

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

CULTEC, INC.,

Petitioner,

v.

STORMTECH LLC,

Patent Owner.

Case IPR2017-00526

U.S. Patent No. 8,672,583

**PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 8,672,583
PURSUANT TO 37 C.F.R. § 42.101**

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I. INTRODUCTION

Petitioner Cultec, Inc. respectfully requests inter partes review (“IPR”) for claims 1-21 of U.S. Patent No. 8,672,583 (“’583” or “’583 patent”) (Ex. 1001) in accordance with 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42.100 et seq.

II. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

As set forth below and pursuant to 37 C.F.R. § 42.8(a)(1), the following mandatory notices are provided as part of this Petition:

A. Real Party-In-Interest Under 37 C.F.R. § 42.8(b)(1)

Petitioner Cultec, Inc. is a privately owned, non-governmental company and is the real party in interest as Petitioner.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

1. Related Litigation

Petitioner states that the ‘583 patent has been asserted against Petitioner in the District Court of Connecticut in *StormTech LLC et al v. Cultec, Inc.*, 3:15-cv-01890-AVC (D. Conn. December 31, 2015) and that the Complaint in that action was served on January 5, 2016.

2. Related Proceedings

There are currently no related Patent Office proceedings; however, Petitioner will be filing an IPR with respect to U.S. Patent No. 9,255,394 (“the ‘394 patent”), which is a related continuation patent of the ‘583 patent.

C. Lead and Back-up Counsel Under 37 C.F.R. § 42.8(b)(3)

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D. Service Information Under 37 C.F.R. § 42.8(b)(4)

Service information for Petitioner is identified in Section II.C., above.

Petitioner hereby consents to service by electronic means.

III. OVERVIEW OF CHALLENGE AND RELIEF REQUESTED

A. Grounds For Standing Under 37 C.F.R. 42.104(A)

Petitioner certifies that the '583 patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting an *inter partes* review challenging the patent claims on the grounds identified in this Petition.

B. Identification of Challenge

Petitioner requests inter partes review of claims 1-21 of the '583 patent, and that the PTAB determine those claims to be unpatentable under 35 U.S.C. §103(a). 37 C.F.R. § 42.104(b), (b)(1), and (b)(2).

Inter partes review of the '583 patent is requested in view of the following

references, each of which is prior art to the '583 patent under 35 U.S.C. §§ 102(b) and/or (e). 37 C.F.R. § 42.104(b)(2).

1. U.S. Patent No. 8,491,224 to Cobb et al. ("Cobb") issued on July 23, 2013 from Application Serial No. 12/370,287, which was filed February 12, 2009 and claims priority to provisional application No. 61/217,905 filed on February 13, 2008. (Ex. 1002). Both of Cobb's application filing date and provisional application filing date are before the earliest filing date claimed by the '583 patent (June 5, 2009). Cobb is therefore available as prior art under pre-AIA 35 U.S.C. § 102(e).

The U.S. Publication of the application that became Cobb and the related PCT application are listed on the face of the '583 patent. Neither of these references were applied during prosecution by the Examiner of the '583 patent. As discussed below, there is reason to doubt that the Examiner was given the opportunity to fully consider and appreciate the disclosure of Cobb before the '583 patent claims were allowed.

2. U.S. Patent No. 4,360,042 to Fouss et al. ("Fouss") issued on November 23, 1982, which is more than one year before the earliest filing date claimed by the '583 patent (June 5, 2009). (Ex. 1003). Fouss is therefore available as prior art under pre-AIA 35 U.S.C. § 102(b). Fouss was cited during the original prosecution of the '583 patent but, as discussed below, the Patent Owner never

substantively responded to the multiple rejections of the claims that were entered based on Fouss.

3. U.S. Patent No. 6,497,333 to Ellis et al. (“Ellis”) issued on December 24, 2002, which is more than one year before the earliest filing date claimed by the ‘583 patent (June 5, 2009). (Ex. 1004). Ellis is therefore available as prior art under pre AIA 35 U.S.C. § 102(b). Ellis was not cited during the original prosecution of the ‘583 patent.

4. U.S. Patent No. 4,759,661 to Nichols et al. (“Nichols”) issued on July 26, 1988, which is more than one year before the earliest filing date claimed by the ‘583 patent (June 5, 2009). (Ex. 1005). Nichols is therefore available as prior art under pre-AIA 35 U.S.C. § 102(b). Nichols was not cited during the original prosecution of the ‘583 patent.

5. U.S. Patent No. 7,306,399 to Smith (“Smith”) issued on December 11, 2007, which is more than one year before the earliest filing date claimed by the ‘583 patent (June 5, 2009). (Ex. 1006). Smith is therefore available as prior art under pre-AIA 35 U.S.C. § 102(b). Smith was cited during the original prosecution of the ‘583 patent.

6. US Patent No. 2,876,801 to November (“November”) issued March 10, 1959, which is more than one year before the earliest filing date claimed by the ‘583 patent (June 5, 2009). (Ex. 1007). November is therefore available as prior

art under pre-AIA 35 U.S.C. § 102(b). November was not cited during the original prosecution of the '583 patent.

7. *Designing with Plastics and Composites A Handbook*, Rosato, DiMattia, & Rosato ("Rosato"), was originally published in 1991, which is more than one year before the earliest filing date claimed by the '583 patent (June 5, 2009). (Ex. 1008). Rosato is therefore available as prior art under pre-AIA 35 U.S.C. § 102(b). Rosato was not cited during the original prosecution of the '583 patent.

Petitioner requests review and cancellation of claims 1-21 of the '583 patent under the following statutory grounds:

Ground 1: Claims 1-21 are unpatentable under 35 U.S.C. §103(a) over Cobb (Ex. 1002).

Ground 2: Claims 1-21 are unpatentable under 35 U.S.C. §103(a) over Cobb (Ex. 1002) in view of Fouss (Ex. 1003).

Ground 3: Claims 1-21 are unpatentable under 35 U.S.C. §103(a) over Cobb (Ex. 1002) in view of Ellis (Ex. 1004).

Ground 4: Claims 1-21 are unpatentable under 35 U.S.C. §103(a) over Cobb (Ex. 1002) in view of Fouss (Ex. 1003) and Ellis (Ex. 1004).

Ground 5: Claims 12 and 17 are unpatentable under 35 U.S.C. §103(a) over Cobb (Ex. 1002) in view of November (Ex. 1007).

Section VII demonstrates, for each of the statutory grounds, that there is a reasonable likelihood that Petitioner will prevail. *See* 35 U.S.C. § 314(a).

Additional explanation and support for each ground of the rejection is set forth in the Expert Declaration of Russell L. Herlache (Ex. 1009).

C. Summary of Grounds of Unpatentability

The claims of the ‘583 patent and the prior art Cobb patent are directed to underground stormwater chambers. Both have sidewalls and a top that form an arch-curve. Both have alternating crest corrugations and valley corrugations that run transverse to the length of the chamber along the arch-curve and that change in width with changes in the vertical elevation of the chamber. Both use smaller, secondary “sub-corrugations” on the chamber’s crest and valley corrugations. The only relevant difference between Cobb and the claims of the ‘583 patent is that Cobb discloses both crest and valley sub-corrugations that extend over the entire arch-curve of the chamber and, alternately, valley sub-corrugations that extend only partially over the arch-curve of the chamber, while the ‘583 patent claims crest sub-corrugations that extend only partially over the arch-curve of the chamber.

The crest sub-corrugations claimed in the ‘583 patent would have been an obvious modification to the chamber of Cobb, as use of partial crest sub-corrugations is a design choice which is merely the substitution of one known

element for another, using known methods to achieve a predictable result. The modification would have been motivated by considerations of reducing material costs and improving the manufacturability of the chamber.

IV. BACKGROUND OF THE TECHNOLOGY AND THE '583 PATENT

The '583 patent relates to molded plastic chambers used to disperse stormwater runoff. (Ex. 1001: Col. 1, lines 9-11). Such chambers are buried underground beneath, for example, parking lots, roads, or other developed areas (Ex. 1003: Col. 1, lines 19-25; Ex. 1006: Col. 1, lines 22-27) so that collected rainwater can be fed to the chambers and then seep into the earth to replenish subsurface groundwater. (Ex. 1001: Col. 1, lines 22-25; Ex. 1006: Col. 1, lines 16-19; Ex. 1002: Col. 1, lines 13-16).

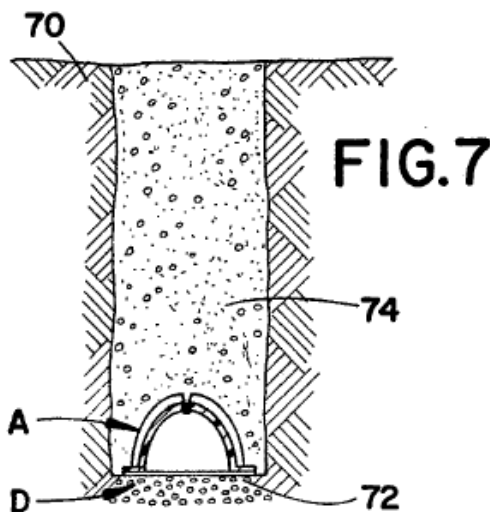


Figure 7 of Fouss (Ex. 1003) showing a drainage chamber buried underground

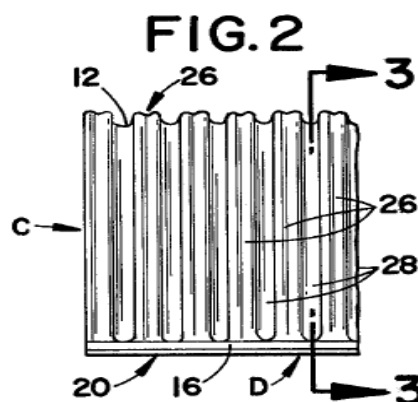
Buried chambers are subject to significant load forces. (Ex. 1003: Col. 4, lines 29-48) These loads include those generated by the soil, gravel, pavement,

etc. above the chamber, as well as loads generated by vehicles, pedestrians, etc.

that pass over the developed area. (Ex. 1003: Col. 4, lines 29-32; Ex. 1001: Col. 1, lines 49-52.

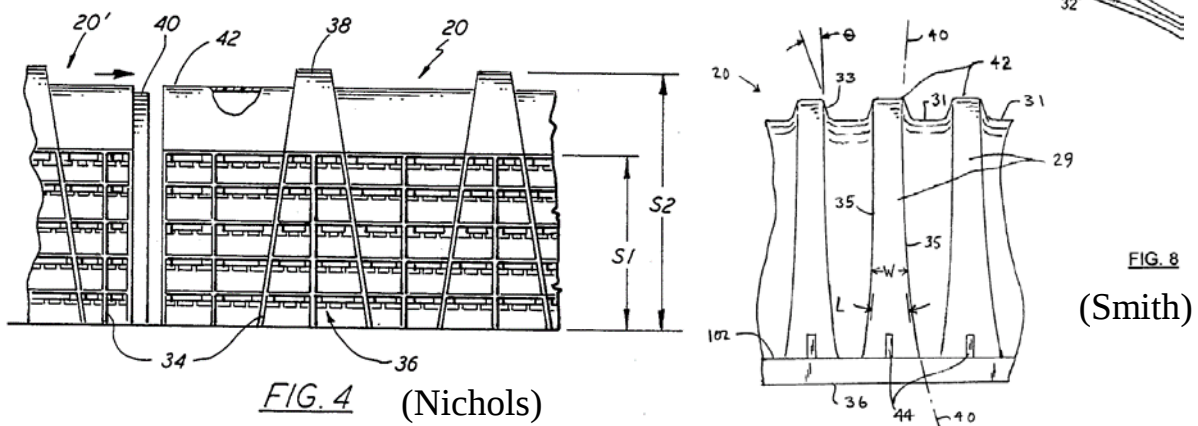
Stormwater chambers must be strong enough to bear these loads and large enough to effectively handle stormwater runoff. Additionally, for a chamber manufacturer to be competitive in the marketplace, the chambers must be economical to manufacture, store, and ship and practical to handle and install. (See Ex. 1003: Col. 2, lines 15-23; Ex. 1006, Col. 1, lines 31-36). Chamber designers work, therefore, to maximize chamber strength and capacity while minimizing material and production costs and chamber weight. (*Id.*).

Corrugated molded plastic stormwater chambers have been known for some time. (Ex. 1003: Col. 1, lines 28-39, 40-43; Col. 4, lines 29 et seq.; Fig. 7). For example, Fouss (Ex. 1003) discloses a chamber with a corrugated configuration with alternating outward projecting peaks 26 and inward projecting valleys 28 to increase the strength and rigidity of the tubing. (Ex. 1003: Col. 1, lines 45-48).



The use of corrugations was known to improve the strength of the chamber without requiring much additional material, as opposed to, for example, a change in the wall thickness to provide a comparable improvement in strength.

It was also well known before the invention of the '583 patent to taper the width of the corrugations along the height of the chamber to improve the storage and shipping of the chambers. For example, both Smith (Ex. 1006) and Nichols (Ex. 1005) disclose drainage chambers with corrugations to improve strength, but where the width of the peak corrugations tapers toward the top of the chamber. (See Ex. 1005: Col. 3, lines 1-3; lines 3-6; Fig. 4; Ex. 1006: Col. 4, lines 45-51; Figs. 8, 9, 10). This feature is taught to enable nesting of the units for shipping. (Ex. 1005: Col. 3, lines 3-6).



Accordingly, as Fig. 4 of Nichols and Fig. 8 of Smith above show, it was common in the industry and well known to those of ordinary skill to employ corrugations in which the widest, flattest parts of the crest corrugations were near the bottom of the chamber while the narrowest parts were near the top. For valley

corrugations, the reverse is true: the widest, flattest portions were near the top, while the narrowest parts were near the bottom.

Prior to the alleged invention of the '583 patent, it was also known that the use of secondary (or sub-) corrugations on primary corrugations could further improve the strength-to-weight ratio of a molded plastic chamber. Fouss (Ex. 1003) describes that improved chamber strength results from putting secondary corrugations on top of larger corrugations. (Ex. 1003: Col. 1, lines 48-52; Col. 5, lines 19-35; Figs. 4 and 5).

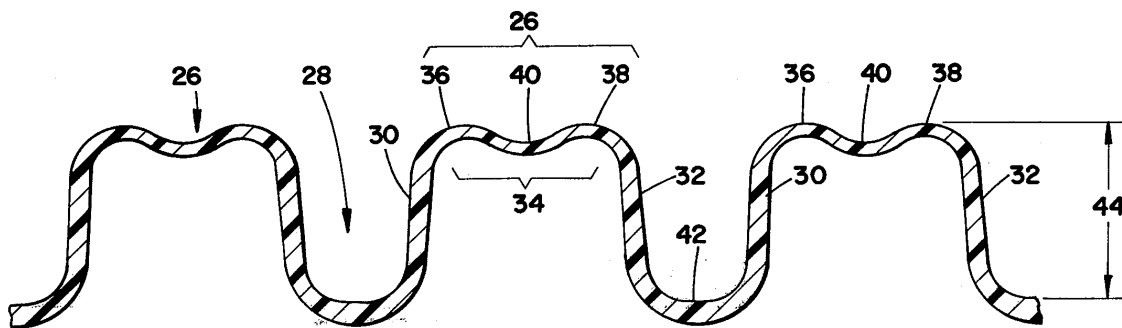


FIG. 5 (Fouss)

Fouss's Figure 5 illustrates peak corrugations 26 with a first outward extending rib 36, a second outward extending rib 38, and an inward extending rounded recess 40. (Ex. 1003: Col. 5, lines 23-28). Fouss describes these features as "effective[ly] provid[ing] corrugations on the peak portions which increases the strength of the peak portions, the corrugations, the side walls, and the conduit." (Ex. 1003: Col. 5, lines 31-35).

Cobb (Ex. 1002) also discloses molded plastic chambers that are intended

for burial in the ground to receive stormwater runoff from developed sites. (Ex.

1002: Col. 1, lines 13-16). Cobb's arch-shaped chamber has primary crest and

valley corrugations that vary in width from the base of the chamber to its top. (Ex.

1002: Col. 1, lines 27-32; Col. 2, lines 23-27). Cobb's primary crest and valley

corrugations both also have sub-corrugation features. (Ex. 1002: Col. 1, lines 32-

36). Cobb teaches that "sub-corrugation features can be used to increase the

effective wall properties (area, moment of inertia and section modulus) that in turn

increases the chamber wall's load carrying strength, stiffness and moment

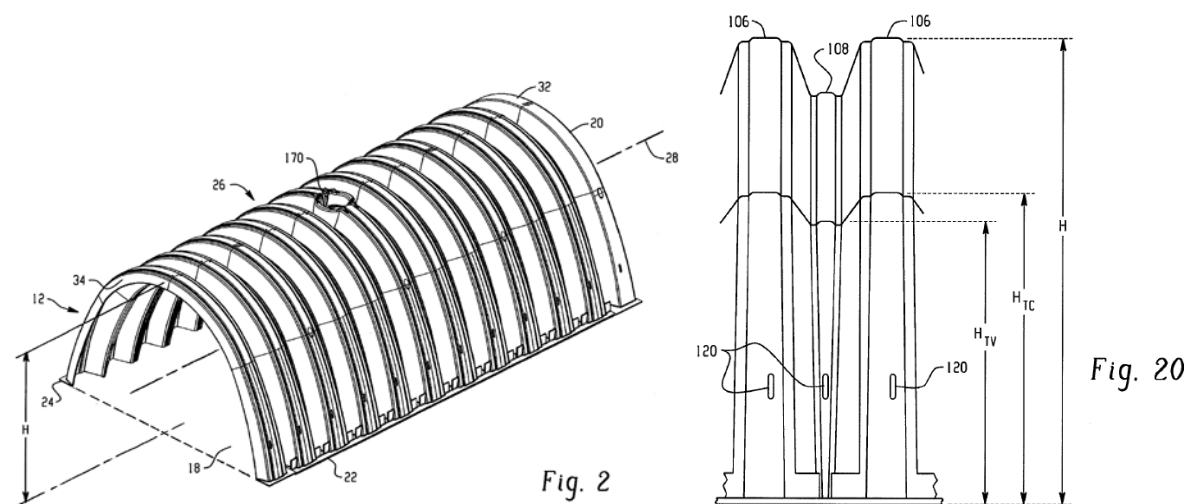
strength." (Ex. 1002: Col. 8, lines 7-11). Cobb also teaches that sub-corrugations

are most useful in "wide and flat" areas of the chamber wall. (Ex. 1002: Col. 8,

lines 11-16). It was therefore known to employ additional, secondary corrugations

on the wide and flat areas of the primary corrugations. Figures 2 and 20 of Cobb

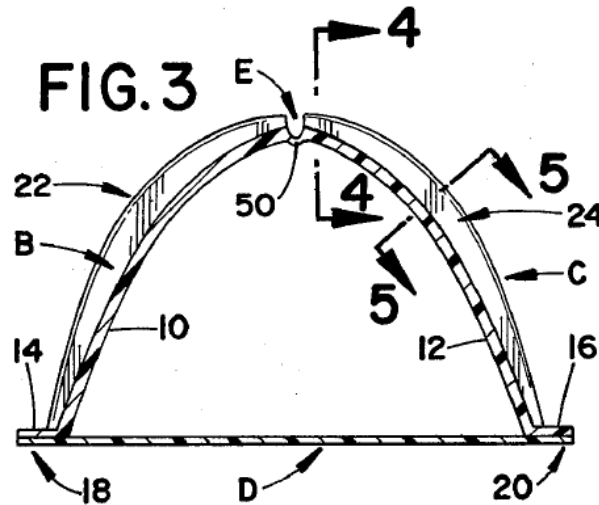
are shown below:



The engineering rationale for using sub-corrugations is the same as the

rationale for using corrugations. By introducing additional height of the material in the direction that a load will be applied, the strength and stiffness of the surface is increased. (Ex. 1002: Col. 8, lines 7-11; Herlache Dec. ¶¶36). This is analogous to the fact that a 2 inch by 8 inch beam is stronger and stiffer when a load is applied to one of its narrow surfaces than when applied to one of its wider (8 inch) surfaces. (Herlache Dec. ¶¶35). Adding a corrugation to any surface was known long prior to the invention of the '583 patent to be an effective means of increasing the strength and stiffness of that surface. (*Id.* ¶36). This technique had been utilized in molded plastic chambers for decades prior to the invention of the '583 patent, as evidenced by Fouss, Nichols, Cobb, and countless others. (*Id.*). And the technique was understood to be especially effective when employed to add sub-corrugations to the wide and flat areas of primary corrugations. (Ex. 1002: Col. 8).

Furthermore, it was known that sub-corrugations did not need to extend around the entire arch of a chamber to be effective. Partial or “terminated” sub-corrugations could be used to strengthen a chamber. The chamber disclosed in Fouss (Ex. 1003) includes a hinge E that interrupts the corrugations and sub-corrugations before they reach the top of the chamber, as shown in Fouss’ Figure 3, below:

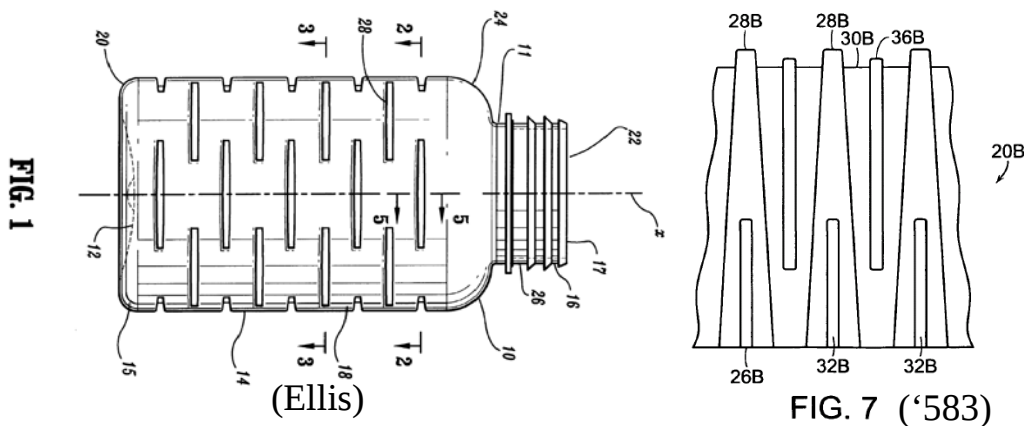


Further, Ellis (Ex. 1004) discloses the use of partial, discontinuous corrugations to strengthen curved, molded plastic containers. Ellis utilizes the same well-known techniques as claimed in the '583 patent to solve the same problems identified by the '583 patent. Ellis discloses grooves intended to increase the structural strength of a container “without substantial increases in material

¹ Fouss explains that the hinge E is included to facilitate folding of the chamber for shipping. (Ex. 1003: Col. 5, lines 60-66).

costs, mold cycle time or tooling complexity.” (Ex. 1004: Col. 2, lines 51-54).

Ellis’s grooves are small corrugations provided in the wall of the container. (See Ex. 1004: Figs. 5, 5A). Just like the ‘583 patent, Ellis explains that increasing wall thickness to provide side load and top load rigidity also requires increased material and mold cycle times, increasing manufacturing costs. (Ex. 1004: Col. 2, lines 3-7; cf. Ex. 1001: Col. 2, lines 30-38). Ellis avoids increasing wall thickness by instead using grooves disposed transverse to the longitudinal axis of the container in an array of rows. (Ex. 1004: Col. 5, lines 8-13). The grooves are discontinuous but staggered to overlap row-to-row, as seen in Figure 1 below. (Ex. 1004: Col. 5, lines 18-25). By staggering the grooves to overlap, the Ellis design ensures there is no longitudinal gap in corrugation coverage on the container wall, which is precisely the effect the ‘583 patent seeks to achieve by staggering the termination points of the crest and valley sub-corrugations. (Herlache Dec. ¶¶94, 97, 129).



Figures 5 and 5a of Ellis show cross sections of the grooves, and Ellis states

that grooves alternatively have an arcuate cross-section. (Ex. 1004: Col. 7, lines 1-2). Ellis teaches that its configuration of grooves “increase[s] geometric strength and resistance to the deflection of side wall 14 (FIG.1).” (Ex. 1004: Col. 5, lines 59-61). The grooves of Ellis have the same structure as the corrugations and sub-corrugations of the ‘583 patent and serve precisely the same purpose.

Ellis states that its disclosure “is applicable to a wide variety of containers and vessels which require enhancement of axial or radial strength and rigidity.” (Ex. 1004: Col. 4, lines 10-12). Applications include “cylindrical objects such as piping, columns or cylinders ... which require added strength and rigidity in axial and/or side wall deflection without the added requirements of additional panel wall thickness.” (Ex. 1004: Col. 4, lines 14-18). Ellis states that its “grooves can be employed in any wall member which requires added deflective and/or axial rigidity.” (Ex. 1004: Col. 7, lines 27-30). Ellis also repeatedly teaches that the design and layout of its strengthening grooves can be varied to meet the requirements of a particular application. (Ex. 1004: Col. 5, lines 4-7 (materials and fabrication methods); lines 13-17 (quantity of grooves); lines 23-25 (spacing of grooves); lines 55-58 (size and spacing of grooves)).

Ellis is evidence that the use of discontinuous corrugations to improve the strength of curved plastic parts was known prior to the invention of the ‘583 patent. (Herlache Dec. ¶¶36, 67-68, 130).

1. Background of Design Considerations for Plastic Molded Parts

Design engineers strive to design chambers that simultaneously maximize strength and minimize manufacturing, material, and shipping costs. (Ex. 1003: Col. 2, lines 15-23; Ex. 1002: Col. 8, lines 29-34; Herlache Dec. ¶¶36-38).

The plastic chambers of Cobb and the '583 patent are typically made using an injection molding process. (Ex. 1002: Col. 7, lines 3-17; Ex. 1001, Col. 2, lines 23-25, et seq.; Herlache Dec. ¶¶39). In this process, melted plastic is injected between mold components. (Herlache Dec. ¶¶39). Once the plastic has had time to cool and solidify ("cure time"), the mold components are separated and the molded part is ejected. (*Id.*). Optimization of a product design for efficient injection molding involves consideration of how the product configuration and features affect cure time and the release of the product from the mold. (*Id.* ¶40). For example, the addition of corrugations and/or sub-corrugations in a chamber creates additional contact area between the product and the mold, a consideration that is well understood by those skilled in the art. (*Id.*).

The additional contact area between the part and the mold increases the force required to release the part from the mold after the plastic has cooled. (*Id.* ¶41). The greater the surface area in contact, the greater the force required. (*Id.* ¶42). Furthermore, the plastic part must be cooled to the point that it attains the required strength for ejection. (*Id.*). Added cooling time and increased mold

release force requirements reduce manufacturing efficiency and increase manufacturing costs, so design engineers seek to minimize these drawbacks when utilizing strength enhancing features, such as corrugations and sub-corrugations. (*Id.*).

A standard plastic part design technique used to facilitate part release from the mold is to taper the walls of the mold components and, thereby, taper the molded part. (*Id.* ¶43). By creating a slight angle relative to perpendicular (the “draft angle”) in the mold walls, the opening of the cavity is wider than its base, providing an easier release of the part from the mold. (*Id.* ¶43-44). Desirably both part sidewalls and features extending therefrom are tapered to employ a draft angle. In the images below (excerpted from Rosato at 811/CULTEC001184, Ex. 1008), the part on the left does not employ draft, and the feature’s sidewalls are perpendicular to the base. As the mold components move (vertically, as depicted) away from the part, the sidewalls of the mold remain in constant contact with the sidewalls of the corrugation feature, creating drag and making ejection difficult. (*Id.* ¶44). The corrugation feature on the right employs draft, and the sidewalls extend from the base at a positive angle. As soon as the mold separates (again, vertically) from the part, the angle creates space between the sidewalls of the mold and the sidewalls of the corrugation feature, making ejection far easier. (*Id.*).

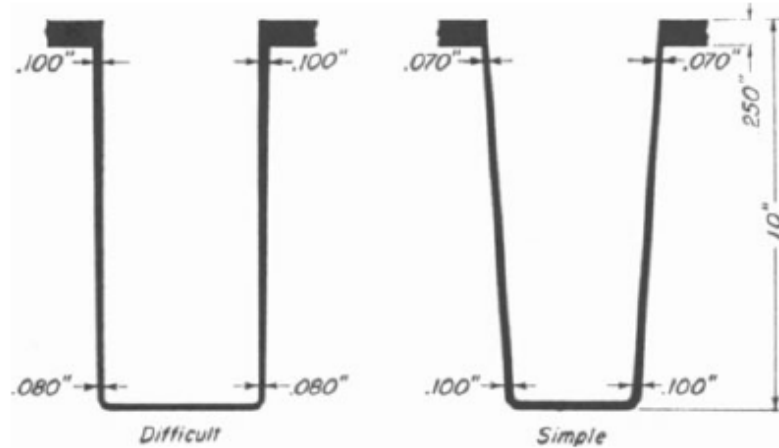


Figure 11-36. An example of designs for long-draw products. The left view has little clearance, but the right side is simplified by the clearance allowed by the walls' taper.

Adding corrugation and/or sub-corrugation features was a commonly used technique to increase the strength of a plastic molded part without increasing wall thickness. But adding corrugation features increased the surface area of the chamber and introduced additional surface-area interaction between the part and the mold, increasing ejection force and cooling time requirements. Design engineers responded by tapering the corrugation features. Adding corrugation features was a known technique that improved part strength without significantly increasing material costs, and tapering the added features reduced the impact on manufacturing efficiency by facilitating the separation of the part from the mold.

2. Prosecution History of the '583 Patent

The PTO issued its first office action on the merits of the application that became the '583 patent in November 2012. (Ex.1010, at 402-410). The Examiner rejected all of the independent claims that were pending at that time as being

obvious over Fouss and U.S. Pat. Appl. 2005/0111915 to Moore et al. (*Id.* at 406-407). The Examiner indicated that dependent claims 2-12, 15, 17, and 18 included allowable subject matter. (*Id.* at 408).

Six months later, on May 2, 2013, Patent Owner responded to the first Office Action but did not provide a substantive response to the prior art rejections of the claims. (*Id.* at 383, 392-395). Then, less than a week later on May 8, 2013, Patent Owner filed an Information Disclosure Statement by which it identified 122 separate prior art references to the PTO. (*Id.* at 80-86). Among these references was the PCT version of the Cobb application (107th entry on the list), as well as “2009/0220320,” which was identified as a published patent application to Cobb dated September 3, 2009 (103rd entry on the list). U.S. Pat. Appl. Publ. No. 2009/0220320 is actually a published application of Li Zhang titled “Insert for a Sandwich Component Having a Honeycomb Core.” The Zhang reference is not relevant to the subject matter of the ‘583 patent and is not the Cobb reference. It is curious that the most relevant reference was misidentified. (*Id.* at 85, 86).

Nine days later, the PTO Examiner issued a Final Office action, which maintained the prior art rejections from the previous office action, maintained the indication of allowability as to dependent claims 2-12, 15, 17, and 18, and included the PTO’s standard form indicating that the Examiner had considered all of the 122 references that Patent Owner had cited only nine days earlier. (*Id.* at 61-67, 73-

Patent Owner responded to the Final Office Action by incorporating the allowable dependent claims into the rejected independent claims so that the application could proceed to issue. (Ex. 1010, at 39-53).

Application claim 1 was amended to incorporate the subject matter of claim 2, adding the limitation “wherein the height of each crest sub-corrugation diminishes with increasing elevation.” (*Id.* at 41, 51). In other words, claim 1 was amended to specify that the crest sub-corrugations have a tapered height.

Application claim 13 (patent claim 14) was amended to incorporate the subject matter of claim 15, adding the limitation “a first plurality of sub-corrugations running upwardly from the opposing side bases on crest corrugations to termination points which are at an elevation less than an elevation of a top of the chamber; and a second plurality of sub-corrugations running in valley corrugations at the top of the chamber and downwardly toward the opposing side bases to an elevation which is less than the elevation of said termination points of the first plurality of sub-corrugation.” (*Id.* at 44-45, 51). In other words, claim 13 was amended to specify that the crest and valley sub-corrugations did not extend over the entirety of the arch of the chamber but that the terminal ends of each overlap. New application claims 29, 30 and 31 (patent claims 19, 20 and 21) were also added, each requiring crest sub-corrugations that terminate below the top of the

Patent Owner again did not substantively address the rejections of the then-pending dependent claims in view of Fouss. (*Id.* at 50-53). The Examiner sent a Notice of Allowance on October 25, 2013, Patent Owner paid the issue fee on January 27, 2014, and the '583 patent issued on March 18, 2014. (*Id.* at 23-30; 14-15; Ex. 1001).

Thus, the PTO has not previously considered the Cobb reference in combination with Ellis or with Fouss. Patent Owner waited almost three years after filing its application and after the Examiner had already made his substantive examination to submit the Cobb PCT in a list of 121 other references comprising hundreds of pages. (Ex. 1010 at 32-38). Patent Owner never substantively distinguished its claims over Cobb, Fouss, or any other reference.

V. LEVEL OF ORDINARY SKILL IN THE ART

In the opinion of Petitioner's expert, Russell Herlache, a person of ordinary skill in the art of the '583 patent is an individual who has the training, experience, and education to understand the engineering principles relevant to molded plastic chamber design. Mr. Herlache opines that person with a Bachelor's Degree in the fields of Mechanical Engineering, Civil Engineering, Materials or Plastics Process Engineering, and/or related fields and a minimum of 6 years of practice in the plastics industry could qualify as a person of ordinary skill in the art. (Herlache

VI. CLAIM CONSTRUCTION

Petitioner believes that the claim terms should be given their broadest reasonable interpretation, giving the words of the claim their ordinary and customary meaning in the art. *In re Translogic Technology, Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

VII. GROUNDS FOR UNPATENTABILITY

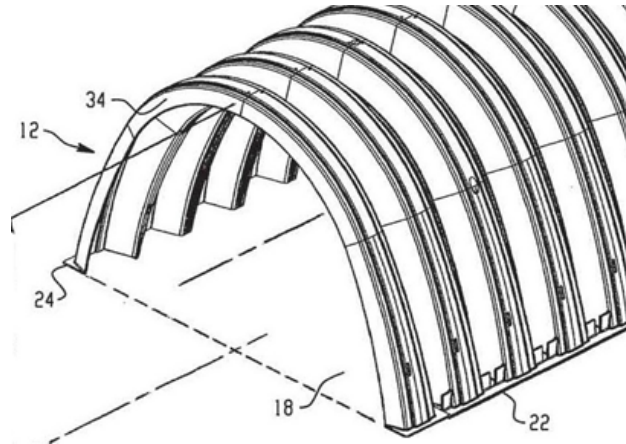
Cobb discloses all of the elements of the claims except for specific termination points and sizes of the crest and valley sub-corrugations. As explained below, these elements would have been an obvious modification to the chamber of Cobb, either as a routine design choice or in view of Cobb itself, Ellis, Fouss or the combination thereof.

A. Claim 1, Ground 1: Cobb

1. Cobb Expressly Discloses All of the Elements of Claim 1 Except for the Crest Sub-Corrugation Termination Point

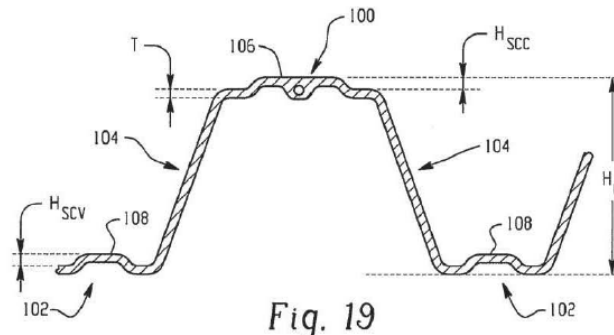
Independent claim 1 (and also independent claims 14, 19, 20, and 21) recites a chamber with opposing side bases running parallel to the chamber length and sidewalls that run from the bases to the chamber top, forming an arch-curve. (Ex. 1001: Col. 13, lines 22-28; Col. 14, lines 43-46, 60; Col. 15, lines 14-20; Col. 15, lines 38-44; Col. 16, lines 16-22). Cobb discloses “molded plastic chambers that are buried in the ground and receive stormwater runoff from developed sites.” (Ex.

1002: Col. 1, lines 13-16). Figure 2 of Cobb, depicted below, shows such a chamber with sidewalls extending from opposing side bases (22, 24) to a chamber top and forming an arch curve, just like in claims 1, 14, 19, 20, and 21.

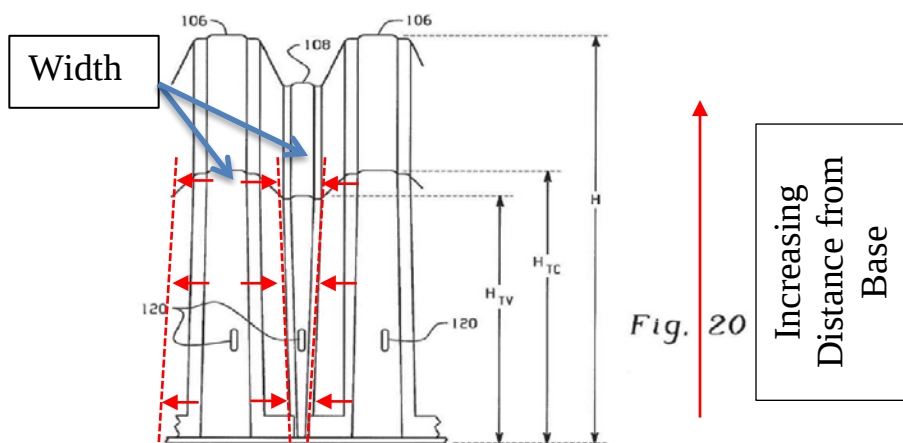


(See also Ex. 1002: Col. 6, lines 36-37; Col. 9, lines 51-55; Col. 6, lines 30-33; Abstract).

Claim 1 (and also independent claims 14, 19, 20, and 21) recites a plurality of alternating crest corrugations and valley corrugations running transverse to the length of the chamber along the arch-curve of the chamber. (Ex. 1001: Col. 13, lines 29-31; Col. 14, lines 49-51; Col. 15, lines 21-23; Col. 15, lines 45-47; Col. 16, lines 23-25). The chamber of Cobb also includes a plurality of alternating crest corrugations (100) and valley corrugations (102) running transverse to the chamber length along the arch curve. (Ex. 1002: Col. 1, lines 28-32; see also Col. 2, lines 38-40.). This is shown in multiple figures of Cobb, including Fig. 19:



Claim 1 (and also independent claims 14, 19, 20, and 21) recites that the crest corrugations *decrease* in width with elevation from the opposing side bases, and the valley corrugations *increase* in width with elevation from the opposing side bases, as width is measured in a direction parallel to the chamber length. (Ex. 1001: Col. 13, lines 31-36; Col. 14, lines 51-56; Col. 15, lines 23-28; Col. 16, lines 1-5; Col. 16, lines 25-30). Cobb discloses that the crest corrugations *decrease* in width with elevation while the valley corrugations *increase* in width with elevation in exactly the same manner. (Ex. 1002: Col. 1, line 64-Col. 2, line 3). This is shown in Fig. 20 of Cobb:



Claim 1 (and also independent claims 14, 19, 20, and 21) recites a plurality

of sub-corrugations running upwardly from the opposing side bases on the crest corrugations. (Ex. 1001: Col. 13, lines 37-39; Col. 14, lines 57-58; Col. 15, lines 29-31; Col. 16, lines 6-8; Col. 16, lines 31-33). Cobb (Ex. 1002) states that “[e]ach one of a multiplicity of the corrugation crests includes a respective crest sub-corrugation feature thereon.” (Ex. 1002: Col. 1, lines 32-34). Cobb discloses a plurality of crest sub-corrugations 106 running upwardly from an opposing side base and along the arch-curve of a crest corrugation. (Ex. 1002: Col. 1, lines 32-44; Col. 2, lines 38-40). These sub-corrugations 106 are shown in Fig. 20, depicted above.

Cobb teaches various types, sizes, and configurations of sub-corrugations:

It is recognized that the sub-corrugations could alternatively be recessed regions, as opposed to the illustrated raised regions. Moreover, a sub-corrugation feature including one or more raised portions and/or one or more recessed portions could be provided. (Col. 8, lines 16-20).

As an alternative to the sub-corrugation features, an intermediate rib could be provided on the crest and/or in the valley. Placement of suitable gas channels² on the crest or in the valley could also provide suitable stability and resistance to global buckling. (Col. 9, lines 6-10).

Cobb teaches that the various sub-corrugation feature designs can be altered and substituted for one another as appropriate for a particular chamber design. (Ex.

² The embodiment of a crest sub-corrugation shown in Cobb’s Figure 19 is a crest sub-corrugation with a gas channel. (Herlache Dec. 54).

Claim 1 (and also independent claims 14, 19, 20, and 21) recites that each crest sub-corrugation has a height less than a local height of the crest corrugation with which it is associated. (Ex. 1001: Col. 13, lines 40-42; Col. 15, lines 31-34; Col. 16, lines 8-11; Col. 16, lines 34-36). Cobb Figure 19 (as well as Figures 1-4, 13, 20-23, et al.) discloses the height (H_{SCC}) of the crest sub-corrugations is less than the height of the crest corrugations. Cobb also discloses a crest sub-corrugation height of less than 10% of the associated crest corrugation. (Ex. 1002: Col. 8, lines 39-49).

Claim 1 (and claims 19, 20, 21) recites that the height of each crest sub-corrugation diminishes with increasing elevation. (Ex. 1001: Col. 13, lines 44-45). Cobb discloses that “sub-corrugations can be less deep . . . as the crest/valley gets more narrow.” (Ex. 1002: Col. 8, lines 36-37). As shown in Fig. 20, the crest corrugations 106 become more narrow with increasing elevation. Accordingly, the crest sub-corrugation height would diminish with increasing elevation.

Thus, Cobb expressly discloses all of the elements of claim 1 except for the claim requirement that the crest sub-corrugations terminate below the chamber top.

2. Crest Sub-Corrugations That Terminate Below the Chamber Top Would Have Been Obvious in View of Cobb

Cobb teaches that sub-corrugations should be used in the widest, flattest areas of the corrugations to increase those areas’ strength and resistance to

buckling because those areas are the most susceptible to buckling. (Ex. 1002: Col. 8, lines 11-16). Cobb's crest corrugations are widest near the opposing side bases. (*E.g.* Ex. 1002: Figs. 3-4 and 20.) Cobb also teaches that sub-corrugations should be sized as appropriate in view of added material cost and other factors, motivating those of ordinary skill in the art to consider alternative arrangements. (Ex. 1002: Col. 8, lines 29-34). Cobb further teaches tapering crest sub-corrugations in width and height as they run up the chamber sidewalls from the opposing side bases to the H_{TC} line. (Ex. 1002: Col. 8, lines 34-38; Fig. 20). And Cobb teaches valley sub-corrugations that "gradually fade out," tapering in width and height, as they run down from the top toward the opposing side bases. (Ex. 1002: Col. 8, lines 56-66; Fig. 20).

Replacing Cobb's crest sub-corrugations, which span the entire arch-curve of the chamber, with crest sub-corrugations that extend upwardly from the chamber base and terminate below the top of the chamber is merely an obvious design choice substituting one known element for another and yielding predictable results. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) ("[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result."). A person of ordinary skill in the art would have expected the modified design to work for its intended purposes based

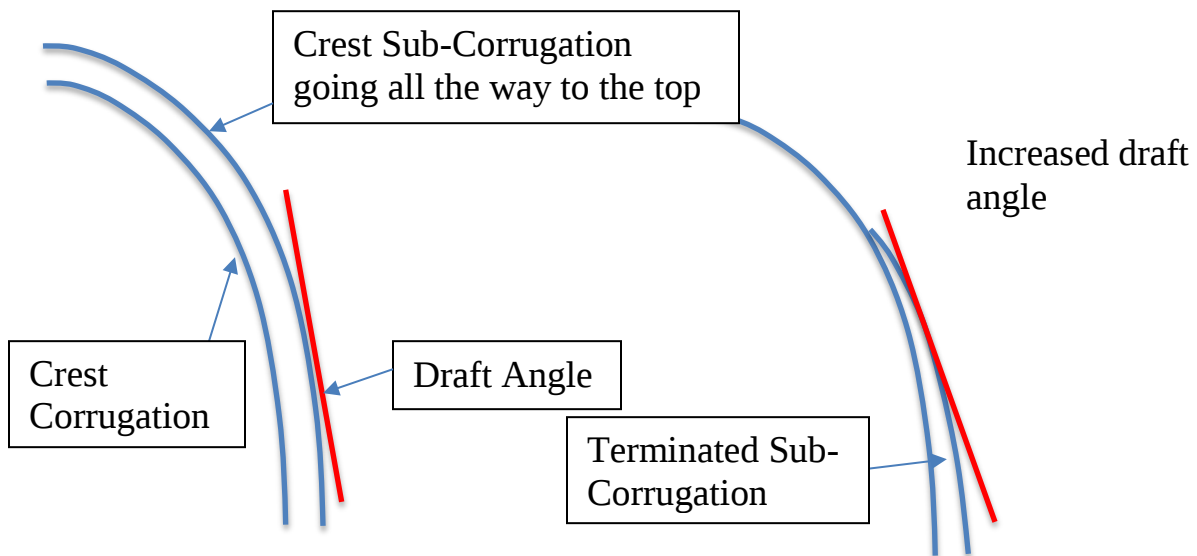
upon Cobb's teachings. And the modification would have been obvious to those of ordinary skill motivated to reduce material costs and increase draft angles. Such modifications would result in the arrangement of features recited in claim 1.

Terminating the crest sub-corrugations below the chamber top (i.e., placing them only in the widest, flattest part of the crest corrugations in Cobb) reduces the material cost and weight of the chamber while utilizing sub-corrugations where they are most effective. (Herlache Dec. ¶55). Cobb teaches that sub-corrugations are most effective on the wide, flat areas of the crest and valley corrugations. (*Id.*; Ex. 1002: Col. 8, lines 7-16). As depicted in the Figures, the widest, flattest areas of Cobb's crest corrugations are below the " H_{TC} " transition line. (*E.g.* Ex. 1002: Figs. 3-4 and 20). Cobb teaches that these areas have a "greater tendency to buckle locally under compression strain." (Herlache Dec. ¶55; Ex. 1002: Col. 8, line 14-16). And Cobb teaches that the use of sub-corrugations should be determined as practical "in view of added material cost etc." (Col. 8, lines 29-34).

Cobb also teaches tapering the crest sub-corrugations with increasing elevation from the side bases and specifically teaches tapering to the H_{TC} line or to a line that is one-third the height of the chamber. (Ex. 1002: Col. 2, lines 25-27; Col. 8, lines 34-45; Fig. 20). And Cobb further discloses *valley* sub-corrugations that have a height and/or width which decreases and will "gradually fade out" to nothing. (Ex. 1002: Col. 8, lines 57-66). Thus, a natural modification of Cobb's

crest sub-corrugations was to taper them down to termination at the H_{TC} line, a location below the top of the chamber. The modification would have been no more than the rearrangement of known elements, utilizing *crest* sub-corrugations that taper to termination in the same manner as Cobb describes with respect to its *valley* sub-corrugations.

The modification would also improve the manufacturability of the chamber by increasing the “draft angle” of the crest sub-corrugation features and reducing the surface area of the chamber, thereby reducing the force necessary to eject the chamber from the mold. (Herlache Dec. ¶43-46). The schematic below depicts the increased draft angle resulting from terminating the crest sub-corrugation features.



Increasing the draft angle was a well-known technique to make manufacturing a chamber more efficient. (Herlache Dec. ¶43-47). Tapering the crest sub-corrugations to termination points below the top of the chamber would reduce the

ejection force needed to remove the mold from the part. (Herlache Dec. ¶46). The H_{TC} line shown in Figure 20 of Cobb would have been a logical selection for the crest sub-corrugation termination point since Cobb's crest corrugations are widest below the H_{TC} line and Cobb suggests tapering its crest sub-corrugations up to the H_{TC} line. (Herlache Dec. ¶53-61; Ex. 1002: Col. 8, lines 34-38; Col. 9, lines 11-19; Figs. 3-4 and 20).

The modification of Cobb's chamber to employ crest sub-corrugations that terminate below the chamber top would have been no more than the substitution of known elements using known methods that yield predictable results, which is unpatentable as obvious. *KSR Int'l*, 550 U.S. at 415–416. Thus, Claim 1 would have been obvious in view of Cobb. (Herlache Dec. ¶73-84).

B. Claim 1, Ground 2: Cobb In View of Fouss

**Crest Sub-Corrugations That Terminate Below the Chamber Top
Would Have Been Obvious in View of Cobb and Fouss**

Cobb expressly discloses all of the elements of independent claim 1 except for the termination of the crest sub-corrugations below the chamber top. Fouss (Ex. 1003) teaches that crest sub-corrugations can be terminated below the chamber top and safely used in an underground drainage chamber. (*See, e.g.*, Ex. 1003: Figs. 1, 3, and 7; Col. 6, lines 3-13). Thus, those of ordinary skill in the art knew that crest sub-corrugations that do not extend all the way around a molded plastic chamber could be used to improve the strength and resistance to buckling.

(Herlache Dec. ¶120-26). Those of ordinary skill in the art would have reasonably expected, as evidenced by Fouss, that a modification to the chamber of Cobb so that the crest sub-corrugations terminated below the chamber top—for example, at the H_{TC} line—would have worked as intended. (*Id.*). See also *KSR Int'l*, 550 U.S. at 416.

Claim 1 would have been obvious over Cobb in view of Fouss.

C. Claim 1, Ground 3: Cobb in View of Ellis

**Crest Sub-Corrugations That Terminate Below the Chamber Top
Would Have Been Obvious in View of Cobb and Ellis**

Cobb expressly discloses all of the elements of independent claim 1 except for the termination of the crest sub-corrugations below the chamber top. Ellis teaches that a plurality of discontinuous grooves arranged in rows provides added strength and rigidity against side wall deflection in plastic, cylindrical objects such as piping. (Herlache Dec. ¶67-68; Ex. 1004: Col. 2, lines 42-54, Col. 5, lines 8-25, 34-45, and 59-61). Ellis shows that those of skill in the art knew that the use of discontinuous sets of corrugations would improve the strength and resistance to buckling of a molded plastic container having a curved cross section. (Herlache Dec. ¶67-68; Ex. 1004: Col. 5, lines 8-25, 34-45, and 59-61). Using discontinuous corrugations provides the added benefits of minimizing material cost and product weight. (Herlache Dec. ¶68-69; Ex. 1004: Col. 2, lines 42-54). Thus, a person of ordinary skill in the art familiar with the teachings of Cobb and Ellis would have

been motivated by material cost and product weight considerations to modify the

chamber of Cobb to employ discontinuous sub-corrugations, as taught by Ellis.

(Herlache Dec. ¶¶67-70 and 127-33). Given Cobb’s instruction to employ sub-

corrugations in the widest, flattest areas of the chamber most likely to buckle, such

a modification would result in crest sub-corrugations beginning at the opposing

side bases and terminating below the chamber top, as required in claim 1 of the

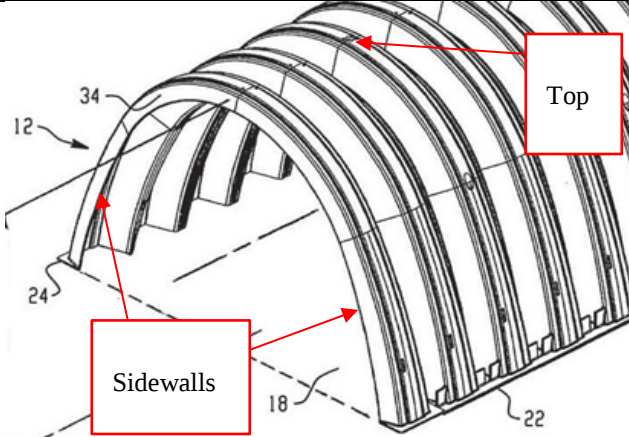
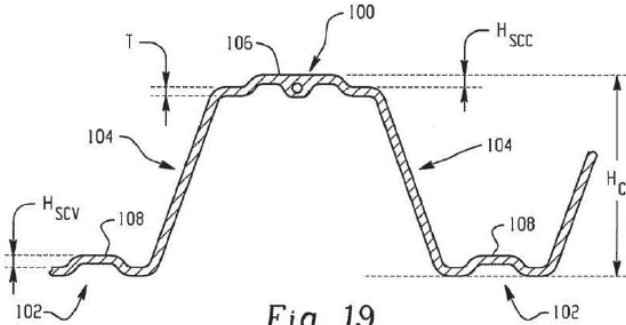
‘394 patent. (Ex. 1002: Col. 8, lines 11-16).

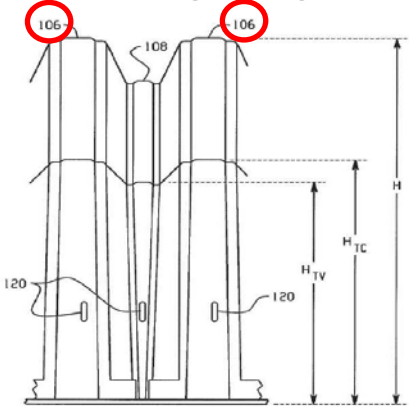
Claim 1 would have been obvious over Cobb in view of Ellis.

D. Claim 1, Grounds 1-4, Invalidity Chart

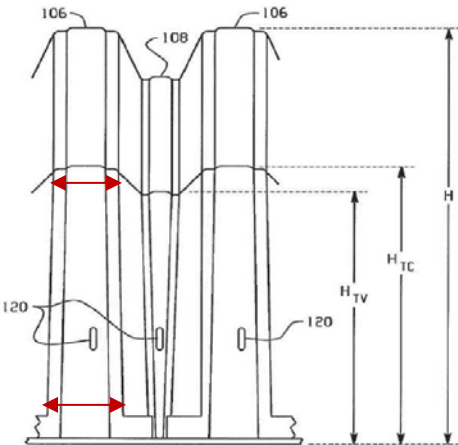
An invalidity claim chart summarizing the evidence of invalidity of claim 1 is presented below, and additional summary invalidity claim charts are provided after each clam discussed in subsequent sections.

‘583 Patent	Invalidating Disclosure
1. A chamber, for drainage, comprising:	Cobb (Ex. 1002) discloses plastic stormwater chambers 10, 12 for receiving and dispersing water. (See, e.g., Title, Abstract, Technical Field, and throughout Specification and Drawings).
opposing side bases running generally parallel to a chamber length for supporting the chamber;	Cobb Fig. 2 shows a chamber (12) with sidewalls extending from opposing side bases (22, 24). Throughout the specification, for example in Col. 6 at lines 36-37, Cobb describes the opposing side bases as “foot portions.” The foot portions 22, 24 each have a horizontal flange.

	
a chamber top;	Cobb Fig. 2 discloses chambers that include a “top.” (See also Fig. 1; Col. 8, line 43).
sidewalls running from the opposing side bases to the chamber top, wherein the sidewalls and top form an arch-curve;	Cobb’s chambers include sidewalls that run from the opposing side bases to the chamber top. Cobb Fig. 2 (above) has sidewalls that extend from the side bases (or “foot portions”) 22, 24 to the “top”. See also, Fouss (Ex. 1003: Title; Abstract; Col. 1, lines 13-18; Col. 4, lines 1-9; Fig. 1).
a plurality of alternating crest corrugations and valley corrugations running transverse to the length of the chamber along the arch-curve of the chamber, wherein the crest corrugations decrease in width with elevation from the opposing side	Cobb’s chambers include multiple alternating valley corrugations and crest corrugations, positioned along the length of the chamber. Cobb: Col. 2, lines 38-40. Both Fig. 2, depicted above, and Fig. 19, depicted below, contain alternating crest (100) and valley (102) corrugations running transverse to chamber length along the arch curve. And the specification discloses, for example in Col. 1, lines 29-30, “a plurality of corrugation crests and valleys distributed along a length of the chamber.”  <i>Fig. 19</i> Cobb Fig. 4 shows the plurality of alternating crest corrugations and valley corrugations.

bases, and the valley corrugations increase in width with elevation from the opposing side bases, as width is measured in a direction parallel to the chamber length;	(See also, Fouss, Figs. 1 and 4) Cobb Fig. 20 (see below) shows a crest corrugation width which increases below the H_{TC} line and the valley corrugation width decreases below the H_{TV} line. The changes in width of the crest and valley corrugations at these transition lines are described in Cobb: Cols. 8 and 9. Cobb: Col. 1, line 64 to Col. 2, line 5 describe crest and valley corrugations with tapering width.
a plurality of crest sub-corrugations, each crest sub-corrugation running upwardly from an opposing side base and along a portion of the arch-curve of a crest corrugation,	Cobb discloses multiple crest sub-corrugations running upward from the base along crest corrugations. “Each one of a multiplicity of the corrugation crests includes a respective crest sub-corrugation feature thereon.” (Col. 1, lines 32-34). Cobb Fig. 20 (as well as figures 1-4, 13, 19, 21-23, et al.) depicts crest sub-corrugations (106) that run upwardly from opposing side bases along corrugation crests.  Fig. 20 See also, Fouss, Col. 5, ll. 31-35, and Fig. 4.
each crest sub-corrugation having a height less than a local height of the crest corrugation with which the crest sub-corrugation is associated	Cobb Fig. 19 shows that the height (H_{SCC}) of the crest sub-corrugation is less than the height of the crest corrugation. “[I]n one example the height H_{SCC} of the sub-corrugation feature is less than 10% of the overall height H_C of the corrugation crest (e.g., within a range of about 3-7%), at least along portions of the corrugation crest that extend from the top of the chamber downward to side locations that are at elevations of about 1/3 of the overall chamber height H.” Ex. 1002: Col. 8, lines 39-45.

each crest sub-corrugation terminating at an elevation lower than the top of the chamber	Cobb Col. 8 describes crest sub-corrugations with tapering height. "[A]s a general rule the sub-corrugations can be less deep (shorter height H_{SCC}, or H_{SCV}) as the crest/valley gets more narrow." Col. 8, lines 34-49. Cobb also discloses valley sub-corrugations that "gradually fade out" to nothing. "[T]he valley sub-corrugation feature 108 may remain relatively uniform when moving from the top of the chamber downward in elevation until a valley transition height H_{TV} is reached, at which elevation the sub-corrugation feature 108 begins to gradually fade out (e.g., width ... of the feature decreases and cross-sectional height of the feature decreases) when moving further downward along the chamber sidewall. Ex. 1002: Col. 8, lines 57-66. A person of ordinary skill in the art would be motivated to add the "fade-out" feature to the crest sub-corrugation to improve the manufacturability, e.g. to facilitate removal of the chamber from its mold when the plastic has cooled. A tapered crest sub-corrugation that has a gradual "fade out" to nothing is a crest sub-corrugation which has a terminal end. Since the claimed crest sub-corrugation runs upwardly from the side base, the terminal end of the crest sub-corrugation will inherently be located "at an elevation lower than the top of the chamber." Fouss, also discloses that the crest sub-corrugations terminate below the top of the chamber. Ex. 1003: Figs. 1, 3, and 6; Col. 6, lines 3-17. Ellis discloses that terminated, discontinuous corrugations are useful to strengthen molded plastic containers. "Grooves 28 are formed in a staggered row arrangement with container 10 along longitudinal axis x....Upon application of an axial and/or a lateral load, inflection points 39, central arc portion 35 and end arc portions 37 facilitate a load path which translates stress towards outside surface 18 due, at least in part, to the orientation of oblique angle β, at which point load stress is uniformly directed along outer surface 18 of container 10. This feature advantageously facilitates load and stress compensation of container 10 for axial and lateral loads applied. Outer arc 34
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	of outer surface 18, and central arc portion 35 and end arc portions 37 of grooves 28 cooperate by providing a stress path that communicates stress from applied loads therebetween and along outer surface 18 of container 10. Ex. 1004: Col. 6, lines 40-58.
wherein the height of each crest sub-corrugation diminishes with increasing elevation.	Cobb discloses that the height of each crest sub-corrugation diminishes with increasing elevation. Col. 8, lines 35-37 states “sub-corrugations [that] can be less deep . . . as the crest/valley gets more narrow.” As seen in Fig. 20, the crest corrugations become more narrow with increasing elevation. The crest sub-corrugations would thus become less deep with increasing elevation as well. This element is also a standard product design consideration, e.g. providing taper or draft to facilitate mold removal is a standard product design feature. 

E. Claim 2, Grounds 1-4

Dependent claim 2 is based on claim 1 and recites that each crest sub-corrugation has a width which *diminishes* with *increasing* elevation. Cobb discloses the claimed subject matter of claim 2 in the context of change in width with *decreasing* elevation, stating that “a width of each crest sub-corrugation feature may be *greater toward the bottom* of the chamber than at the top of the

chamber.” (Ex. 1002: Col. 1, line 66-Col. 2, line 1; Col. 2, lines 25-27). Cobb also describes tapering the width of the crest sub-corrugations with increasing elevation. (Ex. 1002: Col. 8, lines 34-38; Fig. 20). (*See also* Herlache Dec. ¶85).

‘583 Patent	Invalidating Disclosure
2. The chamber of claim 1, wherein each crest sub-corrugation has a width which diminishes with increasing elevation.	Cobb: Col. 2, lines 25-27 - “a width of each crest sub-corrugation feature may be greater toward the bottom of the chamber than at the top of the chamber.”

The claimed subject matter of claim 2 would have been obvious in view of Cobb with or without Fouss and/or Ellis.

F. Claims 3 and 19, Grounds 1-4

Dependent claim 3 and independent claim 19 are similar, in that each have a basic claim that is claim 1 or its equivalent, and add as a claim element that the crest sub-corrugations extend about one quarter to two-thirds of a height of the chamber.

Cobb discloses a transition height H_{TC} located at about $2/3$ the overall chamber height. (Ex. 1002: Col. 9, lines 17-19; Fig. 20). Cobb’s crest sub-corrugations are tapered with an increased width and/or height below the H_{TC} line. As established with respect to claim 1, it would have been obvious to modify the chamber of Cobb to employ tapered crest sub-corrugations having a terminal end at an “elevation lower than the top of the chamber,” and it would have been obvious to select a terminal end at or below Cobb’s H_{TC} line—a location at about

two-thirds of a height of the chamber. (Herlache Dec. ¶¶53-61, 86, 115; Ex. 1002: Col. 8, lines 34-45, Col. 9, lines 17-19, Fig. 20). Furthermore, Cobb discloses that its valley transition height H_{TV} can be “about 2/3 the overall chamber height H (e.g. between 55% and 70% of the overall chamber height H),” making clear that the H_{TC} line can be lower than the 2/3 position. (Ex. 1002: Col. 8, line 66-Col. 9, line 1).

Even if Cobb does not specifically disclose that its “crest sub-corrugations extend about one quarter to two-thirds of a height of the chamber,” the selection of the position of the terminal end of the crest sub-corrugation would have been obvious. (See Herlache Dec. ¶¶53-61, 86, 115). Furthermore, a change in a dimension is not a patentable distinction where the claimed device would not perform differently than the prior art device. *Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 1349 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984)

‘583 Patent	Invalidating Disclosure
3. ...wherein the crest sub-corrugations extend about one quarter to two-thirds of a height of the chamber.	Cobb discloses tapering the crest sub-corrugations with increasing elevation from the chamber base and specifically teaches tapering width to the H_{TC} line located at between 55% and 70% of the chamber height. (Col. 9, lines 1, 11-19; Fig. 20).
19. A chamber, comprising: opposing side bases running generally parallel to a chamber length for supporting the	Cobb discloses plastic stormwater chambers 10, 12 for receiving and dispersing water. Cobb: Col. 6, lines 36-37 describes “foot portions.” The foot portions 22, 24 each have a horizontal flange.

chamber; a chamber top; sidewalls running from the opposing side bases to the chamber top, wherein the sidewalls and top form an arch-curve; a plurality of alternating crest corrugations and valley corrugations running transverse to the length of the chamber along the arch curve of the chamber, wherein the crest corrugations decrease in width with elevation from the opposing side bases, and the valley corrugations increase in width with elevation from the opposing side bases, as width is measured in a direction parallel to the chamber length; and a plurality of crest sub-corrugations, each sub-corrugation running upwardly from an opposing side base and along a portion of the arch-curve of a crest	Cobb Fig. 2 discloses chambers that include a “top.” (See also Fig. 1; Col. 8, line 43). Cobb Fig. 2 shows a chamber (12) with sidewalls extending from opposing foot portion (22, 24). Cobb’s chambers include multiple alternating valley corrugations and crest corrugations, positioned along the length of the chamber. Cobb: Col. 2, lines 38-40. Fig. 2, Fig. 4, and Fig. 19 contain alternating crest (100) and valley (102) corrugations running transverse to chamber length along the arch curve. And the specification discloses, for example in Col. 1, lines 29-30, “a plurality of corrugation crests and valleys distributed along a length of the chamber.” (See also, Fouss, Figs. 1 and 4) Cobb Fig. 20 shows a crest corrugation width which increases below the H_{TC} line and the valley corrugation width decreases below the H_{TV} line. The changes in width of the crest and valley corrugations at these transition lines are described in Cobb: Cols. 8 and 9. Cobb: Col. 1, line 64 to Col. 2, line 5 describe crest and valley corrugations with tapering width. Cobb discloses multiple crest sub-corrugations running upward from the base along crest corrugations. “Each one of a multiplicity of the corrugation crests includes a respective crest sub-corrugation feature thereon.” (Cobb: Col. 1, lines 32-34). Cobb Fig. 20 (as well as
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corrugation, each sub-corrugation having a height less than a local height of the crest corrugation with which the sub-corrugation is associated, each crest sub-corrugation terminating at an elevation lower than the top of the chamber,	figures 1-4, 13, 19, 21-23, et al.) depicts crest sub-corrugations (106) that run upwardly from opposing side bases along corrugation crests. (See also, Fouss, Col. 5, ll. 31-35, and Fig. 4.) Cobb Fig. 19 shows that the height (H_{SCC}) of the crest sub-corrugation is less than the height of the crest corrugation. Col. 8 also discloses a crest sub-corrugation height of less than 10% of the associated crest corrugation along “portions” of the crest above an elevation of $1/3$ the height of the chamber. Col. 8, lines 39-49. Cobb discloses that the height of each crest sub-corrugation diminishes with increasing elevation. Col. 8, lines 35-37 states “sub-corrugations [that] can be less deep . . . as the crest/valley gets more narrow.” As seen in Fig. 20, the crest corrugations become more narrow with increasing elevation. The crest sub-corrugations would thus become less deep with increasing elevation as well. This element is also a standard product design consideration, e.g. providing taper or draft to facilitate mold removal is a standard product design feature. Cobb Col. 8 describes crest sub-corrugations with tapering height. Col. 8, lines 34-49. Cobb: Col. 8, lines 57-66 discloses valley sub-corrugations that “gradually fade out” to nothing. A person of ordinary skill in the art would be motivated to add the “fade-out” feature to the crest sub-corrugation to improve the manufacturability, e.g. to facilitate removal of the chamber from its mold when the plastic has cooled. A tapered crest sub-corrugation that has a gradual “fade out” to nothing is a crest sub-corrugation which has a terminal end. Since the crest sub-corrugation runs upwardly from the side base, the terminal end of the crest
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wherein the crest sub-corrugations extend about one quarter to two-thirds of a height of the chamber.	sub-corrugation will inherently be located “at an elevation lower than the top of the chamber.” Fouss, also discloses that the crest sub-corrugations terminate below the top of the chamber. This is shown in figures 1, 3, and 6, and described in, among other places, Col. 6, lines 3-17 of the specification. Cobb discloses tapering the crest sub-corrugations with increasing elevation from the chamber base and specifically teaches tapering width to the H_{TC} line located at between 55% and 70% of the chamber height. (Col. 9, lines 1, 11-19; Fig. 20).
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The subject matter of claims 3 and 19 would have been obvious in view of Cobb with or without Fouss and/or Ellis.

G. Claims 4 and 20, Grounds 1-4

Dependent claim 4 and independent claim 20 are similar, in that each have a basic claim that is claim 1 or its equivalent, and add as a claim element that a maximum width of each crest sub-corrugation is no more than one-third of a local width of the associated crest corrugation.

The chamber embodiment depicted in Figure 19 of Cobb employs a crest sub-corrugation with a width of about 2.1 centimeters and a crest corrugation with a width of about 6.2 centimeters when these features are measured at their lowermost portions. The crest sub-corrugation width is therefore approximately

one-third of the crest corrugation width.³ Likewise, Fouss discloses crest sub-corrugations crest sub-corrugations with a width approximately one-third the width of the associated crest corrugation. The chamber embodiments depicted in Figures 4 and 5 of Fouss employ crest sub-corrugations with a width of about 1.0 centimeter and crest corrugations with a width of about 3.0 centimeters.

And, even if Cobb or Fouss does not explicitly disclose that their crest sub-corrugations are “no more than” one third of the local width of the crest corrugation, such a difference in relative dimensions would have been obvious. (Herlache Dec. ¶87, 116). *See also Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 1349 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984) (where the only difference between the prior art and the claims was a recitation of relative dimensions and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device).

‘583 Patent	Invalidating Disclosure
4. ... wherein a maximum width of each crest sub-corrugation is no more than one-third of a local width of	Cobb Fig. 19 patent drawing with or without Fouss Figs. 4 and 5 patent drawings

³ The ‘583 patent, Fig. 4 and Col. 7, lines 38-54 suggest that the crest and valley corrugation “webs”—the angled walls shared by the crests and valleys—can be excluded when measuring the width of the features. Nevertheless, however the measurement is taken, it is clear that Cobb contemplates a crest sub-corrugation that is a fraction of the width of the crest corrugation.

the associated crest corrugation.	
20. A chamber... (See chart of claim 19, <i>supra</i> , pp. 37-39.) ...wherein a maximum width of each crest sub-corrugation is no more than one-third of a local width of the associated crest corrugation.	See chart of claim 19, <i>supra</i> , pp. 37-39. Cobb Fig. 19 patent drawing with or without Fouss Figs. 4 and 5 patent drawings

The claimed subject matter of claims 4 and 20 would have been obvious in view of Cobb with or without Fouss and/or Ellis.

H. Claims 5 and 21, Grounds 1-4

Dependent claim 5 and independent claim 21 are similar, in that each have a basic claim that is claim 1 or its equivalent, and add as a claim element “a plurality of valley sub-corrugations, each valley sub-corrugation running downwardly from the top of the chamber and along part or all of a valley corrugation, each valley sub-corrugation having a height less than a depth of the valley corrugation with which the valley sub-corrugation is associated, each valley sub-corrugation terminating at an elevation lower than the top of the chamber.”

Cobb discloses these added limitations. (*See* Herlache Dec. ¶¶88-90, 117-119). Cobb discloses valley sub-corrugations 108, depicted in Figures 19 and 20, running downwardly from the top of the chamber and along part or all of valley corrugations 102. (Ex. 1002: Col. 1, lines 35-36, Col. 8, lines 50-55). The height of Cobb’s valley sub-corrugation feature 108 may be “less than 10% of the overall

height H_c of the corrugation crest . . . , at least along portions of the [valley corrugation] that extend from the top of the chamber downward to side locations.” (Ex. 1002: Col. 8, lines 50-55). Cobb also describes valley sub-corrugations 108 that “fade out” below the valley transition height H_{TV} “when moving further down along the chamber sidewall.” (Ex. 1002: Col. 8, lines 57-66).

‘583 Patent	Invalidating Disclosure
5. ... a plurality of valley sub-corrugations, each valley sub-corrugation running downwardly from the top of the chamber and along part or all of a valley corrugation, each valley sub-corrugation having a height less than a depth of the valley corrugation with which the valley sub-corrugation is associated, each valley sub-corrugation terminating at an elevation lower than the top of the chamber.	Cobb Col. 1, lines 35-36; Figs. 19-20. Cobb: Col. 8, lines 50-55: “valley sub-corrugation feature 108... along portions of the corrugation crest that extend from the top of the chamber downward to side locations...” Cobb: Col. 8, lines 50-55: “With respect to valley sub-corrugation feature 108, in one example the height H_{SCV} of the sub-corrugation feature is less than 10% of the overall height H_c of the corrugation crest ..., at least along portions of the corrugation crest that extend from the top of the chamber downward to side locations...” Figs. 19, 20: reference number 108. Cobb’s valley sub-corrugations 108 “fade out” below the valley transition height H_{TV}. (Col. 8, lines 57-66).
21. A chamber...(See chart of claim 19, <i>supra</i>, pp. 37-39). ... a plurality of valley sub-corrugations, each valley sub-corrugation running downwardly from the top of	See chart of claim 19, <i>supra</i>, pp. 37-39. Cobb’s chambers include multiple alternating valley corrugations and crest corrugations, positioned along the length of the chamber. Cobb Col. 1, lines 35-36; Figs. 19-20. Cobb:

the chamber and along part or all of a valley corrugation,	Col. 2, lines 38-40. Cobb: Col. 8, lines 50-55: “valley sub-corrugation feature 108... along portions of the corrugation crest that extend from the top of the chamber downward to side locations...”
each valley sub-corrugation having a height less than a depth of the valley corrugation with which the valley sub-corrugation is associated,	Cobb: Col. 8, lines 50-55: “With respect to valley sub-corrugation feature 108, in one example the height H_{SCV} of the sub-corrugation feature is less than 10% of the overall height H_c of the corrugation crest ..., at least along portions of the corrugation crest that extend from the top of the chamber downward to side locations...” Figs. 19, 20: reference number 108.
each valley sub-corrugation terminating at an elevation lower than the top of the chamber.	Cobb’s valley sub-corrugations 108 “fade out” below the valley transition height H_{TV} . (Col. 8, lines 57-66).

The claimed subject matter of claims 5 and 21 would have been obvious in view of Cobb with or without Fouss and/or Ellis.

I. Claim 6, Grounds 1-4

Dependent claim 6 is based on claim 5 and recites that each valley sub-corrugation terminates at an elevation above the opposing side bases. Cobb describes valley sub-corrugations 108 that “fade out” below the valley transition height H_{TV} “when moving further down along the chamber sidewall.” (Ex. 1002: Col. 8, lines 57-66). The disclosed sub-corrugation would necessarily terminate at an elevation above the opposing side bases. (*See also* Herlache Dec. ¶¶91-94).

‘583 Patent	Invalidating Disclosure
6. wherein each valley sub-corrugation terminates at an elevation above the opposing side bases.	Cobb Col. 8, lines 57-66.

The claimed subject matter of claim 6 would have been obvious in view of Cobb with or without Fouss and/or Ellis.

J. Claims 7, 13 and 18, Grounds 1-4

Dependent claims 7, 13, and 18 are similar in that each is a dependent claim that specifies that each valley sub-corrugation decreases in width and/or height as they approach the opposing side bases. Claim 7 requires that both height and width of the valley sub-corrugations diminish; Claims 13 and 18 require that only the height of the valley sub-corrugations decrease.

As already discussed, Cobb describes valley sub-corrugations 108 that “remain relatively uniform when moving from the top of the chamber downward in elevation until a valley transition height H_{TV} is reached, at which elevation the valley sub-corrugation feature 108 begins to gradually fade out (e.g., **width** (relative to side elevation view, where width of the sub-corrugation is measured in the lengthwise axis of direction of the chamber) **of the feature decreases and cross-sectional height of the feature decreases**) when moving further downward along the chamber sidewall.” (Ex. 1002: Col. 8, lines 57-66) (emphasis added). (See also Herlache Dec. ¶¶95, 106, and 114).

‘583 Patent	Invalidating Disclosure
7. The chamber of claim 6, wherein each valley sub-corrugation diminishes in both height and width in proximity to the opposing side bases, as width is measured in a direction which is parallel to the length of the chamber.	Cobb: Col. 8, lines 57-66 : “the valley sub-corrugation feature 108 may remain relatively uniform when moving from the top of the chamber downward in elevation until a valley transition height H_{TV} is reached, at which elevation the sub-corrugation feature 108 begins to gradually fade out (e.g., width (relative to side elevation view, where width of the sub-corrugation is measured in the lengthwise axis of direction of the chamber) of the feature decreases and cross-sectional height of the feature decreases) when moving further downward along the chamber sidewall.”
13. The chamber of claim 1, further comprising a plurality of valley sub-corrugations, each valley sub-corrugation running along a valley corrugation, downwardly from the top of the chamber towards the opposing side bases, wherein a height of each valley sub-corrugation decreases as the valley sub-corrugation approaches the opposing side bases.	<i>Id.</i>
18. The chamber of claim 14, wherein a height of each of the second plurality of sub-corrugations running in a valley corrugation decreases as the sub-corrugation approaches the opposing side bases.	<i>Id.</i>

The claimed subject matter of claims 7, 13, and 18 would have been obvious in view of Cobb with or without Fouss and/or Ellis.

K. Claims 8 and 14, Grounds 1-4

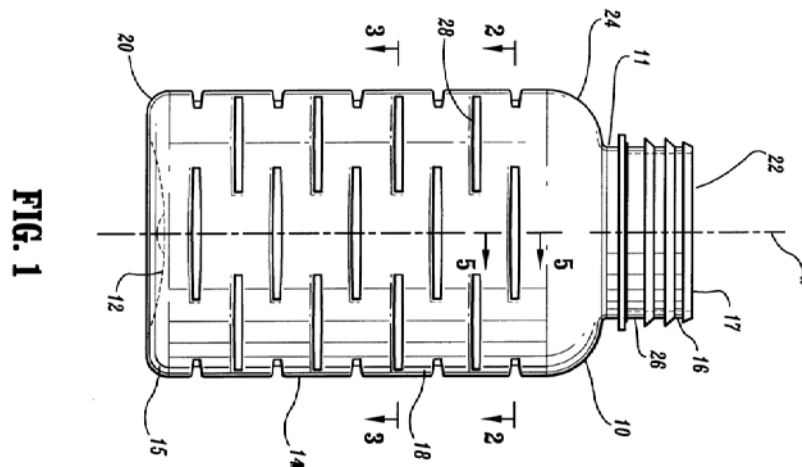
Dependent claim 8 (based on claim 5) and independent claim 14 are similar, in that each have a basic claim that is claim 1 or its equivalent, and add as a claim element the limitation that the upwardly extending crest sub-corrugations have termination points located at an elevation *higher* than downwardly extending valley sub-corrugations termination points. Independent claim 14 also introduces “flanges” associated with the side bases.

With respect to the flanges of claim 14, the ‘583 patent defines the flanges as “horizontal flanges 46 which provide bearing area upon the soil upon which the chamber rests.” (Ex. 1001: Col. 4, lines 57-59, Col. 5, lines 62-66). Cobb discloses a foot portion 22, which is illustrated in Figures 2, 4, 22, and 23 and is described as having “an end part 150 proximate the small end corrugation 30, 32, followed by an intermediate part 152 that extends along the length of the chamber to an opposite end part 154. The end part 150 is generally planar and of uniform thickness and its upper surface is recessed relative to the upper surface of intermediate part 152.” (Ex. 1002: Col. 9, lines 51-55). Cobb thus discloses the claimed flanges.

With respect to the overlapping sub-corrugation features, as discussed in Sections VII.H and VII.I with respect to claims 5, 21, and 6, Cobb describes valley sub-corrugations 108 that extend downwardly from the top of the chamber and

“fade out” below the valley transition height H_{TV} such that they terminate at an elevation above the opposing side bases. (Ex. 1002: Col. 8, lines 57-66). And, as established in Section VII.A with respect to claim 1, crest sub-corrugations 106 that extend upwardly from the side bases and terminate at an elevation lower than the top of the chamber are obvious over the teachings of the prior art.

Furthermore, Ellis teaches the use of overlapping corrugations. Specifically, Ellis discloses “staggered rows of grooves 28 to distribute the longitudinal stiffness evenly around outer surface 18 [of the container].” (Ex. 1004: Col. 5, lines 40-42).



The limitations of claims 8 and 14 create a staggered, overlapping arrangement of sub-corrugations to improve the chamber’s strength in exactly the manner taught by Ellis, which states that “the configuration of grooves 28 increase geometric strength and resistance to the deflection of sidewall 14 (FIG.1).” (Ex. 1004: Col. 5, lines 59-61). And the sub-corrugations remain in the widest, flattest areas of the corrugations, as taught by Cobb. (Ex. 1002: Col. 8, lines 11-16). It would thus

have been obvious to a person of ordinary skill in the art to provide a staggered, overlapping arrangement of sub-corrugations as required by claims 8 and 14.

(Herlache Dec. ¶¶96-98 and 107-110).

‘583 Patent	Invalidating Disclosure
8. The chamber of claim 5, wherein each valley sub-corrugation runs downwardly from the top of the chamber and terminates at a point on each opposing side that is above each opposing side base, wherein each crest sub-corrugation runs upwardly from an opposing side base and terminates at an elevation which is higher than the termination points of the valley sub-corrugations.	Cobb: Col. 8, lines 50-55: “valley sub-corrugation feature 108... along portions of the corrugation crest that extend from the top of the chamber downward to side locations...” Cobb: Col. 8, lines 57-66 : “sub-corrugation feature 108 begins to gradually fade out” Cobb discloses multiple crest sub-corrugations running upward from the base along crest corrugations. Cobb: Col. 1, lines 32-34; Fig. 20. <i>Id.</i> Obvious design choice to overlap the ends of parallel reinforcing sub corrugations Ellis: Col. 5, lines 40-42; 59-61 - “staggered rows of grooves... increase geometric strength and resistance to the deflection of sidewall”

14. A chamber, comprising: opposing side bases; sidewalls running from the opposing side bases and forming an arch-curve of the chamber; flanges associated with the opposing side bases and configured to support the chamber; a plurality of alternating crest corrugations and valley corrugations running transverse to a length of the chamber along the arch-curve of the chamber, wherein the crest corrugations decrease in width with elevation from the opposing side bases, and the valley corrugations increase in width with elevation from the opposing side bases, as width is measured in a direction parallel to the chamber length; a first plurality of sub-corrugations running upwardly from the opposing side bases on crest corrugations	Cobb discloses plastic stormwater chambers for receiving and dispersing water. Cobb: Col. 6, lines 36-37 describes “foot portions.” Cobb Fig. 2 shows a chamber (12) with sidewalls extending from opposing foot portion (22, 24). Cobb: Col. 6, lines 36-37 describes “foot portions.” The foot portions 22, 24 each have a horizontal flange. See Cobb: Col. 9, lines 51-55; Figs. 2, 4, 22, 23 Cobb’s chambers include multiple alternating valley corrugations and crest corrugations, positioned along the length of the chamber. Cobb: Col. 2, lines 38-40; Fig. 2 and Fig. 19 contain alternating crest (100) and valley (102) corrugations running transverse to chamber length along the arch curve. (See also, Fouss, Figs. 1 and 4) Cobb Fig. 20 shows a crest corrugation width which increases below the H_{TC} line and the valley corrugation width decreases below the H_{TV} line. The changes in width of the crest and valley corrugations at these transition lines are described in Cobb: Cols. 8 and 9. Cobb: Col. 1, line 64 to Col. 2, line 5 describe crest and valley corrugations with tapering width. Cobb discloses multiple crest sub-corrugations running upward from the base along crest corrugations. “Each one of a multiplicity of the corrugation crests includes a respective crest sub-corrugation feature thereon.” (Cobb: Col. 1, lines 32-34). Cobb Fig. 20 (as well as figures 1-4, 13, 19, 21-23, et al.) depicts crest
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to termination points which are at an elevation less than an elevation of a top of the chamber; and	sub-corrugations (106) that run upwardly from opposing side bases along corrugation crests. (See also, Fouss, Col. 5, ll. 31-35, and Fig. 4.) Cobb discloses that the height of each crest sub-corrugation diminishes with increasing elevation. Col. 8, lines 35-37 states “sub-corrugations [that] can be less deep . . . as the crest/valley gets more narrow.” As seen in Fig. 20, the crest corrugations become more narrow with increasing elevation. The crest sub-corrugations would thus become less deep with increasing elevation as well. This element is also a standard product design consideration, e.g. providing taper or draft to facilitate mold removal is a standard product design feature. Cobb Col. 8 describes crest sub-corrugations with tapering height. Col. 8, lines 34-49. Cobb: Col. 8, lines 57-66 discloses valley sub-corrugations that “gradually fade out” to nothing. A person of ordinary skill in the art would be motivated to add the “fade-out” feature to the crest sub-corrugation to improve the manufacturability, e.g. to facilitate removal of the chamber from its mold when the plastic has cooled. A tapered crest sub-corrugation that has a gradual “fade out” to nothing is a crest sub-corrugation which has a terminal end. Since the crest sub-corrugation runs upwardly from the side base, the terminal end of the crest sub-corrugation will inherently be located “at an elevation lower than the top of the chamber.” Fouss, also discloses that the crest sub-corrugations terminate below the top of the chamber. This is shown in figures 1, 3, and 6, and described in, among other places, Col. 6, lines 3-17 of the specification.
a second plurality of sub-corrugations running in valley	Cobb Col. 1, lines 35-36; Figs. 19-20. Cobb: Col. 8, lines 50-55: “valley sub-

corrugations at the top of the chamber and downwardly toward the opposing side bases	corrugation feature 108... along portions of the corrugation crest that extend from the top of the chamber downward to side locations...”
to an elevation which is less than the elevation of said termination points of the first plurality of sub-corrugations.	Cobb’s valley sub-corrugations 108 “fade out” below the valley transition height H_{TV} . (Col. 8, lines 57-66: “sub-corrugation feature 108 begins to gradually fade out”) It was an obvious design choice to overlap the ends of parallel reinforcing sub corrugations Ellis: Col. 5, lines 40-42; 59-61 - “staggered rows of grooves... increase geometric strength and resistance to the deflection of sidewall”

The claimed subject matter of claims 8 and 14 would have been obvious in view of Cobb with or without Fouss and/or Ellis.

L. Claim 9, Grounds 1-4

Claim 9 recites that the maximum width of each valley sub-corrugation is no more than one-third of a local width of the associated valley corrugation.

In the embodiment of the chamber depicted in Figure 19 of Cobb, the width of the valley sub-corrugation appears to be *at most* about 0.7 centimeters while the width of the valley corrugation appears to be about 2.1 centimeters. Accordingly, it appears that Cobb explicitly discloses, or at least renders obvious, a valley sub-corrugation that is no more than one-third of a local width of the associated valley corrugation as claimed in claim 9. (*See also* Herlache Dec. ¶199). Further, as

discussed in Section VII.G with respect to claim 4, even if Cobb does not explicitly disclose that its valley sub-corrugations are “no more than” one third of the local width of the valley corrugation, such a difference in relative dimensions would have been obvious. *See Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 1349 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984).

‘583 Patent	Invalidating Disclosure
9. ... wherein a maximum width of each valley sub-corrugation is no more than one-third of a local width of the associated valley corrugation.	Cobb Fig. 19 patent drawing

The claimed subject matter of claim 9 would have been obvious in view of Cobb with or without Fouss or Ellis.

M. Claim 10, Grounds 1-4

Claim 10 recites that the valley sub-corrugations have lower termination ends on the sidewalls of the chamber, the crest sub-corrugations have upper termination ends on the sidewalls of the chamber, and the crest sub-corrugation termination ends are higher in elevation than the elevations of the valley sub-corrugation terminal ends. Claim 10’s limitations are directed to the same staggered and overlapping configuration of the crest and valley sub-corrugations recited in claims 8 and 14, addressed in Section VII.K above. Claim 10 would have been obvious for the same reasons described above with respect to claims 8

‘583 Patent	Invalidating Disclosure
10. ...wherein the valley sub-corrugations have lower termination ends on the sidewalls of the chamber,	Cobb: Col. 8, lines 57-66 : “sub-corrugation feature 108 begins to gradually fade out”
wherein the crest sub-corrugations have upper termination ends on the sidewalls of the chamber,	See chart of claim 14, <i>supra</i> , p. 51. Cobb discloses that the height of each crest sub-corrugation diminishes with increasing elevation. Col. 8, lines 35-37
wherein the crest sub-corrugation termination ends are higher in elevation than elevations of the valley sub-corrugation terminal ends	Obvious design choice to overlap the ends of parallel reinforcing sub corrugations Ellis: Col. 5, lines 40-42; 59-61 - “staggered rows of grooves... increase geometric strength and resistance to the deflection of sidewall”

The claimed subject matter of claim 10 would have been obvious in view of Cobb with or without Fouss and/or Ellis.

N. Claim 11, Grounds 1-4

Claim 11 recites first and second pluralities of valley sub-corrugations located in the valley corrugations and extending towards each other. However, there is no limitation that says the two pluralities cannot be joined together, and thus claim 11 read literally reads on the Cobb’s valley sub-corrugations that extend across the entire arch curve of the chamber. (*See* Ex. 1002: Col. 2, lines 11-14; Col. 11, lines 44-51; Figs. 1-4 and 20).

To the extent claim 11 is limited to the embodiment of ‘583 Fig. 6, claim 11 is obvious over Cobb in view of Ellis. (Herlache Dec. ¶101-02). A person of

ordinary skill in the art, giving consideration to chamber weight, material costs, and manufacturing efficiency would be motivated to alter Cobb's design to provide discontinuous valley sub-corrugations. (Herlache Dec. ¶38, 53-61, 67-70). Ellis teaches that discontinuous corrugations can effectively provide additional stiffness. (Herlache Dec. ¶103; Ex. 1004: Col. 5, lines 8-17, 34-45, and 59-61). One of ordinary skill would be motivated to use Ellis's staggered, discontinuous arrangement on Cobb's valley sub-corrugations. (Herlache Dec. ¶67-70, 101-03).

‘583 Patent	Invalidating Disclosure
11. ...a first plurality of valley sub-corrugations and a second plurality of valley sub-corrugations, each of the first plurality of valley sub-corrugations running downwardly from the top of the chamber and along part or all of a valley corrugation and terminating at terminal ends above the elevation of the opposing side bases, each of the second plurality of valley sub-corrugations running upwardly from an opposing side base in the direction of said terminal ends of the first plurality of valley sub-corrugations.	Cobb Col. 1, lines 35-36; Figs. 19-20. Cobb: Col. 8, lines 50-55: “valley sub-corrugation feature 108... along portions of the corrugation crest that extend from the top of the chamber downward to side locations...” Alternatively: Cobb Col. 1, lines 35-36; Figs. 19-20; and Cobb: Col. 8, lines 50-55: in view of Ellis: Col. 5, lines 40-42; 59-61 - “staggered rows of grooves... increase geometric strength and resistance to the deflection of sidewall”

The claimed subject matter of claim 11 would have been obvious in view of Cobb with or without Fouss and/or Ellis.

O. Claims 12 and 17, Grounds 1-5

Claims 12 and 17 recites valley sub-corrugations having a constant width.

Cobb discloses valley sub-corrugations with constant width. Cobb states that sub-corrugations can decrease in height as the corrugation gets more narrow or stay the same depth but become more narrow. (Ex. 1002: Col. 8, lines 34-38). Thus, one of ordinary skill in the art can only infer that the decrease in height does not necessarily require tapering width. This inference is further supported by Figure 20, which depicts valley sub-corrugations with constant height from the top of the chamber down to the H_{TV} line.

Furthermore, providing valley sub-corrugations having a constant width as claimed in claims 12 and 17 is an obvious design choice. (Herlache Dec. ¶104, 113). Valley sub-corrugations may be of constant width or tapered width as determined by the designer. (Herlache Dec. ¶104-05). A person of ordinary skill in the art would be motivated to use valley sub-corrugations having a constant width because the mold for making such a product is simpler to fabricate than a mold having multiple angled elements. (Herlache Dec. ¶105). Further, a chamber with valley sub-corrugations having a constant width will tend to release more uniformly from a mold compared to a product with multiple angles. (Herlache Dec. ¶104-05). Thus, valley sub-corrugations having a constant width as claimed in claims 12 and 17 is an obvious design choice. (Herlache Dec. ¶104-05, 113).

Additionally, the crest sub-corrugations in Fouss have a constant width.
(See Ex. 1003: Figs. 2, 4, 5). It would have been obvious to provide valley sub-corrugations with constant width in view of the disclosure of Fouss.

Additionally, November discloses a corrugated tubing with valley corrugations of constant width. (Ex. 1007: Col. 3, lines 40-49; Figs. 9-10). It would have been obvious to provide valley sub-corrugations with constant width in view of the disclosure of November.

'583 Patent	Invalidating Disclosure
12. ... wherein a width of each valley sub-corrugation is constant	Obvious design choice to provide valley sub-corrugations having a constant width or
17. ...wherein a width of each of the second plurality of sub-corrugations running in a valley corrugation is constant.	Cobb: Col. 8, lines 34-38- "sub-corrugations can be less deep..as the crest/valley gets more narrow" [e.g., reduce depth, not width]; Fig. 20 or Fouss: Figs. 2, 4, and 5. or November: Col. 3, lines 40-49; Fig. 9 and 10

The claimed subject matter of claims 12 and 17 would have been obvious in view of Cobb with or without Fouss, Ellis, and/or November.

P. Claim 15, Grounds 1-4

Claim 15 recites that the sub-corrugations have a width and a depth that change with the width of the corrugation with which the sub-corrugation is associated.

Cobb discloses that the width and/or height of the sub-corrugations can

change along with changes to the width of the corrugations. (Ex. 1002: Col. 8, lines 34-38; *see also* Herlache Dec. ¶111). Cobb also discloses that the “width . . . of the [valley sub-corrugation] feature decreases **and** cross-sectional height of the feature decreases” along sections of the valley corrugation with changing width. (Ex. 1002: Col. 8, lines 57- 66; *see also* Herlache Dec. ¶111).

‘583 Patent	Invalidating Disclosure
15. The chamber of claim 14, wherein a width and a depth of each sub-corrugation change along part or all of the sub-corrugation as the width of the crest corrugation or valley corrugation with which the sub-corrugation is associated changes.	“For a substantially fixed sidewall thickness, as a general rule the sub-corrugations can be less deep (shorter height H_{SCC} or H_{SCV}) as the crest/valley gets more narrow. The sub-corrugations could also stay the same depth and get more narrow.” (Col. 8, lines 34-38). “the valley sub-corrugation feature 108 may remain relatively uniform when moving from the top of the chamber downward in elevation until a valley transition height H_{TV} is reached, at which elevation the sub-corrugation feature 108 begins to gradually fade out (e.g., width (relative to side elevation view, where width of the sub-corrugation is measured in the lengthwise axis of direction of the chamber) of the feature decreases and cross-sectional height of the feature decreases) when moving further downward along the chamber sidewall.” (Col. 8, lines 57- 66).

The claimed subject matter of claim 15 would have been obvious in view of Cobb with or without Fouss and/or Ellis.

Q. Claim 16, Grounds 1-4

Claim 16 recites that the termination points of the crest sub-corrugations are the same elevation.

In each of the Figures of Cobb, the crest sub-corrugations all terminate at the same elevation.

Similarly, Figures 1 and 2 of Fouss disclose crest sub-corrugations that all terminate at the same elevation.

Further it would be an obvious design choice to design a chamber with crest sub-corrugations having a consistent termination point elevation as it provides a more consistent load distribution, a simpler mold, and a symmetric product that can be more easily stacked together for distribution and transport than an asymmetric product. (Herlache Dec. ¶112).

'583 Patent	Invalidating Disclosure
16. The chamber of claim 14, wherein the elevations of the termination points of the first plurality of sub-corrugations are the same.	Cobb: Figs. 20 and 1-4. or Fouss: Figs 1 and 2.

The claimed subject matter of claim 16 would have been obvious in view of Cobb with or without Fouss and/or Ellis.

VIII. CONCLUSION

All of the claims 1-21 of the '583 patent are invalid under 35 U.S.C. §103(a). The small differences between the claims of the '583 patent and the

disclosure of Cobb require no more than the rearrangement or substitution of known elements to perform as those of ordinary skill in the art would have expected. Further, those of ordinary skill in the art had straightforward motivations for making these modifications.

Petitioner requests inter partes review of claims 1-21 of the '583 patent, that the PTAB determine those claims to be unpatentable under 35 U.S.C. §103(a), and that the claims be cancelled.

Respectfully submitted,

January 5, 2017

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EXHIBIT LIST

Exhibit No.	Description
1001	US Patent No. 8,672,583 to Mailhot et al (“’583” or “’583 patent”)
1002	US Patent No. 8,491,224 to Cobb et al. (“Cobb”)
1003	US Patent No. 4,360,042 to Fouss et al. (“Fouss”)
1004	US Patent No. 6,497,333 to Ellis et al. (“Ellis”)
1005	US Patent No. 4,759,661 to Nichols et al. (“Nichols”)
1006	US Patent No. 7,306,399 to Smith (“Smith”)
1007	US Patent No. 2,876,801 to November (“November”)
1008	Designing with Plastics and Composites A Handbook, by Rosato, DiMattia, & Rosato (1991) (“Rosato”)
1009	Declaration of Russell L. Herlache
1010	Patent Prosecution File History of US Patent No. 8,672,583 to Mailhot et al

CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMITS

I hereby certify that this PETITION FOR INTER PARTES REVIEW OF U.S. PATENT 8,672,583 PURSUANT TO 37 C.F.R. § 42.101 complies with the type-volume limitation of 37 CFR § 42.24 and contains 13,631 words as determined by Microsoft Word “Word Count.”

Dated: January 5, 2017

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6, the undersigned hereby certifies that service was made to the correspondence address of record for the '583 patent as listed in the records of the United States Patent and Trademark Office.

Date of Service: January 5, 2017
Manner of Service: Federal Express Overnight Delivery; Electronic Mail; and The Patent Review Processing System.
Documents Served: Petition for *Inter Partes* Review of U.S. Patent No. 8,672,583; Exhibits as listed above.

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