Resp. 23 (“Pascoe . . . specifically teaches dispensing by continuously monitoring the load cell (a feedback control system), not by calculating or determining a dispensing time (a predictive control system).” (emphasis omitted)). We decline to decide this issue as it is not material to our determination that Petitioner has not met its burden to prove unpatentability.

measuring the amount of liquid in a container of constant cross section.”

Pet. 19 (contending “Wang obtained its data relating height to time by measuring weight of liquid dispensed from the container and converting the weight measurements to height measures” (citing Ex. 1007 ¶ 34c) (emphasis omitted)); *see also* Pet. 14 (“While Pascoe made use of the weight of the liquid, it expressly recognized that weight is directly related to volume for any given liquid.” (citing Ex. 1002, 5:18–20)).

Petitioner contends one of ordinary skill in the art of liquid dispensers would have been motivated to use the polynomial method of Wang in Pascoe to improve accuracy in dispensing a user-specified volume of liquid, and would have possessed the requisite skills to modify Pascoe’s method to determine valve open time using a polynomial equation as taught by Wang. *See* Pet. 18, 20.

Patent Owner contends the problem addressed in Wang is poor dispensing accuracy associated with liquid level sensors. PO Resp. 40. Patent Owner contends Pascoe’s device utilizes a load cell rather than a level sensor in its dispensing method and, therefore, Pascoe’s method is not subject to the inaccuracies with which Wang was concerned. *See id.* at 42. Patent Owner contends one of ordinary skill in the art would not have understood from Wang that a method of using a polynomial equation to calculate a liquid dispense time would provide improved accuracy over a method of dispensing liquids that relies on direct and continuous measurement of weight using a load cell, such as Pascoe’s method. *See id.* at 40. Patent Owner argues, “[i]f anything, [Wang] discloses just the opposite,” *id.*, because Wang uses a load cell to collect calibration data for the polynomial equation and “[o]ne skilled in the art would understand that

[a] predictive model can only be as accurate as the input data used to calibrate the model,” *id.* at 42. Patent Owner further asserts that one of ordinary skill in the art would not have been motivated to use a polynomial equation as taught by Wang to determine valve open time in Pascoe, because Pascoe’s method has the advantage that it can be used with containers of varying cross section, and Wang’s polynomial equation is only viable when used with a container of constant cross section. *See id.* at 46.

In its Reply, Petitioner continues to assert that “[t]o select the predictive control method of Wang for use in Pascoe was a simple substitution of one control method with reported improved accuracy for another control method, both readily available to the person of ordinary skill in the art as disclosed in Wang.” Reply 8; *see* Pet. 20. Petitioner argues there is no evidence that

Pascoe discloses a flexible bag in which the cross-section is constantly changing. In fact, the figures of Pascoe illustrate an aseptic bag with a constant rectangular cross-section. The specification makes no mention of flexibility with respect to the bag other than to illustrate it as being stiff enough to hold its shape.

Reply 9.

3. *The Militzer Declaration (Ex. 1007)*

Petitioner relies on the testimony of Dr. Militzer in support of its asserted motivation to combine Pascoe and Wang. *See, e.g.,* Pet. 18, 20; Reply 7–8 (citing Ex. 1007 ¶¶ 35–37).

Dr. Militzer testified that “[a]ny engineer would know fluid velocity determines the time it takes to dispense a given amount of liquid” from a container via a nozzle at the base of the container,” Ex. 1007 ¶ 20, and “one of ordinary skill would have recognized that there is a correlation between

liquid height and outlet velocity [of a liquid from a container] in a gravity fed system,” *id.* at ¶ 19 (referencing the Fluid Mechanics Text (Ex. 1009)). Dr. Militzer explains that “the greater the fluid pressure at the nozzle[,] the greater the velocity of fluid through the nozzle when open.” Ex. 1007 ¶ 19. “Pressure *in a continuously distributed uniform static fluid* varies only with vertical distance and is independent of the shape of the container. The pressure is the same at all points on a given horizontal plane in the fluid. The pressure increases with depth in the fluid.” *Id.* (quoting Ex. 1009, 76 (emphasis added)). Dr. Militzer testified that “head or height of a liquid *in a column of constant cross-section* is determinative of the pressure at each liquid level” and “velocity of fluid flow out from a nozzle near the bottom of a container can be mathematically represented as a function of liquid level height in the container.” Ex. 1007 ¶ 19 (emphasis added).

Dr. Militzer testified that one of ordinary skill in the art would have known “to measure height or to measure weight is totally equivalent when liquid is *in a container of uniform cross-sectional area*, since one can be obtained from the other by simple calculations.” Ex. 1007 ¶ 34c (emphasis added). “Pressure is directly related to depth or height. . . . Weight . . . is the pressure multiplied by the cross sectional area of the container,” so “[o]ne of ordinary skill in the art would have recognized that given the height of the liquid, the cross-sectional area of the container and the specific weight of the liquid, the weight of the liquid in the container would therefore also be known.” *Id.* ¶ 35.

Dr. Militzer further testified that:

given [Pascoe’s] apparatus, which continuously measure[s] the weight of the liquid in the container, one of ordinary skill seeking to implement the Wang method would have recorded

the time required to dispense a fixed volume of liquid for different initial weights. A data set would be produced as taught by Wang by emptying the container in Pascoe and monitoring time versus weight. Application of the least squares method to the data could have been used to produce the coefficients for a third order polynomial in accordance with the teachings of Wang. The available variable obtained from the load cell would have been used in place of the variable obtained from Wang's level sensors.

Id. ¶ 37.

4. Analysis

There is no dispute that one of ordinary skill in the art would have understood from Wang that a method of using a polynomial equation to predetermine valve open time in a system that senses liquid level in a container of constant cross section is more accurate than a method of continuously monitoring liquid level in the container and closing the valve when a desired volume has been reached. *See* PO Resp. 44; Pet. 18. Patent Owner disagrees, however, with Petitioner's contention that one of ordinary skill in the art also would have understood from Wang that using a polynomial equation to predetermine valve open time in Pascoe's method, is more accurate than Pascoe's method of continuously monitoring weight in the container and closing the valve when a desired volume has been reached. *See* PO Resp. 45; Pet. 20. Patent Owner further argues Petitioner has not shown, by a preponderance of the evidence, that one of ordinary skill in the art would have had a reason to modify Pascoe's method to predetermine valve open time using a polynomial equation. *See* PO Resp. 46–47. Patent Owner's argument is persuasive for the reasons discussed below.

Petitioner's contention that one of ordinary skill in the art would have been motivated to use a polynomial equation to predetermine valve open

time in Pascoe's method relies on Dr. Militzer's testimony that adapting Wang's polynomial equation for use in Pascoe would have involved nothing more than simple calculations. *See* Pet. 20; Reply 7–8 (citing Ex. 1007 ¶¶ 35–37). Dr. Militzer testified that one of ordinary skill in the art would have known how to adapt Wang's polynomial equation to use a variable obtained from Pascoe's load cell in place of the variable obtained from Wang's level sensors based on an understanding that: (1) fluid velocity determines the time it takes to dispense a given amount of liquid through a nozzle at the base of a container; (2) fluid velocity is dependent on pressure at the nozzle; and (3) *in a container of uniform cross-sectional area*, pressure is directly related to height, and weight is the pressure multiplied by the cross-sectional area. *See* Ex. 1007 ¶¶ 29, 30, 34c, 35.

Patent Owner argues Dr. Militzer's testimony is based on an assumption that the only relevant difference in the Wang and Pascoe apparatuses is that Wang uses a level sensor and Pascoe uses a weight sensor. *See* PO Resp. 46. Stated differently, Dr. Militzer's testimony is based on an assumption that Pascoe, like Wang, uses a container of constant cross section. *See id.* The evidence, however, supports Patent Owner's contention that Pascoe uses containers of varying shapes, and in which cross section varies during dispensing of a liquid. *See id.*

Pascoe discloses that its apparatus can be used with more than one container configuration, including a multiplicity of liquid reservoirs, Ex. 1002, 5:10, and a disposable aseptic bag, *id.* at 5:23–24, i.e., a container in which “cross section is constantly changing” during dispensing, PO Resp. 46.

Dr. Militzer explained the relationships between fluid height, weight, and pressure in a container of constant cross-section, and the relationships between pressure, velocity, and dispense time from a valve at the base of a container. Petitioner has not directed us, however, to testimony or other evidence regarding these relationships in a container in which cross section varies during dispensing, such as Pascoe's aseptic bag. In other words, Petitioner has not explained how a polynomial equation as taught by Wang could be adapted for use with Pascoe's aseptic bag (or other containers of varying cross section), and has not directed us to persuasive evidence that one of ordinary skill in the art reasonably would have expected that use of a polynomial equation to predetermine valve open time for dispensing a user-specified volume of liquid from a container of varying cross section, would provide greater dispensing accuracy than Pascoe's method of continuously monitoring weight in the container and closing the valve when a desired volume has been reached.

We note Petitioner does not argue, or otherwise explain why one of ordinary skill in the art would have been motivated to limit the type of container used in Pascoe's method to one of constant cross section. Rather, Petitioner contends that there is no evidence Pascoe's aseptic bag has a varying cross-sectional area, and the bag is illustrated in Pascoe's drawings as having a constant cross section. See Reply 9. Petitioner's argument is not persuasive because an invention is not limited to what is illustrated in the figures, see *MBO Labs., Inc. v. Becton, Dickinson & Co.*, 474 F.3d 1323, 1333 (Fed. Cir. 2007), and because it is controverted by Dr. Militzer's testimony that "[t]he disposable aseptic bag of Pascoe would be understood to suggest a plastic bag to those of ordinary skill in the art." Ex. 1007 ¶ 28

(citing U.S. Patent No. 7,021,206 (Ex. 1016 (“the ’206 patent”)), 2:62, 3:24–28). The referenced portions of the ’206 patent describe “a ‘bag in box’ milk container” as “an arrangement [in which] an aseptic plastic bag is filled with milk and packaged within a protective corrugated paperboard or plastic box.” Ex. 1016, 2:61–64. The ’206 patent describes operation of the arrangement as follows:

The “bag in box” container is positioned in a refrigerated milk storage chamber with the hose that emanates from the bag located at the bottom of the box. An opening is formed in the box near its bottom and the hose is drawn out to extend downwardly. The hose is inserted through a pinch valve, which may be closed by a weight or by some other means. Once the tube has been routed through the pinch valve, the tip of the tube is cut off so that if pressure upon the pinch valve is relieved, the milk flows downwardly due to the force of gravity acting on the milk. As the milk supply in the bag is used up, atmospheric pressure collapses the bag.

Id. at 3:1–11; *see also id.* at 7:66–8:1 (“[T]he container 22 is formed of a corrugated paperboard outer, rectangular box within which a flexible, collapsible plastic bag 24 is located.”).

Dr. Militzer testified that the time required to dispense a particular volume of fluid through a valve in the bottom of a container is based on velocity of the fluid through the valve, and velocity, in turn, is based on pressure of the fluid. Dr. Militzer also testified that pressure in a uniform static fluid varies only with vertical distance, and, therefore, height is determinative of pressure in a container of constant cross section. Dr. Militzer further testified that to measure height or to measure weight is equivalent when liquid is in a container of uniform cross-sectional area. Dr. Militzer did not testify, however, regarding the relationship of height and weight during dispensing from a container having a cross section that

changes as liquid is dispensed therefrom, such as occurs in Pascoe's aseptic bag. In other words, the record is devoid of any evidence that one of ordinary skill in the art would have understood that using Wang's polynomial equation could be adapted to predetermine valve open time to dispense a user-specified volume of liquid from a container of varying cross section, such as an aseptic bag, and that use of such equation to predetermine valve open time in Pascoe's method would provide greater dispensing accuracy than the method of continuously monitoring weight described in Pascoe. *Cf.* Ex. 2002 ¶ 52 (“[T]he fact that there are analytical relationships between the fluid height and the weight when considering basic fluid mechanics does not mean that these properties are necessarily identical or interchangeable in the context of an physical device.”); Ex. 2005 ¶ 13 (“[W]hile there is a known relationship between fluid weight and height in a container based on standard fluid mechanics principles, as discussed in the '497 patent, these parameters are not equivalent or easily interchangeable when what is at issue is using instrumentation to measure the properties in a dynamic system during a liquid dispense.”).

In sum, after considering the parties' arguments and evidence, we determine Petitioner has not shown, by a preponderance of the evidence, that one of ordinary skill in the art would have had a reason to modify Pascoe's method to predetermine valve open time using a polynomial equation as taught by Wang. Thus, Petitioner has not shown, by a preponderance of the evidence, that it would have been obvious to combine Pascoe and Wang to achieve a method of dispensing a user-specified volume of liquid from a container coupled to a load cell, wherein the time the valve is required to be open to dispense the liquid is determined by evaluating a polynomial having

coefficients operating on a value which is representative of a signal obtained from the load cell, as recited in claims 1 and 11 of the '497 patent.

III. CONCLUSION

Petitioner has not shown by a preponderance of the evidence that claims 1–12 of the '497 patent are unpatentable under 35 U.S.C. § 103(a).

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–12 are not held unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Exclude is *denied*; and

FURTHER ORDERED that, because this is a final 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.

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