

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BILLERUD AKTIEBOLAG (PUBL)

Petitioner,

v.

WESTROCK MWV, LLC.

Patent Owner

U.S. Patent No. 11,293,142 B2

Case No. IPR2023-01206

**PETITIONER'S REPLY
TO PATENT OWNER'S RESPONSE
TO PETITION FOR *INTER PARTES* REVIEW**

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PETITIONER'S EXHIBIT LIST

Exhibit No.	Short Name	Description
1001	The '142 Patent	US Patent No. 11,293,142
1002	'142 Patent File History	The relevant file history for US Patent No. 11,293,142
1003	Zotterman Declaration	Declaration of Carl Zotterman
1004	Fugitt	Fugitt et al., U.S. Pat. Appl. Pub. No. 2009/0236062
1005	Papermaking	Excerpts from Rautiainen, P. (2009). <i>Papermaking Science and Technology Book 10: Papermaking Part 3, Finishing</i> (2nd ed., pp. 35-42, 79-99). Paper Engineers' Association.
1006	Gratton	Gratton, et al., Temperature-gradient calendering of foodboard, TAPPI JOURNAL January 1988
1007	Papermaking II	Excerpts from Lehtinen, E. (2000). <i>Papermaking Science and Technology Book 11: Pigment Coating and Surface Sizing of Paper</i> (pp. 581-583). Paper Engineers' Association
1008	Crotogino	Temperature Gradient Calendering (Crotogino, R.H., (1982) Tappi J. 65(10):98).
1009	Paperboard Examples	Hannu (2000). <i>Papermaking Science and Technology Book 18: Paperboard and Grades</i> (p. 55). Paper Engineer's Association
1010	Papermaking	Reminder of Exhibit 1005
1011	Barnes Declaration	Declaration of Thad M. Barnes

1012	Klass Deposition	Transcript of Deposition of Charles Klass
1013	Basis Weight Chart	Basis weight chart showing data from Papermaking Fig. 62 and the Y_2 Curve
1014	Gratton Table	Table showing data from Gratton that falls below the Y_2 curve
1015	Marley	StoraEnso Fors starts up a MHV zone controlled calender, Paper Technology, February 2010

I. INTRODUCTION

On July 17, 2023, Billerud Aktiebolag (Publ) (“Petitioner”) filed a petition for *inter partes* review, challenging claims 1, 2, 4, and 5-23 of US Patent No. 11,293,142 (“the ‘142 Patent”) (Ex. 1001), assigned to WestRock MWV, LLC (“Patent Owner”). Paper 1. On March 13, 2024, the Board issued a Decision granting institution of Case No. IPR2023-01206. Paper 14. On June 19, 2024, Patent Owner filed their Patent Owner’s Response Paper 21.

II. BACKGROUND

A. The ‘142 Patent and its Prosecution History

The ‘142 Patent states “it is believed that calendering paperboard substrates at significantly higher temperatures may compensate for lower nip loads in achieving a desired smoothness.” Ex. 1001, col. 11, lns 19-23. However, the evidence shows that the claimed “significantly higher temperatures” are conventional.

Patent Owner and its expert, Charles Klass, relied on Figure 4 of the ‘142 Patent in touting the achievements of the ‘142 Patent. For example, Klass describes the ‘142 Patent as being superior to the prior art because Examples 1-3, and 4-6 “both show lower density than the prior art data points of comparable caliper.” Ex. 2003, ¶39. Klass and the Patent Owner hold Fig. 4 out as showing “an advance into

an area of density/caliper space that was previously unattained.” *Id.* Figure 4 is reproduced below:

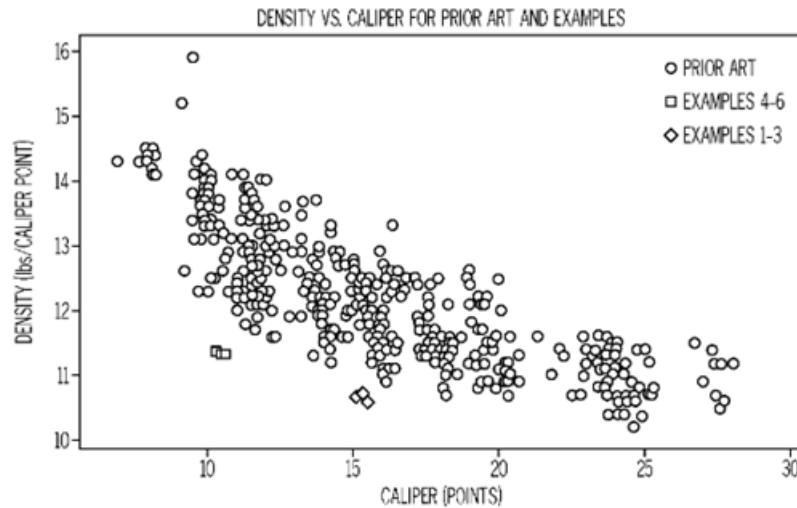


FIG. 4

However, the ‘142 Patent fails to identify what each data point represents, how it was made, and even what type of paperboard it may be. Apparently, the only thing the data point represents is an undefined dot on a map.

Even the Patent Owner’s expert could not define the data points. Instead, Klass acknowledged he did not know how the “prior art” was selected, manufactured, or even what type of paperboard the prior art represents. Ex. 1012, 92-23.

The same can be said regarding Figure 8. Figure 8 was touted by Patent Owner and Klass as showing the much-discussed Y_2 curve, an element in claim 1, *i.e.* $Y_2=3.71+13.14X-0.1602X^2$. Klass states, “Fig. 8, reproduced below, the Y_2

curve is shown again, this time with the prior art data points, which all lie *above* the Y_2 curve.” Ex. 2003. Figure 8 is shown below:

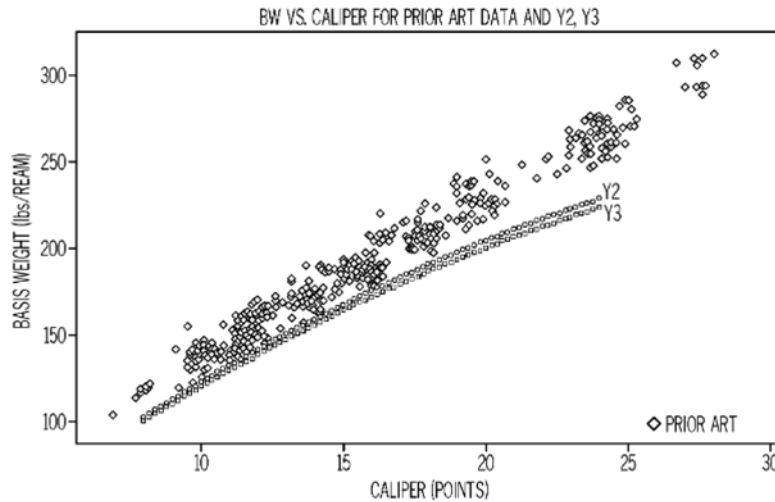


FIG. 8

The problem is, there is no way to determine what “prior art” the invention was compared to that supports the notion that the ‘142 Patent is “an advance into an area of density/caliper space that was previously unattained.” This was also confirmed by Klass, who stated that the only thing he knew about the undefined data points was that they were above the Y_2 curve. Ex. 1012, 93-96.

Further, it is known that the “previously unattained” statement is incorrect, because Patent Owner acknowledges Example 3 in *Fugitt* discloses a paperboard sample that falls below the Y_2 curve. As *Fugitt* is Patent Owner’s own prior art, it is reasonable to assume that it was deliberately left out of Figure 8 to give an impression of an inventive achievement.

Accordingly, the notion that the “‘142 Patent represents an advance over prior conventional techniques” (Ex. 2003, ¶30) is not based on any data, process, or material whose characteristics can be confirmed. Patent Owner greatly overstates the importance of these figures.

In fact, Klass acknowledged that he failed to conduct any calculations on the cited prior art in the process of preparing his declaration to determine where it may lie in relation to the Y_2 curve. His testimony, discussed further below, established that there were examples from *Papermaking* and *Gratton* that fell below the Y_2 curve.

During the prosecution of the ‘142 Patent, the only distinguishing feature the Patent Owner discussed vis-à-vis *Fugitt* was “heating a thermo-roller to an elevated temperature of at least 250°F.” Ex. 1002 at 88.

Patent Owner stated to the Examiner that “Traditional calenders may employ rollers that are heated to temperatures that are greater than ambient temperature,” and the ‘142 Patent claims require “a temperature that is significantly hotter than traditional temperatures – specifically, an elevated temperature of at least 250°F – which is not disclosed or suggested by *Fugitt*.” *Id.* Apparently relying upon this faulty explanation, the Examiner allowed the ‘142 Patent.

There is substantial evidence that contradicts Patent Owner’s statement to the USPTO that resulted in the allowance of the ‘142 Patent.

B. Summary of the Prior Art

1. Fugitt

For an overview of *Fugitt* (Ex. 1004), reference is made to the section VI.A.1 of the Petition. Paper 1, 24-26.

As noted by the Patent Owner, *Fugitt* teaches to replace wet stack calendering with dry stack calendering using rolls that can be steam heated. Notably, wet stack calendaring also is what is referred to as “conventional calendering” in the ‘142 Patent. Hence *Fugitt* is not an example of “conventional calendaring,” but rather a step therefrom in the direction of the ‘142 Patent.

Patent Owner states, presumably with reference to Klass’ declarations, that Example 3 in *Fugitt* is the only example in any of the prior art of a paperboard structure that falls below the Y_2 curve. *See* Response, p. 12. Notably, Example 3 is the only example in *Fugitt* that prepares a paperboard. However, this is incorrect because *Papermaking* discloses bulk values falling well below the Y_2 curve and *Gratton*’s high temperature-calendered SBS also falls below the Y_2 curve (as shown in sections II.B.2 and II.B.3 below).

2. Papermaking

For an overview of *Papermaking* (Ex. 1010), reference is made to the section VI.A.2 of the Petition.

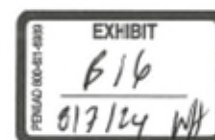
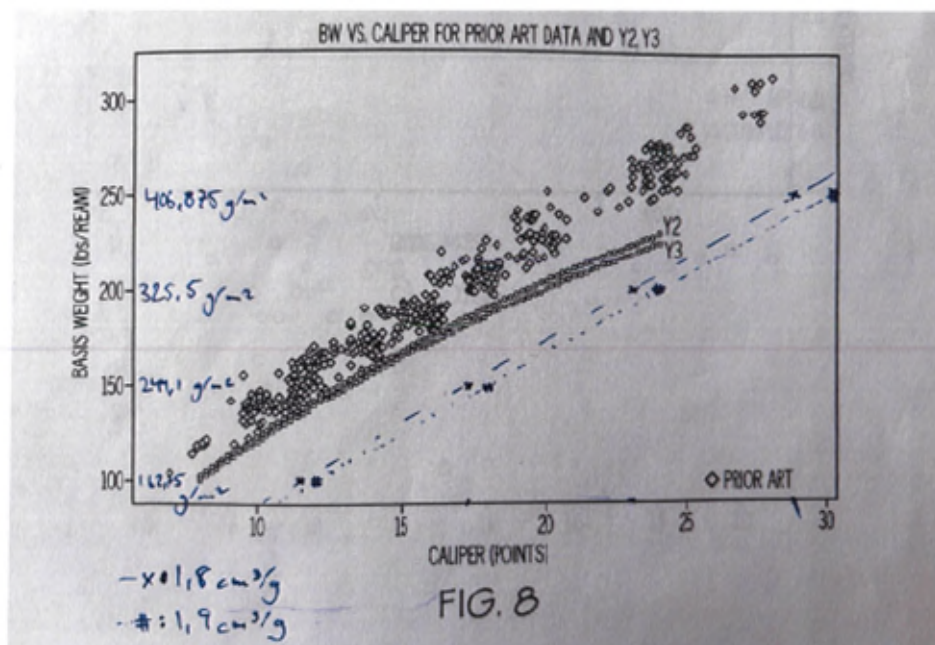
Klass acknowledged that he did not know how the “prior art” lying above the Y_2 curve in Figure 8 of the ‘142 Patent was selected, manufactured, or even what type of paperboard the prior art is.

Additionally, Klass does not recall if he made Y_2 calculations with respect to the paperboard disclosed on page 80 of *Papermaking*, specifically referring to Fig.

62. During his deposition, Klass reviewed Exhibit 1013 containing the following graphical representation of the data from page 80, including Fig. 62, in

Papermaking:

Basis weight (lb/3000ft ²)	Basis weight (g/m ²)	Bulk (cm ³ /g)	Thickness (μm)	Caliper (points)
100	162.75	1.8	292.95	11.53
150	244.125	1.8	439.425	17.30
200	325.5	1.8	585.9	23.07
100	162.75	1.9	309.225	12.17
150	244.125	1.9	463.8375	18.26
200	325.5	1.9	618.45	24.35



When asked if he agrees that there is a diagonal line for bulk in Ex. 1013, he replied that “without doing every calculation basically and looking on a graph, they appear to be approximately right.” Ex. 1012, 13-21. When discussing if the data needed for the diagonal lines is obtainable from Figure 62 in *Papermaking*, Klass

stated “I will say the data appear to be about the same. They appear to be approximately right.” Ex. 1012, 10-12.

Thus, each bulk value corresponds to a straight diagonal line in a basis weight vs. caliper chart like Figure 8. As shown in Exhibit 1013, the bulk values $1.8\text{cm}^3/\text{g}$ and $1.9\text{cm}^3/\text{g}$, which are taken from Figure 62 on page 80 of *Papermaking*, are well below not only the Y_2 curve, but also the Y_3 curve. This was confirmed by Klass:

Q. The lines are below the curve?

A. The points and the plots to them are below the Y_2 line, yes, at least to the point of twenty-four caliper because that's as far as it goes. But appear – if I take the equation right, it appears right.

Ex. 1012, 151:17-23.

Another passage in *Papermaking* of particular relevance for this case reads: “A modern cartonboard line as a rule has one hot hard-nip precalander before the coating section, especially in Asia. High thermo roll temperatures (in some cases over $200\text{ }^\circ\text{C}$) result in bulk savings because of the temperature gradient.” Ex. 1005, 82. How this is understood by a person of ordinary skill in the art (POSITA) was confirmed by Klass.

Q. Here, Papermaking states that a modern cartonboard line, as a rule, has: One, hot hard nip before the coating section and then that a high thermo roll temperature in that calender will result in bulk savings, right?

A. The hot hard nip basically in combination with the nip loading can result in bulk savings, bulk improvement.

Q. And that's what Papermaking says there; correct?

A. Yes.

Q. Would you agree with me that the implied teaching of Papermaking is that the nip loading is reduced when the temperature is higher?

A. If the objective is to - - it depends in the objective of the papermaker. If the objective is to improve bulk or increase bulk, the nip loading could be reduced because of the impact of temperature on calendering.

Q. Because the temperature is increased, correct?

A. Yes.

Ex. 1012, 163:8-25.

In so doing, Klass explained that *Papermaking* teaches POSITA that aiming to increase the bulk to reduce the line load when increasing the temperature so as to achieve the promised bulk increase. This also explains how *Zakaib* (discussed *infra*) can show in Figure 7 that increased sheet temperature (as an isolated adjustment) reduces caliper and still state in the abstract that increased roll temperatures improve bulk.

It should be noted *Papermaking*'s implied teaching to reduce the line load (also referred to as nip load as admitted by Klass, Exhibit 1012, 113:19-25) is perfectly compatible with *Fugitt*, which teaches that "The nip loads ... of the calender may be substantially reduced to minimize or avoid reduction in caliper thickness" *Fugitt*, [0025].

Therefore, POSITA would find it obvious to combine *Papermaking* with *Fugitt* to increase temperature and reduce nip load, and thereby achieve bulk savings.

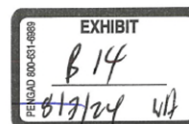
3. Gratton

For an overview of *Gratton* (Ex. 1006), reference is made to the section VI.B.3 of the Petition. Paper 1, 55.

As shown by the calculations in Exhibit 1014¹, Table 1 in *Gratton* provides additional examples of paperboard that lies below the Y_2 curve and hence meets the Y_2 equation of claim 1.

¹ The basis weights (g/m²) used in Exhibit 1014 are taken from *Gratton*'s Experimental section (page 86).

GRATTON Table 1						
Bulk (cm3/g)	Basis weight (g/m2)	Thickness (μm)	Caliper (points)	Y2 (lb/3000ft2)	Basis weight (lb/3000ft2)	
1.81	361	653.41	25.72	235.72	221.81	unsized
1.8	377	678.6	26.72	240.42	231.64	sized
Bulk (cm3/g)	Basis weight (g/m2)	Thickness (μm)	Caliper (points)	Y3' (lb/3000ft2)	Basis weight (lb/3000ft2)	
1.81	361	653.41	25.72	230.50	221.81	unsized
1.8	377	678.6	26.72	237.62	231.64	sized



This was confirmed by Klass after he had repeated the calculations in the Exhibit 1014's table during his deposition. Further, Klass testified that Figure 4 in *Gratton* shows that a bulk reduction of 12.6 % was obtained (with maintained PPS smoothness) as a result of increasing temperature - temperature gradient calendering (using rolls heated to above 200°C [above 392°F]):

Q. These two samples that you've circled both have about six PPS; correct?

A. Yeah, they appear to be at about six PPS.

Q. And that was obtained using different techniques; correct?

A. Yes.

Q. And the difference between the two techniques is temperature; correct?

A. It's temperature-gradient calendering, yes.

Q. Comparing those two samples, how much higher is the bulk for the temperature-gradient calendering technique?

A. Two-tenths. It's basically an increase from 1.5 to 1.7 square centimeters per gram.

Q. Would you agree with me that the difference is about 12.6 percent higher between the two?

A. When in doubt, calculate. Yes.

Ex. 1012, 135-136. This difference in bulk explains *Gratton's* tag line, which is “Temperature-gradient calendering produces smooth, glossy surfaces with less bulk reduction than conventional machine calendaring. Ex. 1006, 81.

Patent Owner states that “the roller temperature and the number of nips appear to be the only meaningful difference between TG and conventional calendering” and “the nip loads used in both TG and conventional calendering were in the same range, *i.e.*, 20, 40, 60, 80, and 100 kN/m.” Paper 21, 14. This is not how the POSITA would understand *Gratton*. Although it is true that the same line/nip load range is used for both calendering techniques, *Gratton's* data show

that to reach a given smoothness, TG calendering requires a significantly lower line/nip load within the range. This is in line with the above-mentioned tag line.

Patent Owner further argues that because the paperboard in *Gratton* is thicker, heavier and rougher than in both *Fugitt* and the '142 Patent, "*Gratton* is not a likely source from which POSITA would draw to try to improve over *Fugitt* to arrive at what is claimed in the '142 Patent." Paper 21, 14. This argument is unfounded for many reasons.

First, it is noted that the Patent Owner has failed to include bulk in the quality metrics considered when comparing *Gratton* to *Fugitt* and the '142 Patent. This is a significant shortcoming because Klass confirmed the relevance of this metric:

Q. Sir, if a person skilled in the art compares the quality of two different paperboards, they would want to look in bulk; correct?

A. Yes.

Ex. 1012, 153:14-18.

Petitioner's expert Carl Zotterman also explained the importance of bulk during his deposition:

Q. What is bulk?

A. It's another way to describe the thickness. Because the board – the basis weight describes the amount of fiber in the board. Depending then on the bulk, it may have

different thickness or caliper. And in US, for example, caliper is very important because the board is sold mostly by caliper. And then what you want to do is to produce as -- to use as little fiber as possible. And then you get back -- then it's beneficial with the bulk. Because the higher bulk, you can sell the board at the specific caliper but with less fiber.

Q. Okay. So when you -- less fiber, better bulk is what you want to achieve?

A. Yes. That's what the engineer or technician would always optimize in the production process.

Ex. 2005, 26:17–27:9.

As shown above, the paperboard used in *Gratton* falls below the Y_2 curve just as the paperboard in *Fugitt*, which means that they have comparable bulk. Given the importance of bulk, this strongly suggests that the POSITA starting from *Fugitt* would consider *Gratton* to be a great source of technical information. This is further supported by that *Gratton*, just as *Fugitt*, relates to calendering of optionally surface sized, but not coated SBS.

Regarding thickness, the Petitioner does not dispute that the paperboard in *Gratton* is thicker than in Example 3 in *Fugitt*. However, there is no indication in *Fugitt* that a greater thickness would be undesired. On the contrary, one of the objectives of *Fugitt* is to maintain maximum thickness. Ex. 1004, [0006], [0025], [0026].

When the Patent Owner complains that *Gratton*'s paperboard is *heavier* than in *Fugitt*, it presumably refers to the basis weight of the paperboard in Example 3 in *Fugitt*, which indeed is lower than the basis weight of the paperboard in *Gratton*. However, nothing in *Gratton* indicates that the teachings therein about the benefits of TG calendering would be limited to paperboard of a certain basis weight. Further, *Fugitt* sets a lower limit (85 pounds per 3000 ft²), but no upper limit, for the basis weight. Hence, there is no reason to assume that basis weight considerations would deter POSITA from applying *Gratton*'s teachings.

Finally, when the Patent Owner notes that *Fugitt*'s paperboard is rougher than in *Fugitt*, it is comparing “apples to oranges” as the PPS values in *Gratton* relate to uncoated board, whereas the PPS value in Example 3 in *Fugitt* is for double coated board.

Thus, POSITA would be motivated to combine *Gratton* with *Fugitt*.

4. Zakaib

Zakaib (Ex. 2007) is a technical journal article introduced by Klass as part of his second declaration.

The abstract of *Zakaib* states that “Hot calendering provides many improvements in sheet printability, strength, bulk, elimination of two-sidedness and optimized calender configuration.” *Id.* (emphasis added). *Zakaib* promotes external induction heating and discloses that it is “Allowing roll surface

temperatures of up to 250°C (482°F).” Ex. 2007, 58, right-hand column. Under the heading “Single Induction Heating System Applications on High Quality Board Grades,” two examples of the promoted technology are given. *Id.* at 60. The second example, “Case B - Board”, relates to a FBB mill at which a single induction heating system was installed on the top roll of a single nip pre-coater calender. *Id.* Klass has confirmed this is precoating using a hard nip. Ex. 1012, 125:20–126:3, 128:2-8. He also confirmed Figure 10 of *Zakaib* shows the roll temperature in the precoating was 180°C [356°F]. Ex. 1012, 127.

III. THE PATENTABILITY OF THE CHALLENGED CLAIMS

A. Ground 1: Claims 1, 2, and 5-23 are Obvious over *Fugitt* in view of *Papermaking*.

1. Claim 1

Fugitt discloses all features of claim 1 of the ‘142 Patent except for the roll temperature of at least 250°F. Paper 1, 28-31. However, *Fugitt* specifically states “[t]he rolls of the calender may be steam heated.” Ex. 1004, ¶25.

A POSITA would find it obvious to use a temperature of at least 250°F in *Fugitt*’s method. Section 5 of Chapter 1 of *Papermaking* (Exhibit 1005) is titled “Calender construction.” Section 5.1.3 concerns heated rolls, and includes a subsection entitled “Heating mediums.” Here, *Papermaking* discloses that “Water, steam and thermal oil are the three main heating media used in thermo rolls.”

Regarding the heating medium used in *Fugitt*, it is specifically disclosed that “Steam can be used up to 170°C [338°F] surface temperature.” It is also disclosed that “The hottest rolls surface temperatures are reached with hot oil, which can reach over 220°C [428 °F].” *Id.* at 98. For the calendering position in question, *i.e.*, precalendering, *Papermaking* teaches use of thermo roll temperatures over 200°C [392 °F]. *Id.* at 82.

Further, *Papermaking* discloses that because of the condensate problem, 140°C [284°F] is the lowest reasonable target with steam that can be used. Ex. 1010, 126. Klass confirmed that this (248°F) was in the range of the lowest he had seen. Ex. 1012, 80-81.

Further, Klass testified he believes the temperatures used in *Fugitt* “were in line with the way paperboard was manufactured at the time.” Ex. 1012, 99:5-8. He gave no reason to believe that a lower temperature was used in *Fugitt* than what he has seen elsewhere.

Thus, while *Fugitt* was asserted as teaching each limitation of claim 1 except for the “elevated temperature of at least 250°F,” *Papermaking* and Klass makes it clear that the “elevated temperatures” were, in fact, conventional and also preferred for practical reasons. This contradicts Patent Owner’s statement to the Examiner that resulted in the allowance of the ‘142 Patent (“significantly hotter than traditional temperatures.” Ex. 1002, p. 88.

Regarding the influence of high temperatures on smoothness, caliper, and basis weight (*see* Papers 21, 17-18), the following is submitted.

First, there is no evidence in the case suggesting that a POSITA would expect a temperature of at least 250°F to result in a rougher surface. Instead, Zotterman has explained the opposite. (Ex. 1003, p. 70.) Further, *Papermaking* states that “Heat in calendering improves the attainable surface properties such as smoothness and gloss. The heat is applied in the process using heated rolls, thermo rolls.” *Id.* at 95, section 5.1.3. Even if it is assumed, for the sake of argument, that a POSITA would be concerned about the effects of higher temperatures on the smoothness, the concerns should be relieved by the fact that *Fugitt*’s PPS10 value (1,5 µm) falls below claim 1’s upper limit (3 µm) by a great margin. According to Figure 62 on page 80 of *Papermaking*, coated SBS as used in *Fugitt* never has a higher PPS10 than about 2.1 µm.

Second, *Papermaking* teaches higher temperatures result in bulk savings. Accordingly, a POSITA would not be concerned about loss of caliper. *See also* Ground 2, claim 1. Adjusting the temperature of a calender roll has no effect on the basis weight, which is the weight per area unit.

Klass appears to argue that *Papermaking* has a European perspective focused on FBB rather than SBS as in *Fugitt*. 2004, ¶ 30. He stated that because of the mechanical pulp in the middle, FBB reacts differently to hot hard calendering

than SBS. *Id.* ¶ 32. This is unfounded since hot hard calendering mainly affects the fibers closest to the surfaces of the board (*see, e.g., Gratton* Fig. 1), which is bleached kraft pulp in both FBB and SBS. Ex. 1012, 152:24 –153:5.

In view of the above, claim 1 is obvious over *Fugitt* in view of *Papermaking*.

2. Claim 2

Claim 2 depends from claim 1 and further recites a nip load “ranging from about 20 pli to about 500 pli.”

Fugitt teaches that the nip load may be substantially reduced to minimize or avoid reduction in caliper thickness, but does not specify what such a reduced nip load may be. Ex. 1004, [0026].

As stated in *Papermaking* with respect to cartonboard, “[t]he linear load may even exceed 100 kN/m [571 pli].” *Id.* at page 82. In view of *Fugitt*’s teaching to reduce the line load, it is likely that a POSITA reading this passage in *Papermaking* would select a linear/nip load below 100 kN/m [571 pli]. That the wording “may even exceed 100 kN/m” not only encompasses linear/nip loads below 100 kN/m, but it also should be understood as that such nip/linear loads are common is explained by Zotterman (Ex. 1003, ¶119): “Accordingly, the nip/linear load is often below 100 kN/m [571 pli]. In my experience 10-90 kN/m [57.1 – 513.9 PLI] is common.”

Zotterman also testified in his deposition that he has personal experience from the KM8 mill in *Skoghall* of running a hot-hard calender operating in the nip load range of 90 to 140 pli. Ex. 2005, 96:18–97:4.

During his deposition, Klass also discussed *Marley* (Exhibit 1015), another prior art example supporting the notion that lower nip loads were common. Klass confirmed Marley discloses a hot hard pre-calender in which the surface temperature of the heated roll is 300° C [582°F] and the nip load is ranging from 10 N/mm [57.1 PLI] to 100 N/mm. Ex. 1012, 110-115.

Accordingly, it would be obvious for a POSITA to use a nip load within the range of claim 2.

3. Claims 5-14 and 16-22

Claims 5-14 and 16-22 were not specifically addressed in Patent Owner's Response.

4. Claim 15

Claim 15 depends from claim 13 and recites that the calcium carbonate comprises from about 10 percent to about 60 percent of the basecoat pigment. *Fugitt* discloses a 50:50 clay/calcium carbonate blend. Ex. 1004, ¶44.

The Patent Owner's asserts Petitioner has not met its burden of explaining how the disclosure of 50:50 clay to calcium carbonate in *Fugitt* "correlates" to the claimed range of 10%-60%. However, a detailed explanation of the fact that 50%

is within the range of 10-60% is not necessary. It is self-evident. Notwithstanding, Klass' testimony confirms it:

Q. And sir, isn't it true that a fifty percent calcium carbonate is within this range, if something was fifty percent calcium carbonate?

A. Yes.

Ex. 1012, 156:20-24.

In view of the above, claim 15 is obvious over *Fugitt* in view of *Papermaking*.

5. Claim 23

Section C.5 of the Patent Owner's response relates to claim 23 and is divided into two subsections. In both subsections, the Patent Owner fails to show claim 23 is non-obvious.

Subsection a: The 12.2 points example

In this subsection, the Patent Owner mischaracterizes Zotterman's and the Petitioner's line of argument as an employment of hindsight. A proper understanding of the line of argument is:

- (i) the POSITA would seek to improve/save bulk;
- (ii) the prior art taught the POSITA that use of high thermo roll temperatures saves bulk; and

- (iii) a bulk improvement resulting in a thickness increase of 1.6%, which is what is needed to meet the Y_3 equation of claim 23, was well within the range that the POSITA would expect from using such temperatures.

Regarding (i), the presumption that a POSITA would seek to improve the bulk follows already from the primary reference, namely, *Fugitt*. The petitioner acknowledges that “one objective in *Fugitt* is to reduce density loss, which is expressed as avoiding reduction in caliper thickness,” which is the same as to save bulk. Paper 21, 11. Further, during his deposition, Klass agreed greater bulk is a generally desired property. Ex. 1012, 153:6-13. As discussed above, Zotterman has also testified that a POSITA has general interested in saving bulk. Ex. 2005, 26:17–27:9.

Regarding (ii), *Papermaking* at page 82 teaches high thermo roll temperatures (in some cases over 200 °C) result in bulk savings because of the temperature gradient. Even the *Zakaib* reference introduced by Klass and the Patent Owner teaches that increased roll temperatures improves bulk. Ex. 1012, 124:6-10. As Zotterman explained, “[E]verybody realized that the heated cylinder would be an advantage in the coated board production. You could increase the bulk and make all the savings and so on” Ex. 2005, 76:9-15.

Regarding (iii), Klass confirmed the prior art shows an example of temperature gradient calendering increasing the bulk by 12.6 % at maintained surface smoothness. Ex. 1012, 132:1–136:16. The 1.6 % increase (from 12.0 to 12.2 points) exemplified by Zotterman and the Petitioner is only a fraction of that potential and hence certainly something that a POSITA would expect to achieve. *See also* Ex. 2005, 66:21–68:11, 69:17-21, 78:9-15.

Thus, it is clear that none of (i)-(iii) employs impermissible hindsight. It cannot be considered an employment of impermissible hindsight to use calculations to show that the bulk improvement needed to go from *Fugitt's* paperboard to a paperboard meeting the Y_3 equation of claim 23 is small in comparison to what could reasonably be expected – not based on the '142 Patent, but taking into account knowledge with was within the level of skill in the art at the time of the '142 Patent.

Subsection b: The 14.2 points example

Patent Owner also mischaracterizes Mr. Zotterman's 14.2 points example as an employment of hindsight. The line of argument using this example should be understood as follows:

- (i) a POSITA would seek to improve/save bulk;
- (ii) the art taught a POSITA that for the same surface smoothness, FBB board generally has higher bulk than SBS board; and

- (iii) a bulk improvement resulting in the Y_3 ' equation being met was well within the range that the POSITA would expect from replacing Fugitt's SBS with FBB.

Regarding (i), see *supra* regarding subsection a.

Regarding (ii), figure 62 in *Papermaking* (Ex. 1005, 80) shows that coated FBB has bulk values of up to 1.9 cm³/g at PPS smoothness values in the same range as those found in SBS. In figure 62, Zotterman noted that coated FBB can have a bulk of 1.7 cm³/g at a PPS10 of up to 2.0 μm (which is still well below claim 1's upper limit of 3.0 μm) and used this as an example. It would be obvious for a POSITA to substitute such an FBB for the SBS of Fugitt. When so doing, it would be natural and straight-forward to maintain *Fugitt's* basis weight of 130 lbs/3000 ft² (211.6 g/m²) as it is within the basis weight range of 150-400 g/m² taught by *Papermaking* in the paragraph discussing figure 62. Ex. 1005, 82. Hence no hindsight is needed to make this combination.

The combination of Fugitt's basis weight of 130 lbs/3000 ft² and *Papermaking's* (conservatively selected) bulk of 1.7 cm³/g gives a caliper thickness of 14.2 points. As shown in paragraph 155 of Zotterman's declaration (and confirmed on p. 25-26 in the Response), the Y_3 equation of claim 23 is thereby met (by a great margin).

Thus, it is again clear that neither of (i)-(iii) employs impermissible hindsight. It cannot be considered an improper use of hindsight reconstruction to calculate the caliper thickness resulting from a combination of prior art references that one would readily make and use the calculated caliper thickness in the Y_3 ' equation devised by claim 23.

Further, Patent Owner fails to address *Fugitt*'s use of the term "about." The Patent Owner's attempt to impose strict meaning to "about 0.012 inches (12 points)" is inconsistent with Federal Circuit precedent. There is nothing in *Fugitt* that limits "about" to "exactly."

There is also nothing in the claim that limits the broad meaning of "paperboard." FBB is encompassed within the scope of claim 23.

Thus, claim 23 is obvious over *Fugitt* in view of *Papermaking*. *Id.* at ¶155.

B. Ground 2: Claims 1, 2, and 4 are Obvious over *Fugitt* in view of *Papermaking* and *Gratton*.

1. Claim 1

For the disclosure of *Fugitt* reference is made to Summary of the Prior art and Ground 1, *supra*.

Gratton discloses that higher roller surface temperatures are advantageous: "temperature-gradient (TG) calendering is a technique that can improve paper

surface properties with less bulk reduction than with conventional calendering.”

(Ex. 1006, page 81.) *Gratton* discloses using roll temperatures of 211°C [411°F], 209°C [408°F], and 207°C [405°F]. Ex. 1006, Table II, 84.

While *Gratton* does not specify its rolls are steam heated, *Papermaking* discloses it is known to use several different heating methods:

Water, steam, and thermal oil are the three main heating media used in thermo rolls. Hot water can be used when the roll surface temperature is under 120°C [248°F]. Steam can be used up to 170°C [338°F] surface temperature. The hottest roll surface temperatures are reached with hot oil, which can reach over 220°C [428°F]... Most modern calenders use water or oil as a heating medium.

Ex. 1005, 980. Similarly, *Mohan*, relied on by Petitioner as being cumulative to *Papermaking*, states that steam and oil are interchangeable heating media for roll surface temperature exceeding 250°F. Ex. 2002, col. 4, lns. 46-57. Accordingly, having different options for heating mediums is well known.

Patent Owner argues it would not be obvious to modify *Fugitt* with *Gratton* because the extra heat would downgrade the paperboard structure of *Fugitt* Example 3 out of the Y₂ area of Claim 1. However, it is shown above that a POSITA would seek to improve/save bulk (Section III(B)(2)) and Klass explained *Papermaking* teaches a POSITA having this objective to reduce the line load when increasing the temperature to achieve the promised bulk savings. This teaching in

Papermaking is in agreement a starting point of *Fugitt*, stating it desirable to produce a board having a smooth surface without densification, thereby maintaining maximum thickness with the minimum cellulose fiber usage (Ex. 1004, [0006]) and teaching to substantially reduce the nip load to minimize or avoid reduction in caliper thickness (*Id.*, [0026]).

The Patent Owner argues with reference to Klass's supplementary declaration "that with greater heat, caliper points in Example 3 of *Fugitt* would be reduced significantly." In turn, Klass refers to Figure 7 in *Zakaib* (Ex. 2007), which indicates that sheet temperature (in isolation) decreases caliper thickness. However, *Zakaib* also states in the abstract that hot calendering provides bulk *improvements*. Hence, the line/nip load reduction facilitated by the heat from the thermo roll in the calender also is implied in *Zakaib*'s teachings.

This is in agreement with *Gratton*'s tag line discussed above. Moreover, Klass confirmed that figure 4 in *Gratton* shows *Gratton*'s TG calendering at above 200°C [392 °F] resulted in 12.6 % higher bulk than traditional calendering at 50°C [122 °F] without impairing smoothness. The data of Figure 4 is presented in Table II in *Gratton*, which shows the nip loads that were used for the samples compared by Klass. The traditionally calendered sample, S-4, was subjected to nip loads of 20, 40, 60 and 80 kN/m in succession to obtain a bulk of 1.51 cm³/g and a PPS10 of 6.32 μm, whereas the TG calendered sample, S-7, was calendered in one pass

through a single nip at 40 kN/m to obtain a bulk of 1.70 cm³/g and a PPS10 of 6.19 μm. Thus, an increase in temperature facilitates a reduction of the line load. As expected from the bulk values, sample S-7 was also significantly thicker than sample S-4. It is thus shown in *Gratton* that TG calendering *increases* thickness, not reducing it significantly as argued by the Patent Owner.

That it was well known, and even described as “fundamental,” that an increase in temperature facilitates a reduction of the line/nip load was also explained by Zotterman during his deposition:

Whenever you would build a coated board machine, you would have a hot-hard nip pre-calender before the coater. And you would use the heat to improve the surface smoothness. And it would allow you to lower the nip load. This is fundamental, everybody working in the mill would know this. And that would be a part of the daily optimization. So normally you would run as high a temperature as possible.

Ex. 2005, pp. 72-73.

Regarding the disagreement on capital costs and obviousness, no matter which figure in the Record is used for a particular type of modification, the figure is only a small fraction of the capital expenditure of the whole machine, which is about \$200,000,000 according to Zotterman. Ex. 2005, p. 81.

Regarding ongoing energy costs, it is sufficient to refer to Zotterman's statement about that they are "totally negligible" in the context of the board-making process.

2. Claims 2 and 4

The Patent Owner did not specifically address claims 2 and 4 in its Response. Regarding claim 2, it is notable Gratton's nip load used in the TG calendering resulted in a 12.6 % bulk increase was 40 kN/m (228.4 pli.)

C. Ground 3: Claim 4 is Obvious over *Fugitt* in view of *Papermaking* and *Papermaking II*.

1. Claim 4

Patent Owner did not specifically address claim 4 in its Response.

IV. CONCLUSION

Petitioner submits that the challenged claims are obvious over the cited prior art. For the foregoing reasons, Petitioner respectfully submits that the Board find each challenged claim invalid.

Dated: September 11, 2024

Respectfully submitted,
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CERTIFICATION OF COMPLIANCE WITH WORD COUNT

This Reply includes 5,490 words, as counted by the word processor used to prepare this Reply. Pursuant to 37 C.F.R. § 42.24(d), I certify that the petition complies with the type-volume limits of 37 C.F.R. § 42.24(c)(1) because it contains less than 5,600 words.

/s/ Richard S. Myers, Jr.
Richard S. Myers, Jr.

PROOF OF SERVICE OF THE PETITION

The undersigned certifies service pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(b) the undersigned hereby certifies that on September 11, 2024, a complete copy of the foregoing Reply to Patent Owner's Response was served in its entirety on Patent Owner's below-listed counsel of record via electronic mail at:

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