

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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WHITEWATER WEST INDUSTRIES, LTD.,

Petitioner

v.

AMERICAN WAVE MACHINE, INC.,

Patent Owner.

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Patent No. 10,662,663

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*Inter Partes* Review No. IPR2022-01032

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**PETITION FOR *INTER PARTES* REVIEW**



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## **I. INTRODUCTION**

Pursuant to 35 U.S.C. § 311 and 37 C.F.R. § 42.100, Petitioner WhiteWater West Industries, Ltd., (“Petitioner”) petitions for *inter partes* review (“IPR”) of Claims 1-9, 13, and 14 of U.S. Patent No. 10,662,663 (“’663 Patent”) (Ex. 1001), owned by American Wave Machines, Inc. (“AWM”).

## **II. MANDATORY NOTICES PURSUANT TO 37 C.F.R. § 42.8(A)(1)**

### **A. Real Parties in Interest**

The real parties in interest are Petitioner WhiteWater West Industries, Ltd., and Murphy’s Waves, Ltd., Surf Loch, LLC, and Aquatic Development Group.

### **B. Related Matters**

Petitioner is concurrently filing petitions challenging the validity of U.S. Patent Nos. 8,434,966 (IPR2022-01033), 9,279,263 (IPR2022-01034), and 10,738,492 (IPR2022-01035). Each of the challenged patents is owned by American Wave Machines, Inc., the owner of the patent at issue in this Petition. None of the other challenged AWM patents is part of the same patent family as the ’663 Patent at issue in this Petition. Petitioner is not aware of any other judicial or administrative matter that would affect, or be affected by, a decision in this proceeding.

### **C. Petitioner’s Lead and Back-up Counsel and Service Information (37 C.F.R. §§ 42.8(b)(3))**

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

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Proof of service of this Petition and exhibits is provided in the appended certificate of service.



### **III. STANDING (37 C.F.R. §§ 42.101 and 42.104(a))**

Petitioner certifies that the '663 Patent is available for IPR, and that Petitioner and the real parties in interest are not barred or estopped from requesting IPR challenging the claims of the '663 Patent on the grounds identified herein. Specifically, (1) Petitioner and the real parties in interest are not the owners of the '663 Patent, (2) Petitioner and the real parties in interest have not filed a civil action challenging the validity of any claim of the '663 Patent, and (3) Petitioner and the real parties in interest have not been served with a complaint alleging infringement of the '663 Patent.

The undersigned authorizes the charge of any required fees to Deposit Account No. 50-0977.

### **IV. IDENTIFICATION OF CHALLENGE (37 C.F.R. § 42.104(b))**

Petitioner requests *inter partes* review and cancellation of claims 1-9, 13, and 14 of the '663 Patent in view of Grounds 1 through 7 below, based on the following prior art references:

- (1) U.S. Patent No. 6,912,738 to Black ("Black") (Ex. 1003);
- (2) U.S. Patent No. 5,86,983 to Wharton. ("Wharton") (Ex. 1004);
- (3) Wisconsin Department of Commerce Conditional Approval Plan for Big Chiefs Mount Olympus Theme Park, dated June 20 2007 ("Mount Olympus") (Ex. 1005)



(4) A. J. Peterka, HYDRAULIC DESIGN OF STILLING BASINS AND ENERGY  
DISSIPATORS (8th Ed., 1984) (“Peterka”) (Ex. 1007)

Ground	Prior Art Reference(s)	Basis <sup>1</sup>	Challenged Claims
1	Black	§ 102	1, 4-6, and 9
2	Black	§ 103	1, 2, 4-6, and 9
3	Mount Olympus	§ 102	1, 4, 6, 9, 13, and 14
4	Black and Wharton	§ 103	1, 2, 4-9
5	Black, Wharton, and Mandalay Bay	§ 103	3
6	Black, Wharton, and Mount Olympus	§ 103	13, 14
7	Black and Peterka	§ 103	1, 4-6, and 9

The ’663 Patent has an AIA priority date of September 27, 2016. (Ex. 1001.) Claims 1, 3-9, 13, and 14 of the ’663 Patent are unpatentable under the AIA versions of the statutory bases for unpatentability, as detailed below. This Petition sets forth “a reasonable likelihood that the Petitioner will prevail with respect to at least 1 of the claims challenged in the petition.” *See*, 35 U.S.C. § 314(a); *see also*, *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1351 (2018). As demonstrated by a preponderance of the evidence, including the prior art and the declaration of Dr. Glen Stevick providing expert testimony (Ex. 1009), all of claims 1-9, 13, and 14 are invalid. (Ex. 1009, ¶¶ 35-43.)

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<sup>1</sup> All citations to §§ 102 and 103 refer to current (AIA) versions.



The Board has identified six, non-exclusive factors when evaluating whether to institute: (1) similarities and material differences between the asserted art and prior art during examination; (2) cumulative nature of the asserted art and prior art evaluated during examination; (3) extent to which the asserted art was evaluated; (4) extent of overlap between arguments during examination and how a petitioner relies on the prior art or a patent owner distinguishes the prior art; (5) whether petitioner sufficiently points out how the Office erred in evaluating the asserted prior art; and (6) extent to which additional evidence and facts presented in the petition warrant reconsideration. *Becton Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 at 17–18 (P.T.A.B. Dec. 15, 2017). Across the various grounds, each of these factors weighs in favor of institution.

The grounds presented in this Petition are not cumulative to grounds in the prosecution history. Among many other references, the Examiner never considered Black (grounds 1, 2, 4-7), Mount Olympus (grounds 3, 6), Mandalay Bay (ground 5) or Peterka (ground 7), nor the combination of any of these references with Wharton (grounds 4-6).

Grounds 4-6 are based on combinations of art including Wharton as a secondary reference. Although Wharton was cited against the originally filed claims in the '663 Patent file history, it was cited only in combination with Lochtefeld, which is not raised in this petition. Following an initial rejection based on Lochtefeld



and Wharton, the claims were heavily amended, and there is no record of whether the Examiner again considered Wharton in light of the amended claims. As described below in the prosecution history section, Petitioner submits that the Examiner did not understand or recognize teachings of Wharton as applied to the amended claims. Accordingly, Petitioner submits that grounds 4-6 satisfy factors (3) through (6) of the *Becton Dickson* factors. *Becton Dickinson*, IPR2017-01586, Paper 8 at 17–18.

Consequently, the Examiner was unable to appreciate that the limitations recited in each of claims 1, 3-9, 13, and 14 of the '663 Patent were all well-established in the prior art. These prior art references, with the addition of the testimony submitted in the Declaration of Glen Stevick, establish important technical details needed to appreciate the anticipated and obvious elements of the challenged claims. Thus, with respect to each of the grounds presented, the *Becton Dickson* factors support institution.

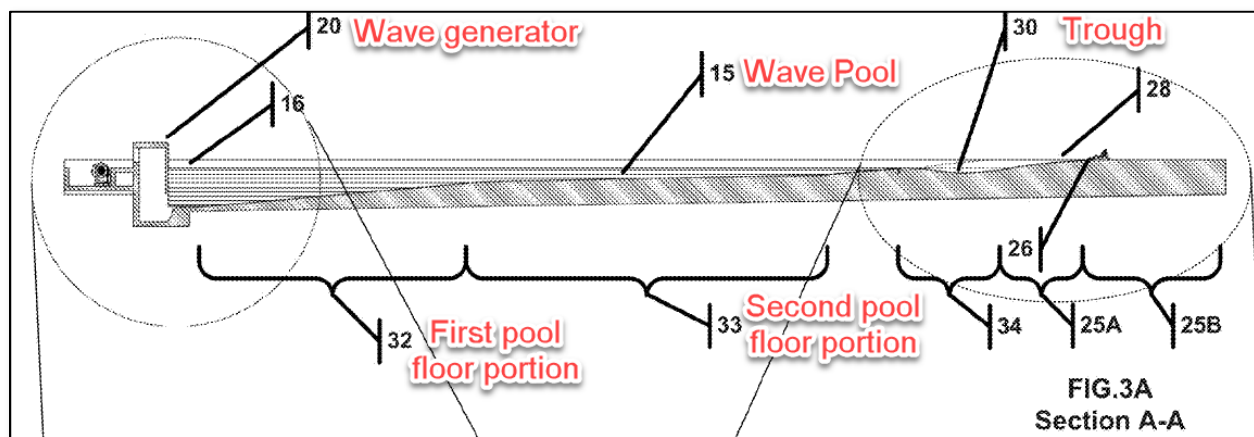
## **V. THE '663 PATENT**

### **A. Overview**

The '663 Patent is assigned to American Wave Machines, Inc. (“AWM”), as shown on the cover sheet of the patent, and was granted from an application filed and claims priority as a continuation-in-part to an application filed on September 27, 2016. (Ex. 1001). The '663 Patent claims are directed to a wave generating



apparatus with three main aspects: a wave generator (20), a wave pool (15), and a



wave-damping trough (30), as shown in the annotated figure 3A from the '663 Patent (Ex. 1001), below.

First is the wave generator (20). The particular form of the wave generator is not important to the claimed invention. The '663 Patent speaks in general terms of “a wave generator” and teaches that while the figures “illustrate a chamber-base wave generator, other wave generators can use the damping trough disclosed herein.” (Ex. 1001 at 6:43-45.) Claim 1 requires only “a wave generator” and the dependent claims get no more specific as to the type. Wave generators have been in use in amusement attractions since before the turn of the 20<sup>th</sup> century. (See Ex. 1004.) In short, the wave generator portion of the '663 Patent is not inventive. (Ex. 1009, ¶¶ 39-40.)

Second, the '663 Patent claims a wave pool (15) with a particular profile. The pool has a deep edge (16) and a “beach” edge (25B). This is also not a new aspect to wave pool amusement attractions. The prior art introduction below shows that



wave pools with a deep end and a shallow, walk-out end (a beach edge) have been in use in water parks for decades. The 1897 Wharton patent describes this pool shape, as do the wave pool plans from the 1990's and early 2000's included in this petition. Claim 1 of the '663 Patent also states that the wave pool has at least two sloped portions (32, 33), with the first sloped portion (32) having a steeper slope than the second sloped portion (33). This is simply a re-creation of natural formations that create waves at the seashore as one moves from deep water toward the beach. (Ex. 1009, ¶¶ 41-42.)

Finally, the '663 Patent claims a “wave-damping trough” that is separated from the wave pool by a mound. According to the only independent claim, when the wave generator is not actuated, the wave pool and the wave-dampening trough each maintain a separate static body of water below the mound height. When the wave generator is actuated, a wave formed at the deep end travels toward the mound, and spills over it into the wave-damping trough. The wave damping trough dampens the incoming wave energy and also dampens the wave backwash. But wave damping troughs are also not new in the art. Wharton disclosed this in 1897, and similar features have been used to control erosion (i.e., to dampen waves) on seashores for decades, and have been used in wave pools at least 18 years before the '663 Patent was filed. (Ex. 1009, ¶ 43.)

In short, each aspect of the '663 Patent was well known and employed in water



parks decades before the '663 Patent was filed. Several of the prior art references disclose each limitation explicitly. For other references, the '663 Patent introduces only minor obvious variations. Under either section 102 or 103, the '663 Patent is subject to cancellation. (Ex. 1009, ¶ 44.)

## **B. Illustrative Claim**

Claim 1 is the only independent claim, and is reproduced below (element numbering added in bold brackets; *see* section XII for full claim listing).

'663 Patent, Claim 1
<b>[1 Preamble]</b> 1. A wave-generating apparatus, comprising:
<b>[1A]</b> a deep edge;
<b>[1B]</b> a beach edge having a shore and a shore terminal edge;
<b>[1C]</b> a wave generator adjacent to the deep edge;
<b>[1D]</b> a wave pool with a pool bottom, wherein the pool bottom comprises two portions, a first pool bottom portion having a first angle of inclination relative to horizontal, and a second pool bottom portion having a second angle relative to horizontal, wherein the first angle is greater than the second angle; and
<b>[1E]</b> a wave-damping trough adjacent to the shore and adapted to retain water, the trough comprising:
<b>[1E.1]</b> a mound with a mound height forming a first edge of the wave-damping trough that separates the water in the wave-damping trough from the water in the wave pool;
<b>[1E.2]</b> a trough bottom; and



<b>[1E.3]</b> a second edge of the wave-damping trough extending from the trough bottom and sloped upward to meet the shore and the beach edge of the apparatus;
<b>[1F]</b> wherein when the wave generator is not actuated, the wave pool retains water defining a static water level that is below the mound height of the wave-damping trough, and the wave-damping pool retains a static body of water below the mound height separated from the water in the wave pool; and
<b>[1G]</b> wherein when the wave generator is actuated, a wave forms at the deep edge, breaks over the junction of the first pool bottom portion and the second pool bottom portion,
<b>[1H]</b> travels over the second pool bottom portion, then travels over the mound of the wave-damping trough toward the shore terminal edge, and
<b>[1I]</b> wherein the wave energy is dampened by the static body of water retained in the wave-damping trough, such that the wave white water is dampened as the wave travels from the first edge of the wave-damping trough towards the second edge of the wave-damping trough and the shore, and the wave backwash is dampened as it travels from the second edge of the wave-damping trough towards the first edge of the wave-damping trough.

The prior art relied on in this Petition includes Black, Wharton, Mount Olympus, Mandalay Bay, and Peterka, which, as set forth below, render claims 1-9, 13, and 14 unpatentable under 35 U.S.C. § 311.

### **C. Prosecution History**

During prosecution, original claims 1-2 and 6-8 of the '663 Patent were rejected under 35 U.S.C. § 103 as being anticipated by Wharton (Ex. 1004) in view of US 2010/0125943 to Lochtefeld (Ex. 1008). With respect to claim 1, the Examiner determined that Wharton taught a wave pool with an inclined bottom



defining a deep edge and a beach edge; a shore adjacent to the beach edge; a wave generator adjacent to the deep edge; a portion of the shore above static water level; an open wave-damping trough adjacent to the shore and adapted to retain water; wherein the wave energy is dampened when the wave encounters the water retained in the trough. (Ex. 1002, page 80.) The only aspect not disclosed by Wharton was a trough having different regions with differing widths and upward slopes. (*Id.*) The Examiner found that Lochtefeld supplied the missing teaching of a trough having different regions with differing widths and upward slopes. (*Id.*, pages 80-81.) Claims 2 and 6-8 were also obvious over Wharton in view of Lochtefeld.

The remaining dependent claims (claims 3-5, 9-13) were rejected as obvious over Wharton in view of Lochtefeld and further in view of additional references.

On December 31, 2019, AWM revived the then-abandoned application and filed a response to the Office Action, including by making extensive amendments<sup>2</sup> to the claims and arguing that the cited prior art did not teach a particular arrangement of features recited in the newly amended claims: “A salient point of difference between the present Application and the prior art is that in the present Application, the wave-generating apparatus has a wave-damping trough that is a

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<sup>2</sup> The amendments improperly showed only the added language underlined; deletions and other modifications to the claims were not indicated per MPEP regulations. [Dec. 31, 2019 Response, Ex. 1002 at pp. 103-106.]



separate body of water, located away from the location where the wave breaks or curls.” (Ex. 1002, page 107.)

In distinguishing the prior art, AWM argued that Wharton teaches that the wave breaks *directly above* the raised portion (mound), and thus “does not anticipate the limitation of the amended claim 1.” (*Id.*, page 109-110.) Likewise, AWM argued that Lochtefeld teaches that the wave breaks adjacent to the wave damping chamber, which is “disadvantageous.” (*Id.*, page 111.) Thus, according to AWM, the configurations allegedly taught by Wharton and Lochtefeld did not anticipate the amended claim because “[h]aving the wave break prior to entering the wave-damping trough 30, as the present Application teaches, at a significant distance away from where the wave-damping trough 30 begins (i.e., the entire length of the second portion of the upwardly-inclined wave pool bottom 33), gives the advantage of allowing the aquatic sports enthusiast to ride an undampened wave in its entirety.” (*Id.*, page 112.) But claim 1 does not include a limitation requiring the wave to break “a significant distance away” from the trough.

With respect to the other references cited in combination with Wharton and Lochtefeld, AWM argued that they do not teach the allegedly missing teaching of a wave-damping trough. (*Id.*, page 112.) AWM affirmatively stated that all other grounds for rejection would remain unaddressed in light of the amendments and arguments summarized here. (*Id.*)



On March 31, 2020, amended claims 1-14 were allowed without comment by the Examiner. (*Id.*, page 137.)

The Office, in reliance on representations made by AWM, misapprehended the applicability of Wharton to amended claim 1 of the '663 Patent. The Examiner never considered Black (Ex. 1003), Mount Olympus (Ex. 1005), Mandalay Bay (Ex. 1006) or Peterka (Ex. 1007) during examination of the application. Consequently, the Office never considered the arguments raised by this Petition – that each of Black and Mount Olympus alone and in various combinations with each other and with Wharton and Peterka anticipate and/or render obvious every element of claims 1, 3-9, 13, and 14 of the '663 Patent.

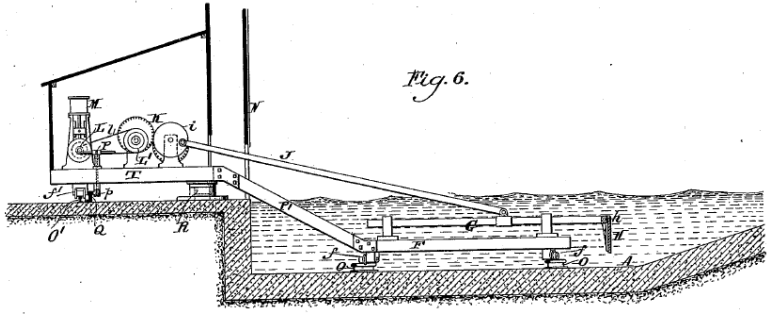
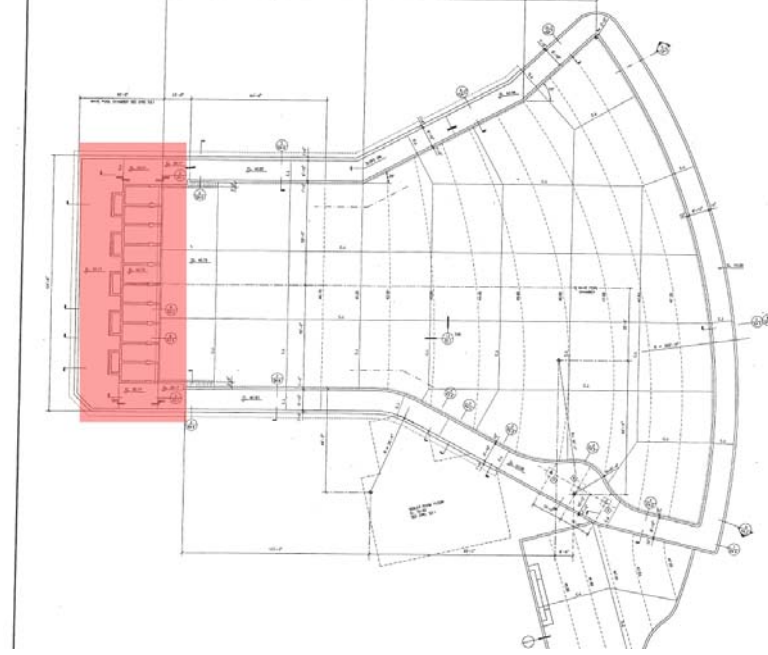
## **VI. OVERVIEW OF THE PRIOR ART**

### **A. General Overview**

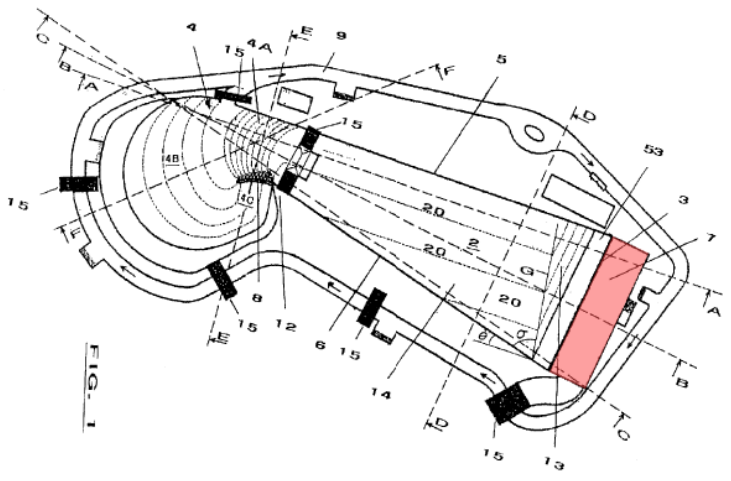
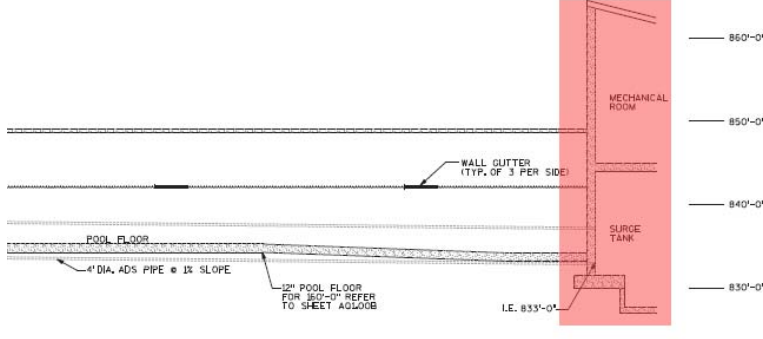
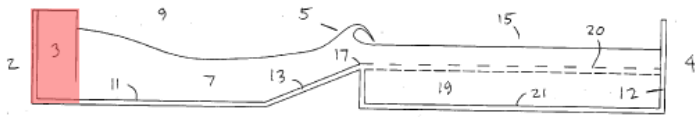
#### **1. Wave generators**

Wave pools employing wave generators have been in constant use in water parks for amusement purposes since before the turn of the 20<sup>th</sup> Century. Wave generators can take several forms. One of the earliest forms was essentially an underwater plow that would push water forward to create a wave. More modern wave generators include sleds on a track that push water, and chamber-based wave generators, which the '663 Patent admits are prior art. (*See* Ex. 1001 at 6:43-45; Ex. 1009, ¶¶ 39-40.) The table below depicts a timeline of wave generators found in the prior art.



Year/Prior Art Reference	Representative Image of Wave Generators
1897 (Wharton, Ex. 1004)	
1998 (Mandalay Bay, Ex. 1006)	



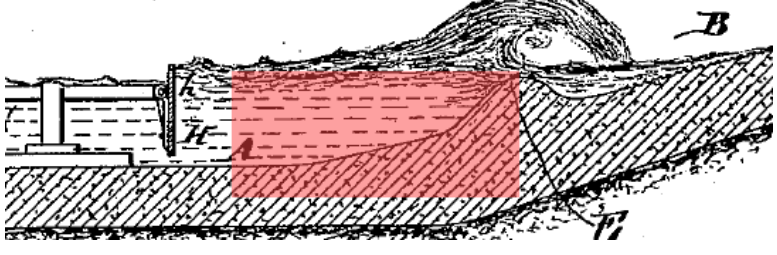
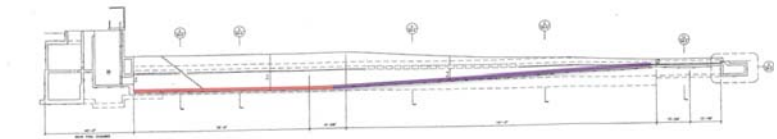
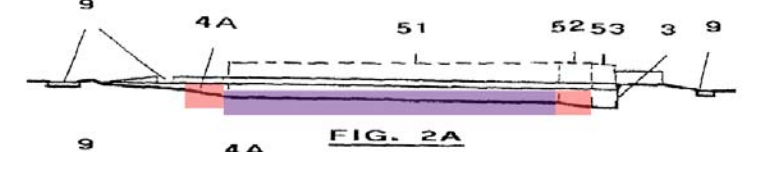
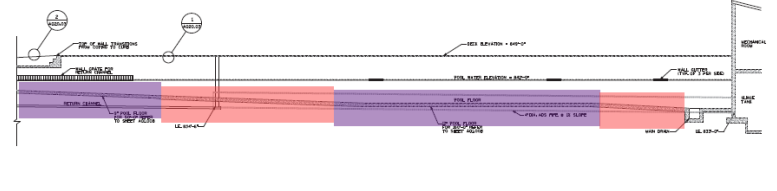
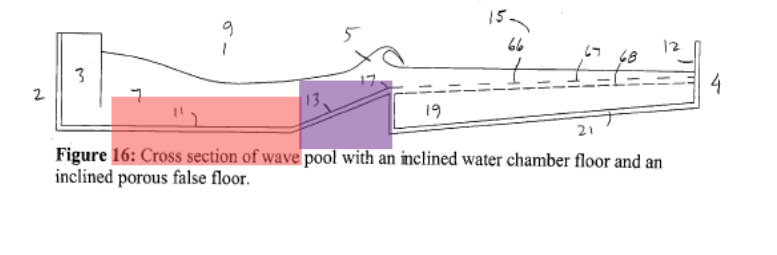
Year/Prior Art Reference	Representative Image of Wave Generators
2000 (Black, Ex. 1005)	
2007 (Mount Olympus, Ex. 1005)	
2009 (Lochtefeld, Ex. 1008)	 <p>Figure 2: Cross section A-A' of wave pool.</p>

## 2. Pool floor profile

Wave pools have, since the beginning, employed a sloped pool floor. That is, the waves are generated at a deep end of the pool, and the pool floor slopes up to a shallow end that allows a user to simply walk out of the pool, as if on a real beach.



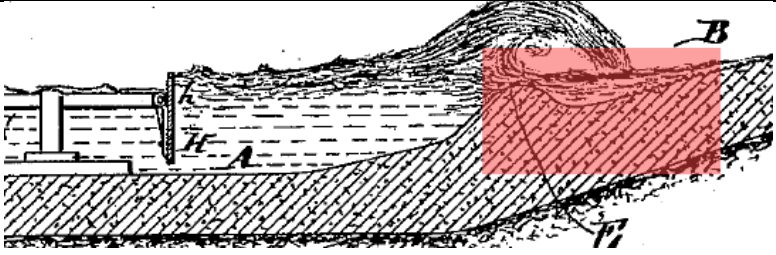
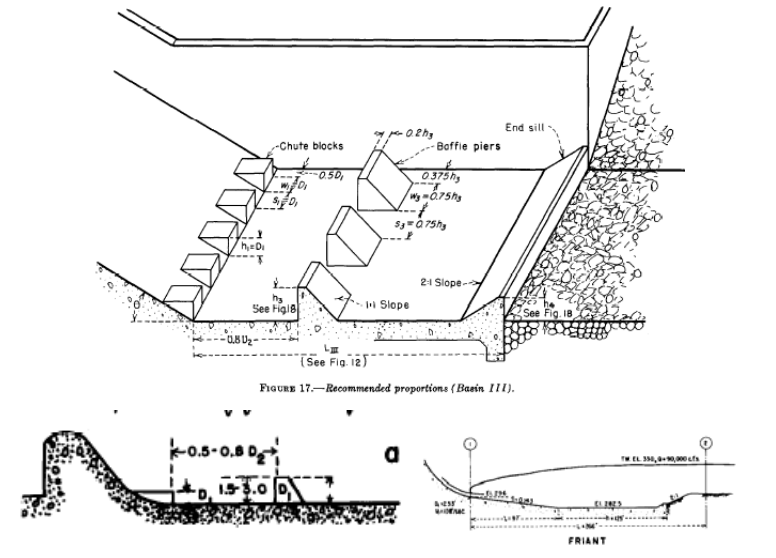
It has also been well known that instead of providing a constant-slope pool floor, the wave pool experience can be enhanced by providing a pool floor with different sections having different slopes. Just as in nature, different contours or slopes on the floor cause different wave profiles on the surface. (Ex, 1009, ¶¶ 41-42.) The table below depicts a timeline of sloping wave pool profiles found in the prior art.

Year/Prior Art Reference	Representative Image of Pool Floor Profiles
1897 (Wharton, Ex. 1004)	
1998 (Mandalay Bay, Ex. 1006)	
2000 (Black, Ex. 1005)	
2007 (Mount Olympus, Ex. 1005)	
2009 (Lochtefeld, Ex. 1008)	

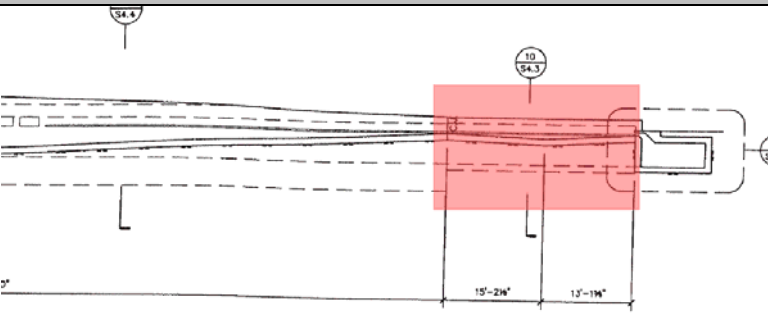
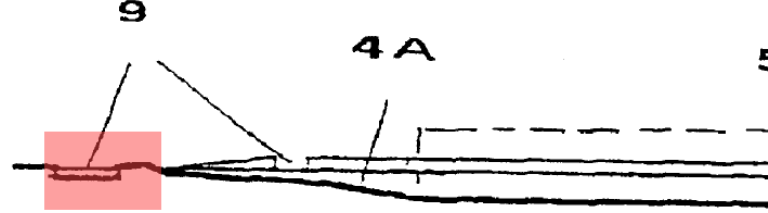
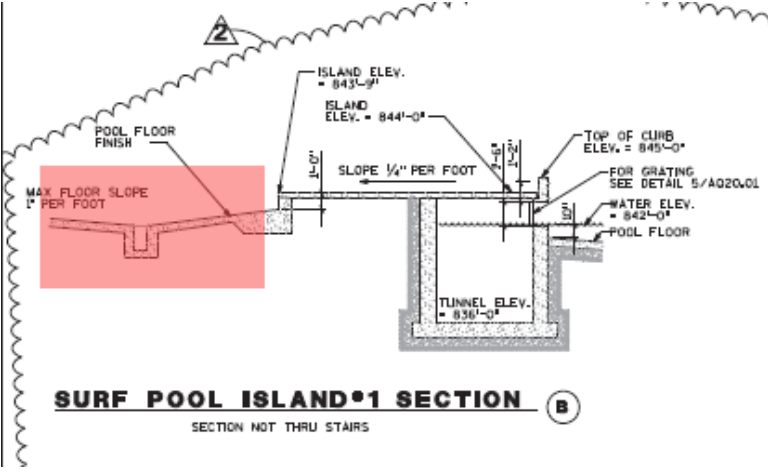
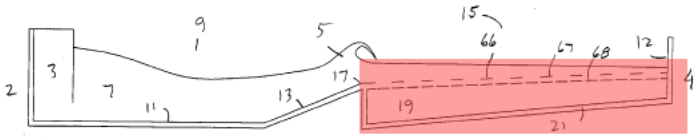


### 3. Wave-damping trough

Just as the wave pool floor profile mimics a seashore, the concept of using a wave-damping trough also comes from actual use of troughs for wave erosion abatement purposes. The concept is straightforward – by providing a mound and a trough, the energy of an incoming wave can be dissipated, thereby also controlling backwash. The wave-damping trough has been used in amusement wave pools since at least 1897, when it was disclosed in the Wharton patent. (Ex, 1009, ¶ 43.) The timeline below provides more examples of its use in nature and in wave pools.

Year/Prior Art Reference	Examples of Prior Art Wave-Damping Troughs
1897 (Wharton, Ex. 1004)	
1958 (Peterka, Ex. 1007)	 <p>FIGURE 17.—Recommended proportions (Basin III).</p>



Year/Prior Art Reference	Examples of Prior Art Wave-Damping Troughs
1998 (Mandalay Bay, Ex. 1006)	
2000 (Black, Ex. 1005)	
2007 (Mount Olympus, Ex. 1005)	 <p><b>SURF POOL ISLAND #1 SECTION B</b> SECTION NOT THRU STAIRS</p>
2009 (Lochtefeld, Ex. 1008)	 <p><b>Figure 16:</b> Cross section of wave pool with an inclined water chamber floor and an inclined porous false floor.</p>

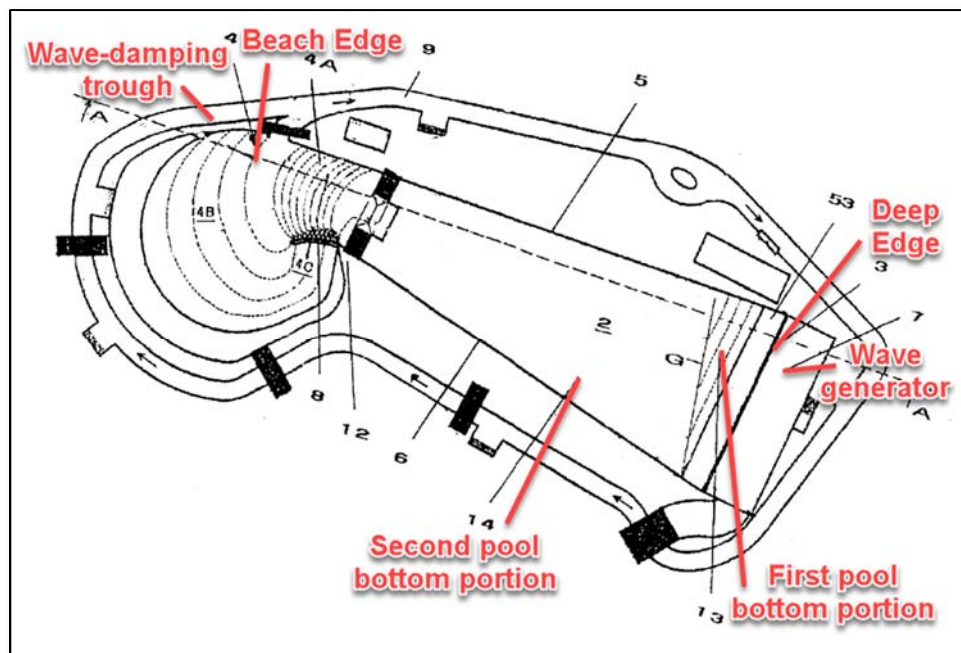


## B. Black

Black was filed as a PCT application on Dec. 13, 2000, entered the US National Stage on October 9, 2002, and issued on July 5, 2005. (Ex. 1003, page 1.)

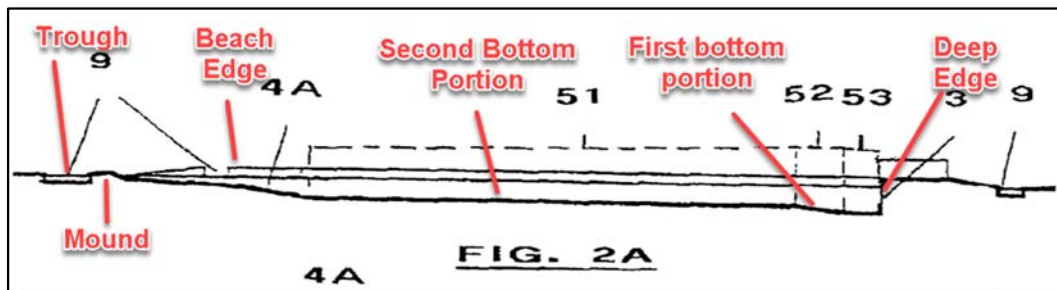
Black is prior art under 35 U.S.C. § 102. Black was not cited during prosecution.

Black discloses a wave pool 1 having a deep edge 3 and a beach edge 4, with wave generators 7 adjacent to the deep edge. The wave pool comprises two bottom portions, with a first bottom portion 13 having a first slope, and a second bottom portion 14 having a second, less steep slope. Black also has a wave damping trough 9 adjacent to the shore at the beach edge, with the wave damping trough being separated from the wave pool by a mound. The wave damping trough 9 has a static body of water that dampens incoming wave white water and dampens wave backwash traveling back toward the wave pool. (Ex. 1003, FIGS. 1, 2A.) Modified





versions of FIGS. 1 (plan view) and 2A (sectional view along line A-A) are included here, indicating each of the features.<sup>3</sup>



According to Black, the floor of the wave pool has two bottom portions 13 and 14 that are similar to an artificial reef. (Ex. 1003 at 6:52-55.) The two floor portions are “substantially mutually exclusive,” with a boundary G between them. (Ex. 1003 at 8:16-29.) The wave is generated at the deep edge, and breaks along the line of the reef. (*Id.* at 10:6-15.) FIG. 1 shows the two floor portions are angled such that the wave breaks from side 5 toward side 6, but other configurations are possible. (*Id.* at 6:44-55, 7:35-38, 8:45-51.)

At the far end (away from the wave generator), the waterway “may extend upwards by an extent sufficient to contain a required amount of water within the waterway 2 but insufficient to prevent waves from travelling over the end 4 into the lazy river 9.” (*Id.* at 8:65-9:15.) This is shown in FIG. 2A where the profile shows an upward slope, culminating in a mound that separates the wave pool (waterway 2)

<sup>3</sup> FIG. 1 is modified to remove extraneous indicators and lines and to add annotations relevant to this Petition. FIG. 2A is modified only to add annotations.



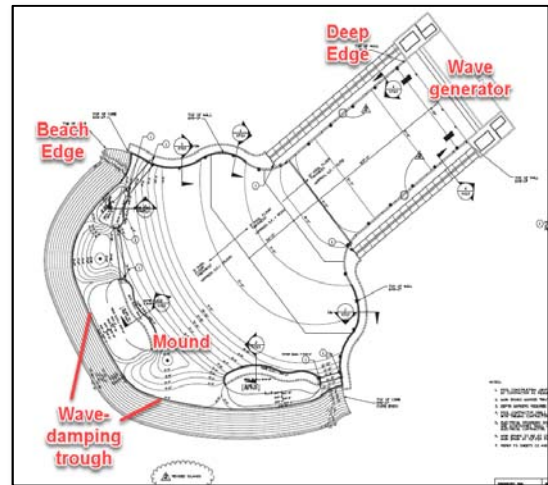
from the wave-damping trough (external channel 9 or lazy river 9). Thus, when waves are not actuated, the water in the waterway is separated from the water in the trough. But when waves are present, the water spills over into the wave damping trough, where the energy of the wave white water is dissipated and the mound prevents wave backwash from returning to the wave pool. Pumps in the trough circulate the water in a direction orthogonal to the direction of wave propagation, which further assists in dissipating the incoming waves. (*Id.* at 3:38-43, 8:65-9:8.)

### **C. Mount Olympus**

The Mount Olympus reference (“Mount Olympus”) consists of a 2007 application for review and engineering drawings for a wave pool at the Big Chiefs Mount Olympus Theme Park in Sauk County, Wisconsin. (Ex. 1005.) It is a public document that was filed with the Wisconsin Department of Commerce and was available to the public on or before the effective filing date of the ’663 Patent, and therefore constitutes a printed prior art publication under 35 U.S.C. § 102. (Ex. 1005, page 1; Ex. 1011, ¶¶ 2-4; Ex. 1011, ¶¶ 1-4; Ex. 1012 ¶¶ 1-6.)

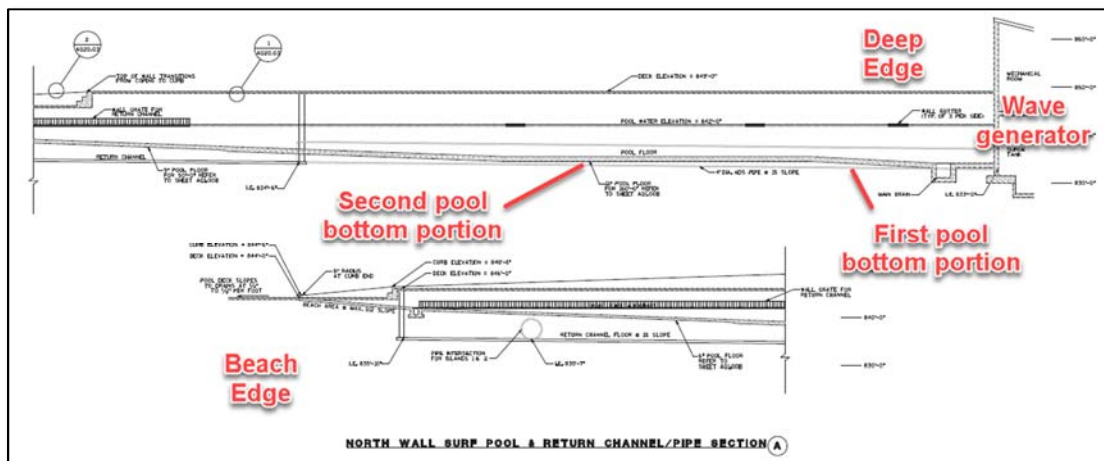


Mount Olympus depicts a wave pool with a wave generator at the deep end, a wave pool bottom with two sloping sections, a beach end with a mound, and a separate water-damping trough, as shown in the figure here. The different floor bottom portions and troughs are better seen by reference to the figures on page 19, below.



*Ex. 1005, page 11 (annotated)*

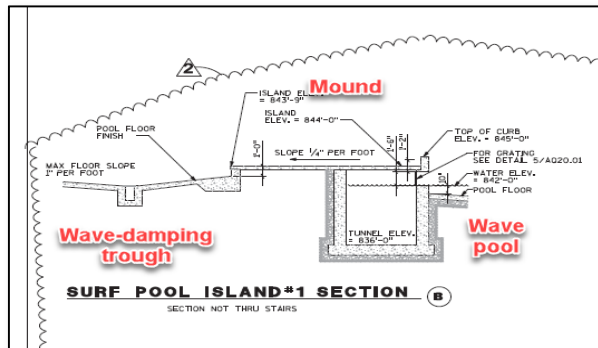
The wave pool has first and second pool bottom portions, with the first pool bottom portion having a greater slope than the second pool bottom portion. The cross section is here broken into two drawings, with the beach edge being shown on the bottom half of the figure, when in reality it would continue along the left side of the upper half of the figure.



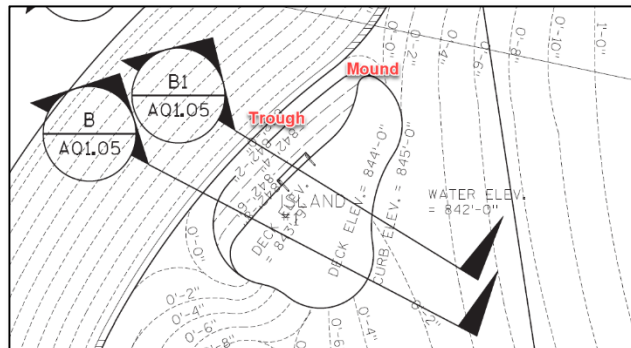
*Ex. 1005, page 19 (annotated)*



The figures on page 16 illustrate the trough configurations in the context of several raised islands found along the beach edge of the pool. A cross-section of one island is reproduced below left, showing that the trough is a separate body of water separated by a mound.



*Ex. 1005, page 16, annotated*



*Ex. 1005, page 10, annotated*

The island shown in cross-section (above left) is also shown here in plan view (above right). The contour lines of the plan view show that the beach edge rises up above the static water line into a mound, and then dips back down to a water-damping trough. This feature is known to a person of ordinary skill in the art (“POSITA”) to have a wave-damping effect. (Ex. 1009, ¶¶ 55-56.)

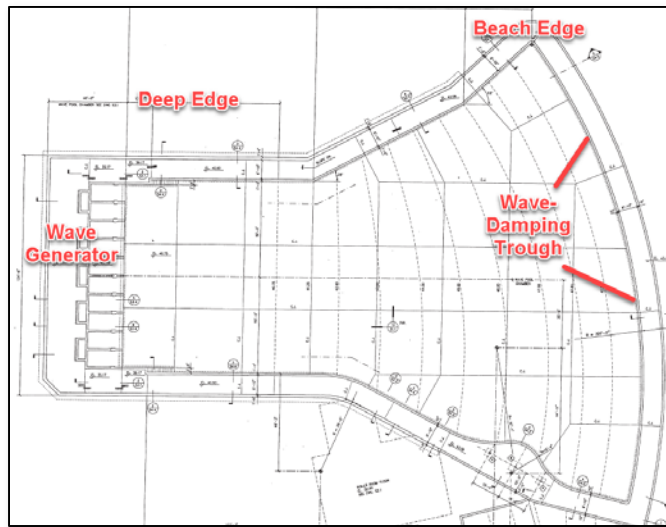
#### **D. Mandalay Bay**

The Mandalay Bay reference consists of a building permit including engineering drawings for a wave pool at the Mandalay Bay resort in Las Vegas, Nevada in 1998. (Ex. 1006.) It is a public document that was filed with the Clark County Building Department and which was available to the public on or before the effective filing date of the '663 Patent, and therefore constitutes a printed prior art



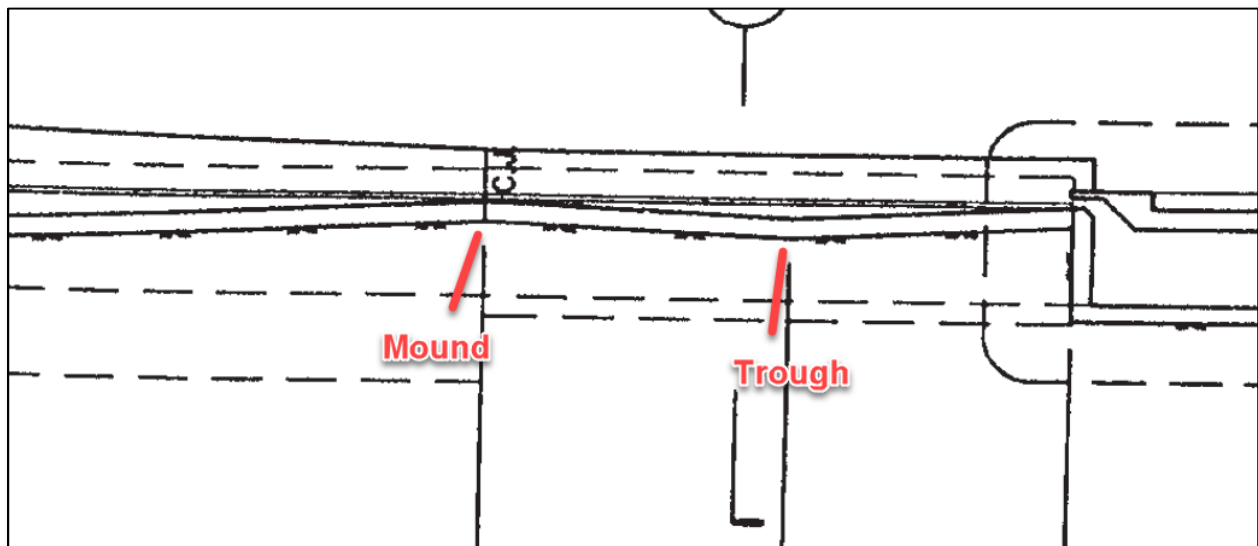
publication under 35 U.S.C. § 102. (Ex. 1006, page 1; Ex. 1012 ¶¶ 7-10.)

Mount Olympus depicts a wave pool with a wave generator at the deep end, a wave pool bottom with sloping sections, and a beach end with a water-damping trough. The figure from page 11 is reproduced here with annotations



*Ex. 1006. Page 11. annotated*

showing the main features that are relevant to this petition. The cross-section from page 13 of Ex. 1006, below, more clearly shows the different floor slopes, mound, and trough. (Ex. 1009, ¶ 58.)

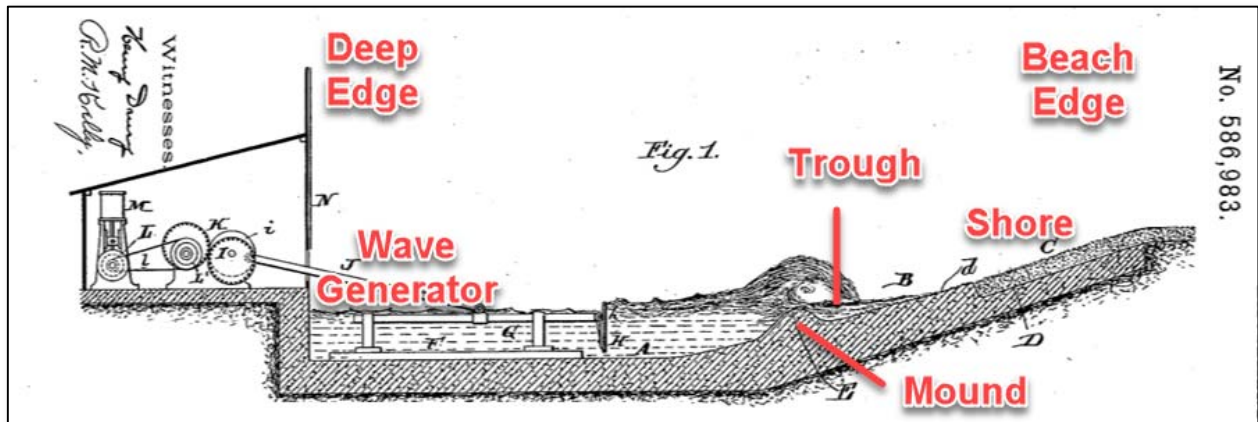


*Ex. 1006, Page 13, annotated*



## E. Wharton

Wharton is an 1897 patent that describes an “amusement apparatus” that is “designed to represent with realistic effect an ocean beach.” (Ex. 1004, page 3:7-9.) As a U.S. Patent issued in 1897, Wharton constitutes prior art under 35 U.S.C. § 102.



*Ex. 1004, FIG. 1, annotated*

Wharton describes an artificial beach made of concrete, with a deep edge and a beach edge. (*Id.*, page 3:10-22, 3:71-79, FIG. 1, claim 1.) At the deep edge, there is a wave generator, or a plurality of wave generators. (*Id.*, page 3:17-28, 4:79-85, FIGS. 1-7, claims 1-5, 7-10.) The wave pool floor has a sloping profile with different sections having different slopes. (*Id.*, FIG. 1.) Toward the beach edge, the wave breaks and spills over a mound. (*Id.*, FIG. 1, page 3:84-86.) On the far side of the mound is a wave-damping trough almost exactly as described by the '663 Patent. (*Id.*, FIG. 1) Beyond the trough is a shore and shore terminal edge (the horizontal portion at far right). Fig. 1 from Wharton depicts each feature. (Ex. 1009, ¶ 60.)



Wharton's trough discloses several elements that are especially relevant to this Petition. First, the trough has a bowl-shaped profile, as seen in FIG. 1, above. Second, the trough has a first and a second edge that slopes upward toward the shore terminal edge. Third, as the Examiner noted during prosecution, Wharton discloses that "the wave energy is dampened when the wave encounters the water retained in the trough." (Ex. 1002, page 80; Ex. 1009, ¶ 61.) The Examiner further recognized that "Wharton discloses that the prevention of washing out or damaging the beach is an important factor in the design, and therefore sizing the structure to ensure proper dissipation of energy would be an obvious consideration by one of ordinary skill in the art." (Ex. 1002, page 81.)

Wharton was cited by the Examiner as a 103 reference during examination of the '663 Patent. The Examiner reasoned that Wharton taught all of the claimed elements of the original version of claim 1 except for a trough having different regions with differing widths and differing upward slopes. (Ex. 1002, pages 80-81.) Following the rejection, AWM amended the claim heavily, including by removing the "different regions" element from claim 1 and placing it in dependent claim 3. The claim was allowed without further substantive input from the examiner. (*See* Ex. 1002, pages 103-110, 138.)

As set forth below, Wharton discloses many of the elements of the amended claims. However, perhaps as a result of AWM's improper mark-up of the amended

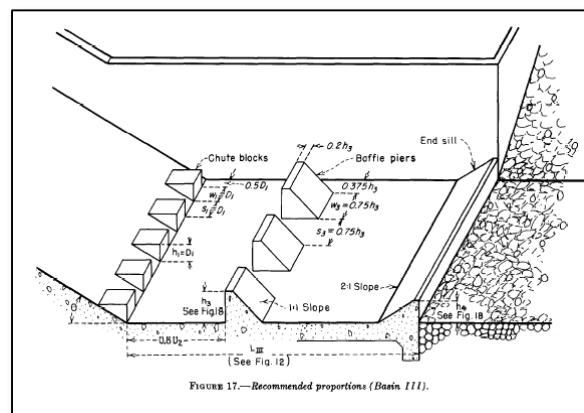


claims, the Examiner did not appreciate how Wharton applied to the heavily-amended claims. In short, although Wharton was cited as a primary 103 reference with respect to an earlier version of the claims, Wharton should be reconsidered as a secondary 103 reference. (Ex. 1009, ¶ 63.)

## F. Peterka

The Peterka reference is an engineering monograph authored by A. J. Peterka, titled “Hydraulic Design of Stilling Basins and Energy Dissipators” first published by the United States Department of the Interior in 1958. (Ex. 1007, page 2.<sup>4</sup>) Peterka is a printed publication that has been available to the public continuously since at least 1958, and therefore constitutes a printed prior art publication under 35 U.S.C. § 102.

Fig. 17 of Peterka (Ex. 1007, page 50) shows a particular type of trough called a stilling basin. When water from an open channel (e.g., a river) surges over the top of the wall (to the left of Fig. 17), it then flows down into the stilling basin, dissipating energy as it flows down the slope and encounters standing water. On the far side of the basin is a ramp (or sill)



<sup>4</sup> References to “page” in Exhibit 1007 are to the pages noted in the footer added by the Petitioner.



that helps to contain the flow. Various configurations of a stilling basin, with or without chute blocks and baffle piers, are described in Peterka. (Ex. 1009, ¶ 65.)

Peterka describes the use of a stilling basin to control water flow coming from rivers, canals, dams, and the like. However, the engineering principals are equally applicable to controlling water flow coming from waves on a seashore, and are certainly applicable to controlling water flow from a wave pool, which in this aspect is similar to a canal or dam in that it is a man-made open channel flow. A POSITA at the time would have been aware of the benefit of stilling basins in wave control, and would have looked to Peterka to solve the problems described in the '663 Patent. (Ex. 1009, ¶ 66.)

## **VII. LEVEL OF ORDINARY SKILL**

The '663 Patent relates to the field of wave generation in a wave pool and wave-damping using a mound and wave-damping trough. (Ex. 1001, Abstract.) A POSITA, as of September 27, 2016, would have knowledge and familiarity with: (i) design of mechanical structures and (ii) fluid characteristics and the interaction of fluid forces upon mechanical structures. Sufficient familiarity and experience with the subject matter of the asserted patents could be obtained by successfully completing a Master's degree in Mechanical Engineering or at least 5 years of experience in a job working with control systems, including designing or implementing such wave generation machines and wave-dampening pool structures.



(Ex. 1009, ¶¶ 31-34); *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (prior art may inform appropriate level of skill in the art).

## VIII. CLAIM CONSTRUCTION

### A. Claim Construction

A claim subject to *inter partes* review shall be given its ordinary and customary meaning to a person of ordinary skill in the art (“POSITA”), consistent with the prosecution history, as in a civil action. 37 C.F.R. § 42.100(b). For patents challenged after November 13, 2018, claims should be construed in accordance with the *Phillips* standard used in civil actions. See 37 C.F.R. 42.100(b); 83 F.R. 51340, 51358; *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). Petitioner reserves its rights to assert in litigation and in post-institution proceedings, claim constructions and prior art references not asserted here and to assert that certain claim terms are indefinite.

### B. Claim Term Definitions

#### 1. “Beach Edge”

The term “beach edge” appears in independent claim 1 to describe the end of the wave generating apparatus that is opposite the wave generator(s). The term is defined in the ’663 Patent specification as follows: “To provide for a more authentic experience, sand may be placed on the **beach edge** of the wave pool—i.e., the edge that is opposite to the wave generators.” (Ex. 1001 at 1:51-53, emphasis added.) Although the specification refers to a “beach” and “sand,” AWM defined the term



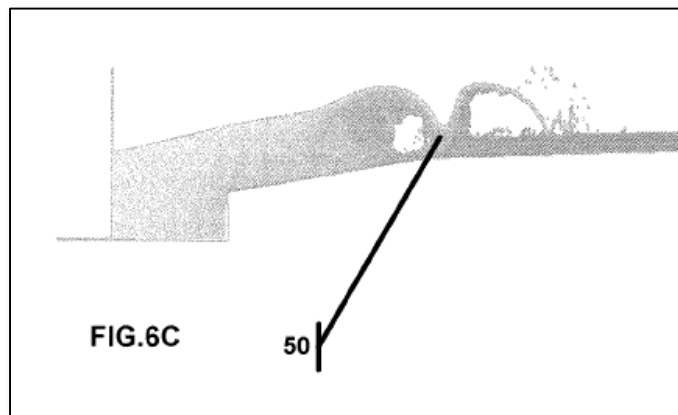
such that sand is optional: “sand *may be* placed on the beach edge.” The specification also says that “even without sand” the problems with unbroken waves and whitewater still occur. (Ex. 1001 at 1:60-62.) The term does not require the “beach edge” to incorporate sand and should be construed as: “the edge of the wave generating apparatus that is opposite to the wave generators.” (Ex. 1009, ¶ 67.)

## 2. “Shore Terminal Edge”

The term “shore terminal edge” appears in the same limitation as the “beach edge” term: “a beach edge having a shore and a shore terminal edge.” The specification defines the shore terminal edge as the part of the beach edge that is substantially horizontal. (Ex. 1001 at 6:20-22; FIG. 3C, structure 26.) (Ex. 1009, ¶ 68.)

## 3. “a wave... breaks”

The term “a wave... breaks” appears in independent claim 1 of the '663 Patent in the context of describing the wave's behavior “at the junction of the first pool bottom portion and the second pool bottom portion.” (Ex. 1001, claim 1). The specification does not clearly explain what is meant by the term “breaks” or “breaking.” At one point, the specification appears to use “breaking” to describe that





point in the life of a wave where the crest of the wave actually overturns or curls over on itself, as in feature 50 of FIG. 6C. (Ex. 1001 at 5:32; FIG. 6C.)

FIG. 8 indicates that a wave might break in several different positions and in several different directions. (See Ex. 1001 at 5:32, 48; FIGS. 6C, 8.) The specification also states that *after* the wave has broken, the wave may *still* continue to curl and break: “Moments later (shown in FIG. 6C), the wave has broken and created a wave that is curling and breaking 50.” (Ex. 1001 at 7:51-53.)

A POSITA understands that a wave “breaks” when the horizontal water velocities in the crest exceed the speed of the crest. In other words, the wave first breaks when the water at the tip of the wave crest first begins to curl over. A wave might continue to break as the wave translates over some distance. For a wave to “break” as used in the ’663 Patent claims, the wave need not have crashed and begun to form white water. Accordingly, the proper construction of the term “a wave... breaks” is: “a wave begins to curl over and water begins to collapse back toward the pool surface.” (Ex. 1009, ¶¶ 68-71.)

## **IX. GROUNDS FOR UNPATENTABILITY**

### **A. Claims 1, 2, 4,-6 and 9 Are Anticipated by (Ground 1) or Obvious Over (Ground 2) Black**

Claims 1, 2, 4-6, and 9 of the ’663 Patent are subject to cancellation under 35 U.S.C. § 102 or § 103 over Black, as set forth below. (Ex. 1009, ¶ 72.)

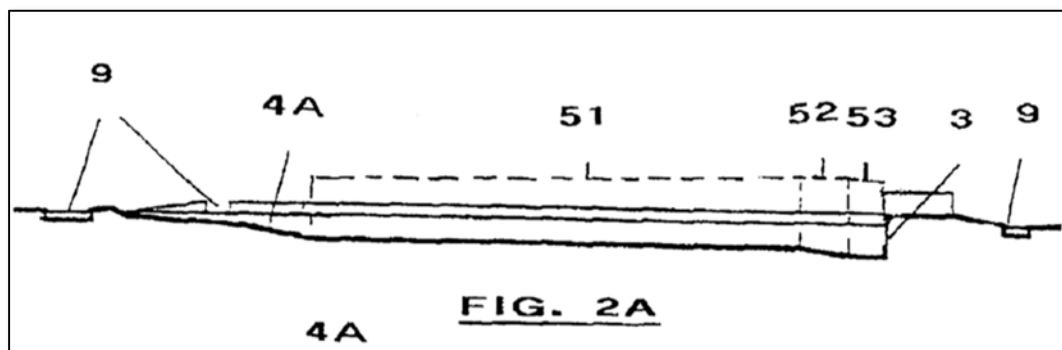
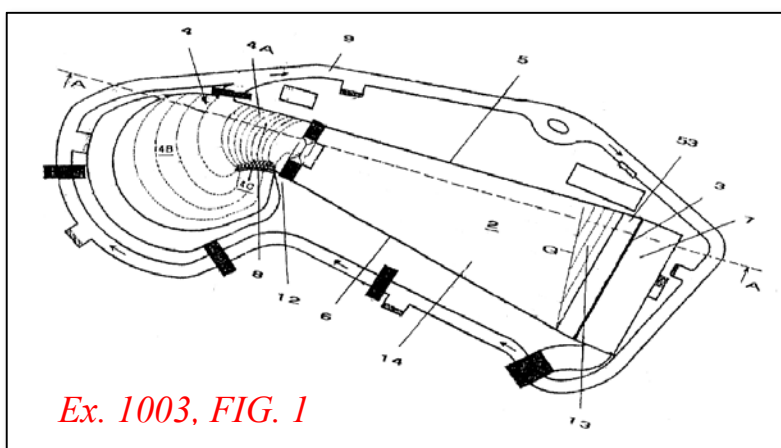


## 1. Independent Claim 1

To the extent the preamble is limiting, with reference to FIGS. 1 and 2A, Black discloses and renders obvious a wave generating apparatus. (Ex. 1003, FIGS. 1, 2A, Abstract, 1:59-67, 5:6-12, 5:56-57; Ex. 1009, ¶ 74.)

### a. [1A] Deep Edge

FIGS. 1 and 2A show a wave pool with a deep edge (3). “The floor of the waterway 2 may include a second sloped portion generally indicated by the numeral 13, resulting in a nominal or still water depth that increases towards the end 3 of the waterway 2.” (Ex. 1003, 7:40-43; 5:8-10; Ex. 1009, ¶ 75.) Black discloses and renders obvious [1A].





**b. [1B] Beach Edge**

The “beach edge” in Black is the “second end 4” shown in FIG. 1. Black discloses that the beach edge has a shore and a shore terminal edge, which is disclosed in FIG. 2A, including the area occupied by items 4A and 9. “[A] series of travelling wave-fronts are created in waterway 2 which travel towards the second end 4 (in this case a beach or shallow area).” (Ex. 1003 at 5:64-65, see also FIGS. 1, 2A, 5:8-10, 6:15-19; Ex. 1009, ¶ 76.) Black discloses and renders obvious [1B].

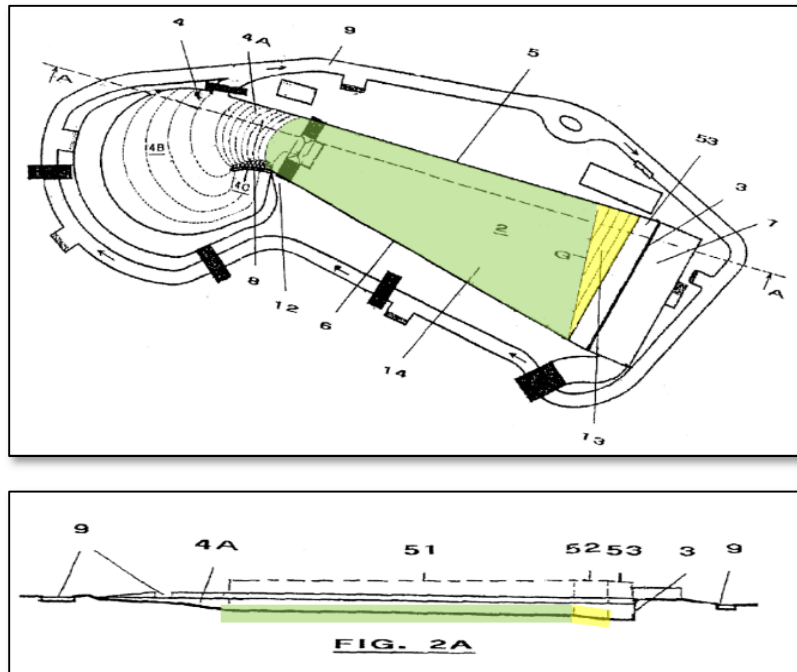
**c. [1C] Wave Generator**

Black discloses a wave generator adjacent to the deep edge. FIG. 1 shows the wave generator (7) located adjacent to the first/deep edge (3). “A wave generating means 7 may be positioned at end portion 3 of waterway 2.” (Ex. 1003 at 5:56-57, FIGS. 1, 2A, 2:20-21; Ex. 1009, ¶ 77.) Black discloses and renders obvious [1C].

**d. [1D] Wave Pool Bottom Portions**

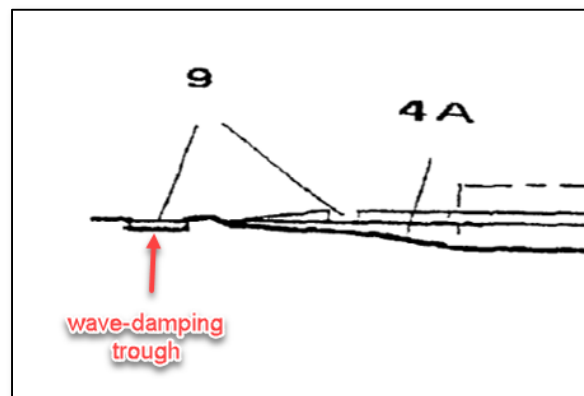
Annotated FIGS. 1 and 2A show a wave pool with a pool bottom (2), having a first pool bottom portion (13) highlighted in yellow with a first angle of inclination relative to horizontal, and the second portion (14) highlighted in green with a second angle relative to horizontal, wherein the first angle (in portion 13) is greater than the second angle (in portion 14). (Ex. 1003 at FIGS. 1, 2A, Abstract, 1:10-13, 2:57-61, 3:19-20, 8:16-20; Ex. 1009, ¶ 78.) Black discloses and renders obvious [1D].





#### e. [1E] Wave-Damping Trough

Fig 2A shows that Black discloses a wave-damping trough (external channel, 9) adjacent to the shore and adapted to retain water. “A circulating flow of water along waterway 2 and lazy river 9 assists in preventing currents from flowing back up waterway 2, avoiding a “rip”-like action. This avoids or minimises [sic] the problem of currents tending to carry surfers back towards the end 3 into the path of other surfers and the problem of disrupting the smooth wave face by adverse currents in the wave pool 1.” (Ex. 1003





at 9:9-15, FIGS. 1, 2A, 3:44-48, 8:52-53, 8:56-9:2, claims 29, 30; Ex. 1009, ¶ 79.)

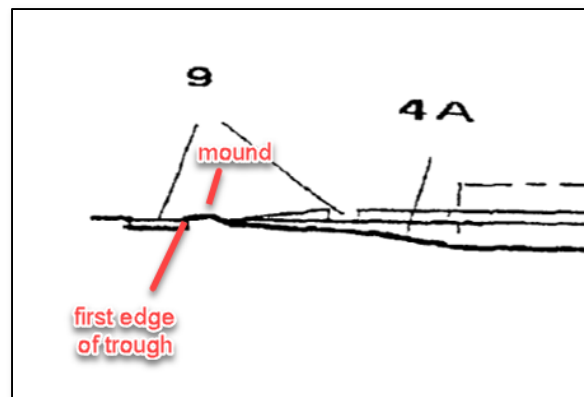
Black discloses and renders obvious [1E].

**f. [1E.1] Mound**

As shown here, Black discloses a mound: “the second end of the waterway may have a height above the waterway floor sufficient to contain a required depth of fluid within the waterway while also allowing waves to spill over at least a portion

of the second end of the waterway into the external channel.” (Ex. 1003, 3:44-48, FIG. 2A, 8:65-9:2, claims 29, 30; Ex.

1009, ¶ 80.) FIG. 2A shows the mound above the static water line and separating



the water in the trough (9) from the water in the wave pool. Black discloses and renders obvious [1E.1].

**g. [1E.2] Trough Bottom**

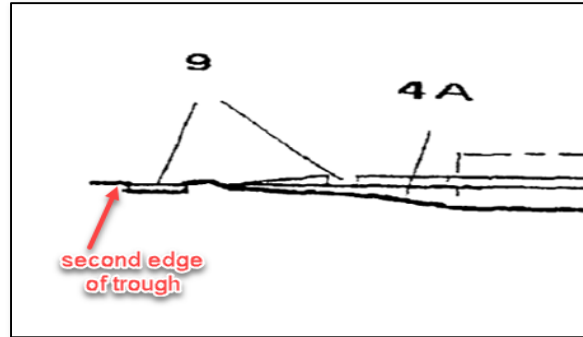
Figure 2A also discloses that the trough has a trough bottom. (Ex. 1003 at FIGS. 1, 2A, 3:32-48, 8:52-53, 8:56-9:2, 9:9-15, claims 29, 30; Ex. 1009, ¶ 81.)

Black discloses and renders obvious [1E.2].



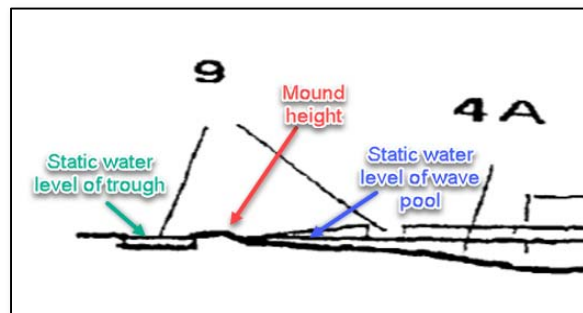
#### **h. [1E.3] Second Edge of Trough**

Black discloses a trough with a second edge that extends upward to meet the far edge of the apparatus. (Ex. 1003 at FIGS. 1, 2A, 3:32-48, 8:52-9:2, 9:9-15, claims 29, 30.) It would also have been obvious for a POSITA to modify the channel disclosed by Black to include a sloped wall or second edge, because a channel or lazy river can have many shapes, such as a v-shaped channel or a u-shaped channel, to allow the second edge to slope upward to meet the shore and beach edge. (Ex. 1009, ¶¶ 82-83.) Black discloses and renders obvious [1E.3].



#### **i. [1F] Wave Generator Not Actuated**

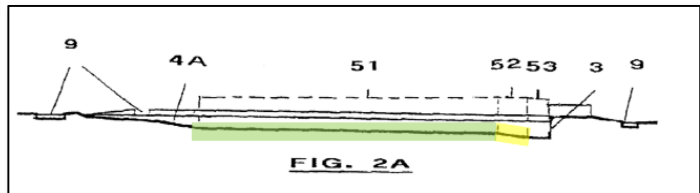
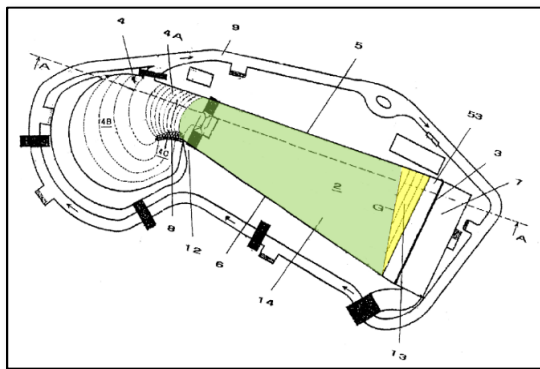
Black discloses that “the second end of the waterway may have a height above the waterway floor sufficient to contain a required depth of fluid within the waterway.” (Ex. 1003, 3:44-48, FIGS. 1, 2A, 3:32-48, 8:52-9:15, claims 29, 30; Ex. 1009, ¶ 84.) FIG. 2A shows that the water level is below the mound height. Black discloses and renders obvious [1F].





**j. [1G] Wave Generator Actuated**

Black discloses the wave forming at the deep edge and breaking over the junction: “A wave generating means 7 may be positioned at end portion 3 of waterway 2” such that “the floor... includes a first sloped portion generally indicated by the numeral 14, creating a reef wall.... This first sloped portion 14 preferably has a direction of fall or a fall-line that is substantially perpendicular to the side wall 5.” (Ex. 1003, 5:56-57; 2:20-21; 6:44-50; 8:16-28.) In addition, Black teaches that “[t]he profile of the floor of waterway 2, in particular the first sloped portions 14, enhances wave-breaking action.” (Ex. 1003 at 8:46-48; 4:47-49; Ex. 1009, ¶¶ 85-86.) Black discloses and renders obvious [1G].



**k. [1H] Wave Travels Over Mound**

Black discloses that “[w]aves formed by the generating means 7 travel from end 3 to end 4 along the waterway 2. The profile of the floor of waterway 2, in particular the first sloped portions 14, enhances wave-breaking action. As shown in FIG. 1, a left breaking wave results, although persons skilled in the art will appreciate that similar principles may be applied to form a right breaking wave.” (Ex. 1003,



8:45-51, 10:6-15.) Black also discloses that “the end 4 of the waterway may extend upwards by an extent sufficient to contain a required amount of water within the waterway 2, but insufficient to prevent waves from travelling over the end 4 into the lazy river 9.” (Ex. 1003 at 8:65-9:2; Ex. 1009, ¶ 87.) Black discloses and renders obvious [1H].

### **I. [1I] Wave Energy Is Dampened**

Black discloses that “[a] circulating flow of water along waterway 2 and lazy river 9 assists in preventing currents from flowing back up waterway 2, avoiding a ‘rip’-like action. This avoids or minimises [sic] the problem of currents tending to carry surfers back towards the end 3 into the path of other surfers and the problem of disrupting the smooth wave face by adverse currents in the wave pool 1.” Thus, in addition to the water itself, the lateral impact of the lazy river has an enhanced impact on the wave damping aspect of the channel 9. (Ex. 1003, 9:9-15, FIGS. 1, 2A, 8:65-9:8, claims 29, 30; Ex. 1009, ¶ 88.) Black discloses and renders obvious [1I].

### **2. Dependent Claim 2**

With respect to claim 2, the Examiner noted that in light of the prior art, “[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made that the trough can be sized and shaped appropriately to properly dissipate a required/desired amount of the wave energy, such as greater than 50%, since such



a modification would have involved a mere change in the size of a component.” (Ex. 1002, page 81.) As noted in [1I] Black discloses that the dissipation of white water energy and the prevention of rip currents is an important consideration. Sizing the structure to ensure proper dissipation of energy would be an obvious consideration by a POSITA. (Ex. 1009, ¶ 90.) Black discloses and renders obvious claim 2.

### **3. Dependent Claim 4**

Black expressly discloses [4] for the same reasons already described for [1D]. As shown in annotated Figure 1, the first pool bottom portion, highlighted in yellow, is closer to the wave generator than the second portion, highlighted in green. (Ex. 1009, ¶ 92.) Black discloses and renders obvious [4].

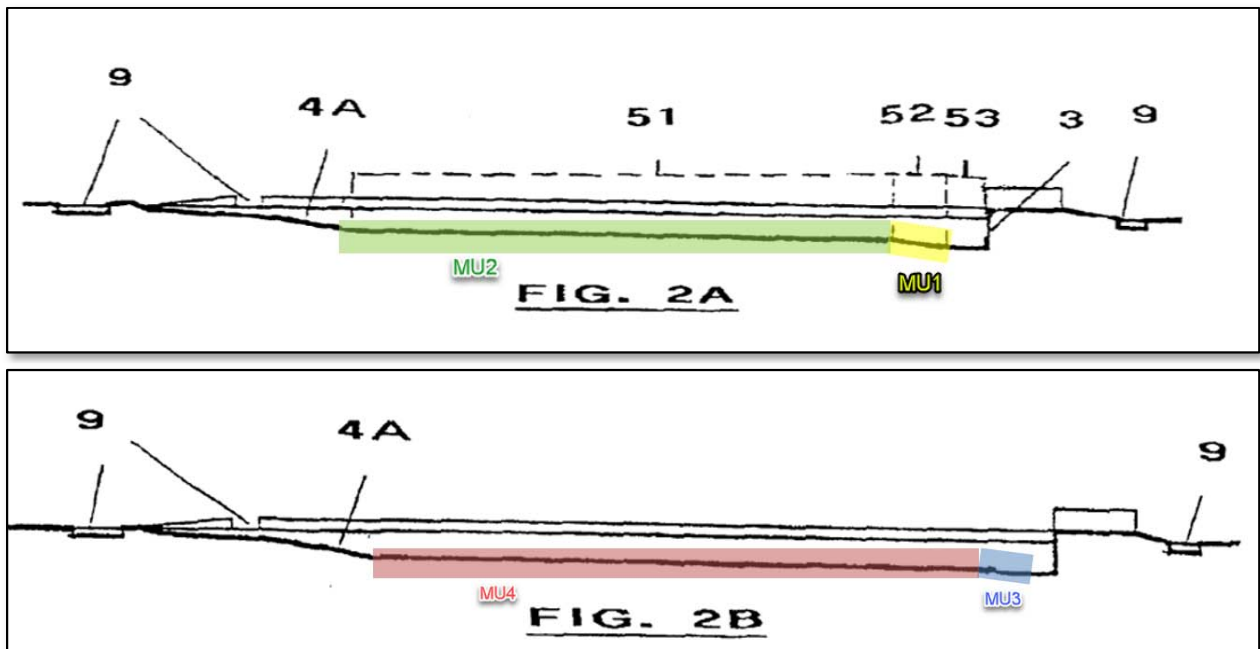
### **4. Dependent Claim 5**

[5 Preamble]: Black discloses the apparatus of claim 1, as described above. (Ex. 1009, ¶ 93.)



**a. [5A] First Cross-Sectional Profile**

As disclosed in FIG. 1, a cross-sectional profile taken along the line AA (indicated in FIG. 1) has a first upwardly inclined region slope, and a second upwardly inclined region slope. Annotated FIG. 2A shows the first region slope ( $M_{U11}$ ) in yellow and the second region slope ( $M_{U12}$ ) in green. (Ex. 1003, 2:57-61, 3:19-20, 8:16-20, 9:16-24; Ex. 1009, ¶ 95.) Black discloses and renders obvious [5A].



**b. [5B] Second Cross-Sectional Profile**

Black also discloses a second cross-sectional profile taken along the line BB (indicated in FIG. 1) has a first upwardly inclined region slope, and a second upwardly inclined region slope. Annotated FIG. 2B shows the first region slope ( $M_{U13}$ ) in blue and the second region slope ( $M_{U14}$ ) in red. (Ex. 1003, FIGS. 1, 2B,



Abstract, 2:57-61, 3:19-20, 8:16-20, 9:25-28; Ex. 1009, ¶ 96.) Black discloses and renders obvious [5B].

**c. [5C]  $M_{UI1} \neq M_{UI3}$  and  $M_{UI2} \neq M_{UI4}$**

Black discloses wherein  $M_{UI1} \neq M_{UI3}$  and  $M_{UI2} \neq M_{UI4}$ . The difference in slope is taught by Black in FIGS. 1, 2A, and 2B, and in the specification which teaches that the wave pool floor slopes from side to side along the length of the wave pool. The cross sections taken at AA and BB are not parallel to each other, and therefore disclose differently sloped areas, wherein  $M_{UI1} \neq M_{UI3}$  and  $M_{UI2} \neq M_{UI4}$ . Black also explicitly teaches that various orientations of the slopes and gradients may be employed. (Ex. 1003, 6:44-64; Ex. 1009, ¶ 97.) Black discloses and renders obvious [5C].

**5. Dependent Claim 6**

Black discloses that “[t]he wave generating means 7 may be integral with end portion 3 and may be an oscillating plunger-type arrangement or incorporate other types of wave generating devices that may be known in the art such as an oscillating pneumatic pressure caisson, oscillating pneumatic vacuum pressure caisson, or an elevated water tower with flood gates.” (Ex. 1003, 5:56-63, 8:3-9, 8:30-36.)

It also would have been obvious to a POSITA that a wave generating apparatus could employ a plurality of wave generators. Use of multiple generators in a wave pool was common practice at the time, and no significant modification, if



any, would be required to add additional generators. Application serial number 14/808,076, which is incorporated by reference in the '663 Patent, explicitly discloses the use of multiple wave generators. (Ex. 1001, 1:10-14; Ex. 1014, Abstract; Ex. 1009, ¶¶ 99-100.) Black discloses and renders obvious claim 6.

## **6. Dependent Claim 9**

Black discloses that “[p]referably, the external channel may extend substantially around the periphery of the waterway, and includes a pump to circulate water around the external channel.” (Ex. 1003, at 3:41-43, 3:38-40, 9:2-8, claim 29; Ex. 1009, ¶ 101.) Black discloses and renders obvious claim 9.

## **B. Ground 3: Claims 1, 4, 6, 9, 13, and 14 Are Anticipated by Mount Olympus**

Claims 1, 4, 6, 9, 13, and 14 of the '663 Patent are subject to cancellation under 35 U.S.C. 102 in light of Mount Olympus, as set forth below.

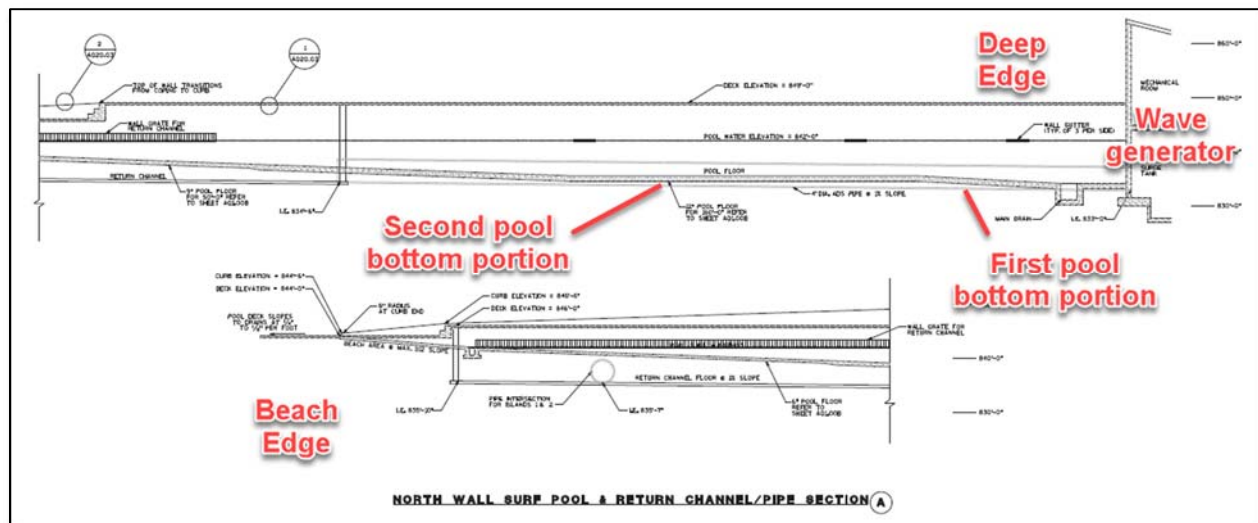
### **1. Independent Claim 1**

To the extent the preamble is limiting, Mount Olympus discloses a wave generating apparatus. (Ex. 1005, page 1, 6; Ex. 1009, ¶ 104.)



**a. [1A] Deep Edge**

Mount Olympus discloses on page 19 a wave pool with a deep edge. (Ex. 1005, page 19.) The deep end can also be discerned by the water depth markings shown on page 11. (*Id.*, page 11; Ex. 1009, ¶ 105.) Mount Olympus discloses and renders obvious [1A].



*Ex. 1005, page 19, annotated*

**b. [1B] Beach Edge**

Mount Olympus pages 11 and 19 disclose the beach edge. (Ex. 1005, pages 11, 19; Ex. 1009, ¶ 106.) Mount Olympus discloses and renders obvious [1B].

### c. [1C] Wave Generator

Mount Olympus discloses a wave generator (surge tank) adjacent to the deep edge on pages 17-20 and 22-25. (Ex. 1005, pages 17-20, 22-25; Ex. 1009, ¶ 107.) Mount Olympus discloses and renders obvious [1C].



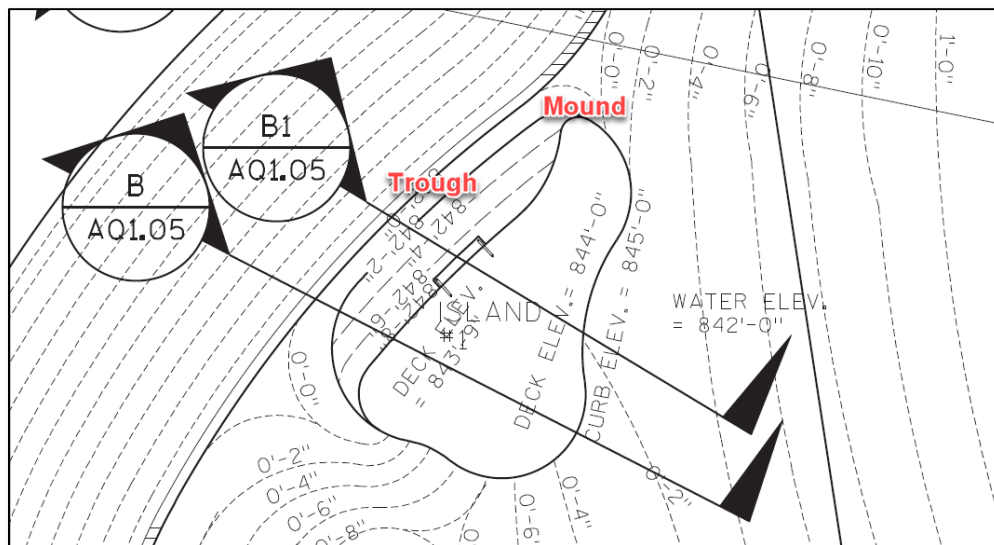
**d. [1D] Wave Pool Bottom Portions**

Mount Olympus discloses a wave pool with a pool bottom having a first pool bottom portion with a first angle of inclination relative to horizontal, and a second pool bottom portion with a second angle relative to horizontal, such that the first angle is greater than the second angle. (Ex. 1005, pages 19-20; Ex. 1009, ¶ 108.)

Mount Olympus discloses and renders obvious [1D].

**e. [1E] Wave-Damping Trough**

Mount Olympus discloses a trough shown in the various “surf pool island” cross-sections shown on page 16 of Ex. 1005. (See [1E.1], below.) The trough has sloped edges, and a gutter, indicating that it is designed to retain water. The depth and water line elevation contours shown on pages 10 and 11 of Ex. 1005 further disclose the location and configuration of the trough. Mount Olympus discloses and renders obvious [1E]. (Ex. 1009, ¶ 109.)



*Ex. 1005, page 10, annotated*



**f. [1E.1] Mound**

Mount Olympus discloses a mound or island above the water line. (Ex. 1005, page 16.) In the cross section below, for example, the island is at 844'0", while the water elevation is 842'0". Each of the other islands disclosed in Mount Olympus are also at a higher elevation than the water elevation. (Ex. 1009, ¶ 110.)

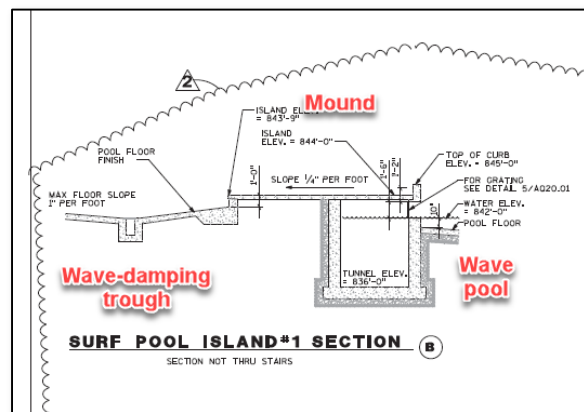
The trough has sloped edges and a gutter designed to retain water. These mounds separate the trough from the wave pool. Mount Olympus discloses and renders obvious [1E.1]. (Ex. 1009, ¶ 111.)

**g. [1E.2] Trough Bottom**

Mount Olympus discloses that the trough bottom is the sloped portion shown in the figures reproduced above from page 16. The center of the trough bottom includes a gutter. (Ex. 1009, ¶ 112.) Mount Olympus discloses and renders obvious [1E.2].

**h. [1E.3] Second Edge of Trough**

The second edge of Mount Olympus is part of the sloped edge that extends from the gutter up toward the flat part of the apparatus. As depicted in the cross-sections on page 16, the second edge is seen on the left side of the trough.



***Ex. 1005, page 16 (annotated)***

(Ex. 1009, ¶ 113.) Mount Olympus discloses and renders obvious [1E.3].



**i. [1F] Wave Generator Not Actuated**

Mount Olympus discloses a static water level in the wave pool of 842'-0". (Ex. 1005, pages 11, 16.) The mound is shown in each case to be higher than this static water level. Likewise, the wave damping pool is disclosed to retain a static body of water below the mound height, indicated by the trough and the gutter. (Ex. 1009, ¶ 114.) Mount Olympus discloses and renders obvious [1F].

**j. [1G] Wave Generator Actuated**

It is well known in the art that the differently sloped pool bottom portions are provided to cause the waves to break at the point where the pool bottom portions meet. That is, two variables must be factored into this changing slope to get it to break at a certain point: pool depth and anticipated amplitude of the wave. Knowing those additional factors, the pool can be shaped to facilitate the wave breaking at that particular point. By changing the slope, the depth of the water is being changed, thus impacting the location of the wave break. Mount Olympus discloses that when the wave generator is actuated, a wave forms at the deep edge, breaks over the junction of the first pool bottom portion and the second pool bottom portion noted in [1D]. (Ex. 1009, ¶ 115.) Mount Olympus discloses and renders obvious [1G].

**k. [1H] Wave Travels Over Mound**

As noted in [1E] through [1F], Mount Olympus discloses a mound and a trough with the structure set forth in the '663 Patent so as to function in accordance with the limitation set forth in [1H]. In addition, a POSITA viewing Mount Olympus



understands that the wave generated on the deep edge would continue to travel across the length of the wave pool. A POSITA would further understand that, upon reaching the beach edge, the wave would continue up and over the mound of the wave-damping trough toward the shore terminal edge. That the wave continues over is indicated by the gutter in the trough on the beach edge to help channel excess water from the waves away from the area. (Ex. 1009, ¶ 116.) Mount Olympus discloses and renders obvious [1H].

#### **I. [1I] Wave Energy Is Dampened**

As noted in [1E] through [1F], and [1H], Mount Olympus discloses a mound and a trough with the structure set forth in the '663 Patent so as to function in accordance with the limitation set forth in [1I]. In addition, a POSITA understands the function of the trough disclosed in Mount Olympus is to dissipate or dampen the wave energy of incoming white water. The sloped edges further would help dampen backwash travelling back toward the wave pool. Whenever a wave encounters friction, such as in the form of the mound, the standing water in the trough, and the sloped sides of the trough, the wave will lose energy, or be dampened. (Ex. 1009, ¶ 117.) Mount Olympus discloses and renders obvious [1I].

#### **2. Dependent Claim 4**

For the reasons noted in [1A], Mount Olympus discloses and renders obvious claim 4. (Ex. 1009, ¶ 118.)



### **3. Dependent Claim 6**

Mount Olympus discloses on pages 22 and 23 a wave generator having a plurality of wave generators. (Ex. 1005, 22-23; Ex. 1009, ¶ 119.) Mount Olympus discloses and renders obvious claim 6.

### **4. Dependent Claim 9**

Mount Olympus discloses a trough with a gutter that is situated in a direction substantially orthogonal to the direction of the wave propagation. Mount Olympus also discloses a pump and filter system for pumping and returning water in the gutters. (See Ex. 1005, page 11, 15, and 21; Ex. 1009, ¶ 120.) Mount Olympus discloses and renders obvious claim 9.

### **5. Dependent Claim 13**

Mount Olympus discloses a pump and filter system for pumping and returning water in the gutters. Page 21 discloses a “Recirculation Pump: R1, R2, R3, and R4,” seen in the drawings. (Ex. 1005, pages 21-25.) Mount Olympus also discloses a beach area, which can include sand, and a filter for the water circulation system. (Ex. 1005, pages 4, 21.) This corresponds to the sand filter described in the specification of the ‘663 Patent. (Ex. 1001 at 6:63-66; Ex. 1009, ¶ 121.) Mount Olympus discloses and renders obvious claim 13.

### **6. Dependent Claim 14**

Mount Olympus discloses a trough having a pump that creates a current and having a gutter situated in a direction substantially orthogonal to the direction of the



wave propagation. Mount Olympus also discloses a pump and filter system for pumping and returning water in the gutters to the wave pool. (Ex. 1005, pages 21-25; Ex. 1009, ¶ 122.) Mount Olympus discloses and renders obvious claim 14.

**C. Ground 4: Claims 1, 2, 4-9 Are Obvious over Black and Wharton**

Claims 1, 2, 4-9 of the '663 Patent are subject to cancellation under 35 U.S.C. § 103 over Black in view of Wharton, as set forth below. As discussed above in Grounds 1 and 2 (section IX.A, above), Black discloses or renders obvious each element of claims 1, 2, 4-6, and 9. Claims 1, 2, and 4-9 are also obvious over Black in view of Wharton.

Black and Wharton are in a common field of endeavor: wave generating amusement attractions, or wave pools. Wharton, like Black, discloses a wave generating apparatus with a wave generator, a deep edge, a beach edge, a sloped floor profile, a mound, and a wave damping trough. (See Section VI.E, above; Ex. 1009, ¶ 125.) However, Wharton also discloses that the mound and trough have a curved or sloping shape, which is relevant to claims 1 and 4-9.

Given the similarities between Black and Wharton, a POSITA would have been motivated to combine the teachings of Wharton with the primary reference of Black to improve the performance of the wave-damping aspect of the attraction, including by modifying the cross-sectional shape of the channel (9) disclosed by



Black to instead have a bowl-shaped wave-damping trough with a second edge that slopes upward to the shore terminal edge. (Ex. 1009, ¶ 126.)

The motivation to combine these references would have been, first, to provide for a walk-out style beach edge that has been known and in use for over a hundred years in wave pool amusement attractions. The walk-out beach allows users to more fully simulate the experience of being at a beach, and, as disclosed in Wharton, “enjoy the pleasure and benefit of an artificial surf – bathing upon a safe and permanent sloping beach.” (Ex. 1006, page 3:101-103.) Second, the modification would have provided an additional measure of wave-damping efficacy, as the sloped or bowl-shaped trough provides additional friction as the wave remnant enters the trough over and down the sloped first edge and then up along the sloped second edge. (Ex. 1006, page 3:95-4:5.) A POSITA would have understood that each feature that increases friction experienced by the incoming wave white water will increase the wave-damping efficacy. With the additional measure of water in the trough (disclosed by Black and Wharton), the wave encounters yet more friction and the wave-damping features of the apparatus are further enhanced. (Ex. 1009, ¶ 127.)

As described above with respect to the state of the prior art (section VI.A.3), it was well known that a sloped trough was advantageous to use in such a situation, and had already been widely incorporated in the amusement attraction industry. The substitution would have merely improved upon the apparatus already disclosed in



Black, as the mound and trough already existed, and needed only to be modified in shape. The '663 Patent notes that “many variations and modifications to the exemplary embodiments are possible as would be apparent to a person of ordinary skill in the art.” (Ex. 1001, 10:33-35.) It is evident that one such modification would be to the shape of the trough that already existed in Black to include a different trough shape that had been disclosed and in use for many decades in the industry. (Ex. 1009, ¶ 128.)

### **1. Independent Claim 1**

To the extent the preamble is limiting, Black discloses a wave generating apparatus. (*See* section IX.A, above.) Wharton also discloses a wave generating apparatus. (*See* Section VI.E, above.) The combination of Black and Wharton renders obvious the preamble. (Ex. 1009, ¶ 130.)

#### **a. [1A] Deep Edge**

Black discloses in IX.A a deep edge. Wharton discloses in VI.E a deep edge. The combination of Black and Wharton therefore renders obvious [1A]. (Ex. 1009, ¶ 131.)

#### **b. [1B] Beach Edge**

Black, in IX.A, and Wharton in VI.E, each disclose a beach edge. The combination of Black and Wharton therefore renders obvious [1A]. (Ex. 1009, ¶ 132.)



**c. [1C] Wave Generator**

Black, in IX.A, and Wharton in VI.E, each disclose a wave generator adjacent to the deep edge. The combination of Black and Wharton renders obvious [1C]. (Ex. 1009, ¶ 133.)

**d. [1D] Wave Pool Bottom Portions**

Black, in IX.A, and Wharton, in VI.E, each disclose a wave pool bottom with two portions, with different angles of inclination. The combination of Black and Wharton renders obvious [1D]. (Ex. 1009, ¶ 134.)

**e. [1E] Wave-Damping Trough**

Black, in IX.A, and Wharton, in VI.E, each disclose a wave-damping trough adjacent to the shore and adapted to retain water. The combination of Black and Wharton renders obvious [1D]. (Ex. 1009, ¶ 135.)

**f. [1E.1] Mound**

Black, in IX.A, and Wharton, in VI.E, each disclose a trough comprising a mound with a mound height forming a first edge of the wave-damping trough that separates the water in the wave-damping trough from the water in the wave pool. To the extent Wharton does not disclose the mound, [1D] is rendered obvious by the combination of Black and Wharton. (Ex. 1009, ¶ 136.)

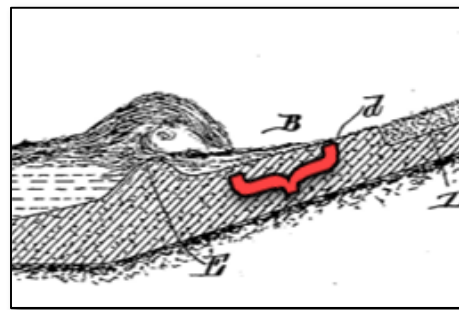


**g. [1E.2] Trough Bottom**

Black, in IX.A, and Wharton, in VI.E, each disclose a trough comprising a trough bottom. The combination of Black and Wharton renders obvious [1E.2]. (Ex. 1009, ¶ 137.)

**h. [1E.3] Second Edge of Trough**

Black, in IX.A, and Wharton in annotated Figure 1, reproduced here, each disclose a second edge of the wave-damping trough extending from the trough bottom and sloped upward to meet the shore and the beach edge of the apparatus. (Ex. 1005, FIG. 1.)



In addition, it would have been obvious for a POSITA to modify the channel disclosed by Black to include the sloped second edge disclosed in Wharton. The combination of Black and Wharton therefore renders obvious [1E.3]. (Ex. 1009, ¶¶ 138-140.)

**i. [1F] Wave Generator Not Actuated**

Black, in IX.A, and Wharton, in VI.E, each disclose that when the wave generator is not actuated each of the wave pool and the wave-dampening pool retains water defining a static water level that is below the mound height. The combination of Black and Wharton renders obvious [1F]. (Ex. 1009, ¶ 141.)



**j. [1G] Wave Generator Actuated**

Black, in IX.A, discloses that when the wave generator is actuated, a wave forms at the deep edge, breaks over the junction of the first pool bottom portion and the second pool bottom portion. To the extent Wharton does not disclose [1G], it is rendered obvious by the combination of Black and Wharton. (Ex. 1009, ¶ 142.)

**k. [1H] Wave Travels Over Mound**

Black, in IX.A, discloses that the wave travels over the second pool bottom portion, then travels over the mound of the wave-damping trough toward the shore terminal edge. To the extent Wharton does not disclose element 1H, it is rendered obvious by the combination of Black and Wharton. (Ex. 1009, ¶ 143.)

**l. [1I] Wave Energy Is Dampened**

Black, in IX.A, and Wharton, in VI.E, each disclose that wave energy is dampened by the static body of water retained in the wave-damping trough as the wave travels from the first edge towards the second edge of the wave-damping trough and the shore, and the wave backwash is dampened as it travels from the second edge towards the first edge of the wave-damping trough. To the extent Wharton does not disclose [1I], it is rendered obvious by the combination of Black and Wharton. (Ex. 1009, ¶¶ 144-146.)

**2. Dependent Claim 2**

Black, in IX.A, and Wharton, in VI.E, each inherently discloses that the wave energy is dampened by greater than 50% as the wave reaches the shore terminal



edge. To the extent Wharton does not disclose claim 2, it is rendered obvious by the combination of Black and Wharton. (Ex. 1009, ¶¶ 147-148.)

### **3. Dependent Claim 4**

Black, in IX.A, and Wharton, in VI.E, each disclose that the first pool bottom portion is closer to the wave generator than the second pool bottom portion. The combination of Black and Wharton renders obvious claim 4. (Ex. 1009, ¶¶ 149-151.)

### **4. Dependent Claim 5**

Black, in IX.A, and Wharton, in VI.E each disclose the elements of claim 5. The combination of Black and Wharton renders obvious claim 5. (Ex. 1009, ¶ 152-157.)

### **5. Dependent Claim 6**

Black, in IX.A, and Wharton, in VI.E, each discloses wherein the wave generator is comprised of a plurality of wave generators. The combination of Black and Wharton renders obvious claim 6. (Ex. 1009, ¶¶ 158-160.)

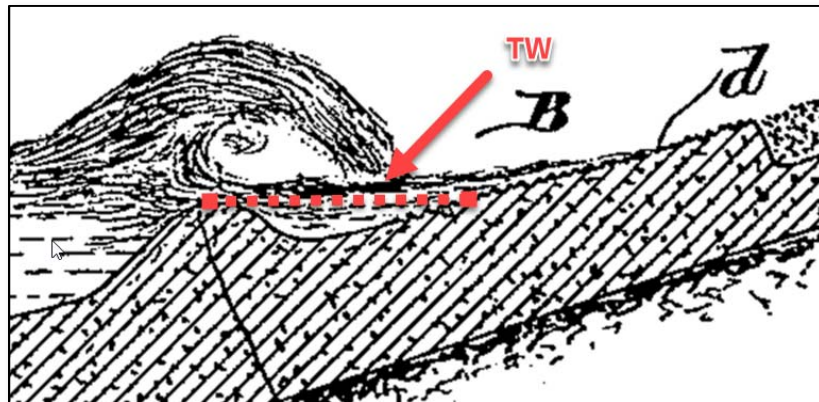
### **6. Dependent Claim 7**

Claim 1 is disclosed by Black or made obvious by the combination of Black and Wharton, as discussed above. The elements of claim 7 are disclosed by the combination of Black and Wharton. A POSITA would have been motivated to combine Black and Wharton in the manner and for the reasons discussed above. (Ex. 1009, ¶¶ 161-162.)



**a. [7A] Trough Width Defined by Plane Parallel to Mound Height**

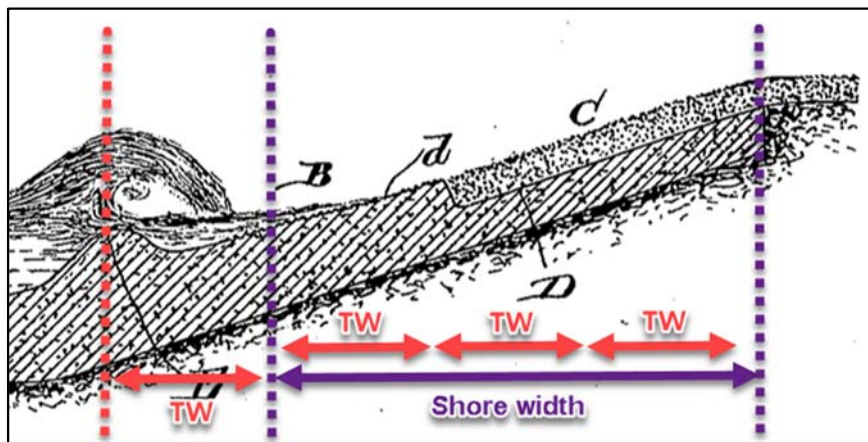
Black, in IX.A, teaches or renders obvious [7A]. Wharton discloses the mound of the wave-damping trough has a maximum height point and a plane parallel to horizontal and intersecting the maximum height point, wherein the trough has a trough bottom and a trough width defined by where the trough bottom intersects the plane, as shown in the annotated Figure 1, below. The plane is depicted by the dashed line, which extends from the maximum height point of the mound on the left to the point where the plane meets the shore on the right. The dashed line also defines the trough width (TW). It would have been obvious to a POSITA to modify the wave pool and trough of Black with the trough and shore of Wharton to meet this element of claim 7, for the reasons described above. (Ex. 1009, ¶ 164.) The combination of Black and Wharton renders obvious [7A].





**b. [7B] Upwardly Inclined Shore Bottom**

Black, in IX.A, teaches or renders obvious [7B]. Wharton discloses wherein the shore has an upwardly-inclined shore bottom and a shore width defined on one edge where the shore bottom intersects the plane and on an opposite edge where the shore bottom is substantially horizontal, as shown in annotated Figure 1, below. The shore width begins at the point where the trough width identified in the previous figure ends, and ends at the horizontal portion of the shore/beach to the right, as indicated in the figure below. The shore has an upward incline, as can be easily seen. It would have been obvious to a POSITA to modify the wave pool and trough of Black with the trough and shore of Wharton for the reasons described above. (Ex. 1009, ¶ 165.) The combination of Black and Wharton renders obvious [7B].



**c. [7C] Shore Width**

Black, in IX.A, teaches or renders obvious [7C]. Wharton discloses wherein the shore width is at least 50% longer than the trough width, as shown in the figure above. As shown above, the shore width disclosed by Wharton is approximately



300% longer than the trough width. It would have been obvious to a POSITA to modify the wave pool and trough of Black with the trough and shore of Wharton for the reasons described above. (Ex. 1009, ¶ 166.) The combination of Black and Wharton renders obvious [7C].

## **7. Dependent Claim 8**

Claim 1 is disclosed by Black or made obvious by the combination of Black and Wharton, as discussed above; therefore Black or Black and Wharton disclose the elements of [8 Preamble]. A POSITA would have been motivated to combine Black and Wharton in the manner and for the reasons discussed above. (Ex. 1009, ¶¶ 167-169.) The elements of claim 8 are disclosed by the combination of Black and Wharton.

### **a. [8A] Trough Width Defined by Plane Parallel to Mound Height**

Black, in IX.A, teaches or renders obvious [8A]. Element [8A] is identical to [7A] and the combination of Black and Wharton renders obvious [8A] for the same reasons as set forth above with respect to [7A]. (Ex. 1009, ¶ 170.)

### **b. [8B] Upwardly Inclined Shore Bottom**

Black, in IX.A, teaches or renders obvious [8B]. Element [8B] is identical to [7B] and the combination of Black and Wharton renders obvious [8B] for the same reasons as set forth above with respect to [7B]. (Ex. 1009, ¶ 171.)



**c. [8C] Shore Width**

Black, in IX.A, teaches or renders obvious [8C]. Wharton discloses wherein the shore width is at least twice the trough width, as shown in the figure provided in the discussion of [7B]. As shown above, the shore width disclosed by Wharton is approximately three times longer than the trough width. It would have been obvious to a POSITA to modify the wave pool and trough of Black with the trough and shore of Wharton in the manner and for the reasons described above. (Ex. 1009, ¶ 172.) The combination of Black and Wharton renders obvious [8C].

**8. Dependent Claim 9**

Black, in IX.A, discloses a trough having a pump that creates a current in a direction substantially orthogonal to the direction of the wave propagation. It would have been obvious to a POSITA to modify the wave pool and trough of Black with the trough and shore of Wharton in the manner and for the reasons described above. (Ex. 1009, ¶¶ 173-175.) The combination of Black and Wharton renders obvious claim 9.

**D. Ground 5: Claim 3 Is Obvious Over Black, in View of Wharton, and further in View of Mandalay Bay**

Claim 3 of the '663 Patent is subject to cancellation under 35 U.S.C. § 103 over Black, Wharton, and Mandalay Bay, as set forth below. As discussed in IX.A, Black alone, or the combination of Black and Wharton discussed in IX.C, disclose



or render obvious each element of claim 1, from which claim 3 depends. (Ex. 1009, ¶ 177.)

Black, Wharton, and Mandalay Bay occupy a common field of endeavor: wave generating amusement attractions, or wave pools. Black, in IX.A, Wharton, in VI.E, and Mandalay Bay, in VI.D, each discloses a wave generating apparatus with a wave generator, a deep edge, a beach edge, a sloped floor profile, a mound, and a wave damping trough. In addition, Mandalay Bay also discloses a wave-damping trough that has first and second regions with different widths and slopes, as recited in claim 3. (Ex. 1009, ¶ 178-179.)

Given the similarities between Black, Wharton, and Mandalay Bay, a POSITA would have been motivated to combine the teachings of Mandalay Bay with the primary reference of Black and the secondary reference of Wharton to arrive at a trough with different regions with different widths and slopes, which might have beneficial effects on wave dissipation, and would also provide more varied profiles that would contribute to a more realistic-looking artificial beach. At the time of filing the '663 Patent, it would have been obvious to a POSITA to modify the trough already disclosed by both Black and Wharton with the trough of Mandalay Bay, as it would require only a simple substitution of known parts to obtain predictable results. (Ex. 1009, ¶ 180.)



The motivation to combine these references would have been that it was well known to use varying trough widths in wave pools. Both Black and Wharton disclosed the use of troughs, as discussed above. Black further discloses that the trough (9) can have different widths at different locations. (*See, e.g.*, Ex. 1003, FIG. 1.) A POSITA would have recognized that by providing sand in the beach area of the attraction, one could provide a feature desired by guests (a more realistic and varied artificial beach) as well as provide enhanced wave damping function. (Ex. 1009, ¶ 181.)

### **1. Dependent Claim 3**

[3 Preamble] Claim 1 is disclosed by Black in IX.A or made obvious by the combination of Black and Wharton, in IX.C. A POSITA would have been motivated to combine Black, Wharton, and Mandalay Bay for the reasons discussed immediately above, to render obvious claim 3. (Ex. 1009, ¶ 183.)

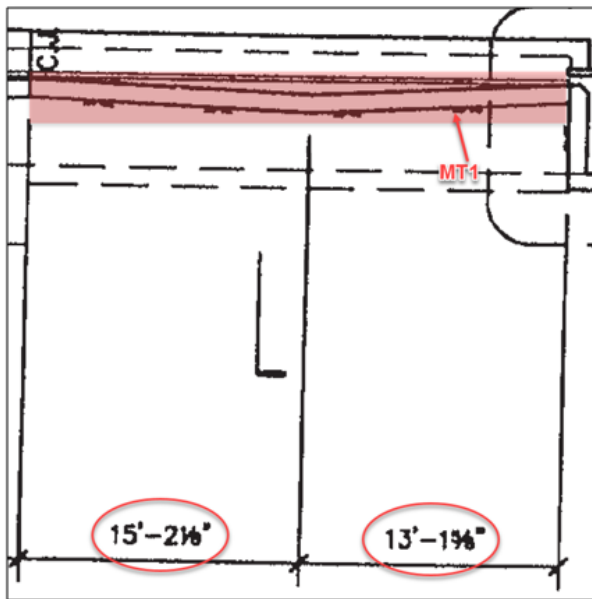
#### **a. [3A] First Trough Width and Slope**

Mandalay Bay also discloses a second edge of the wave damping trough comprising a first region with a first trough width  $T_{W1}$  and a first bottom upward trough slope  $M_{T1}$ . Cross-section “A” on page 13 of Mandalay Bay discloses a first trough width of 28’ $3\frac{3}{4}$ ” and a corresponding slope  $M_{T1}$ , as shown in the figures reproduced below from page 13. (Ex. 1009, ¶ 184.) The combination of Black, Wharton, and Mandalay Bay renders obvious [3A].

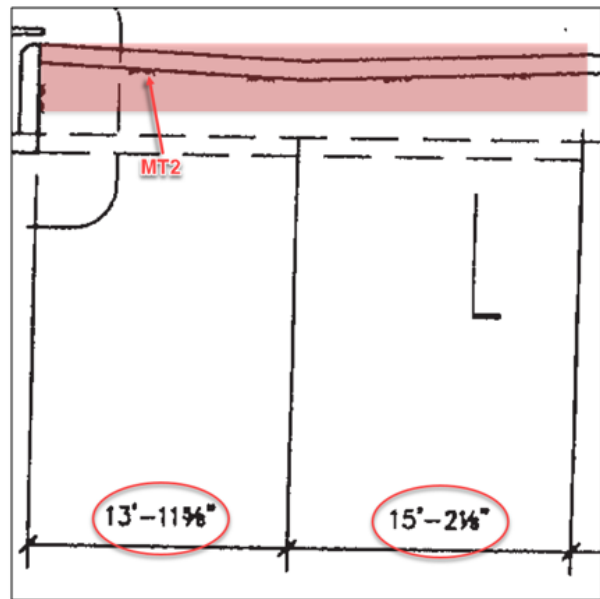


**b. [3B] Second Trough Width and Slope**

Mandalay Bay also discloses a second edge of the wave damping trough comprising a second region with a second trough width  $T_{W2}$  and a second bottom upward trough slope  $M_{T2}$ , wherein  $T_{W1} \neq T_{W2}$  and  $M_{T1} \neq M_{T2}$ . Cross-section “B” on page 13 of Mandalay Bay discloses a first trough width of 29’ 1 $\frac{1}{4}$ ”. The 10 inches of difference comes entirely from the bottom upward trough side of the trough, as shown. And, because both troughs rise the same amount (1.58”) from bottom (47.25”) to top (48.83”) of the trough, but have different runs (width), by definition, the slope is different. (See marking on Ex. 1006, pages 12, 13.) (Ex. 1009, ¶ 185.) The combination of Black, Wharton, and Mandalay Bay renders obvious [3B].



*Ex. 1006, Page 13, Cross-Section A*



*Ex. 1006, Page 13, Cross Section B*



**E. Ground 6: Claims 13 and 14 are Obvious over Black, in view of Wharton, and further in view of Mount Olympus**

Claims 13 and 14 of the '663 Patent are subject to cancellation under 35 U.S.C. § 103 over Black, in view of Wharton, and Mount Olympus, as set forth below. As discussed above in IX.A, Black alone, or the combination of Black and Wharton, in IX.C, disclose or render obvious each element of claim 1, from which claims 13 and 14 depend. (Ex. 1009, ¶ 186-188.)

Black, Wharton and Mount Olympus occupy a common field of endeavor: wave generating amusement attractions, or wave pools. Black, in IX.A, Wharton, in VI.E, and Mount Olympus, in VI.C, each discloses a wave generating apparatus with a wave generator, a deep edge, a beach edge, a sloped floor profile, a mound, and a wave-damping trough. In addition, Mount Olympus also discloses a sand pump and filter that is relevant to obviousness of claims 13 and 14. (Ex. 1009, ¶ 189.)

Given the similarities between Black, Wharton, and Mount Olympus, a POSITA would have been motivated to combine the teachings of Mount Olympus with the primary reference of Black and the secondary reference of Wharton to improve the performance of the wave-damping aspect of the attraction, by including a pump and sand filter. At the time of filing the '663 Patent, it would have been obvious to a POSITA to include both a pump to circulate water from the trough and gutter, and to provide a sand filter. (Ex. 1009, ¶ 190.)



The motivation to combine these references would have been that it was well known to use a sand bed as a filter in wave amusement attractions. Both Black (Ex. 1001, 6:15-19) and Wharton (Ex. 1004, page 3:69-83) disclosed the use of a sand beach, and the prior art continued to incorporate these features in the beach areas, as the ‘663 Patent concedes in the background section: “To provide for a more authentic experience, sand may be placed on the beach edge of the wave pool.” (Ex. 1001, 1:51-52.) A POSITA would have recognized that by providing sand in the beach area of the attraction, one could provide a feature desired by guests (a sandy beach) as well as provide filtration for the water circulation system in the trough. (Ex. 1009, ¶ 191.)

### **1. Dependent Claim 13**

Claim 1 is disclosed by Black, in VIII.A, or made obvious by the combination of Black and Wharton in IX.C, and by Mount Olympus in IX.B. Therefore, the combination of Black, Wharton, and Mount Olympus also disclose the elements of claim 1. Mount Olympus also discloses a pump and filter system for pumping and returning water in the gutters, as recited in claim 13. Page 21 discloses a “Recirculation Pump: R1, R2, R3, and R4,” seen in the drawings. (Ex. 1005, pages 21-25.) Mount Olympus also discloses a beach area, which can include sand, and a filter for the water circulation system. (Ex. 1005, pages 4, 21.) This corresponds to the sand filter described in the specification of the ‘663 Patent. (Ex. 1001 at 6:63-



66.) A POSITA would have been motivated to combine Black, Wharton, and Mount Olympus in the manner and for the reasons discussed immediately above. (Ex. 1009, ¶¶ 192-194.) The combination of Black, Wharton, and Mount Olympus renders obvious claim 13.

## **2. Dependent Claim 14**

Claim 13 is disclosed by the combination of Black and Wharton, in IX.C, and Mount Olympus, in IX.B. Mount Olympus also discloses wherein the pump of claim 14 can be actuated to drain water from the wave-damping trough into the wave pool. Page 21 discloses a “Recirculation Pump: R1, R2, R3, and R4,” seen in the drawings. (Ex. 1005, pages 21-25.) It would have been obvious to a POSITA to combine the teachings of Black and Wharton with Mount Olympus in the manner and for the reasons discussed above. (Ex. 1009, ¶¶ 195-197.) The combination of Black, Wharton, and Mount Olympus renders obvious claim 14.

## **F. Ground 7: Claims 1, 4-6, and 9 Are Obvious Over Black, in View of Peterka**

Claims 1, 4-6, and 9 of the '663 Patent are subject to cancellation under 35 U.S.C. § 103 over Black, in view of Peterka, as set forth below. As discussed above Black alone, in IX.A, discloses or renders obvious each element of claims 1, 4-6 and 9. A POSITA would have been motivated to combine the teachings of Black with Peterka because Peterka describes methods and structures for controlling wave energy from open-channel flows such as might come from rivers, canals, dams, and



the like. Because the engineering principals are equally applicable to controlling water flow coming from waves in a wave pool, a POSITA would have been well aware of the benefit of stilling basins in wave control, and would have looked to Peterka to solve the problems described in the '663 Patent. (Ex. 1009, ¶¶ 199-200.)

To implement the combination of Black and Peterka, a POSITA would have needed only to substitute the form of the channel (9) taught by Black with one of the stilling basins described in Peterka. Both the channel of Black and the stilling basin of Peterka are designed to be separated from the main open water flow by a wall or mound, over which waves will surge. The channel or basin then dissipates the wave energy and prevents some or all of the wave backwash from reentering the main water pool. Thus, the implementation would simply require substituting one well trough design for another. (Ex. 1009, ¶ 201.)

Given that Black and Peterka are directed to solving the same problems – dissipating waves and water energy – and given that the implementation requires simple substitution of known elements, it would have been obvious to modify the trough of Black with the trough of Peterka in the manner and for the reasons described above. (Ex. 1009, ¶ 202.)

### **1. Independent Claim 1**

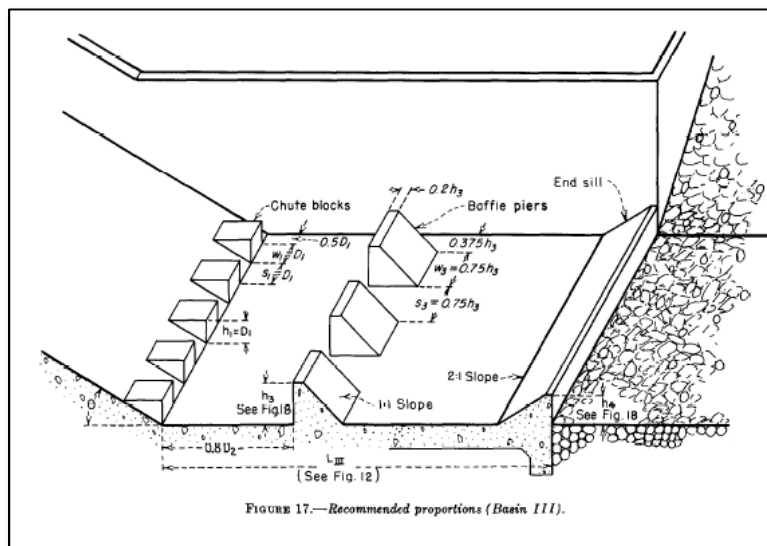
Black, in IX.A, discloses each of the elements of claim 1. (Ex. 1009, ¶¶ 73-88.) The combination of Black and Peterka therefore also discloses each of the



elements of claim 1. (*Id.*, ¶¶ 203-220.) To the extent Black does not teach the elements [1E], [1E.1], [1E.2], [1E.3] and [1I], those elements are taught by the combination of Black and Peterka, as set forth below.

**a. [1E] Wave-Damping Trough**

To the extent Black does not teach a wave-damping trough, Peterka supplies this teaching. Peterka discloses a trough referred to as a stilling basin, which is used to catch and dissipate wave energy from open-channel water flows. (Ex. 1007, pages 34-45, page 50, Fig. 17.) A POSITA would have understood that the stilling basin taught by Peterka could be used in place of the channel or lazy river taught by Black. A POSITA would have been motivated to combine Black and Peterka in the manner and for the reasons described above. (Ex. 1009, ¶ 209.)



Alternative designs for a stilling basin or disclosed on pages 59, 89, and 90 of Ex. 1007. (See also chart in VI.A.3.) Each alternative design is a wave-damping



trough adjacent to the shore and adapted to retain water. (Ex. 1009, ¶ 210.) The combination of Black and Peterka renders obvious [1E].

**b. [1E.1] Mound**

Black discloses [1E.1]. The combination of Black and Peterka therefore also discloses this limitation. (Ex. 1009, ¶ 211.)

**c. [1E.2] Trough Bottom**

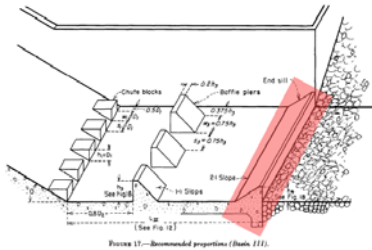
To the extent Black does not teach a trough bottom, Peterka supplies this teaching. The stilling basin taught by Peterka has a trough bottom, which is the flat bottom portion of the design shown in FIG. 17 of Peterka (reproduced above). (Ex. 1007, page 50.) Alternative designs for a stilling basin are disclosed on pages 59, 89, and 90 of Ex. 1007. Each has a trough bottom of various shapes. The combination of Black and Peterka therefore discloses this element. A POSITA would have been motivated to combine Black and Peterka in the manner and for the reasons described above. (Ex. 1009, ¶ 212.) The combination of Black and Peterka renders obvious [1E.2].

**d. [1E.3] Second Edge of Trough**

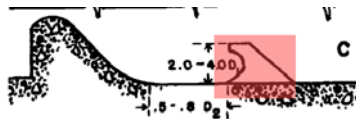
To the extent Black does not explicitly disclose “a second edge... sloped upward to meet the shore and the beach edge,” that element is disclosed by Peterka. In Figure 17, the second edge is seen on the right side of the image. The alternative designs for stilling basins disclosed on pages 44 and 74-75 of Peterka also disclose



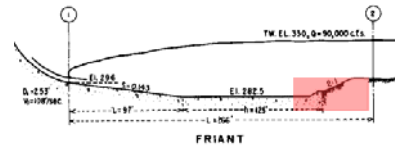
various alternatives with a second edge, as seen in the annotated images from Peterka, below. (Ex. 1009, ¶ 214.)



*Ex. 1007, page 50*



*Ex. 1007, page 59*



*Ex. 1007, page 90*

It would have been obvious for a POSITA to modify the channel disclosed by Black to include a sloped wall or second edge, such as those disclosed in Peterka, as described above. The combination of Black and Peterka therefore disclose this element. A POSITA would have been motivated to combine Black and Peterka in the manner and for the reasons described above. (Ex. 1009, ¶ 215.) The combination of Black and Peterka renders obvious [1E.3].

#### **e. [1I] Wave Energy Is Dampened**

To the extent Black does not teach that the wave energy is dampened, that teaching is disclosed by Peterka. (See, e.g., Ex. 1007, pages 16-19, 48-56, describing the use of stilling basins as energy dissipators.) It would have been obvious for a POSITA to modify the channel disclosed by Black to include a sloped wall or second edge, such as those disclosed in Peterka, as described above. The combination of Black and Peterka therefore disclose this element. A POSITA would have been motivated to combine Black and Peterka in the manner and for the reasons described



above. (Ex. 1009, ¶¶ 219-220.) The combination of Black and Peterka renders obvious [1I].

## **2. Dependent Claim 4**

Black, in IX.A, teaches wherein the first pool bottom portion is closer to the wave generator than the second pool bottom portion, as required by claim 4. A POSITA would have been motivated to combine Black and Peterka in the manner and for the reasons described above. The combination of Black and Peterka renders obvious claim 4. (Ex. 1009, ¶ 222-223.)

## **3. Dependent Claim 5**

Black, in IX.A, teaches or renders obvious claim 5. A POSITA would have been motivated to combine Black and Peterka in the manner and for the reasons described above. The combination of Black and Peterka therefore also renders obvious claim 5. (Ex. 1009, ¶¶ 224-231.)

## **4. Dependent Claim 6**

Black, in IX.A, teaches or renders obvious claim 6. A POSITA would have been motivated to combine Black and Peterka in the manner and for the reasons described above. The combination of Black and Peterka therefore also renders obvious claim 6. (Ex. 1009, ¶¶ 235-239.)

## **5. Dependent Claim 9**

Black, in IX.A, teaches or renders obvious [9]. A POSITA would have been motivated to combine Black and Peterka in the manner and for the reasons described



above. (Ex. 1009, ¶¶ 240-242.) The combination of Black and Peterka renders obvious [9].

## **X. CONCLUSION**

For the foregoing reasons, *inter partes* review should be instituted and claims 1-9, 13, and 14 of U.S. Patent No. 10,662,663 should be canceled.

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## **XI. APPENDIX – LIST OF EXHIBITS**

<b>Exhibit #</b>	<b>Shorthand</b>	<b>Description</b>
1001	'663 Patent	U.S. Patent No. 10,662,663 to McFarland
1002	'663 File History	Certified Copy of Prosecution History of the '663 Patent
1003	Black	U.S. Patent No. 6,912,738 to Black
1004	Wharton	U.S. Patent No. 586,983 to Wharton
1005	Mount Olympus	Wisconsin Department of Commerce Conditional Approval Plan for Big Chiefs Mount Olympus Theme Park, dated June 20 2007
1006	Mandalay Bay	Clark County, Nevada, Building Department Permit for Mandalay Bay Temple Ruins Wave Pool, issued September 4, 1998.
1007	Peterka	A. J. Peterka, HYDRAULIC DESIGN OF STILLING BASINS AND ENERGY DISSIPATORS (1958)
1008	Lochtefeld	U.S. Patent Pub. No. 2010/0125943 to Lochtefeld, et al.
1009	Stevick Decl.	Declaration of Glen Stevick
1010	Stevick CV	Curriculum Vitae of Glen Stevick
1011	Matzke Decl.	Declaration of Daryl Matzke
1012	Taché Decl.	Declaration of Rick Taché
1013	Wisc. Stat.	Wisconsin Statutes, Section 101.12
1014	'135 Patent	U.S. Patent No. 10,145,135 (App. Ser. No. 14/808,076)



## XII. APPENDIX – CLAIM LISTING

U.S. Pat. No. 10,662,663

Claim Element Designation	Claim Language
<b>Claim 1</b> [1 Preamble]	1. A wave-generating apparatus, comprising:
[1A]	a deep edge;
[1B]	a beach edge having a shore and a shore terminal edge;
[1C]	a wave generator adjacent to the deep edge;
[1D]	a wave pool with a pool bottom, wherein the pool bottom comprises two portions, a first pool bottom portion having a first angle of inclination relative to horizontal, and a second pool bottom portion having a second angle relative to horizontal, wherein the first angle is greater than the second angle; and
[1E]	a wave-damping trough adjacent to the shore and adapted to retain water, the trough comprising:
[1E.1]	a mound with a mound height forming a first edge of the wave-damping trough that separates the water in the wave-damping trough from the water in the wave pool;
[1E.2]	a trough bottom; and
[1E.3]	a second edge of the wave-damping trough extending from the trough bottom and sloped upward to meet the shore and the beach edge of the apparatus;
[1F]	wherein when the wave generator is not actuated, the wave pool retains water defining a static water level that is below the mound height of the wave-damping trough, and the wave-damping pool retains a static body of water below the mound height separated from the water in the wave pool; and



<b>Claim Element Designation</b>	<b>Claim Language</b>
[1G]	wherein when the wave generator is actuated, a wave forms at the deep edge, breaks over the junction of the first pool bottom portion and the second pool bottom portion,
[1H]	...travels over the second pool bottom portion, then travels over the mound of the wave-damping trough toward the shore terminal edge, and
[1I]	wherein the wave energy is dampened by the static body of water retained in the wave-damping trough, such that the wave white water is dampened as the wave travels from the first edge of the wave-damping trough towards the second edge of the wave-damping trough and the shore, and the wave backwash is dampened as it travels from the second edge of the wave-damping trough towards the first edge of the wave-damping trough.
<b>Claim 2</b>	The apparatus of claim 1, wherein the wave energy is dampened by greater than 50% when the wave has reached the shore terminal edge.
<b>Claim 3</b> [3 Preamble]	The apparatus of claim 1, wherein the second edge of the wave-damping trough comprises:
[3A]	a first region with a first trough width $T_{W1}$ and a first bottom upward trough slope $M_{T1}$ ;
[3B]	a second region with a second trough width $T_{W2}$ and a second bottom upward trough slope $M_{T2}$ , wherein $T_{W1} \neq T_{W2}$ and $M_{T1} \neq M_{T2}$
<b>Claim 4</b>	The apparatus of claim 1, wherein the first pool bottom portion is closer to the wave generator than the second pool bottom portion.
<b>Claim 5</b> [5 Preamble]	The apparatus of claim 1, further comprising:



<b>Claim Element Designation</b>	<b>Claim Language</b>
[5A]	a first cross-sectional profile with a first upwardly inclined region adjacent to the wave generator with a first upwardly inclined region slope $M_{UI1}$ and a second upwardly inclined region adjacent to the first upwardly inclined region with a second upwardly inclined region slope $M_{UI2}$ ; and
[5B]	a second cross-sectional profile with a first upwardly inclined region adjacent to the wave generator with a first upwardly inclined region slope $M_{UI3}$ and a second upwardly inclined region adjacent to the first upwardly inclined region with a second upwardly inclined region slope $M_{UI4}$ ; and
[5C]	wherein $M_{UI1} \neq M_{UI3}$ and $M_{UI2} \neq M_{UI4}$ .
<b>Claim 6</b>	The apparatus of claim 1, wherein the wave generator is comprised of a plurality of wave generators.
<b>Claim 7</b> [7 Preamble]	The apparatus of claim 1, wherein:
[7A]	the mound of the wave-damping trough has a maximum height point and a plane parallel to horizontal and intersecting the maximum height point, wherein the trough has a trough bottom and a trough width defined by where the trough bottom intersects the plane
[7B]	wherein the shore has an upwardly-inclined shore bottom and a shore width defined on one edge where the shore bottom intersects the plane and on an opposite edge where the shore bottom is substantially horizontal; and
[7C]	wherein the shore width is at least 50% longer than the trough width.
<b>Claim 8</b> [8 Preamble]	The apparatus of claim 1, wherein:



<b>Claim Element Designation</b>	<b>Claim Language</b>
[8A]	the mound of the wave-damping trough has a maximum height point and a plane parallel to horizontal and intersecting the maximum height point, wherein the trough has a trough bottom and a trough width defined by where the trough bottom intersects the plane
[8B]	wherein the shore has an upwardly-inclined shore bottom and a shore width defined on one edge where the shore bottom intersects the plane and on an opposite edge where the shore bottom is substantially horizontal; and
[8C]	wherein the shore width is at least twice the trough width.
<b>Claim 9</b>	The apparatus of claim 1, wherein the trough further comprises a pump that creates a current in a direction substantially orthogonal to the direction of the wave propagation.
<b>Claim 10</b>	The apparatus of claim 1, wherein the wave-damping trough and the pool bottom are separated by a mound, and the height of the mound is controlled by a mound elevator.
<b>Claim 11</b>	The apparatus of claim 10, wherein the wave-damping trough further comprises a sand filter and a pump, and wherein when the mound elevator is actuated, it lowers the mound below the static water level, allowing the pump to pull water from the wave pool into the trough and through the sand filter.
<b>Claim 12</b>	The apparatus of claim 10, wherein the wave-damping trough further comprises a sand filter and a pump, and wherein when the mound elevator is actuated, it lowers the mound below the static water level, allowing the pump to pull water from the wave pool into the trough and through the sand filter.
<b>Claim 13</b>	The apparatus of claim 1, wherein the wave-damping trough further comprises a sand filter and a pump.
<b>Claim 14</b>	The apparatus of claim 13, wherein the pump can be actuated to drain water from the wave-damping trough into the wave pool.



**XIII. APPENDIX – CERTIFICATE OF WORD COUNT UNDER 37  
C.F.R. § 42.24(D)**

Pursuant to 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 13,458, as counted by the Word Count feature of Microsoft Word, which is less than the 14,000 allowed under 37 C.F.R. § 42.24(a)(1)(i), excluding the parts of the paper exempted by 37 C.F.R. §42.24(a), and complies with the typeface requirements of 37 C.F.R. §42.6(a)(ii) and the style requirements of 37 C.F.R. §§42.6(a)(iii) and (iv).

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Dated: May 19, 2022

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#### **XIV. APPENDIX – CERTIFICATE OF SERVICE**

Pursuant to 37 C.F.R. § 42.105, I hereby certify that I caused a true and correct copy of the Petition for *Inter Partes* Review in connection with U.S. Patent No. 10,662,663 and supporting evidence to be served via FedEx Priority Overnight on May 19, 2022, on the patent owner as follows:

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Dated: May 19, 2022

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