

UNITED STATES PATENT AND TRADEMARK OFFICE

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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KOHLER CO.,  
Petitioner,

v.

DELTA FAUCET CO.,  
Patent Owner.

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Case No. IPR2024-00700  
U.S. Patent No. 10,393,363

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**DECLARATION OF DR. RICHARD KLOPP REGARDING  
CLAIMS 1-24 OF U.S. PATENT NO. 10,393,363**

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I, Richard Klopp, Ph.D., P.E., declare as follows:

## **I. INTRODUCTION**

1. My name is Richard W. Klopp.

2. I am making this declaration at the request of Delta Faucet Company (“Delta” or “Patent Owner”) as an independent expert consultant in this proceeding before the United States Patent and Trademark Office and to provide testimony pertinent to the Patent Owner’s Response for *Inter Partes* Review of U.S. Patent No. 10,393,363 (“’363 patent”). I understand that Kohler Company (“Kohler” or “Petitioner”) challenged the patentability of claims 1-24 of the ’363 patent.

## **II. QUALIFICATIONS AND EXPERIENCE**

3. I am a Principal Engineer employed by Exponent, Inc. (Exponent) in its Mechanical Engineering Practice. I am a full-time salaried employee based in Exponent’s Menlo Park, California, office. With more than 900 employees, over 500 of whom hold doctorates in their field of science and engineering, Exponent is the largest engineering and scientific firm in the nation dedicated primarily to the analysis of complex technical problems.

4. I am a trained mechanical engineer licensed to practice in the states of California, Texas, Washington, Nevada, and Michigan. I hold four academic degrees: a B.S. in Mechanical Engineering from Lehigh University in Bethlehem, Pennsylvania; and a Sc.M. in Engineering, a Sc.M. in Applied Mathematics, and a

Ph.D. in Engineering, all from Brown University in Providence, Rhode Island. I was elected to be a Fellow of the American Society of Mechanical Engineers in 2020. Attached as **Appendix A** is my curriculum vitae, which describes my education, experience, and professional activities and lists, among other things, my publications and work as an expert consultant in patent matters.

5. For the past 25 years, I have provided engineering services as a full-time employee at Exponent, based in the Menlo Park, California, office. Exponent is a publicly traded engineering and scientific consulting firm (NASDAQ symbol “EXPO”). Prior to my work at Exponent, I worked for 14 years at SRI International as a Postdoctoral Fellow and Research Engineer.

6. I used and improved optical interferometry methods throughout my graduate studies at Brown to measure small and rapid mechanical motions. This work included building combined laser interferometers that relied on mirrors, lenses, beamsplitters, windows, and detectors. I continued using optical methods during my time at SRI International. These included optical levers based on fiber optic light pipes, fiber-optic interferometers, and light ladders. I developed a novel optical interferometer to measure the axial motion of a hypodermic needle tube impacted on its end. I audited Stanford University Professor Joseph Goodman’s course “Introduction of Fourier Optics” during my time at SRI.

7. I regularly provide consulting services in the areas of mechanical engineering and mechanics, including machine design, product design, solid mechanics, failure analysis, fracture mechanics, and experimental mechanics. My failure analysis work has often involved faucets and other residential plumbing technology. Examples include failures from corrosion of metal parts, degradation of plastic and rubber parts, and from improper installation. Approximately three-fourths of my current work relates directly to commercial disputes. The remainder is split between reactive failure analyses and proactive engineering work supporting, specifically, product design, product improvement, and the prevention of failures.

8. My project work at Exponent has involved analysis of computer display screen illumination systems and defects in components such as prisms, light guides, and diffusers. I have also analyzed fiber optic connectors used for eye surgery instruments in the context of a patent dispute. I have gained considerable experience in consulting matters involving intellectual property disputes, and about half of my current work involves patent, trade secret, and other intellectual property disputes.

9. I have done engineering work related to a wide variety of faucets and spray heads in my professional career. This includes analysis of magnetic pulldown-style spray heads in the context of intellectual property. I purchased, disassembled, and cross-sectioned various spray heads and reviewed design drawings extensively

as part of this work. I also tested shower heads with fluidic nozzles to help validate claims regarding water distribution patterns.

10. In addition, I have purchased and installed kitchen and lavatory faucets in my own photography darkroom, homes, and workshop. These include pull-down style kitchen faucets, lavatory faucets, tub spouts, and showerheads. I have purchased, installed, removed, and repaired these devices over the years.

11. I am over 18 years of age, I have personal knowledge of the facts stated in this Declaration, and I could testify competently to them if asked to do so.

### **III. LEGAL PRINCIPLES**

12. I am an engineer, not an attorney. Nevertheless, I understand my analysis needs to be considered in light of U.S. Patent Law. My understanding of the law is based on discussions with Patent Owner's counsel, and my prior experience in patent litigation matters. I applied the legal standards listed in this section in reaching the conclusions of this Declaration.

13. I have been informed and understand that an issued patent is presumed valid. I have been informed and understand the petitioner of an *inter partes* review bears the burden of proving whether the challenged claims are invalid through facts supported by a preponderance of the evidence. I have been informed that a "preponderance of evidence" means evidence sufficient to prove that a fact is more likely true than not.

**A. Patent Claims**

14. I have been informed and understand that a patent's claims describe the invention made by the inventors and describe what the patent owner owns. I understand that claims may describe products, such as machines or chemical compounds, or processes and methods for making or using a product. Claims are usually divided into parts or steps called limitations. I understand that every claim term has to have a meaning.

15. I have been informed and understand that patents may include two types of claims: independent claims and dependent claims. An independent claim stands alone and simply recites the limitations it covers. In contrast, a dependent claim depends on either an independent claim or another dependent claim, and incorporates all the limitations recited in the claim or claims from which it depends along with the limitations it recites itself. By virtue of its dependency, a dependent claim must be narrower than the independent claim from which it depends.

**B. Prior Art**

16. I have been informed and understand that, in the context of an IPR, a claimed invention is not patentable if the invention was patented or described in a printed publication available to the public before the effective filing date of the claimed invention.

**C. Anticipation**

17. I have been informed and understand that a patent claim is invalid for anticipation only if each and every limitation in the claim is disclosed, either expressly or inherently, in a single prior-art reference. I understand that it is the petitioner's burden to prove that every limitation in a challenged claim was found in the prior art, either inherently or explicitly.

18. I have been informed and understand that, to anticipate, the reference must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements arranged as in the claim. I understand that, where the reference discloses elements in different locations in the disclosure, the reference must be sufficiently clear in disclosing that those elements could be combined such that a person of ordinary skill in the art ("POSITA" or "skilled artisan"—*see* §VII) at the time of the invention would at once envisage the claimed combination.

19. I have been informed and understand that an anticipating reference must be enabling. That is, the disclosure in the assertedly anticipating reference must be adequate such that a POSITA can practice the subject matter based on the reference without undue experimentation.

**D. Obviousness**

20. I have been informed and understand that a patent claim is invalid as obvious if the subject matter as a whole would have been obvious to one of ordinary skill in the art before the effective filing date of the claim invention. The obviousness analysis involves several factual inquiries, including (i) the scope and content of the prior art, (ii) the differences between the prior art and the claim, (iii) the level of ordinary skill in the art at the effective filing date of the claimed invention, and (iv) the existence of objective indicia of non-obviousness.

21. I have been informed and understand that for a patent claim can be found to be obvious over a single prior art reference or multiple prior art references. I understand that references qualify as prior art for an obviousness determination only when they are analogous to the claimed invention. Two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed; and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

22. I have been informed and understand that there should be some reason or motivation that would have led a POSITA to combine or modify the relevant teachings in the prior art to obtain the claimed invention. I understand that the motivation to combine prior art references can come from the knowledge of those

skilled in the art, from the prior art reference itself, or from the nature of the problem to be solved. However, I understand that the mere fact that a POSITA could combine the references is not sufficient, and the evidence must show that a POSITA would have been motivated to do so.

23. Furthermore, I have been informed and understand that a POSITA must have had a reasonable expectation of success in achieving the claimed combination based on the teachings of the prior art. A reasonable expectation of success includes that a POSITA would have expected the claimed combination to have its desirable properties.

24. I have been informed and understand that an invention is more likely to be deemed non-obvious if it yields unexpected results or if the prior art teaches away from the claimed invention. I understand that a reference may be said to teach away from the claimed invention when a person of ordinary skill in the art, upon reading the reference, would be discouraged from following or would be led in a direction divergent from the path that was taken by the inventor. But even if a reference is not found to teach away, its statements regarding preferences are relevant to whether a POSITA would be motivated to combine that reference with another reference.

25. I have been informed and understand that it is incorrect to evaluate obviousness from a hindsight perspective, using the teachings of the patent at issue as a guide to combine the right prior art references in the right way so as to achieve

the results of the claimed invention. Evidence of a motivation to combine prior art references helps avoid the use of hindsight in determining obviousness. I understand that the inventor's own path itself should not be relied on to reach a conclusion of obviousness—that is hindsight. Rather, what matters is the path that a POSITA would have followed as evidenced by the pertinent prior art. Patentability shall not be negated by the manner in which the invention was made.

26. I have been informed and understand that objective indicia of non-obviousness may include, for example, unexpected results, copying, fulfillment of a long-felt unmet need, failure of others, skepticism, praise by others, and commercial success. I understand that for objective indicia of non-obviousness to be given weight, there must be a nexus (causal connection) between the indicia and the claimed invention.

27. I have been informed and understand that if the asserted objective indicia are tied to a specific product and that product embodies the claimed features, and are coextensive with them, then a nexus is presumed and the burden shifts to the party asserting obviousness to present evidence to rebut the presumed nexus. Nexus can also be shown if the objective indicia of non-obviousness are commensurate in scope with the claims or if the objective indicia of nonobviousness is the direct result of the unique characteristics of the claimed invention. I understand that objective

indicia must be tied to the merits of the claimed invention beyond what was known in the prior art.

#### **IV. MATERIALS CONSIDERED**

28. In forming my opinions, in addition to my knowledge and experience, I have considered the materials cited herein and listed in **Appendix B**.

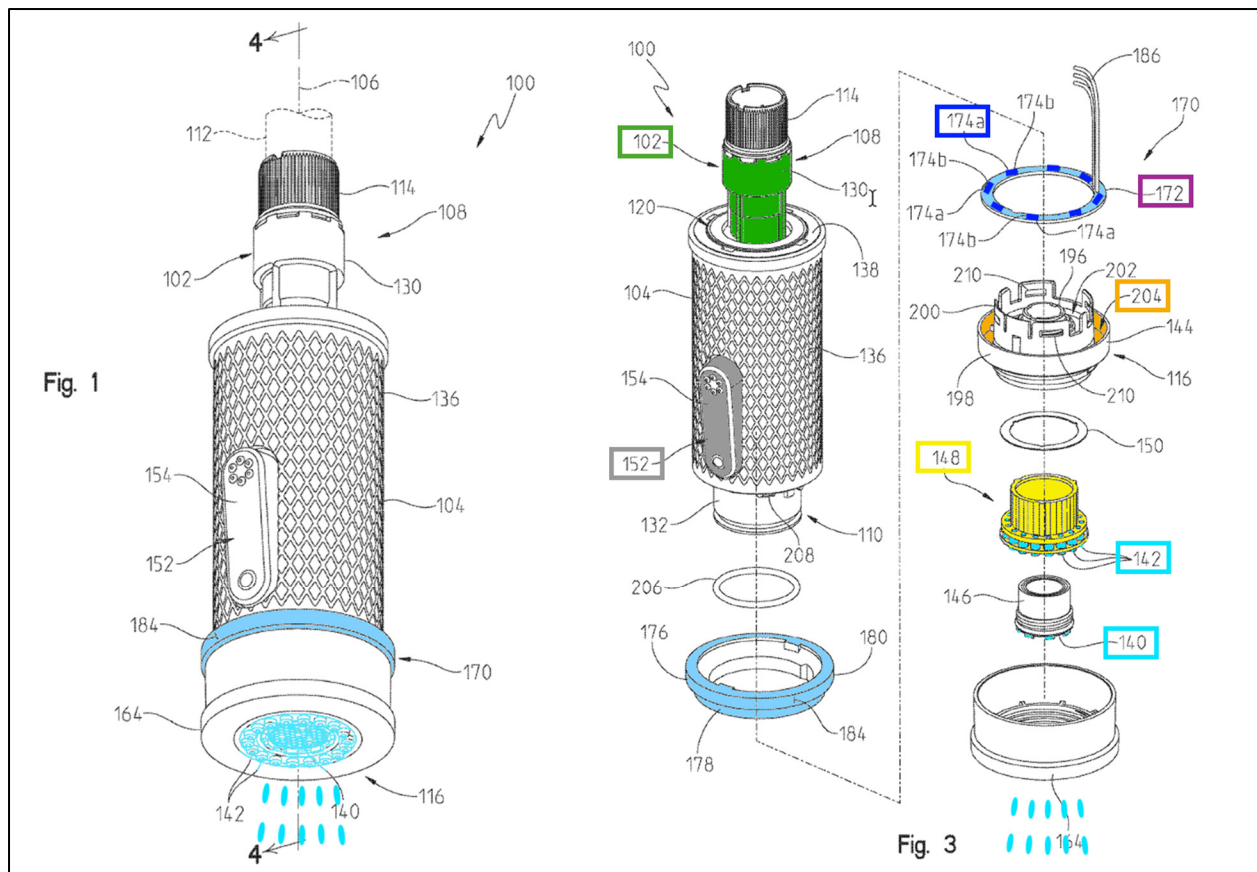
#### **V. THE '363 PATENT (EX. 1001) AND BACKGROUND TECHNOLOGY**

##### **A. Overview of the Patent**

29. I have reviewed the '363 patent. The '363 patent relates to “[a] sprayhead for dispensing water [that] includes a housing and an illumination device supported by the housing.” Ex. 1001, Abstract, 1:15-17, 1:27-33. The '363 patent was filed claiming priority to a provisional application dated April 25, 2017. The non-provisional application was filed on April 20, 2018. Ex. 1001, Face. As far as I am aware, the Petitioner has accepted that the date of the provisional application is the effective priority date. Petition, 6. However, my opinions would not change if instead the priority date is April 20, 2018.

30. The '363 patent explains that in conventional fluid delivery devices with illumination, the illumination devices “typically include[d] a single light source, or a plurality of light sources providing for discrete areas of illumination (i.e., “hot spots.”). Ex. 1001, 1:24-26. Thus, one of the problems the '363 patent solves is “hot spots,” i.e., discrete or uneven lighting, in conventional fluid-delivery devices with

illumination. Ex. 1001, 1:24-26. The patent does so by placing **light emitters 174** on a closed-loop **substrate 172** and placing a similarly shaped and sized translucent closed-loop **light pipe 176** directly on top of the substrate to define a closed loop to diffuse light. Ex. 1001, 1:40-2:3, 3:52-58, Figures 1-4. The '363 patent also places the substrate “within the outer **annular space 204**” to protect light emitters from water damage. Ex. 1001, 4:33-34, Figure 3.



Ex. 1001, Figures 1 (left) and 3 (right).<sup>1</sup>

<sup>1</sup> All annotations and emphasis added unless otherwise noted.

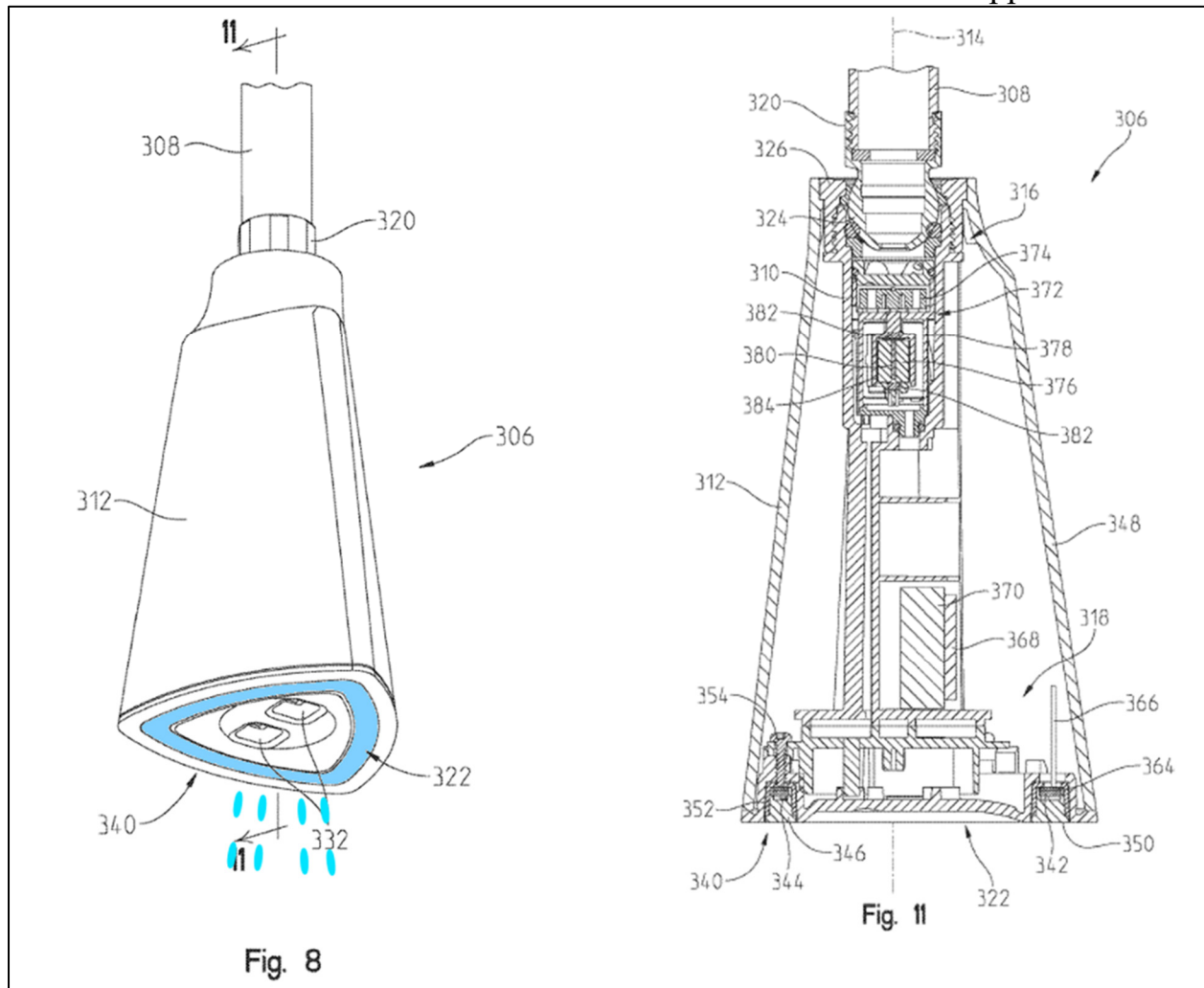
31. The '363 patent concludes with 24 claims including three independent claims. The '363 patent specification describes three embodiments, including two comprising sprayheads. One sprayhead is expressly disclosed as a pull-down sprayhead, e.g., one that is detachable from the faucet tube to be manipulated by the user. All three embodiments are characterized as having housings defining a longitudinal axis, a waterway within the housing, and a sprayface at the distal end of the waterway that includes a water outlet. Ex. 1001, 1:34-65.

32. All three '363 embodiments include an illumination device supported by their housings. The illumination devices each comprise a substrate circuit board which supports a plurality of light emitters, e.g., LEDs. In each embodiment, light from the emitters is diffused by a light pipe. In one disclosed sprayhead embodiment, the light is diffused outwardly away from the housing. In a second sprayhead embodiment, the light is diffused outwardly to an outer illumination surface. In the shower head embodiment, the light is diffused outwardly in a direction parallel to the longitudinal axis. In all three embodiments, the light pipe defines a closed loop surrounding all the water outlets. One sprayhead embodiment is described as having a built-in hydro-generator to provide electricity to the light emitters. Ex. 1001, 1:34-2:2.

33. As shown in the figures below, the '363 Patent teaches a fluid delivery device, which comprises a housing 104, a **waterway 102** positioned within the

housing 104, an illuminating device 170 supported by the housing 104, and a sprayface 116 including both a stream outlet 140 and a spray outlet 142, which is connected to the waterway 102. Ex. 1001, 2:53-57, 3:25-58.

34. The illuminating device 170 includes a plurality of **light emitters 174** which are supported by a **substrate 172** and a translucent **light pipe 176**. The translucent light pipe forms a closed loop to diffuse light outwardly from the light emitters 174 for example, in the “radial direction” (i.e., direction radially from or perpendicular to the axis 106 of the sprayhead 100) as illustrated in Figures 1 and 3 above or in the “axial direction” (i.e., direction parallel to the axis 314 of the showerhead 306) as illustrated below in Figures 8 and 11 of the '363 patent. Ex. 1001, 3:54-65.



Ex. 1001, Figures 8 (left), 11 (right).

35. The '363 patent discloses a power source, for example, a hydro-generator 212 that is fluidly coupled with the waterway 102 and is in electrical communication with the light emitter 174. Ex. 1001, 4:39-41.

More particularly, an impeller 214 of the hydro-generator 212 is positioned within the water flow path defined by the distal portion 132 of the waterway 102. Magnets 216 are received within a housing 218 and coupled to the impeller 214 via a shaft 220 rotatably supported by bearings 222. As such, rotation of the impeller 214 by water flow through the waterway 102 causes similar rotation of the magnets 216.

Coils 224 are supported within the housing 218 and proximate the magnets 216. As is known, rotation of the magnets 216 relative to the coils 224 generates electricity which is then provided to the light emitters 174.

Ex. 1001, 4:42-52.

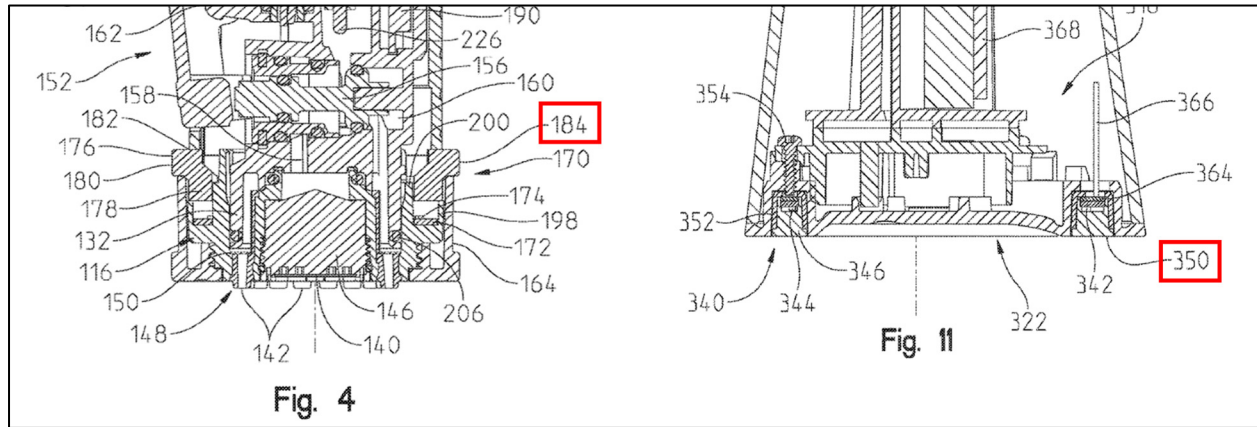
36. Additionally, the '363 patent discloses a light emitter 174 that generates light of a color when the signal from a temperature sensor 226 within the waterway 102 detects a water temperature. Ex. 1001, 4:53-4:54.

In operation of an illustrative embodiment, light emitters 174<sub>a</sub> generate light of a first color (e.g., blue) when the signal from the temperature sensor 226 detects a first water temperature, and light emitters 174<sub>b</sub> generate light of a second color (e.g., red) when the signal from the temperature sensor 226 detects a second water temperature greater than the first water temperature. Illustratively, the first and second light emitters 174<sub>a</sub>, 174<sub>b</sub> blend the light of the first color and the light of the second color and generate light of a third color when the signal from the temperature sensor 226 detects a third water temperature between the first water temperature and the second water temperature.

Ex. 1001, 5:5-16.

37. The '363 patent describes implementing light in different directions to provide different benefits to a user. For example, light may be emitted from a faucet sprayhead in a direction perpendicular to a longitudinal axis of the sprayhead, so the user can easily view water temperature. *See, e.g.*, Ex. 1001, 1:52-59, 3:52-4:38 (“**outer illumination surface 184**”), Figures 1-4. In another example, light may be emitted from a shower sprayhead in a direction parallel to the longitudinal axis of

the sprayhead, e.g., to provide additional light in a shower area. *See, e.g., id.*, 5:65-6:14 (“**outer illumination surface 350**”), Figures 7-11.



Ex. 1001, Figures 4 (excerpted) (left) and 11 (excerpted) (right).

## B. Challenged Claims

38. I have reviewed the Petition and understand that the Petition challenges all claims of the '363 patent. The table below maps the grounds and the asserted prior art with each challenged claim, with the independent claims bolded:

| Challenged Claims | Grounds | Asserted Prior Art                    |
|-------------------|---------|---------------------------------------|
| <b>1</b>          | 1, 4, 5 | Tseng; Tse; Tse and Carter            |
| 2-5               | 1       | Tseng                                 |
| 6-8               | 4, 5    | Tse; Tse and Carter                   |
| 9                 | 2, 4, 5 | Tseng and Mizuno; Tse; Tse and Carter |
| <b>10</b>         | 1       | Tseng                                 |
| 11                | 2       | Tseng and Mizuno                      |
| 12-16             | 1       | Tseng                                 |
| 17-18             | 3       | Tseng and Schneider                   |
| <b>19-23</b>      | 4, 5    | Tse; Tse and Carter                   |
| 24                | 6       | Tse (or Tse and Carter) and Spangler  |

The independent claims are reproduced below. Every independent claim recites, among other features, a “translucent light pipe defining a closed loop” “to diffuse light from the light emitters.”

1. A sprayhead comprising:
  - a housing defining a longitudinal axis;
  - a waterway received within the housing;
  - a sprayface fluidly coupled to the waterway and supporting a water outlet; and
  - an illumination device supported by the housing, the illumination device including a substrate, a plurality of light emitters supported by the substrate, and ***a translucent light pipe defining a closed loop to diffuse light from the light emitters*** outwardly away from the housing.

’363 Patent, Claim 1 (emphasis added).

10. A pull-down sprayhead for a faucet, the sprayhead comprising:
  - a housing defining a longitudinal axis extending between a proximal end and a distal end;
  - a waterway received within the housing;
  - a sprayface fluidly coupled to the waterway and defining a water outlet; and
  - an illumination device supported by the housing, the illumination device including a substrate, a plurality of light emitters supported by the substrate, and a translucent light pipe including ***an outer illumination surface extending perpendicular to the longitudinal axis of the housing, the translucent light pipe defining a closed loop to diffuse light from the light emitters*** outwardly away to the outer illumination surface.

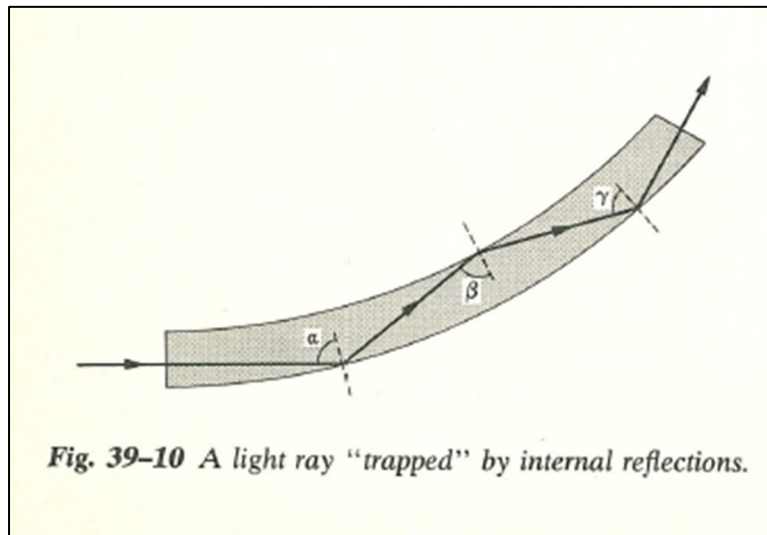
’363 Patent, Claim 10 (emphasis added).

19. A pendant showerhead comprising:
- a housing defining a longitudinal axis;
  - a waterway received within the housing;
  - a sprayface fluidly coupled to the waterway and including a water outlet;
  - and
  - an illumination device supported by the sprayface, the illumination device including a substrate, a plurality of light emitters supported by the substrate, and ***a translucent light pipe defining a closed loop surrounding the water outlet to diffuse light from the light emitters outwardly in a direction parallel to the longitudinal axes.***

'363 Patent, Claim 19 (emphasis added).

### **C. Background Technology**

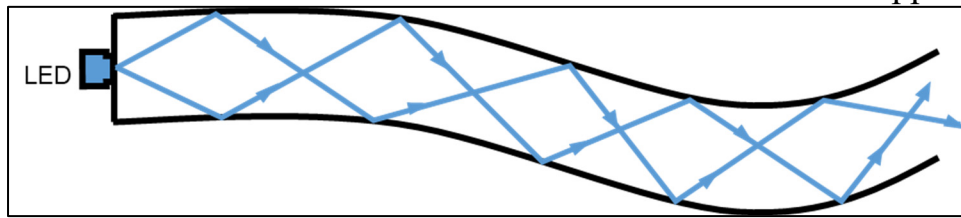
39. The dictionary definition of a light pipe is a solid transparent plastic rod for transmitting light lengthwise. Ex. 2017. A light pipe may also be glass and does not have to be a circular rod; any relatively elongated geometry can provide similar function. The light pipe operates by transforming a quasi-point source into an artificially extended light source by repeated total internal reflection (TIR). TIR occurs when light hits an interface beyond a critical angle such that it reflects completely back into its original medium rather than leaking outward. This critical angle is determined by the optical properties of the light pipe and its surrounding environment. Ex. 2010, 657-658.



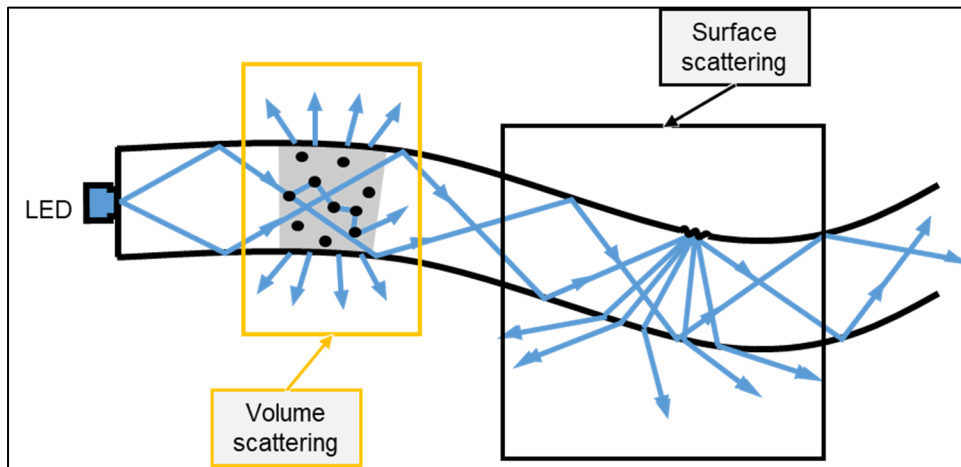
Ex. 2010, 658.

40. The characteristics of pipe material play a significant role in the optical properties of a light pipe. There are various pipe material characteristics that influence the optical performance of a light pipe; however, based on the scope of my declaration, I will focus on two: surface irregularities and internal discontinuities.

41. Surface irregularities and internal discontinuities cause light to scatter in a light pipe. Light pipes with surface irregularities experience surface scattering while light pipes with internal discontinuities experience volume scattering. Ex. 2018, §§3.1-3.2. The figures below illustrate the difference between a light pipe experiencing no scattering, surface scattering and volume scattering.



Light pipe with no scattering.



Light pipe with scattering.

42. Translucent materials exhibit surface irregularities and/or internal discontinuities and as such, experience surface scattering and/or volume scattering when used in light pipes. On the other hand, when non-translucent (i.e., transparent) materials are used in light pipes, they transmit light by TIR almost exclusively, with negligible scattering.

## VI. CLAIM CONSTRUCTION

43. I am informed and understand that, in an IPR, I should give claim terms their ordinary and customary meaning as understood by a person of ordinary skill in the art at the time of the invention. I am informed and understand that the words used

in the patent's claims and the context in which the words are used in the claims are highly relevant in determining the meaning of the words. I also understand that the words of a claim are to be interpreted in the context of the entire patent, including the patent's claims, specification, and figures.

44. I have been further instructed that, in general, a patent's prosecution history (also called the file history) may provide helpful evidence about how the U.S. Patent and Trademark Office and the applicant understood the patent and its claims. Therefore, I have been instructed that claims should also be interpreted with the patent's prosecution history in mind.

45. I have also been instructed that "extrinsic evidence" (such as dictionaries, pertinent scientific or technical references, and expert opinion) may also help inform how a person of ordinary skill in the art would have understood a claim term. I have been instructed that extrinsic evidence must always be considered with intrinsic evidence and that intrinsic evidence has priority over extrinsic evidence.

46. I have applied these instructions in this declaration. For the purposes of this IPR, I give the claim terms their plain and ordinary meaning, as they would have been understood by a person of ordinary skill in the art as of the effective priority

date, April 25, 2017.<sup>2</sup> However, if the Petitioner later proposes claim construction for any particular claim term, I reserve the right to respond to that construction. I also reserve the right to propose an express construction consistent with the term's plain and ordinary meaning, if needed.

## **VII. LEVEL OF ORDINARY SKILL IN THE ART**

47. I understand that when considering the claims of the '363 patent and the Petitioner's asserted prior art, I must do so from the perspective of one of ordinary skill in the art as of the '363 patent's effective priority date.

48. I have been informed and I understand that the factors to be considered in determining who would be a person of ordinary skill in the art include: (1) the types of problems encountered in the art; (2) the prior art solutions to those problems; (3) the rapidity with which innovations are made; (4) the sophistication of the technology; and (5) the educational level of active workers in the field.

49. I have reviewed the declaration of J. Chris Cook submitted in support of the Petition. Ex. 1003. Mr. Cook opines in his declaration that "a POSITA in the field of the '363 patent would have had a degree in industrial design or an equivalent field, along with 2 years of professional experience working with kitchen, bath, or other plumbing fixtures (or similar products), or an equivalent level of skill,

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<sup>2</sup> The same meanings would result if the priority date were April 20, 2018.

knowledge, and experience. This POSITA would have been aware of and generally knowledgeable about the standard features and functionality of kitchen, bath, and other plumbing fixtures (or similar products).” Ex. 1003, ¶38.

50. In my opinion, this definition is incorrect. Because the ’363 patent and the proffered prior art describe, and the independent claims substantially relate to, optical aspects such as light pipes, light interaction with surfaces, translucence, illumination, illumination devices, and substrates for such devices, a background in basic optics is necessary for understanding the field of invention. Moreover, a degree in industrial design and merely “working with” kitchen, bath, or other plumbing fixtures (or similar products) is unlikely to provide the knowledge necessary to understand basic fluid mechanics associated with water passage sizing, diverters, hydro-generators, and multidimensional fluidic devices as those relate to the claims. Thus, in my opinion, A POSITA needs knowledge attained from training in basic fluid mechanics or from designing or analyzing designs of kitchen, bath, or other plumbing fixtures (or similar products).

51. In my opinion, the POSITA would have had (1) a degree in mechanical engineering, industrial design, or an equivalent field, including education in the field of optics, (2) at least two years of professional experience designing or analyzing kitchen, bath, or other similar plumbing fixtures or consumer products, and (3) at

least two years of professional experience designing or analyzing optical apparatus.

Additional education could compensate for professional experience or vice versa.

### **VIII. SCOPE AND CONTENT OF THE ASSERTED PRIOR ART**

52. I understand that the Petition asserted various prior art, including various combinations of references referred to as “Tseng,” “Tse,” “Carter,” “Mizuno,” “Schneider,” and “Spangler.”

#### **A. U.S. Pub 2015/0354186 to Tseng (Ex. 1004)**

53. I understand that the Petition asserts the patent application by Tseng as a primary prior art reference in Grounds 1-3. Petition, 6-7. Tseng was filed in 2015. Ex. 1004, p. 1.

54. As can be seen in the figures below, Tseng teaches “a pull-out faucet which contains a shower assembly to illuminate lights.” Ex. 1004, ¶1. The pull-out faucet contains a body 2 and a shower assembly 3 mounted on the body 2.

55. Tseng recognizes problems with a conventional illuminated showerhead—that their electric wires break easily as the showerhead rotates, and because of that, the rotation angle of the shower head has to be limited. Ex. 1004, ¶4. Tseng also notes that it is difficult to integrate a printed circuit board (PCB) to the conventional showerhead because the space is narrow. Ex. 1004, ¶7. This is also because a showerhead (or sprayhead) includes other devices such as a switch

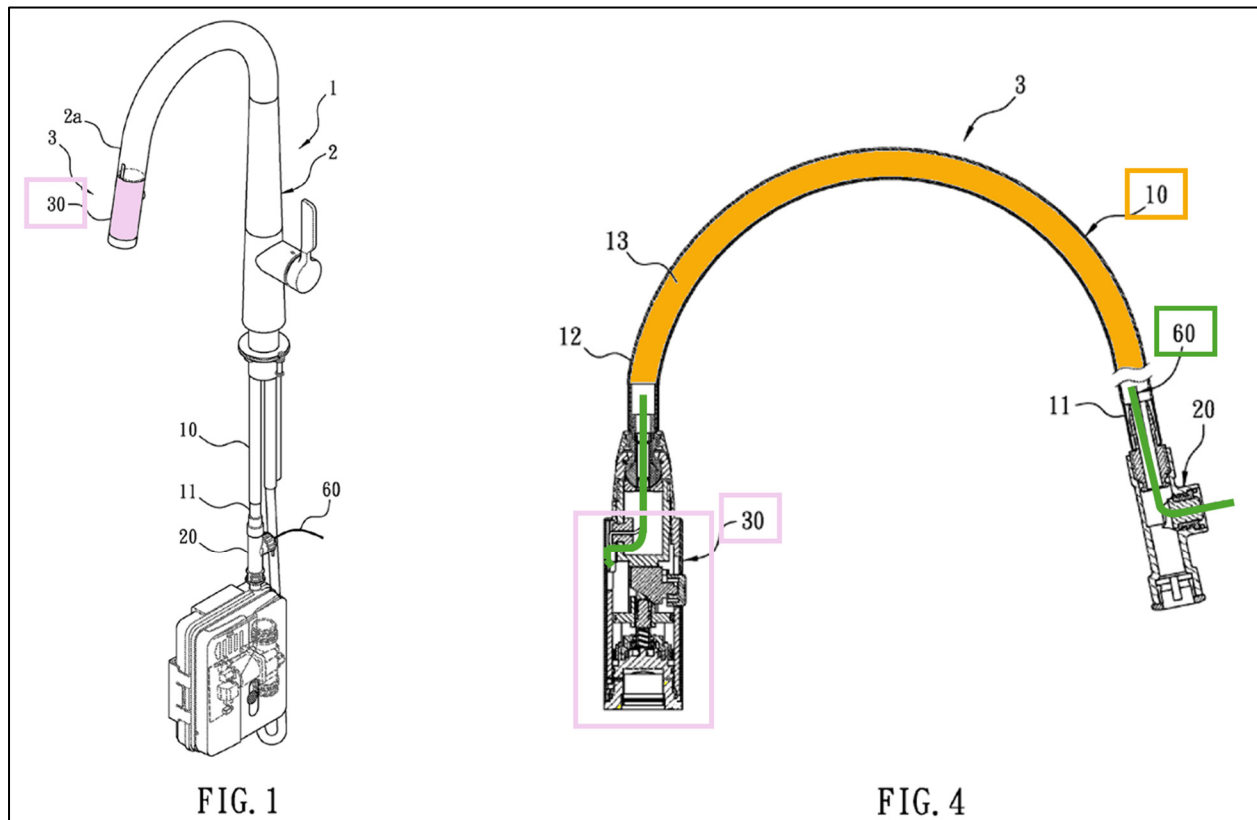
device for changing the water flow between straight (through a “central channel”) and spray (through “peripheral channels”). Ex. 1004, ¶¶7, 15.

56. To solve these problems, Tseng proposes a flexible printed circuit to replace the conventional PCB to fit into the narrow space of a **spray head 30** of a shower assembly 3. Ex. 1004, ¶¶30, 108.

57. The shower assembly 3 as taught by Tseng includes a **flexible pipe 10**, an inflow member 20 connected to the inlet segment 11 of the flexible pipe 10, a sprayhead 30 connected to the outlet segment 12 of the flexible pipe 10 and retracting back to an outlet 2a of the body 2 after being pulled outwardly, a plurality of LED elements 40 arranged in the sprayhead 30, a printed circuit board 50 electrically connected to the plurality of LED elements 40, and an **electric wire 60** inserted along the flexible pipe 10 and electrically connected with the circuit board 50 to supply power. Ex. 1004, ¶¶68, 71. The shower assembly 3 further includes an angle limiter 80 fixed between the spray heard 30 and the coupling member 70. Ex. 1004, ¶81.

58. The flexible pipe 10 into which the electric wire 60 is inserted serves to protect the wire from breaking easily. Ex. 1004, ¶¶30, 107. The angle limiters and stoppers also prevent damage to the electric wire from by ensuring that the showerhead rotates smoothly over a limited range and by preventing water leakage from reaching the electric wire. Ex. 1004, ¶¶30, 109-110. Tseng explains that all this

can be implemented while maintaining the faucet's size comparable to conventional faucets. Ex. 1004, ¶106.



Ex. 1004, Figures 1 (left) and 4 (right).

59. Tseng also discloses three embodiments for the light conductor; a first embodiment where the light conductor 31 is the guiding member, a second embodiment where the light conductor 37 is disposed on a peripheral side of the guiding member 36, and a third embodiment where the light conductor 38 is formed in a sleeve shape to retain with a guiding member 39. Ex. 1004, ¶¶72, 91, 97. The light conductors 37 (for the second embodiment) and 38 (for the third embodiment)

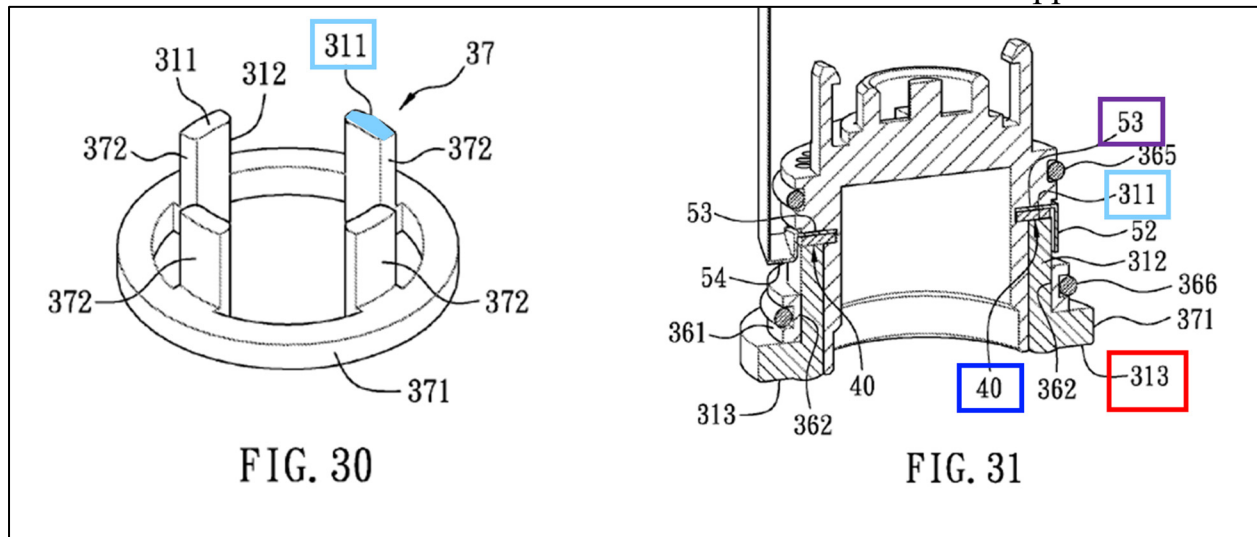
have plural **input face 311** for inputting the lights, a light transmission portion 312 for transmitting the light, and an **output face 313** located at the bottom of the light conductors 37 and 38 for outputting the lights. The LED elements face the input faces 311 to transmit light downward through the input faces 311, transmission portions 312, and through output faces 313. Ex. 1004, ¶¶91, 97:

Referring further to FIGS. 30 and 31, the pull-out faucet of the second embodiment further includes a light conductor 37 disposed on a peripheral side of the guiding member 36, and the light conductor 37 has a circular rib 371 and plural light columns 372 extending upwardly from an inner wall of the circular rib 371, wherein each light column 372 has an input face 311 formed on a top end thereof, and bottom ends of the plural light columns 372 and a bottom end of the circular rib 371 define at least one output face 313, the plural light columns 372 form at least one light transmission portion 312.

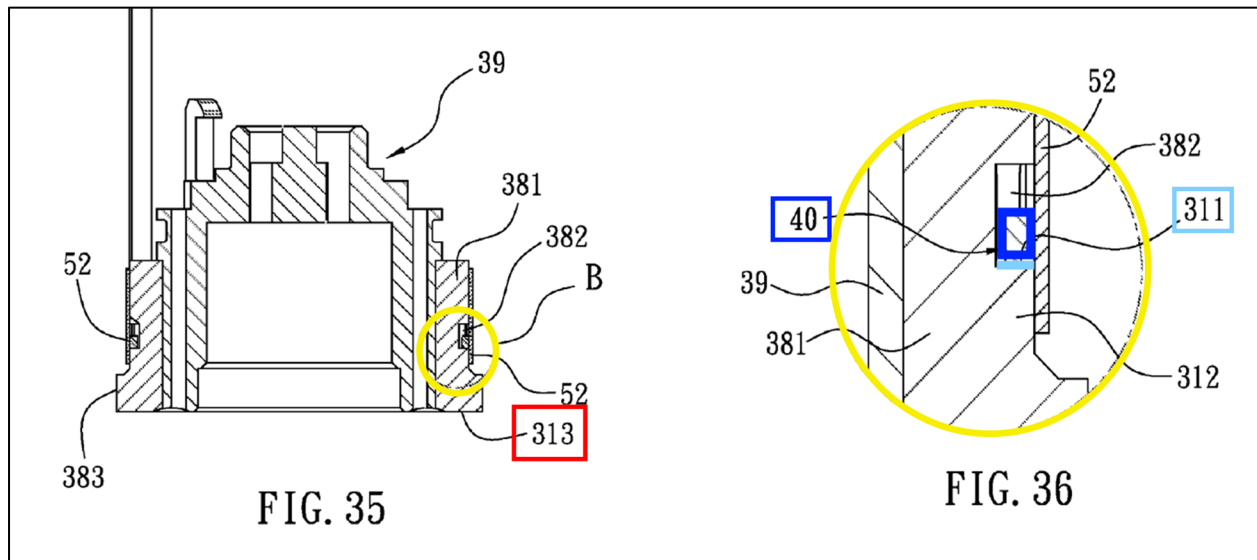
Ex. 1004, ¶91.

a light conductor 38 formed in a sleeve shape to retain with a guiding member 39, wherein the light conductor 38 has an outer cliff 381, and the outer cliff 381 has plural indentations 382 arranged around a middle section thereof, wherein each indentation 382 has an input face 311 formed on a bottom end thereof, and the outer cliff 381 also has an output face 313 defined on a bottom end thereof. In addition, the outer cliff 381 among input faces 311 of the plural indentations 382 and the output face 313 forms a light transmission portion 312.

Ex. 1004, ¶97.



Ex. 1004, Figures 30 (left), 31 (excerpted) (right).



Ex. 1004, Figures 35 (excerpted) (left), 36 (right).

**B. JP 2003027537A to Mizuno (Ex. 1007; Ex. 1008 for translation)**

60. Mizuno was considered by the Examiner during prosecution of the '363 patent and is listed on the face of the '363 patent. *See* Ex. 1001, 3; Ex. 1002, 63.

61. Mizuno generally describes a faucet with an LED illumination lamp powered by a hydroelectric generator. Ex. 1008, ¶1. Mizuno's teaching focuses on the spout head 10 of a faucet. Ex. 1008, ¶19. Mizuno teaches a body 14 of a spout head 10 with an upper part 16, a lower part 18 and an annular part 20. Ex. 1008, ¶19. The spout head 10 contains LED illumination lamps 12, a generator unit 32, and a control board 49 that supplies power generated by the generator unit 32 to the LED illumination lamps 12 and controls the operation thereof. Ex. 1008, ¶23.

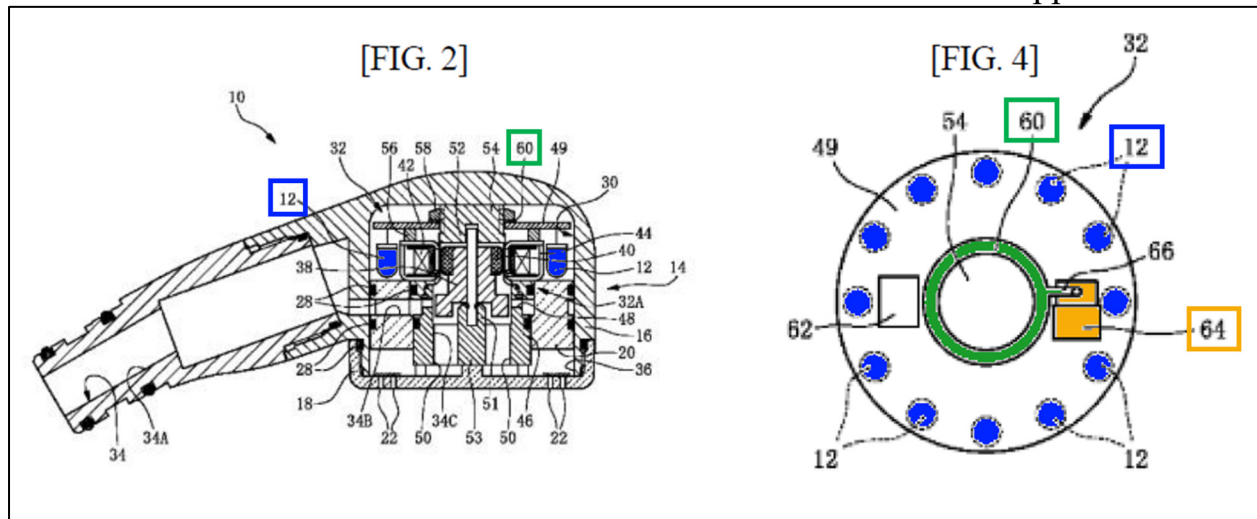
62. Mizuno identifies a very different solution than Tseng to problems in the prior art regarding provision of electric wiring in a faucet sprayhead. Ex. 1008, ¶¶4-5. By using a hydroelectric generator to generate power using the flow of the water, Mizuno explains that "there is no need to perform electrical wiring," Ex. 1008, ¶6. According to Mizuno, the generator unit 32 is fitted within the recess 30 formed inside the body 14 of the sprout head 10. The generator unit 32 is connected to a water flow inlet 34, allowing water flow into the generator unit, and a water flow outlet 50, allowing water to flow out of the generator unit into a water chamber 36 formed under the annular part 20 in communication with the water-sprinkling hole 22. Ex. 1008, ¶22.

63. Mizuno also identifies that using a hydroelectric generator causes another problem—excessive power generated from high water flow—which could damage the LEDs. Ex. 1008, ¶7 ("when the feed-water pressure to the faucet

provided with the LED illumination lamp and the hydroelectric generator is too high, excessive power is supplied to the LED illumination lamp causing various inconveniences such as malfunctions”).

64. Among its embodiments, Mizuno teaches a **voltage-stabilizing element 64** that stabilizes the power from a generator unit 32 but warns that the voltage-stabilizing element can also be overheated and become inoperable when the water pressure is too high. Ex. 1008, ¶8 (“However, even then, when excessive power is generated in the hydroelectric generator, a large amount of heat is generated by the voltage-stabilizing element, and there is a risk that the voltage-stabilizing element may fall into inoperability due to the heat”).

65. As such, Mizuno teaches additional components, such as a scheme that increases the number of **LED illumination lamps 12** lit up in response to an increased power generated by the generator unit 32, a relief valve 78 that relieves inlet pressure into the inner water passage 34, a pressure-reducing valve 80 that stabilizes the force of water flow acting on the generator, and a **metal heat transfer ring 60** that connects the stabilizing element 64 to the top part 54 of the water turbine case 46 of the generator unit 32 to promote heat dissipation of the stabilizing unit. A residual light circuit can be added to consume surplus power generated by the generator and keep the LEDs on for a predetermined period of time even after the water flow stops. Ex. 1008, ¶¶14-17, 29-30, 39-40.



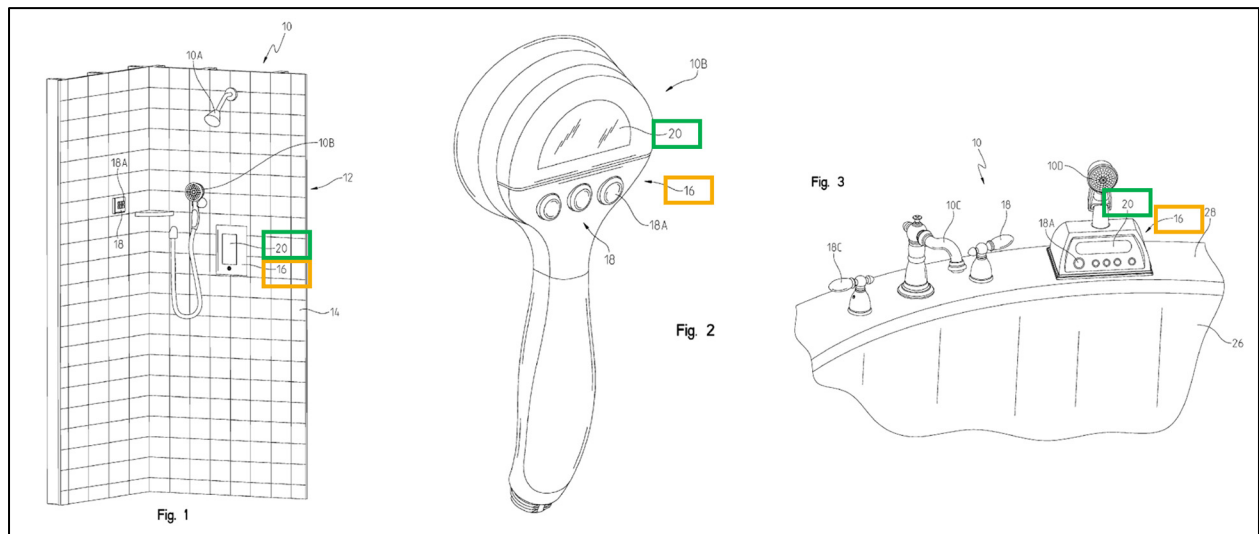
Ex. 1008, Figures 2 (left) and 4 (right).

**C. U.S. Pub. 2015/0221206 to Schneider (Ex. 1009)**

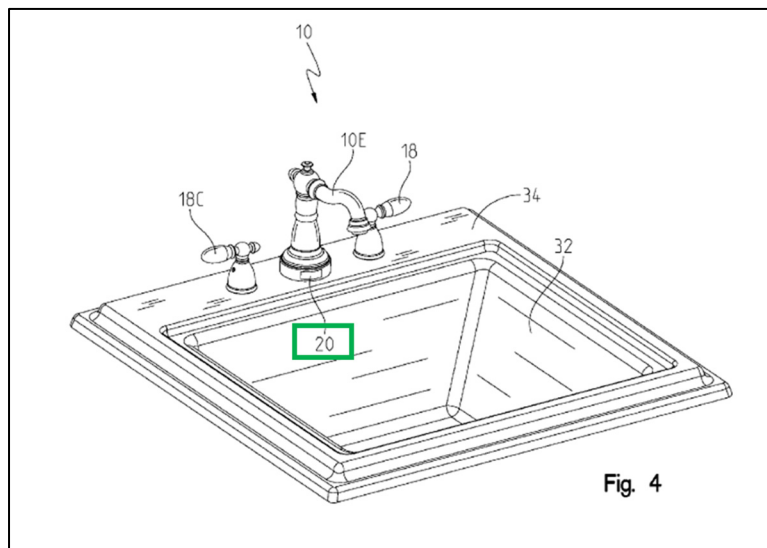
66. Schneider is assigned to the same assignee as the '363 patent, Delta Faucet Co.

67. Schneider is directed to a user interface with color changing backlight for fluid delivery devices displaying temperature. Ex. 1009, Patent Title, ¶3. Schneider teaches a fluid delivery device 10 operably coupled to a user interface 16 which includes a user input 18 configured to supply of hot and/or cold water. Ex. 1009, ¶¶25-26. As can be seen in the figures below, the fluid delivery device 10 may define a hand shower or hand sprayer 10B supported on wall 14 of the shower enclosure 12, a tub faucet 10C, or a kitchen or lavatory faucet 10E. Ex. 1009, ¶¶27-29.

68. Amongst its other embodiments, Schneider also teaches a delivery device 10 operantly coupled to a **user interface 16** that includes **display unit 20** with a variable backlight 54 which changes its response based on the water temperature. The display unit displays water temperature, operating mode, time and date, and information about the fluid-deliver device. Ex. 1009, ¶¶2-4.



Ex. 1009, Figures 1 (left), 2 (middle), 3 (right).



Ex. 1009, Figure 4.

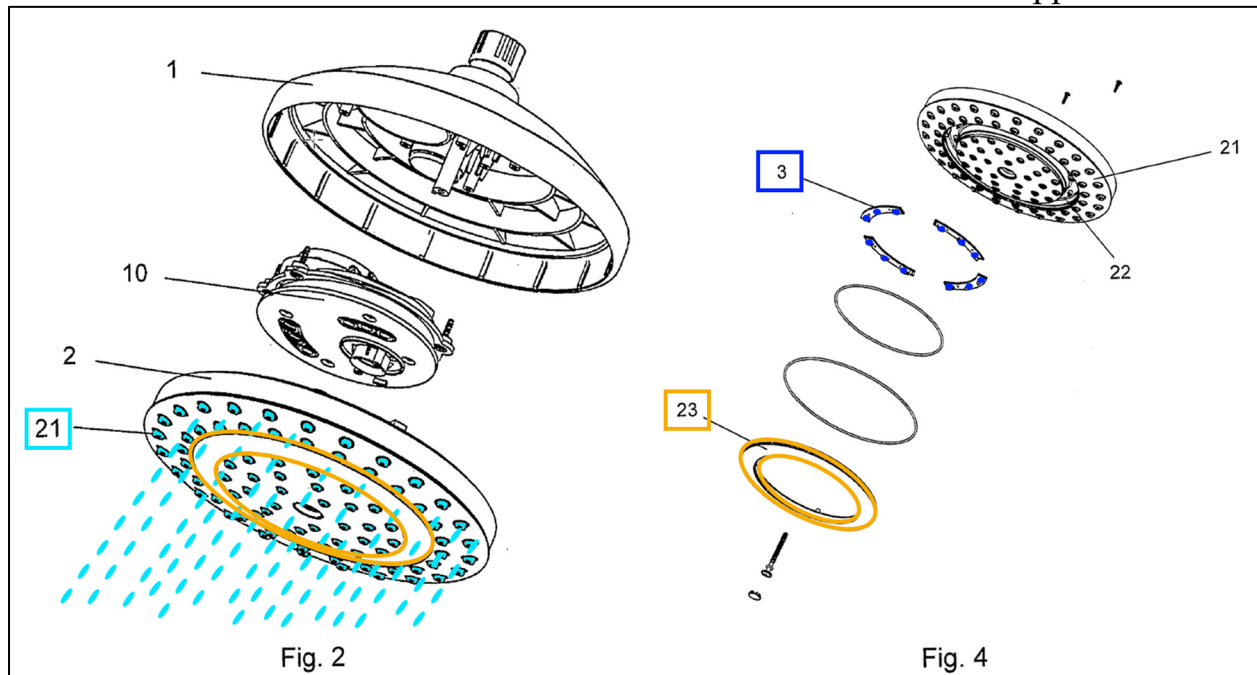
69. The display unit 20 is electrically coupled to the controller 24 and contains a printed circuit board 40, a translucent block or diffuser 42 and a display screen 44. The display unit 20 further includes a first light source and a second light source electrically coupled to the printed circuit board. The first light source 54A and second light source 54B define backlighting for the display screen 44. Operation of the first and second light source is adjusted in response to the temperature of the output water of the fluid delivery device 10. The temperature of the output water of the fluid delivery device 10 is measured with a temperature sensor 22. Ex. 1009, ¶33-37, 40.

**D. WO 2009/000109 to Tse (Ex. 1005)**

70. Tse discloses a showerhead with lighting means which is powered by a hydroelectric generator located in the showerhead. Ex. 1005, 1:4-5, 1:18-20. Tse teaches a showerhead comprising a showerhead body having a rear portion 1 and a front portion 2 for the supply and discharge of water, respectively, a power source and a lighting means 3. The front portion 2 of the showerhead body is adapted with a perforated member 21 to discharge water in the spray form. The **perforated member 21** sprays water through water outlets and is disposed with a groove 22, the groove is disposed with a cover 23. Ex. 1005, 5:14-22.

71. The power source of Tse comprises a water turbine 43 with blades 41, an electrical generator 5, a cluster of gears, and a printed circuit board 9 that are disposed between the rear portion 1 and the front position 2 of the showerhead body. Ex. 1005, 5:24-29.

72. In the middle of the perforated member, the **light emitting means 3** are connected to the printed circuit board 9 and disposed radially in the groove 22 of the perforated member 21 and sealed by the cover 23 of the groove 22. **Cover 23** is “transparent” or “semi-transparent.” Ex. 1005, 6:27-29. As seen in the figure below, cover 23 is positioned in the middle of the water outlets. Some of the water outlets are positioned radially within the cover 23, and some of the water outlets are positioned radially around the cover 23. The cover 23 of the groove 22 of the perforated member 21 is made of a transparent or semi-transparent material. Ex. 1005, 6:23-30. “Water coming out from the perforated member ha[s] the same color” as the light so that “a user can have visual enjoyment of the color light while showering.” Ex. 1005, 4:17-19, 8:20-23.



Ex. 1005, Figures 2 (left) and 4 (excerpted) (right).

**E. U.S. Pub. 2010/0046199 to Carter (Ex. 1006)**

73. Carter generally describes a plumbing fixture for spas or pools covered with a molded-in-place, “integrated light pipe” made of “transparent, light channeling plastic” in which the integration is achieved by having the “transparent over-molded portion” formed by “a multi-shot method of injection molding method.” Ex. 1006, Abstract, ¶3.

74. Carter suggests improving the durability of light fixtures of water jets that are often submerged in pools/spas by using better manufacturing techniques (e.g., injection-molding, multi-shot molding, or pre-mold/over-mold molding). Ex. 1006, ¶8. Carter explains that its jets are “well suited to the rigorous environment

[that uses] plumbing fixtures and illumination.” Ex. 1006, Abstract. Carter explains that the multi-shot over-molding method provides the ruggedness for the application. Ex. 1006, Abstract.

75. As shown in Figure **Error! Reference source not found.**, Carter teaches a plumbing fixture 20 which includes a **substrate 1**, a **decorative layer 2**, and an integrated **light pipe feature 3**. The light pipe is illuminated by a wired light source array 15. Ex. 1006, ¶¶22, 24. The light source array 15 consists of multiple **light elements 6** controlled by a PC board 9 powered by a power supply 7. Ex. 1006, ¶¶3, 7-8, 17-18. The light provided by the light source array 15 is generally directed as indicated by arrows 8 upward from the lighting array and into the light pipe 3 as shown in Figure **Error! Reference source not found.** Ex. 1006, ¶¶19, 25 (“Light 8 is transmitted up and through the molded in place integrated **light pipe 3**, past the barrier wall 4 of the appliance/structure and is disbursed across a partial or complete exposed surface area of the targeted part(s) 10 and 20”). Carter does not explain the internal function of the light source array.



Ex. 1006, Figures 6 (left) and 7 (right).

**F. U.S. Pub. 2013/0299608 to Spangler (Ex. 1014)**

76. Spangler is assigned to the same assignee as the '363 patent, Delta. Spangler's disclosure is incorporated by reference in the '363 patent. Ex. 1001, 5:61-64. I understand that Spangler was considered by the Examiner during prosecution of the '363 patent, and is listed on the face of the '363 patent. *See* Ex. 1001, 3; Ex. 1002, 66.

77. Spangler teaches a showerhead assembly 10 that is fluidly coupled to the water supply 22 and comprises a first fluid dispensing unit 12 and a second fluid dispensing unit 14 removably coupled with the first fluid dispensing unit 12. Ex. 1014, ¶43-44. The showerhead is configured to provide selective or combine water

flow to either or both the first fluid dispensing unit 12 and the second fluid dispensing unit 14 by the use of a diverter valve 80. Ex. 1014, ¶49. Spangler provides multi-dimensional spray patterns. Ex. 1014, Abstract, ¶¶1, 50.

**IX. MR. COOK FAILS TO SHOW THAT THE CHALLENGED CLAIMS ARE UNPATENTABLE.**

78. I disagree with Mr. Cook’s opinion that any of the grounds asserted in the Petition demonstrate that the challenged claims are unpatentable. In my view, the evidence presented does not sufficiently support a finding of unpatentability for the challenged claims.

**A. Ground 1: Claims 1-5, 10, And 12-16 Would Not Have Been Obvious Over Tseng.**

79. Mr. Cook opines that “Tseng discloses all the limitations of and renders claims 1-5, 10, and 12-16 of the ’363 patent obvious.” Ex. 1003 ¶127. Despite claiming that Tseng discloses all limitations, Mr. Cook conspicuously does not opine that Tseng anticipates ’363 patent claims 1-5, 10, and 12-16. His reasoning is unclear, but it implies that Mr. Cook recognizes that Tseng does not disclose one or more claim elements after all. This implies that some element(s) in Tseng are different than the element(s) in the claims at issue. Mr. Cook has not identified those differences, the changes that would be required, nor anything motivating a POSITA to make the changes.

80. I disagree that claims 1-5, 10, and 12-16 of the '363 patent are obvious over Tseng for at least for the following reasons. First, Mr. Cook fails to provide clear evidence that Tseng's second and third embodiments, which Mr. Cook relies on for his opinion that claims 1 and 10 are obvious, teach or suggest "**translucent light pipe**." Only Tseng's first embodiment light pipe is disclosed as having translucence, but Mr. Cook does not otherwise rely on the first embodiment. I would not interpret Tseng as suggesting the use of translucent material for the second and third embodiments upon which Mr. Cook's opinion relies. Mr. Cook does not offer any motivation why a POSITA would implement the first embodiment translucence element into the second or third embodiments. Second, for claims 3, 10, and 12, Mr. Cook misinterprets the LEDs' orientation and their illumination directionality with respect to input and output faces. Tseng is clear about the location and orientation of light input and output faces, and they are aligned with each other and the LEDs. Thus, Mr. Cook fails to explain that Tseng teaches or suggests the claimed "annular ring configured to transmit light **radially outwardly**." Third, for claims 1 and 10, under the plain and ordinary meaning of "**closed loop to diffuse light**," which I believe a POSITA would understand based on the '363 patent's specification and figures, Tseng does not teach or suggest "a translucent light pipe defining a **closed loop to diffuse light** from the light emitters outwardly away from the housing."

**1. Tseng’s second and third embodiments do not disclose or render obvious a “translucent light pipe.”**

81. The ’363 patent’s claims 1 and 10 recite a “**translucent** light pipe.” Mr. Cook relies only on Tseng’s light conductor 31, which Tseng discloses as made of translucent material. Ex. 1003, ¶163; Ex. 1004, ¶70. For the claim term “translucent light pipe,” Mr. Cook cites paragraph 70 of Tseng to show that Tseng teaches the “translucent” part of the claim. Ex. 1003, ¶163; Petition 29-30. Tseng paragraph 70 states that “a light conductor 31 made of translucent material to guide lights, as shown in FIGS. 7 to 10.” Ex. 1004, ¶70. According to paragraphs 37 to 40, Tseng states that Figures 7 to 10 depict the first embodiment. Thus, translucence is only assigned to the first embodiment.

82. Tseng discloses three **different** embodiments with different structures. Tseng’s paragraphs 31 to 56 state that Figures 1-26 depict the first embodiment, paragraphs 57-61 state that Figures 27-31 depict the second embodiment, and paragraphs 62-67 state that Figures 32-37 depict the third embodiment. Ex. 1004, ¶¶31-67. Mr. Cook states that his analysis focuses on the second and third embodiments, citing Tseng’s Figures 30 and 37.<sup>3</sup> Ex. 1003, ¶¶92 (“This declaration

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<sup>3</sup> For portions of independent claim 10, Mr. Cook only relies on Tseng’s third embodiment.

focuses on the second and third embodiments of Figures 27 and 32”), 164-166 (“Figures 30 and 37, both reproduced below, provide two examples of how this “light conductor” can be structured”); Petition, 15, 29-30. According to Tseng paragraphs 60, Figure 30 depicts Tseng’s second embodiment, while according to paragraph 67, Figure 37 depicts Tseng’s third embodiment. Ex. 1004, ¶¶60, 67.

83. Mr. Cook’s declaration does not address the fact that, for the second and third embodiments, Tseng is silent about the material for the light conductors. Tseng paragraphs 90 to 95, which describe the second embodiment in detail, do not say anything about the material of the light conductor 37. Ex. 1004, ¶¶90-95. Tseng paragraphs 96 to 101, which describe the third embodiment in detail, also do not say anything about the material of the light conductor 38. Ex. 1004, ¶¶96-101. Mr. Cook never addresses this lack of disclosure.

84. Mr. Cook’s analysis starts with the light conductor of the first embodiment, citing Tseng paragraph 70 (Ex. 1003, ¶168), and directly connects it to the light conductors of the second and third embodiments, citing Tseng Figures 30 and 37 (Ex. 1003, ¶169), without any other explanation. He simply concludes with the statement, “[a] POSITA would have understood this is how all commercially available light pipes work,” without citing any evidence. Ex. 1003, ¶172. This is well short of a preponderance of the evidence I understand is needed to show obviousness.

85. At best, without explaining how or why, Mr. Cook states that a POSITA would have understood Tseng's first embodiment features to apply equally to Tseng's second and third embodiments:

92. This declaration focuses on the second and third embodiments of Figures 27 and 32. But, because Tseng's three embodiments are overlapping and have numerous common structural features—many of which are discussed only in the context of the first embodiment—this declaration also cites to certain first embodiment passages. In my opinion a POSITA would understand Tseng's discussion of the features in the first embodiment to apply equally to the same or analogous features when present in the second and third embodiments.

Ex. 1003, ¶92. This opinion is fatally flawed. For one, it cannot be true that all features are the equally the same for all three light conductors—that is against what Tseng expressly states when distinguishing three embodiments. Moreover, even if features are “analogous,” Mr. Cook fails to identify which features are analogous or why they should be deemed analogous.

86. Indeed, my opinion is that Tseng's second and third embodiments do not teach translucent light pipes. Tseng only makes a single reference to translucent material, namely in paragraph 70 regarding the first embodiment. *See generally* Ex. 1004; *id.*, ¶70 (“a light conductor 31 made of translucent material to guide lights, as shown in FIGS. 7 to 10”). Tseng uses different annotations for light conductors for the first, second, and third embodiments, indicating that Tseng is intentionally distinguishing the three light conductors. *See, e.g.*, Ex. 1004, ¶¶70 (“light conductor

31” for the first embodiment), 91 (“light conductor 37” for the second embodiment), 97 (“light conductor 38” for the third embodiment). Tseng also suggests that the light conductor 31 of the first embodiment is not used in the second or third embodiments. *See* Ex. 1004, ¶90 (“With reference to FIGS. 27 to 29, a difference of a pull-out faucet of a second embodiment from that of the first embodiment comprises: a guiding member 36, wherein the conducting member 36 does not conduct and penetrate the lights, so it does not have the plural input faces 311, the light transmission portion 312, and the output face 313 of the light conductor 31 of the first embodiment.”).

87. Therefore, in my opinion, Mr. Cook has mixed and matched various features from different Tseng embodiments without identifying which specific features from different embodiments he combines, how that would be accomplished, nor why a POSITA would be motivated to do so. Mr. Cook expressly states the legal requirement he needed to follow in his obviousness analysis, but he fails to follow it:

23. I understand that claimed subject matter may be obvious in view of more than one item of prior art. I understand, however, that it is not enough to show simply that all the limitations of the claimed subject matter are spread throughout the prior art. Instead, for claimed subject matter to be obvious over multiple references, there must be some reason or motivation for a POSITA to combine the prior art references to arrive at the claimed subject matter.

Ex. 1003, ¶23.

88. As described in Section V.C (Background Technology), translucency significantly influences how a light pipe functions, particularly in terms of how light travels through and exits the pipe. In a translucent light conductor, light is scattered within the conductor through either volume scattering and/or surface scattering, due respectively to inhomogeneities within the conductor or irregularities on its surface. The occurrence of scattering in a translucent light pipe causes light to be distributed evenly throughout the pipe, resulting in a soft and uniform glow. Ex. 2018, §§3.1-3.2.

89. On the other hand, in a non-translucent light pipe, light moves through the pipe via the TIR process. This TIR phenomenon enables light to travel through the conductor with minimal light loss and results in the concentration of light at specific points (hot spots). Ex. 2018, §§3.1-3.2.

90. In my opinion, Tseng teaches away from using translucent material in its second and third embodiments because a POSITA would have appreciated that Tseng's three different embodiments serve different objectives. For the first embodiment, Tseng paragraph 79 explains that the light conductor 31 "enhance[s] illumination effect." Ex. 1004, ¶79. For the second embodiment, Tseng explains that it is "differen[t]" from the first embodiment and "enhance[s] light **transmission** and illumination." Ex. 1004, ¶¶90, 94, 95. For the third embodiment, Tseng explains that it enhances **light transmission**. Ex. 1004, ¶98. A POSITA would recognize that

translucence is antithetical to enhanced transmission, due to the light scattering associated with translucence. A POSITA would have appreciated that Tseng's second and third embodiments work like a flashlight, projecting light in one direction and illuminating a targeted spot rather than emanating or glowing light in all directions. That is, based on the use of the words transmission and illumination, the intent of Tseng's second and third embodiments is for light to efficiently exit the sprayhead and illuminate an external object. In this regard, using translucent material would be a suboptimal choice for the second and third embodiments due to scattering. Using translucent material in the light pipes of Tseng's second and third embodiments would go against the stated "advantage" in Tseng, namely "brilliant illumination." Ex. 1004, ¶¶102-103.

2. **Tseng does not render obvious an "outer illumination surface extending perpendicular to the longitudinal axis of the housing" and an "annular ring configured to transmit light radially outwardly."**

Independent claim 10

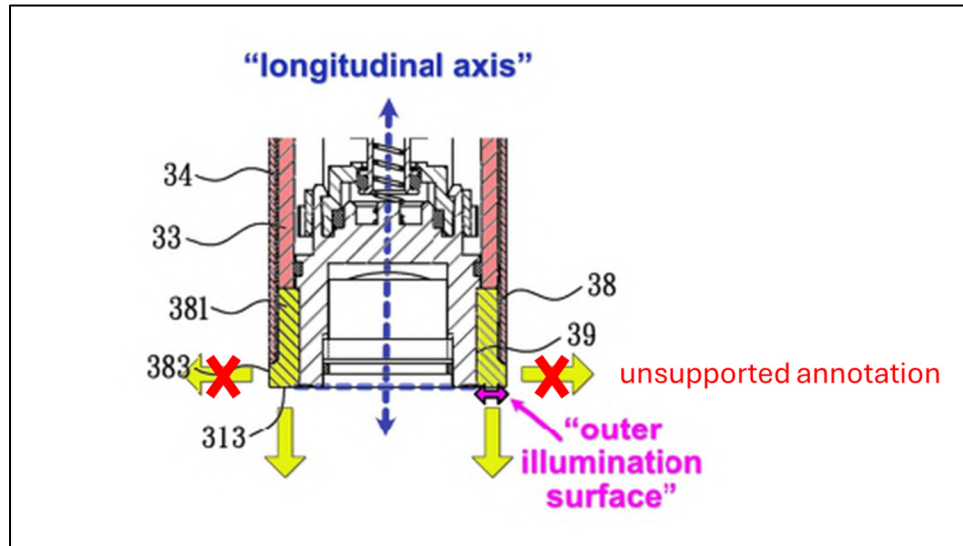
91. I understand that independent claim 10 recites an additional element not included in claim 1, requiring that the claimed light pipe "includ[e] an outer illumination surface extending perpendicular to the longitudinal axis of the housing." I also understand that Tseng under Ground 1, is the only ground asserted against claim 10 and its dependent claims 12-16. Petition, 35-38. I disagree with Mr.

Cook that Tseng discloses or renders obvious the claimed light pipe that includes an “outer illumination surface extending **perpendicular** to the longitudinal axis of the housing.”

92. Mr. Cook exclusively uses Tseng’s third embodiment, Figures 32-37, to show “an illumination surface extending perpendicular to the longitudinal axis of the housing.” Ex. 1003, ¶¶195-206. In particular, Mr. Cook opines that Tseng “includes two [] surfaces,” “light emitting protrusion 383 forms an outer surface that proceeds circumferentially around the spray head like a belt” and “light emitting lower surface 313.” Ex. 1003, ¶¶195-197.

93. Mr. Cook’s analysis is speculative at best, because of the lack of evidence of translucence in Tseng’s third embodiment. As discussed, a POSITA would see that significant internal light scattering resulting in translucence would be required to achieve radially outward light emission from protrusion 383 or to illuminate the bottom surface of protrusion 383 in Tseng. Mr. Cook’s annotations to Tseng’s Figures 32 and 37—the yellow horizontal arrows in Figure 32 and the purple arrow in Figure 37 suggesting emanating light—are inaccurate and not supported by Tseng or by a POSITA’s understanding. Mr. Cook uses his own added highlighting to conclude that the figures disclose “an outer illumination surface extending perpendicular to the longitudinal axis of the housing.” *See* Ex. 1003, ¶¶196-197.

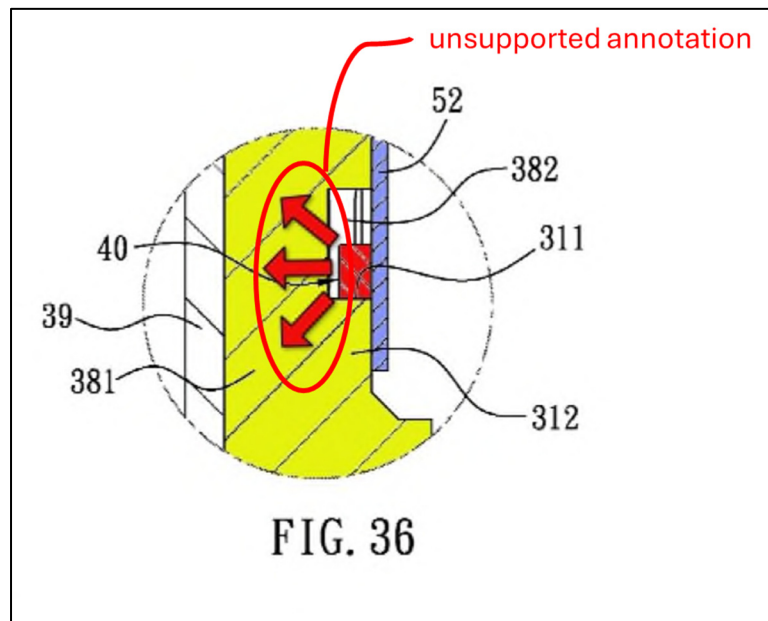
Below, I marked the unsupported annotation added to Tseng's Figure 32 by Mr. Cook with **red Xs**.



Ex. 1003, ¶197 (annotation added). In Tseng, the relevant paragraph that describes this portion of the third embodiment does not say whether the side of the annular protrusion 383 is an illumination surface. *See* Ex. 1004, ¶¶98-99 (“In addition, the outer cliff 381 among input faces 311 of the plural indentations 382 and the output face 313 forms a light transmission portion 312. To enhance light transmission, the outer cliff 381 of the light conductor 38 has an annular protrusion 383 extending outwardly adjacent to the bottom end thereof to contact with a bottom end of an external sleeve 34.”). If anything, Tseng is suggesting that the protrusion is intended to move light pipe material and surfaces out of the way of light transmitting downward from the LEDs just above, thereby enhancing transmission.

94. Further, Mr. Cook seems to be relying on hindsight to identify the radial outer surface of protrusion 383 as extending perpendicular to the longitudinal axis of the housing. Instead, the surface he identifies extends in the circumferential and axial directions. A POSITA would recognize that a surface extending perpendicular to an axis is a surface transverse to the axis, that is, a surface such that its surface normal is parallel to the axis. A POSITA would not consider the circumferential outer surface of a cylinder to be extending transverse to the cylinder's axis, and the radial outer surface of the protrusion is a short cylinder.

95. Mr. Cook's errant conclusion is based on apparent misunderstanding of Tseng. Mr. Cook states, "as shown in Figures 35 and 36, LEDs 40 face **inward** and emit light towards the center of the spray head (**red arrows**).” Ex. 1003, ¶174. The LEDs do not face or emit inward, and therefore Mr. Cook annotates Tseng's Figure 36 **incorrectly**, as shown below:



Ex. 1003, ¶174 (annotation added).

96. Nowhere does Tseng disclose that the LED 40 faces and emits light inward, towards the center of the sprayhead, like Mr. Cook annotates with the red arrows shown above. According to Tseng, the LED 40 faces and emits **downward** towards input face 311, which is the bottom surface of the indentation 382. Tseng explains this clearly in paragraph 97: “each indentation 382 has an input face 311 formed on a **bottom end thereof**”). Ex. 1004, ¶97 (emphasis added). If the input face is at the bottom of the indentation 382, as Tseng states, the LED would have to face and emit downward towards the input face 311 to input light to the “input” face. Otherwise, Tseng would have called all three inner surfaces of the indentation 382 input faces, for example. Given the orientation of the input face and the disclosure of the benefit of good light transmission for illumination, a POSITA would

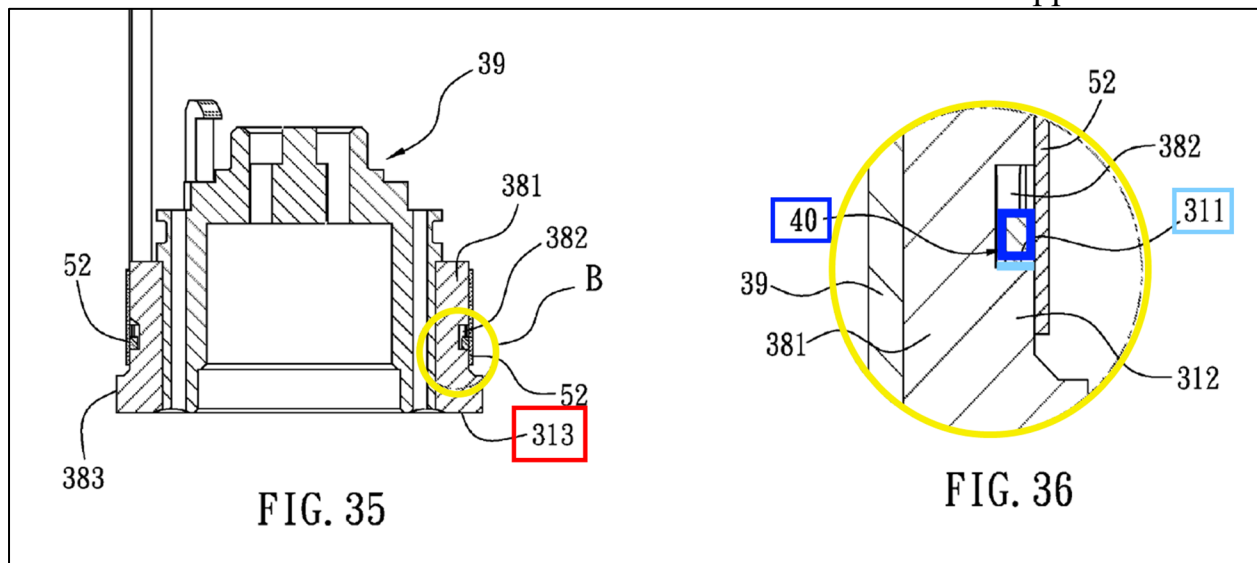
understand that light would enter the input face 311 from the LED and proceed straight downward to exit the inner part of the output face 313 without being materially scattered into the protrusion 383 to exit the outer radial surface or the outer portion of the bottom surface of the protrusion 383.

97. The misunderstanding of the LED's orientation and the direction in which light enters the light pipe forms the basis of Mr. Cook's apparent speculation and incorrect conclusion.

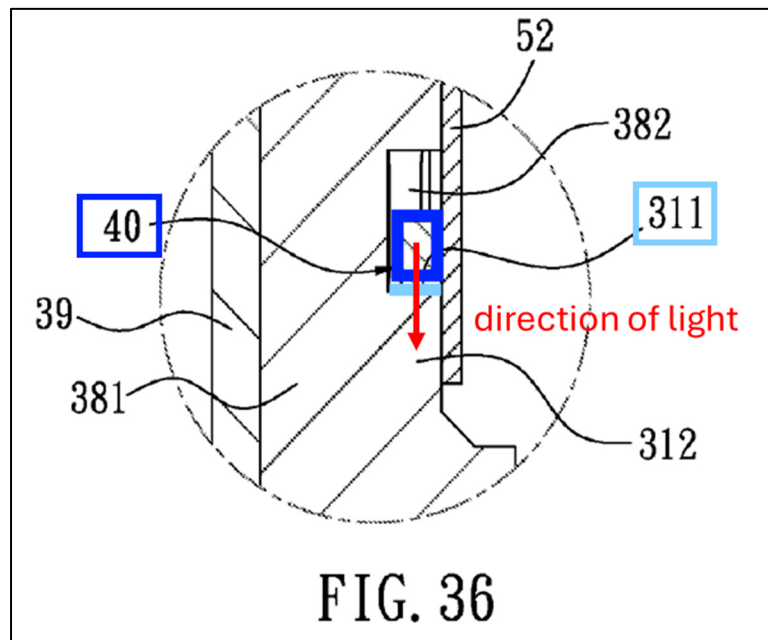
98. Mr. Cook concludes that "[b]ecause faces 313 and 383 are oriented in different directions than LEDs 40, a POSITA would have understood that Tseng's light conductor engages in internal light diffusion and reflection to transmit the light emitted from the LEDs through (and eventually out of) the conductor." Ex. 1003, ¶175. I assume Mr. Cook means internal light scattering when he says internal light diffusion. As discussed above, scattering is contrary to providing good illumination, so Mr. Cook has no basis to conclude that Tseng's third embodiment teaches a "annular ring configured to transmit light radially outwardly," because there is no disclosure of scattering that would send light emitted vertically from the LED into the light pipe radially into the protrusion 383.

99. Mr. Cook seems to misunderstand the effects of internal reflection. Internal reflection keeps light emitted from the LED confined to the vertical direction in the light pipe and does not let it escape radially.

100. Tseng has no description that the entire protrusion is the light output face—Tseng only describes and annotates the bottom surface as the output face. Ex. 1004, 97 (“the outer cliff 381 also has an output face 313 defined on a **bottom end thereof**”). And Tseng does not describe anything that a POSITA would have understood that light scatters and reflects in this light conductor like Mr. Cook states. *See* Ex. 1004, ¶¶96-103, Figures 32-37. I show below what Tseng actually discloses. Tseng explains that, in the third embodiment, “the light conductor 38 has an outer cliff 381, and the outer cliff 381 has plural indentations 382 arranged around a middle section thereof, wherein each indentation 382 has an **input face 311 formed on a bottom end thereof**, and the outer cliff 381 also has an **output face 313 defined on a bottom end thereof**. In addition, the outer cliff 381 among input faces 311 of the plural indentations 382 and the output face 313 forms a light transmission portion 312.” Ex. 1004, ¶97 (emphasis added). This paragraph of Tseng clearly says that the light conductor has an outer cliff 381, which has indentations 382, and the LEDs 40 are inserted into the indentations 382. To visualize, I highlighted the figure below based on Tseng paragraph 97. The **input face 311** is highlighted in light blue and is the bottom surface of the indentation 382. The **output face 313** is highlighted in red and is the bottom surface of the outer cliff 381. The **LED 40** is highlighted in blue and faces towards the input and output faces.



Ex. 1004, Figures 35 (excerpted) (left), 36 (right). Put together, as shown below, the direction of light is downward, not the three inward directions Mr. Cook annotates. The light projects from the **LED 40** through the **input face 311** and exits through the **output face 313** at the bottom of the assembly, shown in Figure 35 above. Moreover, by identifying the portion 312 as “the light transmission portion,” a POSITA would understand that Tseng is intending to confine light to the vertical direction without material scattering.



Ex. 1004, Figure 36.

101. A POSITA would have also understood that light would pass downwardly from the LED element 40 through input face 311 and to output face 313 in the **same downward direction**. A POSITA would not have understood Tseng meant that light passes through the three directions Mr. Cook annotates without evidence in his paragraph 174. For example, Tseng states that “the outer cliff 381 among input faces 311 of the plural indentations 382 and the output face 313 forms a light transmission portion 312.” Ex. 1004, ¶97. Here, Tseng uses input faces (plural) indicating each bottom surface of indentations 382s around the outer cliff (“the outer cliff 381 has plural indentations 382 arranged around a middle section thereof”) and output face (singular) indicating the bottom surface of the outer cliff (“the outer cliff 381 also has an output face 313 defined on a bottom end thereof”).

Ex. 1004, ¶97. Tseng marks the light transmission portion 312 of the outer cliff 381 right below where the LED element 40 and input face 311 meet, further teaching that the light enters only downwardly through the input face 311. Ex. 1004, Figure 36. Ex. 2005, 80:3-81:20 (“

Q: And input face 311 is on the bottom end of the indentation 382, correct?

A: That is correct.

Q: And input face 311 aligns with LED element 40, correct?

A: Correct.

Q: So it's your understanding of Tseng that light emanating from the LED would emanate downward toward input face 311, correct?

A: Correct.

Q: The left side of indentation 382 is not marked as input face 311, correct?

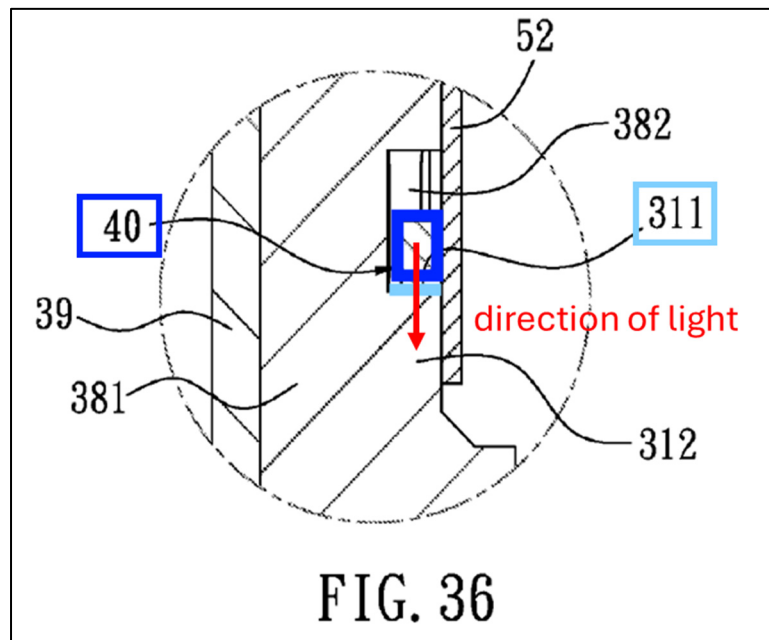
A: It does not appear to be, no.

Q: And the top side of indentation 382 is not marked as input face 311, correct?

A: Correct. ...

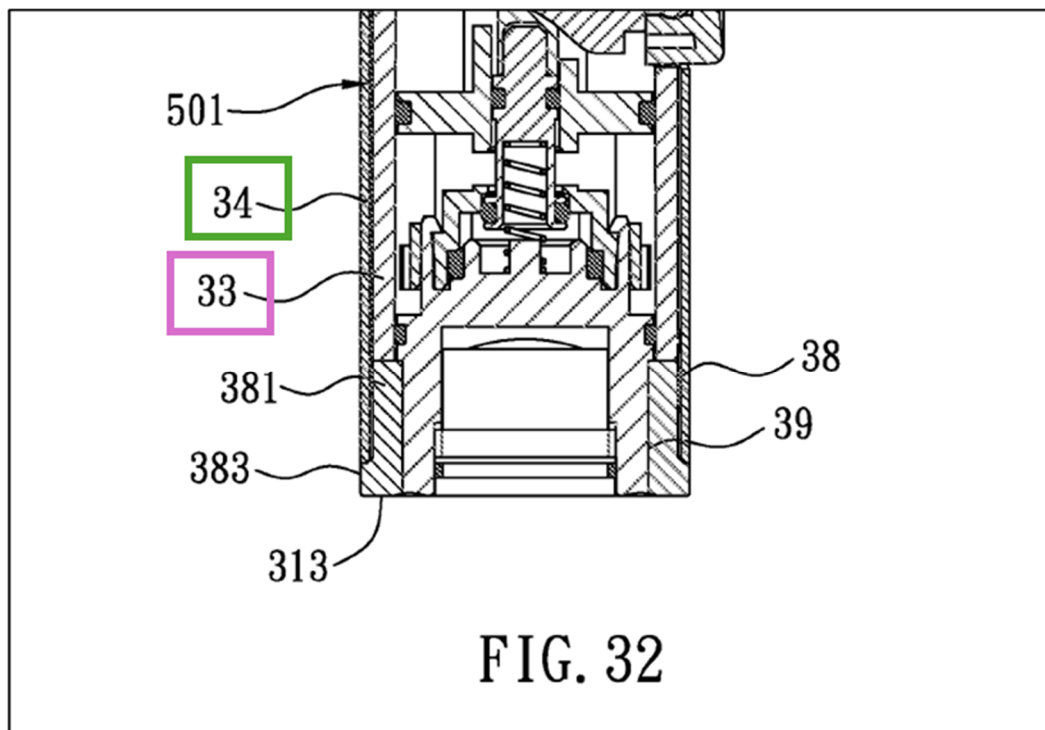
Q: ... Tseng describes light transmitting from LED downward through input face 311, downward through output face 313, correct?

A: That is correct”).



Ex. 1004, Figure 36. Furthermore, Tseng mentions the annular protrusion 383 only once and only states that it extends outwardly. Ex. 1004, ¶98. Tseng does not state that the side of the annular protrusion 383 is an output face, whereas it does expressly state that the bottom of the outer cliff 381 is output face. Tseng also teaches, as shown in Figures 32 (below) and 36 (above), that the side of the outer cliff 381 is blocked by the C-shaped ring 52, the internal sleeve 33, and the external sleeve 34. Ex. 1004, Figures 32 and 36, ¶99 (“To increase configuration space of the light conductor 38, an area of a bottom end of the internal sleeve 33 is diminished upwardly, such that the light conductor 38 is accommodated among a lower side of the internal sleeve 33, an outer wall of the guiding member 39 and an inner wall of the external sleeve 34.”). This also teaches that the light from the LED travels downward and exits through the bottom, not the side, surface of the outer cliff 381,

because the C-shaped ring 51 and sleeves 33 and 34 would limit the light—like a flashlight inside a tube—in the case that the light is not otherwise confined by total internal reflection from the cylindrical inner and outer surfaces of the light pipe itself. A POSITA would understand from Tseng’s third embodiment that light from the LED would bypass the annular protrusion 383 of outer cliff 381, while transmitting downwardly toward the output face 313. Ex. 2005, 81:22-825 (“Q: Other than the bottom surface of Figure 35, no other surfaces are marked as output face 313, correct? A: That is correct, from what I see in Figures 35 and 36.”).



Ex. 1004, Figure 32 (excerpted).

102. Further, a skilled artisan would have understood that Tseng’s annular protrusion 383, which “extend[s] outwardly,” enlarges the output face 313 at the

bottom of the outer cliff 381 and moves the radially outward surface of the protrusion further from the vertical light path, thereby mitigating the potential for light to interact with that surface. Ex. 1004, ¶98. This feature would be recognized by the skilled artisan as contributing to one of the key advantages of Tseng, namely, “brilliant illumination.” Ex. 1004, ¶103. That is because the larger bottom output face, resulting from the outward extension of the annular protrusion 383, would allow for less chance of light scattering and leaking out of the protrusion in unintended directions, thereby enhancing the “illumination function.” Ex. 1004, ¶105.

103. Tseng’s disclosure of enhanced illumination is consistent with several examples. For instance, if Tseng’s sprayhead were used in a kitchen faucet, the brighter lighting from the bottom end of the faucet would help in visualizing dirt on dishes. As another example, if Tseng’s sprayhead were used in a shower, the brighter light from the bottom end of the showerhead would provide improved visibility for activities such as shaving or reading instructions on shampoo bottles. Or if the faucet were used in a laboratory setting, the brighter lighting may help with detailed work such as working with fine tools. A side illumination surface, however, would interfere with this practical use by unnecessarily dispersing light in an undesired direction—perpendicular to the direction of the water flow—and thus making the downward projection of light dimmer. Since the total amount of light emitted from

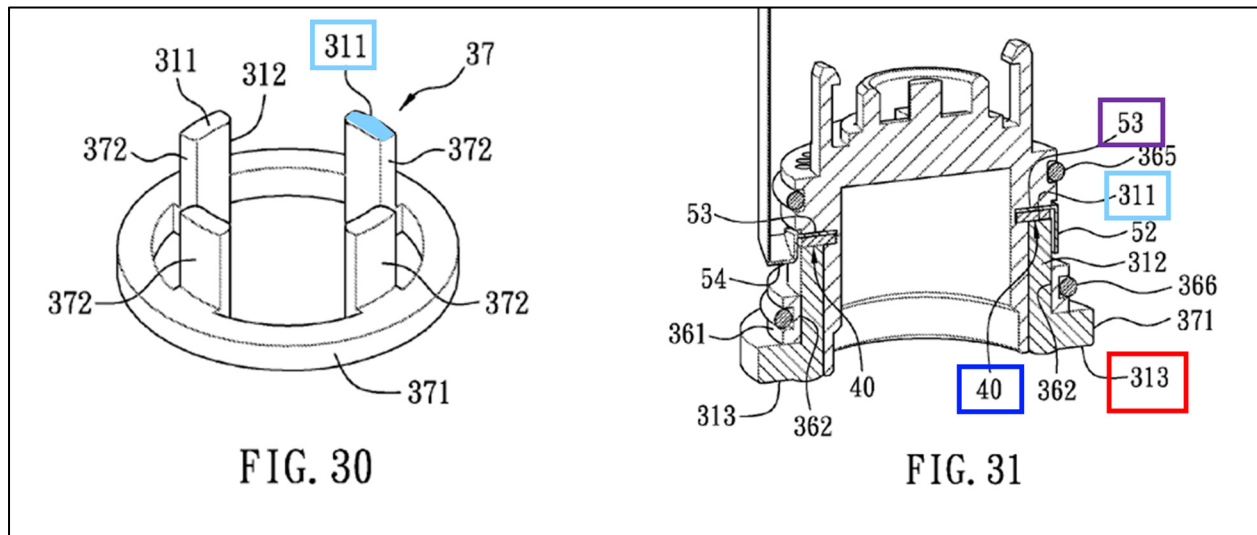
the light source remains unchanged, side illumination would reduce the effectiveness of Tseng's intended "brilliant illumination," and would hinder achieving Tseng's stated objective of "brilliant illumination." Ex. 1004, ¶103.

104. Using translucent material also works against achieving brilliant illumination because such material would scatter the light, making the lighting dimmer. In other words, regardless of whether Mr. Cook has addressed this inconsistency between the Tseng reference and his conclusion (he has not), a POSITA would have recognized that Tseng teaches away from modification because Tseng's purpose is different from the challenged '363 patent claims.

105. Although Mr. Cook does not use the second embodiment for his analysis of claim 10, I provide my analysis for completeness, as he has relied on the second embodiment in his declaration for other claims. Ex. 1003, ¶92 ("This declaration focuses on the second and third embodiments of Figures 27 and 32"). Tseng's second embodiment teaches vertical light transmission and confinement even more clearly than his third embodiment. In Tseng's second embodiment, as depicted in Figures 30 and 31 below, the light conductor 37 includes "a circular rib 371 and plural light columns 372 extending upwardly from an inner wall of the circular rib 371, wherein each light column 372 has an **input face 311** formed on a **top end** thereof, and **bottom ends** of the plural light columns 372 and a **bottom end** of the circular rib 371 define at least one **output face 313**." Ex. 1004, ¶91 (emphasis

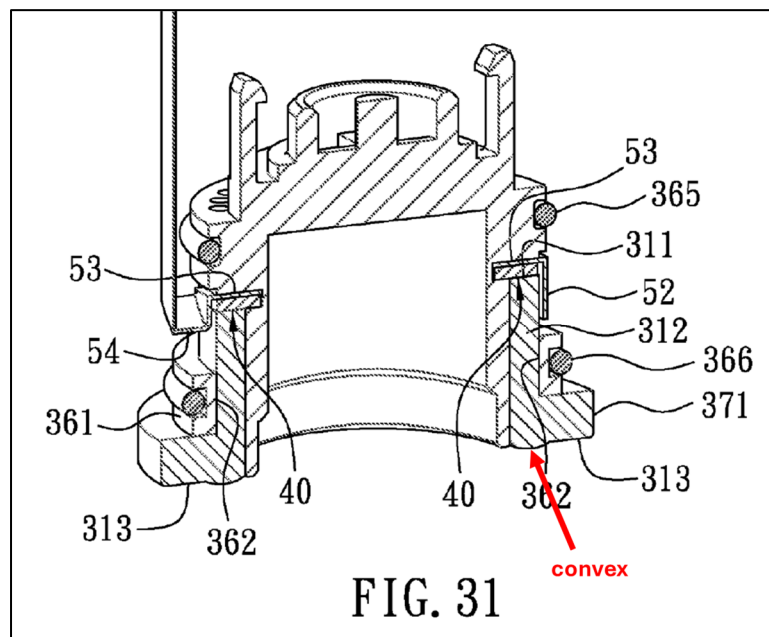
added). Clearly, these columns would be understood to rely on total internal reflection and minimal scattering translucence in order to function as individual light pipes and transmit as much light as practical from the LEDs and out the bottom surface of the sprayhead for the illumination function. Similar to the third embodiment, the “plurality of LED elements 40 on each of the plural extensions 53 of the circuit board 50 faces to the input faces 311 of each light column 372.” Ex. 1004, ¶92. That is, similar to the third embodiment explained above, Tseng also describes in the second embodiment that each **LED 40** projects light downward toward the **input face 311** highlighted in the figures shown below. Clearly, any light from the LED that fails to be input into the columns or leaks out the side of the columns by scattering would be wasted. Tseng further explains that, like the annular protrusion in the third embodiment, the circular rib 371 is “expose[d] outside the external sleeve 34 to enhance light transmission and illumination.” Ex. 1004, ¶94. This structure would also result in light projecting **parallel** to the longitudinal axis of the housing, similar to the flashlight effect explained above, and not to the side or perpendicular to the longitudinal axis of the housing. Just like the third embodiment, a POSITA would recognize that the purpose of the circular rib is to enlarge the **bottom** illumination surface, make the radially outward surface remote from the light path, and increase the brightness of the flashlight effect. *See*, Ex. 1004, ¶103

(“brilliant illumination”). In other words, the circular rib 371 enlarges the bottom surface, or the **output face 313**, to “enhance light transmission and illumination.”



Ex. 1004, Figures 30 (left), 31 (excerpted) (right).

106. A POSITA would have also observed from Tseng’s figures that the output face 313 of the circular rib 371 includes a **convex** portion, as shown below.



Ex. 1004, Figure 31 (excerpted). A skilled artisan with experience in basic optics would recognize that the convex surface would act as a lens that focuses the light. Therefore, a POSITA would have understood that one potential purpose of the convex surface shown in Figure 31 is to enhance light transmission **through** the **output face 313** by focusing the light. See, Ex. 1004, ¶103 (“brilliant illumination”). Consistent with my analysis of Tseng’s third embodiment, this further suggests that Tseng’s light conductor is designed to channel light from the input face 311 to the output face 313 as efficiently as possible to achieve the “brilliant illumination” function using the shower assembly 3 that Tseng discloses. Ex. 1004, ¶¶103, 105.

Dependent claims 3 and 12

107. I understand that dependent claims 3 and 12 recite an “annular ring configured to transmit light radially outwardly.” I understand that Ground 1 is the only ground asserted against claims 3-5 and 12-14. Petition, 39-43. Mr. Cook opines, similar to his analysis for claim 10, that the circular rib 371 in Tseng’s Figure 30 and the annular protrusion 383 in Figure 37 teach the claims because both the circular rib and annular protrusion extend outwardly. Ex. 1003, ¶217-219. However, as explained above for claim 10, Tseng teaches only that the circular rib and annular protrusion extend outwardly, to enlarge the bottom output face 313 through which light is emitted. As discussed in relation to claim 10, Tseng does not teach that the **light** is emitted radially outwardly from the sides of the circular rib or annular

protrusion—the sides are just surfaces, not further “configured to transmit light radially outwardly.”

108. I also noticed that Mr. Cook relies on the same annular protrusion 383 of Tseng for multiple other claimed elements. For example, for claims 1 and 10, Mr. Cook uses Tseng’s annular protrusion 383 to illustrate the claimed “light pipe” (*e.g.*, Ex. 1003, ¶¶190-194), and for claim 10, the claimed “outer illumination surface extending perpendicular to the longitudinal axis of the housing” (Ex. 1003, ¶¶195-198). Mr. Cook also references the same annular protrusion 383 to show the claimed “annular ring configured to transmit light radially outwardly [from the longitudinal axis]” for claims 3 and 12. Ex. 1003, ¶¶215-219. Mr. Cook does not identify alternative components for the additionally claimed elements. There is no basis in Tseng for Mr. Cook to conclude that protrusion 383 is the “jack of all trades” he relies on for any of the multiple elements.

109. In sum, Tseng does not teach an “outer illumination surface extending perpendicular to the longitudinal axis of the housing” and an “annular ring configured to transmit light radially outwardly” as claimed.

**3. Tseng does not teach or render obvious “a translucent light pipe defining a closed loop to diffuse light from the light**

**emitters outwardly [away from the housing / to the outer illumination surface].”**

110. I understand that claims 1 and 10 recite a “translucent light pipe defining a closed loop to diffuse light from the light emitters outwardly [away from the housing / to the outer illumination surface].”

111. Mr. Cook states that Tseng’s light conductors “uniformly diffuse light.” Ex. 1003, ¶¶167-172. I disagree. Tseng does not support such a blanket assertion, in part because scattering, which could enhance the perception of uniformity, is contrary to enhanced illumination. At best, Tseng states that the light conductor “enhances” light transmission and illumination. *E.g.*, Ex. 1004, ¶¶79, 94, 98. Below, I reproduce each of the paragraphs from Tseng’s paragraphs that Mr. Cook cites to support his assertion is, and none of them mention “uniformly diffuse light”:

The spray head includes a light conductor, and the light conductor has at least one input face for inputting lights, at least one light transmission portion for transmitting the lights, and at least one output face for outputting the lights.

Ex. 1004, ¶11.

The light conductor has a circular rib and plural light columns extending upwardly from an inner wall of the circular rib, wherein each light column has an input face formed on a top end thereof, and bottom ends of the plural light columns and a bottom end of the circular rib define the at least one output face, the plural light columns form the at least one light transmission portion.

Ex. 1004, ¶24.

Referring further to FIGS. 5, 7 and 10, each slot 318 of the peripheral fence 314 of the light conductor 31 further has a first stopping portion 31 b arranged on an upper side of an outer wall thereof and has a second stopping portion 31 c arranged on a lower side of the outer wall thereof to close the internal sleeve 33, thus stopping the water flowing into the outer room 327 of the conduit member 32 and penetrating to the plurality of LED elements 40 and the circuit board 50 between the first stopping portion 31 b and the second stopping portion 31 c. The light conductor 31 further has a circular rib 31 d extending outwardly from a lower side of an outer wall of the second stopping portion 31 c opposite to the internal sleeve 33 and the external sleeve 34, such that the circular rib 31 d exposes outside to enhance illumination effect.

Ex. 1004, ¶79.

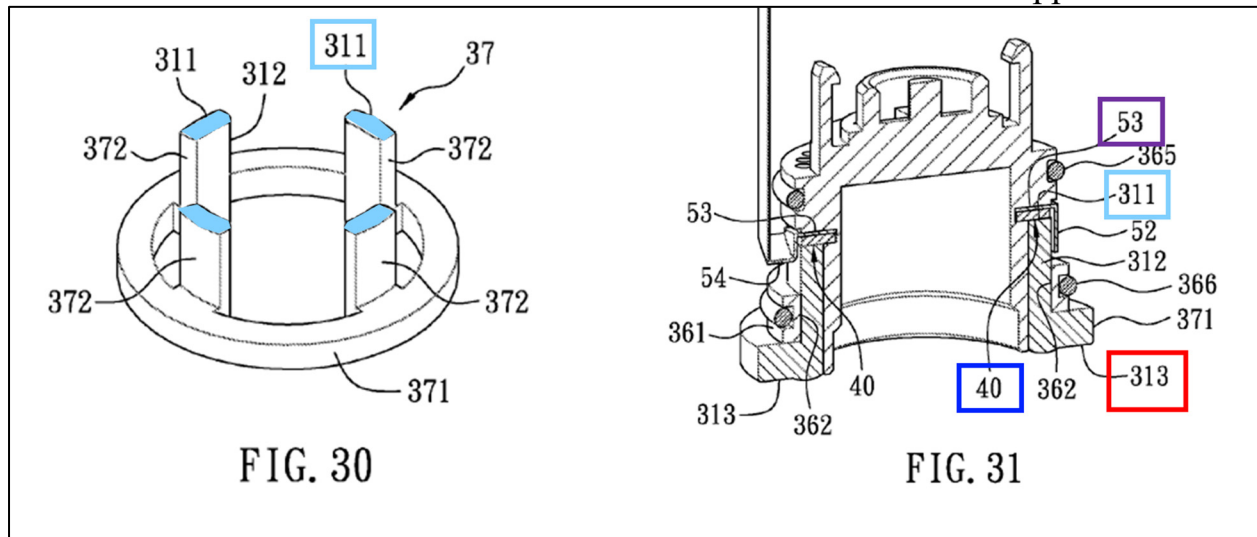
The peripheral fence 361 of the guiding member 36 has a first stopping portion 365 disposed above the first gap 363 thereof, and the peripheral fence 361 also has a second stopping portion 366 defined between the first gap 363 and the second gap 364 of the peripheral fence 361, such that the first stopping portion 365 and the second stopping portion 366 contact with an inner wall of an internal sleeve 33, thus stopping water flowing into an outer room 327 of the conduit member 32 and penetrating to the plurality of LED elements 40 and the circuit board 50 between the first stopping portion 365 and the second stopping portion 366. A top end of the circular rib 371 of the light conductor 37 is opposite to a bottom end of the second stopping portion 366, a bottom end of the internal sleeve 33, and a bottom end of an external sleeve 34, such that the circular rib 371 exposes outside to enhance light transmission and illumination.

Ex. 1004, ¶94.

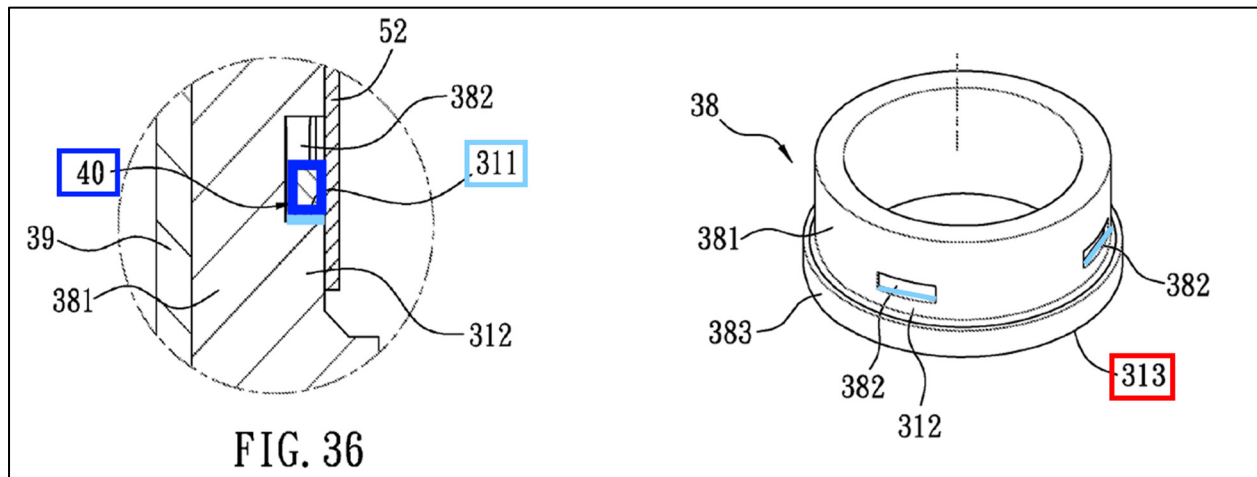
To enhance light transmission, the outer cliff 381 of the light conductor 38 has an annular protrusion 383 extending outwardly adjacent to the bottom end thereof to contact with a bottom end of an external sleeve 34.

Ex. 1004, ¶98.

112. A POSITA would understand that Tseng's light conductors in the second and third embodiments efficiently transmit light without scattering and even focus light. Ex. 1004, ¶¶94 ("to enhance light transmission and illumination"), 98 ("to enhance light transmission and illumination"), 103 ("brilliant illumination"). Light from the LEDs enters the light conductor 37 or 38 through individual, discrete surfaces situated around the circumference, as shown below in Figures 30 and 37 (four highlighted **input faces 311**). That is, there are gaps in the illumination in the circumferential direction. A POSITA would understand that, through the light transmission portion 312 and due to the lack of internal scattering, light from the LEDs arrives from above at distinct spots on the bottom surface of the light conductor, or output face. For example, in Tseng's second embodiment (Figures 30 and 31, below), each of the four **LEDs 40** sits on a **distinct extension 53**. Light from the four LEDs enters the light conductor 37 through four **distinct input faces 311** located below each of the four **distinct extensions 53** and is projected downward through the **output face 313**. Ex. 1004, ¶¶90-95. In Tseng's third embodiment (Figures 36 and 37, below), each of the four **LEDs 40** sit in a **distinct** indentation 382. Light from these LEDs enters the light conductor 38 through four **distinct input faces 311** located at the bottom of each indentation 382 and is projected downward through the **output face 313**. Ex. 1004, ¶¶96-101.



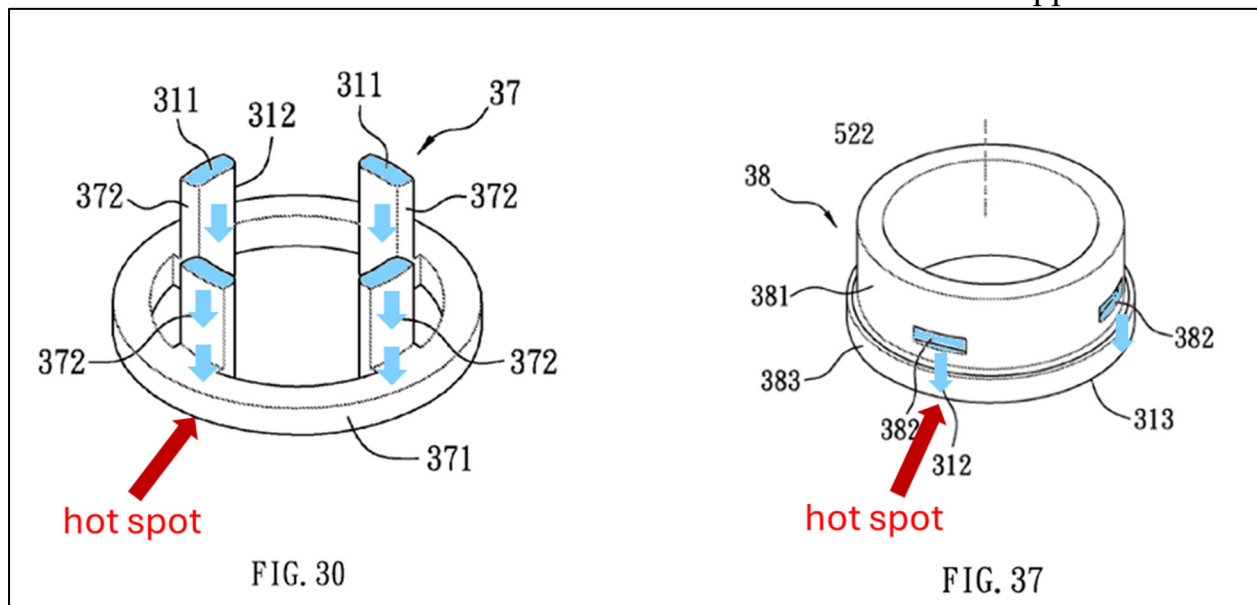
Ex. 1004, Figures 30 (left), 31 (excerpted) (right).



Ex. 1004, 36 (left), 37 (excerpted) (right).

113. A POSITA would have understood that Tseng's LED and light conductor configurations would create hot spots, whereas the '363 patent explains that it improves over the prior art by eliminating hot spots. Ex. 1001, 1:24-26. As explained above, Mr. Cook agrees that that light enters through the input faces and travels downward through light the transmission portion 312—the light columns 372

(Figure 30) and indentations 382 (Figure 37). However, Mr. Cook identifies that the light is diffused as it is transmitted and, as discussed above, there is no basis in Tseng suggesting material diffusion. *See* Ex. 1003, ¶202 (“a POSITA would have understood that light entering Tseng’s light conductor will not be substantially diffused **as it is transmitted towards** protrusion 383 and face 313.”) (emphasis added); Ex. 1004, ¶¶91 (“the plural light columns 372 form at least one light transmission portion 312”), 97 (“the outer cliff 381 among input faces 311 of the plural indentations 382 and the output face 313 forms a light transmission portion 312”). However, the second part of the Cook Declaration paragraph 202, as explained above, is incorrectly assumed because Tseng does not explain that the light diffuses through the light conductors 37 and 38. Ex. 1003, ¶202 (“This in turn will lead to near uniform emission of light out of the light conductor upon arrival at these surfaces.”). A POSITA would understand that hotspots will inevitably form, as illustrated below, because the light enters and exits at discrete spots.



Ex. 1004, Figures 30 (left), 37 (excerpted) (right).

114. Mr. Cook also does not explain how, much less why, a POSITA would have avoided hot spots using Tseng's second and third light conductors or appreciated the structural differences between Tseng's light conductors and the claimed light pipe. A POSITA would have understood that Tseng teaches away from the '363 patent's approach, in addition to the other motivations I explained above.

**B. Ground 2: Claims 9 And 11 Would Not Have Been Obvious Over Tseng and Mizuno.**

115. Mr. Cook opines that, whereas '363 patent independent claims 1 and 10 are obvious over Tseng alone and dependent claims 9 and 11 are beyond the scope of Tseng, yet they are rendered obvious by the combination of Tseng and Mizuno. Ex. 1003 ¶¶239-241. The element missing from Tseng and provided by Mizuno is

“a hydro-generator fluidly coupled to the waterway and in electrical communication with the illumination device.” Ex. 1001, claims 9, 11.

116. I disagree with Mr. Cook’s analysis that claims 9 and 11 would have been obvious over Tseng and Mizuno. I understand that claim 9 depends on claim 1 and claim 11 depends on claim 10. I understand that Ground 2 is the only ground asserted against claim 11. As I explained regarding Ground 1, because Tseng does not render independent claims 1 and 10 from which claims 9 and 11 depend obvious, and because Mr. Cook does not opine how Mizuno cures the deficiencies in Mr. Cook’s analysis that I explained for Ground 1, Ground 2 fails at least for the same reason as Ground 1, based on Tseng alone.

117. Mr. Cook’s analysis that a POSITA would have been motivated to combine Mizuno’s hydro-generator with Tseng’s pull-out faucet for dependent claims 9 and 11 is not persuasive. In my opinion, a POSITA would not have been motivated to combine Mizuno and Tseng, as doing so would undermine the objective of **improving** wiring to the external electrical power source, which Tseng explicitly seeks to address. Moreover, Mizuno states that using a hydro-generator requires extra components to mitigate the problems associated with its use in a faucet, and these additional components would take up more space. Given that Tseng specifically notes the limited space in its faucet, a POSITA would not have had a

reasonable expectation of success in combining the two references. I understand that this combination is the kind that the reference explicitly teaches away from.

**1. Mr. Cook fails to address the lost benefits of Tseng’s external wired power supply in the alleged combination with Mizuno.**

118. Mr. Cook states that because Mizuno explains that using a battery as a power source makes the water discharge port (faucet) undesirably large to accommodate the battery, a POSITA “would have recognized that Tseng is subject to [the same] problems.” Ex. 1003, ¶¶250-251. This statement mischaracterizes the references. Tseng concerns a faucet that is **wired** to an external power supply, which typically would not require a battery **at all**. Furthermore, Mr. Cook's statements are misleading because Tseng and Mizuno do not address the same problem. They propose two divergent designs that solve different problems in fundamentally different ways.

119. Tseng addresses the problem of protecting the electric wire. In the background section, Tseng introduces conventional illuminative faucet prior art, U.S. Patent No. 7,467,874 (“’874 patent,” Ex. 2009). Ex. 1004, ¶3. Tseng then outlines the problems with the conventional faucet, which a POSITA would have recognized as the objectives Tseng wanted to improve. For example, Tseng explains that in the conventional faucet, “the electric wire is mounted between the internal tube and the fitting casing or the woven cloth to cause complicated assembly[, and]

the electric wire is broken easily as rotating the shower head and a rotation angle of the shower head is limited,” “[t]he outlet segment of the flexible pipe is configured in the shower head so that the electric wire extends out of the outlet segment of the flexible pipe, but the outlet segment is located on an outer wall of the shower head, so the electric wire exposes outside the shower head,” and “the circuit board (such as a PCB) is arranged in the shower head difficultly because of a narrow space of the shower head. Furthermore, the electric wire is broken as rotating the shower head.” Ex. 1004, ¶¶4, 6, 7. Following these identified problems, Tseng states that it “mitigate[s] and/or obviate[s] the **afore-described** disadvantages” of the conventional illuminative faucet. Ex. 1004, ¶8 (emphasis added). Therefore, a POSITA reading Tseng would have understood that Tseng aims to improve a faucet powered by a wired power source, not eliminate the wiring or external power supply altogether. In view of these problems, Tseng seeks to “avoid[] damage [to] an electric wire in the pull-out faucet.” Ex. 1004, ¶9.

120. A POSITA would have reviewed the ’874 patent to further understand the problems Tseng addresses, and while doing so, would have also recognized several benefits highlighted in the ’874 patent regarding powering the faucet with a wired power source. These benefits include, for example:

**The supply of electrical energy** to the electrical circuit and the light source 70 **is ensured** via the electrical line 84 which is connected electrically to a power supply. The power supply is preferably mounted

in a specific box below the washing table and is designed to be used in a wet area. A power pack is used as energy source for the power supply, although batteries or accumulators may also be used instead of the power pack.

Ex. 2009, 4:24-31 (emphasis added).

Many diverse possibilities are conceivable for switching on and switching off the light source 70, in any of the above-described or below-described structures. For example, both switch-on and switch-off may take place via a dimmer switch, so that the light intensity increases or decreases continuously.

Ex. 2009, 8:25-29.

Further, the light intensity can be adapted to the current light conditions in the room by a sensor.

Ex. 2009, 8:30-31.

Moreover, the light source may be switched off with a time delay, and/or the valve of the mixer cartridge 144 may be closed with a time delay.

Ex. 2009, 8:40-32. Because Tseng purports to **improve** the conventional faucet described in the '874 patent, a POSITA would have had no reason to eliminate the benefits of a wired power supply as the '874 patent describes. In other words, a POSITA would have **preserved** these benefits of a wired external power source. Mr. Cook fails to address this aspect of Tseng and did not discuss or review the '874 patent at all. Ex. 1003, ¶19; Ex. 2005, 30:9-18 (Mr. Cook admitting he did not review the '874 patent).

121. Tseng explicitly explains the “advantages” of its design including **retaining** the and improving electrical wiring, rather than eliminating the wiring

altogether. Thus, a POSITA would have understood that Tseng's objective was to enhance the existing wired power supply, not to dispose of it:

5. *The electric wire 60* is inserted along the tunnel 13 of the flexible pipe 10, so it is not broken easily. Preferably, the *electric wire 60* is mounted in the flexible pipe 10 conveniently and securely.

...

7. The angle limiter 80 is mounted between the coupling member 70 and the spray head 30 to limit the rotation of the spray head 30 smoothly within the first angle range, such as 110 degrees. Preferably, *the electric wire 60* is not damaged as rotating the spray head 30.

8. The inflow member 20 includes the second stopper 25 for inserting *the electric wire 60* to prevent a leakage of the water from the inflow member 20. Likewise, the conduit member 32 has the first stopper 320 installed thereon, thus avoiding the water penetrating into the internal sleeve 33 and the external sleeve 34 from the conduit member 32 to contact the circuit board 50. Furthermore, the first stopper 320 and the second stopper 25 affix the *electric wire 60* fixedly.

*Id.*, ¶¶102-110 (emphasis added). Tseng's design was specifically aimed at enhancing the integration of electrical wiring to the external power supply and makes clear that this objective was achieved. Tseng does not, however, suggest replacing the external wired power supply with an alternative solution, as doing so would forfeit the advantages described in the '874 patent.

122. A POSITA would have recognized that Tseng's choice to use an external power supply with wiring was a deliberate design decision distinct from Mizuno's hydro-generator approach, also because Tseng published **twelve years** after Mizuno. *See* Sections VIII.A, VIII.B; Ex. 1003, ¶¶84, 116. Mr. Cook opines

that Mizuno avoids the complications from using electric wiring by using a hydro-generator. Ex. 1003, ¶¶253-260 (“wire 60 (which again is subject to strain when the spray head is pulled) is eliminated as a point of possible failure. This would in turn improve the reliability of Tseng’s fixture and further motivate the application of Mizuno’s generator to Tseng.”). But this overlooks the advantages of an external power supply that the ’874 patent explains and Tseng sought to improve.

123. For instance, the external power supply of the ’874 patent **ensures** consistent, reliable power. This is an advantage over Mizuno’s hydro-generator, which only works when water is flowing and can be prone to inconsistency due inherent inconsistency in water flow. Moreover, a hydrogenator is a relatively intricate electromechanical device with moving parts subject to wear and tear.

124. Also, in contrast to Mizuno’s system, where the light intensity is dependent on the “feed-water pressure,” the ’874 patent’s external wired power supply allows for control over light intensity through a dimmer switch or a sensor that adjusts the lighting according to ambient light conditions. Ex. 1008, ¶38 (“when the power generated by the generator 32A is low, the respective necessary illuminance can be secured by reducing the number of LED illumination lamps 12 that light up, and when the power generated by the generator 32A becomes excessive due to high feed-water pressure, the excessive power can be consumed by increasing the number of LED illumination lamps 12 that light up in response to such.”); Ex.

2009, 8:27-31 (“For example, both switch-on and switch-off may take place via a dimmer switch, so that the light intensity increases or decreases continuously. Further, the light intensity can be adapted to the current light conditions in the room by a sensor.”). Mizuno does not mention the possibility of dimming the lights using a dimmer switch or sensor based on user preference, and instead suggests that brightness is tied to water pressure and not controllable—it has to be increased or decreased to avoid “excessive power generation” regardless of the user’s preference. Ex. 1008, ¶38.

125. To even begin to provide the same function as the ’874 patent with Mizuno’s design, a skilled artisan would have recognized that additional design changes would be required, possibly utilizing the voltage-stabilizer regulator, but that would not be as versatile as using an electric power source and a dimmer switch. For example, when the water flow is high enough, a stabilizer may help lower the luminance, but when the water flow is low, the stabilizer would not help increase the luminance because the power generated is simply not enough, and when flow stops, no power is generated. On the other hand, with a wired external power supply, the power supplied stays the same regardless of the water flow or pressure. A POSITA would have weighed the advantages and disadvantages of each approach even if considering modifications. But Mr. Cook offers no analysis comparing the advantages and disadvantages between Mizuno’s hydroelectric generator approach

and the '874 patent's "conventional illuminative faucet" approach, which Tseng expressly sought to improve. Instead, Mr. Cook simply states, without offering any justification, that a POSITA would be motivated to abandon the flexibility of Tseng's improved wired external power supply in favor of Mizuno's hydro-generator, Mr. Cook fails to explain why such a trade-off would have been reasonable or desirable. Ex. 1003, ¶¶253-260. I understand that a reasoned motivation to combine is necessary to show obviousness.

126. Tseng, which came a decade after Mizuno, opted for a **different** solution than Mizuno and focused on retaining the electrical wiring in its design while improving its integration. Thus, Tseng apparently did not view wiring as a disadvantage *per se*. Specifically, Tseng proposed embedding the electric wire along the flexible pipe to prevent it from breaking, using an angle limiter to allow smooth rotation of the sprayhead within a specified range to prevent damage to the wire, affixing the wire with stoppers, and employing a flexible printed circuit—all while maintaining a wired external power source. Ex. 1004, ¶¶107-110. Additionally, a skilled artisan would recognize that changing the power source from a wired external supply to a hydro-generator would require a significant redesign. A POSITA reading Tseng's disclosure would have seen no reason to undertake such a major redesign, especially when considering the benefits provided by Tseng's approach and the '874 patent's design.

**2. Mr. Cook alleges benefits that would not have improved Tseng's existing system.**

127. Mr. Cook asserts that “a POSITA would also have been motivated to employ Mizuno’s generator—instead of other prior art generators—as it includes several beneficial design features” including “various features to avoid damage to both the generator itself and the LED lights.” Ex. 1003, ¶¶261-262. Mr. Cook opines that the features include “a voltage stabilizer to ensure proper electrical supply to LEDs,” “cooling component to “promote heat dissipat[i]on,” and “relief valve” to stabilize the water flow and avoid damage to electrical components.” Ex. 1003, ¶262. Mr. Cook reasons that with these additional components, “[a] POSITA would have recognized that Mizuno’s hydro-generator is specifically designed to provide a consistent and reliable source of power that is unlikely to itself fail (or cause the connected LEDs to fail) over time due to voltage fluctuations, excessive heat, or the generation of excessive electrical power,” suggesting that a POSITA would have adopted the whole package, including the hydro-generator and its associated components, to address power stability and longevity concerns.. Ex. 1003, ¶264.

128. But these are solutions to problems that Mizuno created in the first place by using a hydro-electric generator, which do not arise with a wired power supply as in Tseng. A POSITA would have had **no reason** to incorporate Mizuno’s additional components, such as the voltage stabilizer, cooling component (metal heat

transfer ring), and relief valve—all of which are part of Mizuno’s design—into Tseng. As explained in Section VIII.B, Mizuno acknowledges that the issue of excessive power generation from high water flow arises specifically from using the hydro-electric generator and addresses this problem with the additional components, including the voltage stabilizer, cooling component, relief valve, and related circuitry. Section VIII.B; Ex. 1008, ¶¶7-8, 14-17, 31-40. Tseng does not face this issue because it receives a consistent and appropriate amount of power from its external power source. Tseng’s design does not require these extra components, as they are only necessary to mitigate the problems caused by Mizuno’s choice of a hydro-electric generator.

129. Therefore, at least for these reasons, a POSITA would have recognized that Mizuno’s approach was unnecessary and irrelevant to Tseng’s design. This suggests that Mr. Cook’s opinion that a POSITA could combine Tseng and Mizuno and would be motivated to do so is based on hindsight supporting the Petitioner’s attempt to map the two references onto ’363 patent claims 9 and 11.

**3. A POSITA would not have had a reasonable expectation of success implementing Mizuno into Tseng.**

130. Mr. Cook opines that a POSITA would have had a reasonable expectation of success in integrating Mizuno’s hydro-generator into Tseng’s faucet showerhead. Ex. 1003, ¶¶275-270. I disagree. Aside from the fact that both Tseng

and Mizuno involve faucets with LEDs, his only support for this assertion is that “a POSITA would have recognized that the **large** internal “chamber 321” within Tseng’s shower head could be readily adapted to accommodate and fit Mizuno’s hydro-generator without significantly impacting the spray head’s water flow.” Ex. 1003, ¶270 (emphasis added). However, this assertion is unsupported. Tseng and Mizuno expressly state or at least suggest the contrary—that space within the faucet is limited—and, as such, a POSITA would not have reasonably expected success in adapting Mizuno’s hydro-generator into Tseng’s space-limited design.

131. Mr. Cook incorrectly characterizes Tseng’s faucet as having sufficient space to add all the components Mizuno suggests as necessary for its approach to work properly. Contrary to Mr. Cook’s incorrect representation, Tseng never describes its chamber 321 as “large.” The word simply does not appear in Tseng at all. Ex. 2005, 95:14-16 (“Q: Tseng paragraph 77 doesn't say the inlet chamber is large? A: It does not”), 96:8-10 (“Q: Tseng paragraph 78 does not say the inlet chamber of 321 is large? A: It does not”), 98:7-9 (“Q: Tseng paragraph 83 doesn't say inlet chamber 321 is large, correct? A: It does not”), 98:20-22 (“Q: Tseng paragraph 85 does not say inlet chamber 321 is large? A: It does not”), 99:11-13 (“Q: Tseng paragraph 88 does not say inlet chamber 321 is large? A: That is correct”). Instead, Tseng explicitly states that the space inside the showerhead is **narrow**, referring to the difficulties posed by the limited space in the faucet. Ex.

1004, ¶¶7 (“because of a **narrow** space of the shower head”), 108 (“fixed in a **narrow** space easily”) (emphasis added). Mizuno also identifies spacing concerns for faucets in general, highlighting that adding components like a battery can cause the faucet to become large. *See* Ex. 1008, ¶5 (explaining that the faucet becomes large when mounting a battery, which suggests that a faucet without a battery is small and lacks space for additional components); *see also* Ex. 2005, 88:8-11 (“So Tseng’s faucet is a narrow space, right? A: It appears to be narrow, yes”). Mr. Cook’s characterization that Tseng’s chamber 321 is large to fit Mizuno’s hydro-generator (which should be accompanied by other components according to Mizuno) is simply not in the reference.

132. Mr. Cook also does not offer an opinion whether a POSITA would have been motivated to enlarge Tseng’s faucet chamber to accommodate Mizuno’s hydro-generator and the additional components that Mizuno’s design requires. *See* Ex. 1003, ¶¶239-270. It would have been clear to a skilled artisan, based on Mizuno’s explicit discussion of the issues and solutions associated with using a hydro-electric generator, that adopting Mizuno’s hydro-generator would necessitate additional space for various components, such as the voltage stabilizer, cooling components, and relief valve—elements that Mizuno explains are necessary for the proper functioning of its hydro-generator. Ex. 1008, ¶¶7-8, 14-17, 31-40. Even if, hypothetically, Mizuno’s hydro-electric generator could somehow fit inside Tseng’s

chamber, the voltage stabilizer, as required by Mizuno, would need to be placed on Tseng's flexible circuit board 50 and connected to the cooling component. This also requires additional space constitute a significant redesign, rather than a simple modification. Given that Tseng specifically describes its faucet as having a "narrow" space, it is evident that Tseng's design is not "readily adapt[able]" to accommodate the added components of Mizuno's system, as Mr. Cook suggests against the reference.

133. Taking Mizuno's teachings as a whole, which I understand is the standard in obviousness analysis, it is my opinion that a POSITA would have been discouraged from implementing Mizuno's approach into Tseng.

134. I conclude that Mr. Cook has failed to show that a POSITA would have been motivated to combine Tseng and Mizuno. Therefore, he has failed to show that '363 patent claims 9 and 11 are obvious over Tseng in view of Mizuno.

**C. Ground 3: Claims 17 And 18 Would Not Have Been Obvious Over Tseng and Schneider.**

135. Mr. Cook opines that, whereas '363 patent independent claim 10 is obvious over Tseng alone, dependent claims 17 and 18 are rendered obvious by the combination of Tseng and Schneider. Ex. 1003 ¶¶271-275. I disagree with Mr. Cook's analysis that claims 17 and 18 would have been obvious over Tseng and Schneider. I understand that claim 17 depends on claim 10 and claim 18 depends on

claim 17. Additionally, I recognize that Ground 3 is the only ground challenging claims 17 and 18. As I explained with respect to Ground 1, because Tseng does not render independent claim 10 obvious, and Mr. Cook does not provide any analysis to show that Schneider addresses the issues in Ground 1, Ground 3 fails for at least the same reasons as Ground 1 based on Tseng alone.

136. As with Tseng in view of Mizuno, Mr. Cook fails to explain **why** a POSITA addressing Tseng would look to Schneider to supply missing pieces. As with Tseng and Mizuno, Tseng and Schneider address different problems. Tseng seeks to improve the integration of electric wiring within the limited space inside a faucet, while Schneider aims to enhance the user interface in a much larger system, such as a shower booth or sink. The only motivation to combine Tseng and Schneider that Mr. Cook provides is the one outlined below, which I find conclusory and unpersuasive:

298. In my opinion, a POSITA would have been motivated to apply Schneider's teachings to Tseng.

299. A POSITA would have recognized that doing so would have improved Tseng in a number of ways.

300. For example, employing Schneider's red and blue LEDs, temperature sensor, and controller, Tseng's pull-out faucet would not only illuminate, but would also convey information to the faucet user regarding water temperature

301. This would in turn produce a number of benefits. For instance, the faucet could emit color alerting the user to the fact that the water is hot such that care should be exercised.

302. Additionally, the faucet could also notify a user when water reaches a desired temperature range.

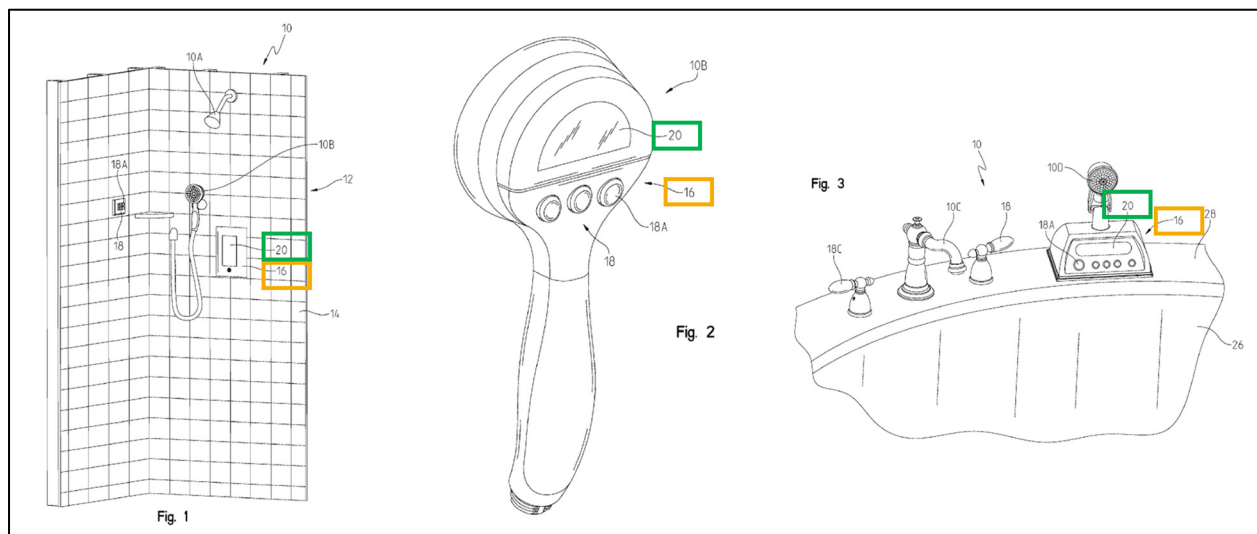
303. In my opinion, a POSITA would have recognized that this functionality would have allowed for safer and more convenient operation of Tseng's faucet: a user would be informed when the water coming out of the faucet is dangerously hot, uncomfortably cold, or just right.

Ex. 1003, ¶¶298-303. Mr. Cook cites to no text in Tseng or Schneider to support these opinions.

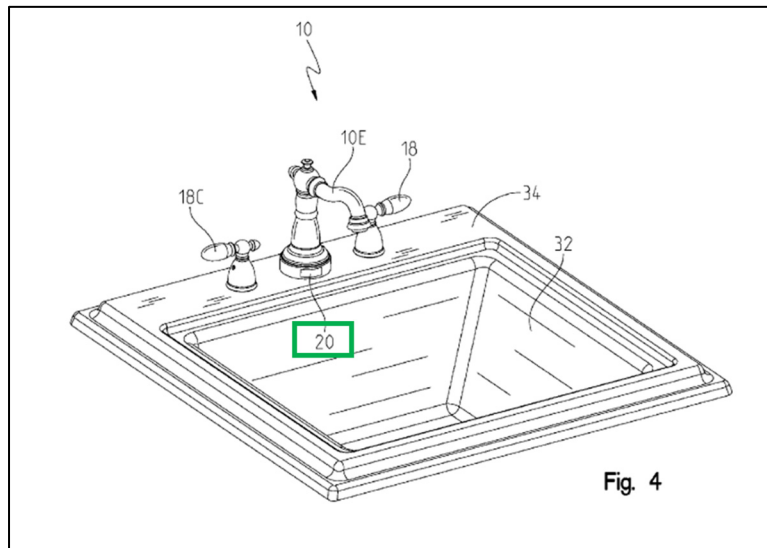
137. Mr. Cook suggests that a POSITA would recognize from Schneider that “convey[ing] information to the faucet user regarding water temperature” is beneficial because it could “aler[t] the user [that] the water is hot such that care should be exercised” and “notify a user when water reaches a desired temperature range.” Ex. 1003, ¶¶300-302. However, this generic benefit applies to **any** faucet that provides temperature information—even without an LED. For example, Schneider features a display that shows the actual temperature of the water. Ex. 1009, ¶26 (“For example, display unit 20 may be a liquid crystal display (“LCD”) configured to output the temperature of the water, the operating mode, the current time and/or date, and/or any other information about fluid delivery device 10.”). Mr. Cook does not explain why a POSITA would choose only the display's “backlight” feature in Schneider and apply it to a location on Tseng that is different from where Schneider places the display. Ex. 1009, ¶¶271-313. Nothing in Schneider is about a

need to provide illumination as in Tseng. Nothing in Tseng is about the need to communicate information. Tseng and Schneider are addressing wholly different technical problems.

138. For example, perhaps recognizing that **display units 20** shown in Figures 1-3 of Schneider (*see below*) would be too distant from the claimed light emitters on the sprayhead, Mr. Cook chooses to combine only Figure 4 of Schneider with Tseng, citing exclusively Figure 4. *E.g.*, Ex. 1009, ¶¶279, 310. Notably, Schneider Figure4 does not show a pull-down faucet.

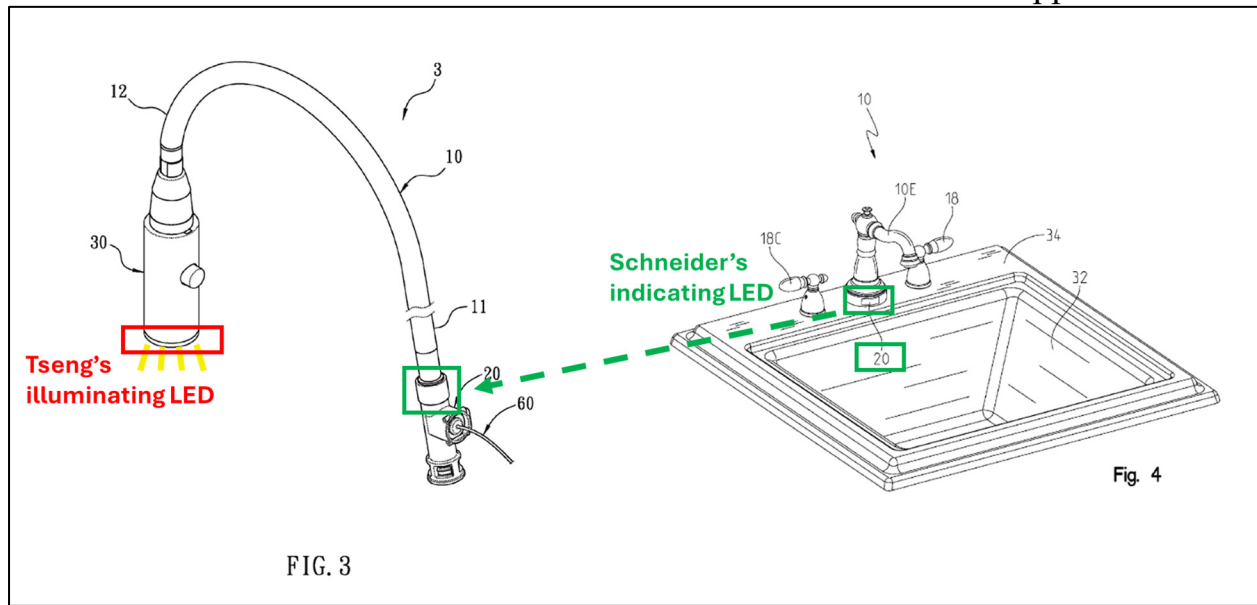


Ex. 1009, Figures 1 (left), 2 (middle), 3 (right).



Ex. 1009, Figure 4. Mr. Cook generally states that “[t]he combined faucet of Tseng and Schneider would continue to provide all this very same functionality,” but he has not explained **how** the combination would be made or what the resulting combination would look like.

139. There could be multiple ways to combine Tseng and Schneider’s Figure 4. One example, and the most straightforward way of combining Tseng’s Figure 3 with Schneider’s Figure 4, is to place Schneider’s LED interface at the base of Tseng’s faucet, just like the location of the display unit/user interface in Schneider’s Figure 4. The resulting combination would look like the figure on the below left:



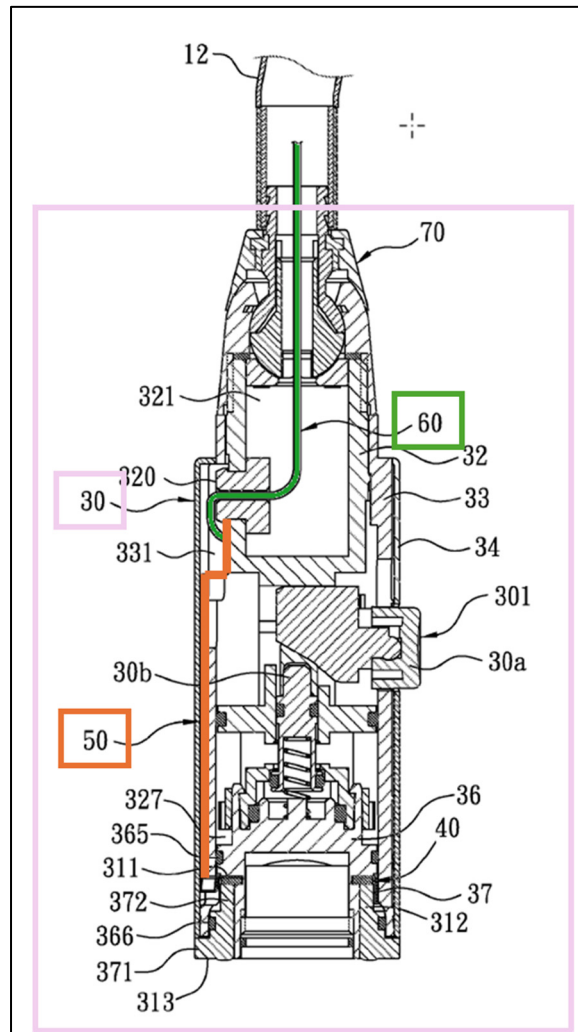
Ex. 1004, Figure 3 (left); Ex. 1009, Figure 4 (right). As can be seen in the figures above, the resulting combination would retain **Tseng's illuminating LEDs** in the sprayhead while adding **Schneider's indicating LEDs** to the base of the faucet. The user would use Tseng's LED for its intended purpose, such as "brilliant illumination" (Ex. 1004, ¶ 103), and would use Schneider's added LED for temperature indication.

140. Another modification would be required beyond the most straightforward combination of Tseng and Schneider to achieve the claimed LEDs that change color "in response to the temperature detected by the temperature sensor," as claim 17 recites. I show the difference between the resulting combination of Tseng and Schneider and the claimed sprayhead below, and it is easy to



141. As best as I can tell, Mr. Cook’s suggestion is to take only the concept of temperature sensing and changing the color of the light from the LEDs in response, and apply that to Tseng’s LEDs. *See, e.g.*, Ex. 1003, ¶312 (“Tseng similarly teaches a faucet that employs LEDs for illumination.”). This is hindsight, not only because of the lack of motivation but also because there are other, more reasonable ways to combine the references, as I explained above. Regardless, the modification of replacing Tseng’s LED with Schneider’s LED would exacerbate one of the problems Tseng seeks to address—limited space in the sprayhead. As I

explained in earlier sections VIII.A and IX.A, Tseng's electric wire solution, using a flexible printed circuit board and a flexible pipe, is designed to address the problem of limited spacing. However, by replacing Tseng's LED with Schneider's LED solution, and not separately adding Schneider's solution to the base where there could be more space, the combination would encounter even more space issues. These issues would arise in attempting to fit into Tseng's already narrow sprayhead 30, the additional components required by Schneider's solution that do not exist in Tseng, such as a temperature sensor, a controller to change the light color, and the circuitry to connect them, shown below:



Ex. 1004, Figure 27. In addition, the added components would need to be connected to electrical power and to each other. Specifically, the additional wire connections would introduce additional risk of wire damage, which Tseng aims to avoid. These challenges, which a POSITA would recognize and find demotivating, are not addressed in Mr. Cook's declaration. Accordingly, Mr. Cook has failed to explain why a POSITA would introduce even more complication than moving Schneider's lighted display to Tseng's faucet base when combining the Tseng and Schneider

disclosures. Lacking reasoned motivation to combine, Mr. Cook has failed to show that '363 patent claims 17 and 18 are obvious over Tseng in view of Schneider.

**D. Ground 4: Claims 1, 6-9, and 19-23 Would Not Have Been Obvious Over Tse.**

142. Mr. Cook opines that “Tse discloses all the limitations of and renders claims 1, 6-9, and 19-23 [of the '363 patent] obvious.” Ex. 1003, ¶316. Despite claiming that Tse alone discloses all limitations, Mr. Cook conspicuously does not opine that Tse anticipates '363 patent claims 1, 6-9, and 19-23. His reasoning is unclear, but it implies that Mr. Cook recognizes that Tse does not disclose one or more claim elements after all. This implies that some element(s) in Tse are different than the element(s) in the claims at issue.

143. I disagree with Mr. Cook that Tse’s “cover” teaches or renders obvious “a translucent light pipe defining a closed loop to diffuse light from the light emitters,” because the plain language of Tse and its depictions clearly fail to teach the required elements.

144. Particularly for claim 19, Mr. Cook simply ignores the claim requirement, “a closed loop **surrounding the water outlet**,” because, in Tse, the water outlets surround the “closed loop” instead of the other way around as claimed.

**1. Tse’s “cover” is not a light pipe.**

145. Tse does not use the word “light pipe” anywhere, and Mr. Cook agrees. Ex. 1003, ¶359 (“While Tse does not use the term ‘light pipe’...”). A POSITA would not recognize Tse’s cover as a light pipe. ¶¶39-42. Tse discloses that the function of its cover is to seal the groove containing the light emitting means. Ex. 1005, 2:16-18 (“the light emitting means is disposed in the groove of the perforated member and sealed by the cover of the groove.”), 5:19-22 (“As shown in FIG. 4, the perforated member 21 is disposed with a groove 22, the groove 22 is disposed with a cover 23, the cover 23 is adapted to be in sealed engagement with the groove 22 to prevent water from entering the groove 22.”).

146. Further, Tse teaches away from using translucency for its cover—it instead encourages the light emitting means to be visible by making the “cover of the groove ... of transparent or semi-transparent material so that the light emitted by the light emitting means can be seen.” Ex. 1005, 3:3-5, 6:27-29 (“The cover 23 of the groove 22 of the perforated member 21 is made of transparent or semi-transparent material so that the light emitted by the light emitting means 3 can be seen.”). Making the cover of transparent or semi-transparent material would not have diffused light, and additionally would have resulted in “hot spots,” since the visible light emitting means (e.g., each LED) could be seen through the transparent or semi-transparent cover.

147. Moreover, a POSITA would readily see from the figures in Tse that the thickness-to-width aspect ratio of the cover is too thin to be an effective light pipe, and too thin to avoid hot spots and effectively diffuse light from the emitters. Mr. Cook appears to agree. Ex. 1003, ¶¶381-385. Tse's disclosure that the cover (which is more like a window) is made of transparent or semi-transparent material further suggests that the cover does not effectively diffuse light. This is consistent with my observation that Tse does not use the terms such as "diffuse," "diffusion," "scatter," or "glow" anywhere. Thus, Mr. Cook is speculating that "a POSITA would also have understood that Tse's cover would obviously have been designed to diffuse the light emitted by its LEDs in a manner that produces even, consistent illumination and avoids hot spots." Ex. 1003, ¶378.

148. Mr. Cook seems to agree that Tse's window (cover) is not a light pipe, which may explain why he adopts a single-reference obviousness approach instead of an anticipation approach. Specifically, Mr. Cook seems to agree that Tse's cover is too thin to be a light pipe. He states, "[a] thicker cover with curved surfaces formed using a transparent material will produce more light diffusion than a thin, flat cover formed from the same transparent material. This would in turn result in reduced light hot spots and more even illumination. This is dictated by standard light pipe design rules." Ex. 1003, ¶382. Mr. Cook has not disclosed the "standard light pipe design rules" to which he is referring. Notwithstanding, Mr. Cook admits that Tse's cover

has to be changed to make it a light pipe that diffuses light, as required by the '363 patent claims.

149. But Mr. Cook also states, in attempt to cover other limitations, that Tse's cover "sits flush" with the surface of the sprayface. Mr. Cook is trying to have it both ways—Tse's cover is thin, so it aligns with the sprayface and is also thick and curved to create diffusion. The argument is simply flawed.

Mr. Cook's opinion is additionally flawed because he combines Tse with a "thicker cover with curved surfaces formed using a **transparent** material," yet all '363 patent claims require a **translucent** light pipe. Ex. 1003, ¶382. Even ignoring this flaw, Mr. Cook only provides conclusory statements regarding motivation to combine, without citing any evidence. He writes, "[f]orming the shower head with such a cover would increase its aesthetic appeal by allowing for more uniform light emission." Ex. 1003, ¶384. In no way has Mr. Cook established that whatever thicker transparent cover he has in mind would lead to more uniform light emission. He also speculates, "[a] thicker cover would also have been considered more durable and less likely to be damaged either during manufacture, assembly, installation, or later use." Ex. 1003, ¶385. This is not true for the case of surface scratches, which could potentially be the most likely and noticeable damage in the case of a cover that is designed to remain transparent or semi-transparent.

**2. Tse’s “cover” does not define a closed loop surrounding the water outlets.**

*Independent Claim 19*

150. The ’363 patent’s claim 19 recites “a translucent light pipe defining a closed loop surrounding the water outlet.” The ’363 patent describes that “[a] translucent light pipe or diffuser 346 is coupled to the substrate 342 and defines a closed loop laterally surrounding the water outlet openings 332.” Ex. 1001, 6:2-5.

151. I understand claim 19 to require the light pipe to be a closed loop wholly on the outside of the water outlets, as set forth below. Mr. Cook states that he applied plain and ordinary meaning in his declaration, yet he does not explain how the plain and ordinary meaning of surrounding the water outlet is the same as surrounded by the water outlet. Ex. 1003, ¶¶81, 358. In paragraph 385 of his declaration, he simply applies Tse’s alleged light pipe to the light pipe in claim 19, without explaining what the claim term “surrounding the water outlet,” which describes the metes and bounds of the claimed light pipe, meant to a POSITA reading the ’363 patent. Ex. 1003, ¶358 (“Further, Tse’s “light pipe” (translucent cover 23, yellow) encircles and “surround[s]” the “water outlet” (the holes through the central portion of Tse’s perforated member)).”

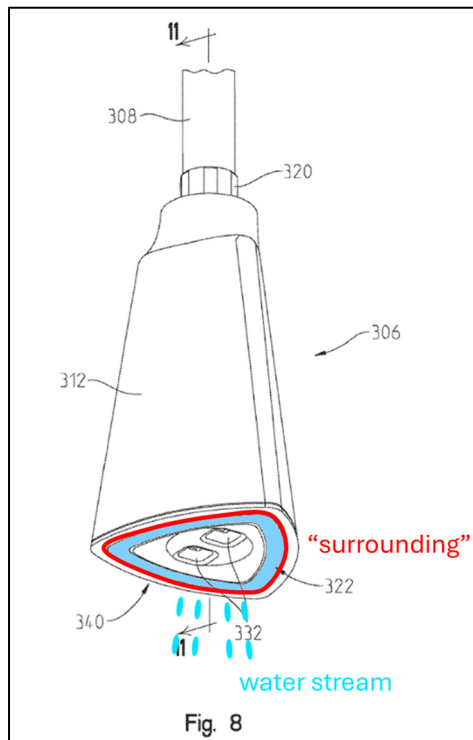
152. A dictionary definition of “surround” is to “enclose on all sides.” Ex. 2007. The ’363 patent describes in multiple places that, in the context of the ’363 patent, this means to encircle all of the water outlets of a showerhead. For example:

A translucent light pipe or diffuser 346 is coupled to the substrate 342 and defines a closed loop laterally surrounding the water outlet openings 332.

Ex. 1001, 6:2-5 (emphasis added).

The outer illumination surface 350 illustratively defines a closed loop positioned **laterally outside the water outlets 332** and flush with the adjacent outer surface 336 of the sprayface 322.

Ex. 1001, 6:11-15 (emphasis added).



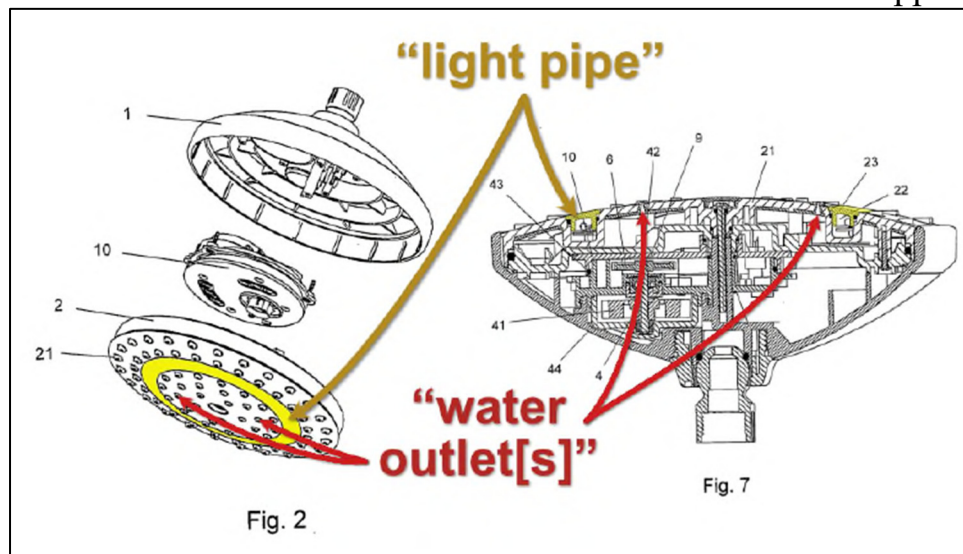
Ex. 1001, Figure 8. Based on the dictionary definition and the consistent representation in the ’363 patent specification and figures, a POSITA would have

understood that **surrounding the water outlet** means to enclose all sides of the water outlet—encircling **all** of the water stream. “Surrounding” contrasts with, for example, the light pipe being “between” water outlets. Mr. Cook agrees that the ’363 patent only depicts the light pipe completely surrounding all the water outlets. Ex. 2005, 109:15-22 (Q: In Figures 1 through 11 of the ’363 patent, the ’363 patent depicts water outlets completely surrounded by a light pipe, correct? A: That is correct. Q: The ’363 patent does not depict any water outlets not completely surrounded by a light pipe, correct? That is correct.”).

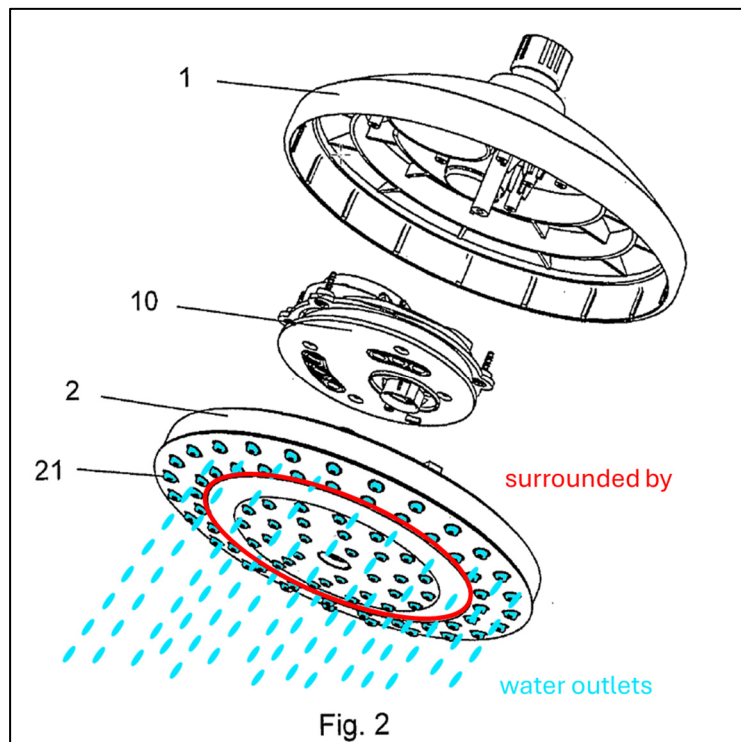
153. I disagree with Mr. Cook’s opinion that Tse discloses the claimed light pipe which surrounds the water outlet. Ex. 1003, ¶358. The very figure which Mr. Cook cites in support of his assertion shows water outlets outside of the closed boundary defined by cover 23, which he annotates as a light pipe. Tse describes:

[T]he present invention generally comprises a shower head body having a rear portion adapted to be connected to a water supply and a front portion with a perforated member adapted to discharge water **in the form of a spray**, a power source and a light emitting means, wherein the perforated member is disposed with a groove[.]

Ex. 1005, 1:24-2:1, *see also* Ex. 1005, Figure 2 (below). Mr. Cook ignores the positions of Tse’s water outlets entirely, as shown below:



Ex. 1003, ¶358. Mr. Cook acknowledges that what he is calling the “water outlet” are the (plural) “holes through the central portion of Tse’s perforated member,” (Ex. 1003, ¶358.) but he provides no reasoning for ignoring the holes through the outer portion, which surround the light pipe instead of being surrounded by it, as shown below:



Ex. 1005, Figure 2 (right). Figure 8 of the '363 patent confirms that Mr. Cook's interpretation of "surrounding the water outlet" is incorrect, as it shows a light pipe that wholly surrounds the water stream.

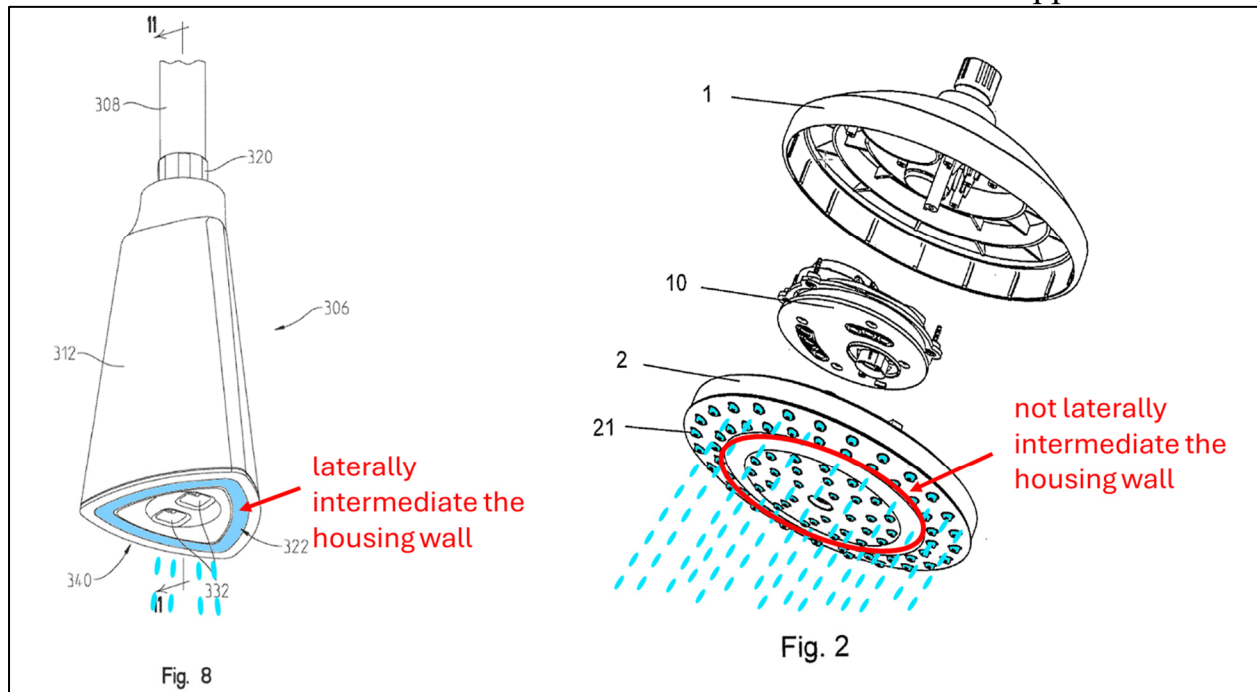
154. All of the Tse's figures are directed to the same single embodiment. Ex. 2005, 153:1-3 ("Q: All of Tse's ten figures depict the same embodiment, correct? A: Correct."). Tse does not show any other embodiment with a form of water stream other than spray. That is, a POSITA could consider Tse's lighting to be intentionally positioned in the middle of the field of spray emitters for aesthetic reasons, as Mr. Cook suggests. Ex. 1003, ¶¶379 ("Again, Tse's goal is to give the all the water coming out of its shower head the "same color" for purposes of enhancing user "visual enjoyment."") (citing Ex. 1005, 4:16-18, 8:20-23), 384 ("Forming the

shower head with such a cover would increase its aesthetic appeal by allowing for more uniform light emission.”).

Dependent Claims 8 and 22

155. Claims 8 and 22 further recite “the light pipe is supported within the spray face **laterally intermediate the water outlet and the housing wall.**” I understand that Grounds 4 and 5 are the only grounds asserted against claims 8 and 22.

156. The '363 patent describes that “the housing 312 includes an outer housing wall 348, and the light pipe 346 is supported within the sprayface 322 laterally intermediate the water outlets 332 and the housing wall 348.” Ex. 1001, 6:5-9, *see also* Figure 8 (below left). A POSITA would have understood that the light pipe must be located radially toward the **outer edge** of the sprayface, surrounding the water outlets, in order to be “**laterally intermediate the water outlet and the housing wall.**”



Ex. 1001, Figure 8 (left); Ex. 1005, Figure 2 (right).

157. In this regard, Tse's showerhead does not disclose the light pipe "laterally intermediate the water outlet and the housing wall." All of Tse's figures (Figure 2 above right, for example) show the cover (alleged light pipe) positioned in the middle of the sprayface, not at the outer edge of the sprayface. Mr. Cook does not opine on whether a POSITA would modify Tse to move the cover. However, even if a POSITA were to consider such a modification, it would involve significant changes. It would at least require moving the groove under the cover, relocating the LEDs inside the groove, adjusting the four circuit boards that connect the LEDs, modifying the associated circuitry, repositioning the water outlets radially around

the cover. These changes would effectively amount to a redesign of Tse's showerhead.

**E. Ground 5: Claims 1, 6-9, and 19-23 Would Not Have Been Obvious Over Tse and Carter.**

158. I disagree with Mr. Cook that Claims 1, 6-9, and 19-23 are obvious over Tse and Carter. First, Carter is not applicable to Tse or to the '363 patent, because it is not analogous art. Second, Carter does not teach a "translucent light pipe defining a closed loop [surrounding the water outlet] to diffuse light from the light emitters" because, at least according to Mr. Cook, Carter discloses a "transparent" light pipe.

**1. Carter is non analogous art.**

159. Carter states that it is "primarily intended for the spa and pool industry." Ex. 1006, ¶27. While Mr. Cook asserts that Carter and Tse are "analogous art," (Ex. 1003, ¶424), his reasoning is contrary to the language in Carter itself and ignores the requirements for plumbing fixtures in different industries.

160. Mr. Cook uses Carter's general language ("this technology could also be adapted to all forms of recreational and/or non-recreational water applications") as his basis of analysis and concludes that Carter's teachings "can be adapted to any plumbing fixture." Ex. 1006, ¶27; Ex. 1003, ¶424 (emphasis added). But Mr. Cook still does not explain why a POSITA **would** adapt Carter, much less to **any** plumbing fixture.

161. Devices intended for applications, like Carter’s water jet for use in a spa or pool, are designed to be durable to withstand constant or nearly constant submersion, often in circulating, chlorinated, or salt water. Carter emphasizes throughout the importance of this durability and the cost associated with achieving durability. *E.g.*, Ex. 1006 Abstract (“simple and rugged and well suited to the rigorous environment of recreational uses of plumbing fixtures and illumination”), ¶6 (“The primary shortcoming of prior combinations of plumbing and light has been cost and durability. A light is somewhat more subject to failure when exposed to the rugged environment of a pool or spa or fountain and protecting the water tight integrity of the light creates cost and complication. If the integrity of the light and/or electrical source is compromised serious complications can result, including inadvertent electrocution.”). In addition, because Carter’s water jet is “primarily intended for the spa and pool industry,” it is stationary and embedded within a wall or floor, unlike sprayheads or showerheads, which typically move and are well proud of any surfaces such as ceilings or countertops. Ex. 1006, ¶27, Figures 1-3. Given the language in Carter and the distinctions between Carter’s applications and the ’363 patent, a POSITA would not seek to utilize Carter’s water jets to improve sprayheads.

162. Moreover, Carter also does not address the problem addressed by the ’363 patent. The ’363 patent focuses on structural design to resolve hot spots. Carter

utilizes manufacturing techniques to address the need for cost efficient, durable, lighted plumbing fixtures in a spa or pool. Jets as in Carter are often placed where they must withstand more rigorous environments than a typical sprayhead. For example, chlorinated or salt water may damage the water jet components. Also, since water jets are under the water for most of the time, they are more likely to corrode. The inner electrical components have to be more tightly sealed, due to the electrocution risk in pool or spa applications. Because pool and spa water jets are typically embedded solidly in walls and floors, they are at greater risk of damage due to being stepped on or impacted by pool cleaning tools. Carter proposes “multi-shot molding or pre-mold/over-mold molding” technique to tightly integrate its light pipe cost-effectively. *E.g.*, Ex. 1006, ¶8.

**2. A POSITA would not have been motivated to replace Tse’s cover with Carter’s over-molded light pipe**

163. Additionally, Carter achieves its light pipe structure by multi-shot over-molding a transparent layer onto another structural layer. Ex. 1006, ¶7. Carter describes that the layer “encapsulates” “a partial or complete surface area of the substrate.” Ex. 1006, ¶7. Thus, “the light pipe layer functions as an integrated light pipe.” Ex. 1006, ¶8. Carter clearly is teaching the manufacturing efficiency and durability benefits of having the light pipe be a tightly integrated layer that a

POSITA would recognize would be inseparable from the substrate and could not be a standalone component.

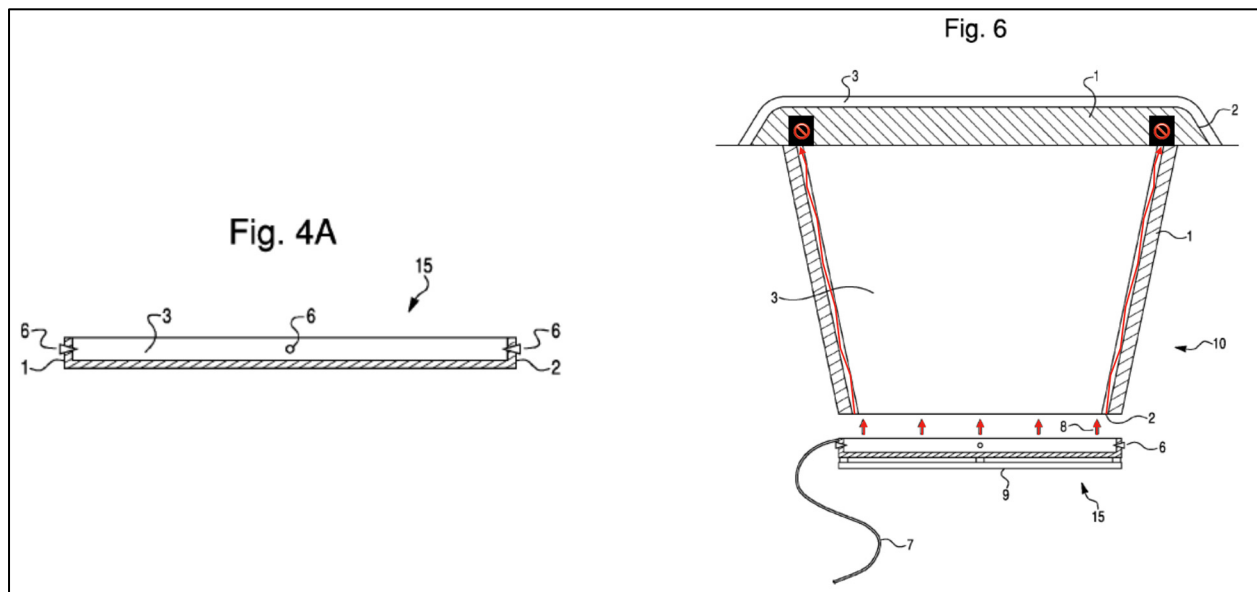
164. A POSITA would not understand how to replace Tse's cover 23 with an over-molded light pipe layer 3 on a substrate 1 as taught in Carter. For example, a POSITA would not understand what the substrate would be and where it would go and not block the light from Tse's LEDs. Thus, Mr. Cook's statements, "Replacing its simple cover with a customized, molded light pipe would have resulted in a better, more customizable dispersion of light" (Ex. 1003, ¶441) and "[a] POSITA would have had a more than reasonable expectation of success" (Ex. 1003, ¶442) are purely conclusory.

165. Mr. Cook fails to describe how one would possibly combine Carter's layer construct with Tse. Mr. Cook points to Carter's Figure 4A as disclosing a light pipe, but he does not explain how or why that could possibly be combined with Tse. For example, a POSITA would have examined Tse and recognized that its cover is removable. *See, e.g.*, Ex. 1005, Figure 4. However, replacing Tse's cover with Carter's light pipe would result in an integrated light pipe somehow attached to the groove, losing the flexibility of Tse—if the LED were broken, it would not be replaceable. Mr. Cook does not address any of these possibilities.

166. Carter applies the Figure 4A structure in its Figure 6, yet Figure 6 seems inapt with respect to any combination with Tse. First, Carter's Figure 6 discloses

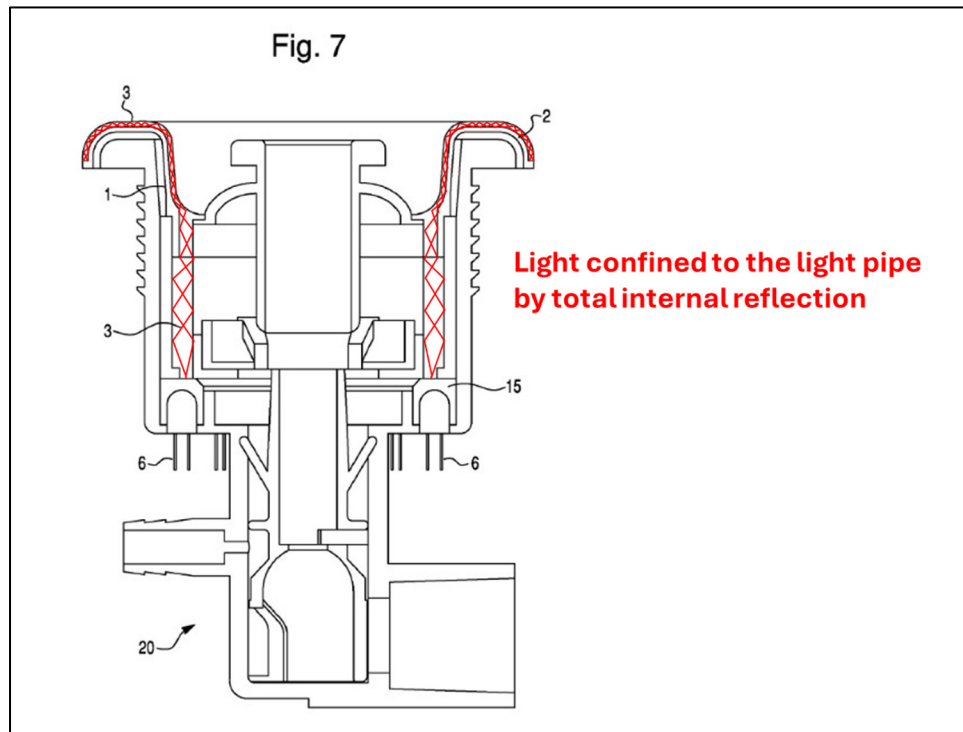
nothing about how and where water is involved. Further, Carter's lighting element array would appear to involve a light pipe feeding a light pipe, namely the pipe in the array possibly illuminating the light pipe layer on the tapered walls of the device. Tse has no need for a light pipe feeding a light pipe.

167. Moreover, light seemingly cannot get out the top of Carter's Figure 6 device or to the uppermost light pipe layer because of the horizontal substrate in the way. Thus, Mr. Cook has no valid basis to say, "In my opinion, applying this light pipe to Tse results in the claimed subject matter: cover 23 would be replaced with an integrated, molded light pipe taught by Carter that diffuses light from Tse's LEDs out of the face of perforated member 21." Ex. 1003, ¶422. In my opinion, a POSITA would not be motivated to combine Carter's disclosures into Tse.



Ex. 1006, Figure 4A (left), Figure 6 (right).

168. A POSITA would understand Carter's light pipe functionality to involve light transmission along the path identified by annotations in Carter's Figure 7 shown below.



Ex. 1006, Figure 7.

3. Tse in view of Carter does not teach or render obvious “a translucent light pipe defining a closed loop [surrounding the water outlet] to diffuse light from the light emitters.”

169. As described by Mr. Cook, the light pipe described in Carter is “transparent.” Ex. 1003, ¶418; Ex. 1006, ¶6. As a result, even according to Mr. Cook, Carter cannot teach a “translucent” light pipe as required by all claims of the ’363 patent.

170. Transparent and translucent materials are different. While both permit light to travel through the material, transparent materials do so without substantially scattering the light, and translucent materials scatter light by design. This significantly effects where light goes within a material and where it goes once it exits the material. In particular, translucent material scatters light in all directions within a material, such that light exits the material in many directions. Light within a transparent material scatter very little, and therefore tends to exit the material in a narrow range of direction.

**F. Ground 6: Tse (or Tse in view of Carter) in view of Spangler does not render dependent claim 24 obvious.**

171. Mr. Cook opines that Tse (or Tse and Carter) in further view of Spangler renders obvious claim 24. Ex. 1003, ¶¶449-469. For at least the same reasons I explained for Ground 4 (Tse) and Ground 5 (Tse in view of Carter), Ground 6 also fails because this ground depends on Grounds 4 and 5, and Spangler does not cure the deficiencies of Tse and Carter grounds.

**X. SECONDARY CONSIDERATIONS SHOW THE CLAIMS WOULD NOT HAVE BEEN OBVIOUS**

172. I have been informed and understand that objective indicia, such as the fulfillment of a long-felt unmet need and praise by others, among other factors, could serve as evidence that the claimed invention is not obvious in view of the asserted references. *See* Section III.D.

**A. Nexus**

173. I have been informed that Delta has two lines of products that embody the claimed features: the Allentown kitchen faucet (Ex. 2012) and Pendant Raincan showerhead (Ex. 2013). I have reviewed major retailers' webpages for these products and confirmed that the products embody the claimed features. For example, as shown below, the Allentown kitchen faucet has "a translucent light pipe defining a closed loop to diffuse light from the light emitters outwardly away from the housing" (claim 1) and "an outer illumination surface extending perpendicular to the longitudinal axis of the housing" (claims 3, 10 and 12). The color of light changes based on temperature (claims 17 and 18). The faucet is water-powered, meaning it has a hydroelectric generator (claims 9 and 11).



Ex. 2012.<sup>4</sup> The Pendant Raincan showerhead also has “a translucent light pipe defining a closed loop surrounding the water outlet to diffuse light from the light emitters outwardly in a direction parallel to the longitudinal axes” (claim 19). The Pendant Raincan’s light pipe is placed at the outer edge of the spray face, so that it is “is supported within the spray face laterally intermediate the water outlet and the housing wall” (claims 8 and 22) and is water-powered (claim 21). The showerhead can shoot water stream in multi-dimensions (claim 24).



Ex. 2013.<sup>5</sup>

<sup>4</sup> See also [https://media.deltafaucet.com/elvis/Video/PRODUCT\\_19935L-SPSD-DST.mp4](https://media.deltafaucet.com/elvis/Video/PRODUCT_19935L-SPSD-DST.mp4)

<sup>5</sup> See also [https://media.deltafaucet.com/elvis/Video/PRODUCT\\_57140-25-L.mp4](https://media.deltafaucet.com/elvis/Video/PRODUCT_57140-25-L.mp4)

**B. Objective Indicia Demonstrating Non-Obviousness**

**1. Long-Felt Unmet Need**

174. I was informed and understand that the length of time between the prior art and the claimed invention can be an important factor in determining whether the claimed invention was nonobvious. If a significant amount of time has passed since the asserted references, it may suggest that the combination of the references was not obvious, even though each reference individually may show some of the claimed elements.

175. The Mizuno reference, which Mr. Cook combines with Tseng for the hydroelectric generator, is from 2003. Ex. 1008, p.1. Mizuno was available 12 years before Tseng and 14 years before the '363 patent. However, Tseng still did not choose to incorporate a hydroelectric generator, for the reasons I discussed in response to the Petitioner's Tseng grounds. This suggests that combining Mizuno with Tseng may not have been so obvious, contrary to Mr. Cook's opinion.

176. Tse is from 2009, eight years before the '363 patent. Ex. 1005, p.1. Yet Tse does not render the challenged claims obvious, as I explained in response to the Petitioner's Tse grounds. This further indicates that it was not so obvious to modify Tse or combine Tse with Carter or Spangler, as Mr. Cook opines.

## **2. Industry Praise**

177. I have reviewed the webpages of major home appliance retailers, such as Home Depot, for Delta's products, including the Allentown kitchen faucet and Pendant Raincan showerheads. As one example, on Home Depot's webpage for the Allentown kitchen faucet, customers gave an overall rating of 4.5/5, with hundreds of reviews expressing their appreciation for the claimed features. *See, e.g.*, Ex. 2015. For example, one customer said, "Delta has outdone itself with this faucet." Ex. 2015, 5. Customers generally liked the claimed features and left good reviews: "[t]he color coded temp LED light makes it safer to have my young boys help with the dishes" (Ex. 2015, 3), "[without] sticking your hand in[t]o the water [] just from looking at it. ... it show's blue when the water is cold and it changes to red when the water is hot" (Ex. 2015, 2), "TempSense indicator is hydro powered, so no batteries needed" (Ex. 2015, 4).

## **XI. SUMMARY OF OPINIONS**

178. As discussed above, it is therefore my opinion that claims 1-24 should be confirmed.

## **XII. AVAILABILITY FOR CROSS-EXAMINATION**

179. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I recognize that I may be subject to

cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

### **XIII. RIGHT TO SUPPLEMENT**

180. I reserve the right to supplement my opinions in the future to respond to any arguments that the Petitioner raises and to take into account new information as it becomes available to me.

### **XIV. JURAT**

181. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true. I declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.



Dated: January 17, 2025

By:  
Richard Klopp, Ph.D.

# APPENDIX A



**Exponent<sup>®</sup>**  
Engineering & Scientific Consulting

**Rich Klopp, Ph.D., P.E., F.A.S.M.E.**

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Menlo Park  
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## Professional Profile

Dr. Klopp specializes in mechanical engineering and the mechanics of materials. He has particular expertise in laboratory-based testing, mechanical design, failure analysis and prevention, and manufacturing.

Dr. Klopp's mechanical engineering background includes extensive experience in machining; machinery; mechanisms; analysis of fasteners, gears, and bearings; power generation; mechanical power transmission; optical systems; metrology; hydraulic systems; and fluid handling components. His mechanics of materials background includes extensive experience in fracture mechanics, high strain rate deformation and failure, impact and shock wave loading, mechanical testing and optical measurement methods.

Dr. Klopp has applied his expertise to machine tools, industrial machinery, laser systems, electric and gas utilities, automobiles, trucks, construction equipment, potable, fire protection, and wastewater system components, plumbing, computer equipment, electronic packaging, consumer products, hand and power tools, medical equipment and medical devices, toys, recreational products, railroad tank cars, chemical storage tanks, underground tunnels, armor/antiarmor, and missile defense. Dr. Klopp has studied the mechanical behavior of metals, ceramics, rock, plastics, advanced composites, liquids, and wood.

Dr. Klopp has provided consulting services on matters of industrial problem solving, product recalls, product defect litigation, intellectual property disputes, commercial disputes, national defense, and insurance issues. His consulting relating to intellectual property has included patent infringement and non-infringement analyses, patent invalidity analyses, patent claim construction support, trade secret matters, and technology licensure.

Dr. Klopp is a skilled machinist qualified to set up and operate machine tools such as lathes, milling machines and other shop equipment. His personal machine shop is equipped with a computer numerical control (CNC) vertical machining center, two manual milling machines, two toolroom lathes, grinders, and a wide variety of supporting tooling and equipment. Dr. Klopp routinely uses computer-aided design (CAD) and computer-aided manufacturing (CAM) software. Dr. Klopp is a mentor for the local high school FIRST Robotics team. In addition to mentoring on mechanical design, Dr. Klopp's role includes maintaining, tooling, upgrading, and repairing the school's machine tools and teaching students and other mentors how to use them.

Prior to joining Exponent, Dr. Klopp was a Research Engineer at SRI International and worked as a Research Associate at Brown University. He is a Fellow of the American Society of Mechanical Engineers.

## Academic Credentials & Professional Honors

Ph.D., Engineering, Brown University, 1986

Sc.M., Applied Mathematics, Brown University, 1986

Sc.M., Engineering, Brown University, 1984

B.S., Mechanical Engineering, Lehigh University, 1981

Fellow, American Society of Mechanical Engineers, 2019

SRI International Postdoctoral Fellowship

University Fellowship, Brown University

Ingersoll Rand Award

Alfred Stenning Award

Pi Tau Sigma

Tau Beta Pi

## Licenses and Certifications

Professional Engineer Mechanical, California, #31530

Professional Engineer, Michigan, #6201069727

Professional Engineer Mechanical, Nevada, #24867

Professional Engineer Mechanical, Texas, #113452

Professional Engineer Mechanical, Washington, #52816

## Prior Experience

Research Engineer, SRI International Poulter Laboratory, 1987-1999

Postdoctoral Fellow, SRI International Poulter Laboratory, 1986-1987

## Professional Affiliations

### Community Service

Mentor to the FIRST Robotics teams at Woodside High School, Woodside, CA.

### Affiliations

American Society of Mechanical Engineers (ASME - Fellow)

ASME B5 Technical Committee 52 - Machine Tool Performance

ASME B5 Technical Committee 64 – Linear Positioning

ASM International — American Society for Metals

American Water Works Association

Society of Manufacturing Engineers

Peer reviewer for ASM International Journal of Materials Engineering and Performance

Peer reviewer for Proceedings of the iMechE Part E: Journal of Process Mechanical Engineering

Peer reviewer for ASME 2010 International Design Engineering Technical Conferences (IDETC) and Computers and Information in Engineering Conference(CIE)

Peer reviewer for ASME 2013 International Design Engineering Technical Conferences (IDETC) and Computers and Information in Engineering Conference (CIE)

Peer reviewer for ASME 2015 International Design Engineering Technical Conferences (IDETC) and Computers and Information in Engineering Conference (CIE)

Peer reviewer for ASME 2015 International Mechanical Engineering Congress and Exhibition (IMECE)

Peer reviewer for American Gear Manufacturers Association (AGMA) 2024 Fall Technical Meeting

## Publications

Spak KS, Klopp RW. Traces of bentonite prevent bonding of electrofusion pipeline joints. Pipeline & Gas Journal, pp. 50-52, December 2017.

Klopp RW. Failure analysis of redundant escalator chain pin retention mechanisms. Proceedings of the ASME 2011 International Mechanical Engineering Congress & Exposition (IMECE2011), Denver, CO, ASME, November 11-17, 2011.

Klopp RW, Dugnani R, Edmonds JS. The role of brush spring kinking in a generator flash-over incident. Proceedings, 43rd North American Power Symposium (NAPS2011), Boston, MA, IEEE, August 4-6, 2011.

Tokheim RE, Cooper T, Lew B, Klopp RW, Groethe MA, Peterson RR, Williamson D, Blanchard JP. Computational modeling of Z plasma-radiation-source debris. Journal of Radiation Research Engineering 2004; 20(1).

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Simons JW, Kirkpatrick SW, Klopp RW, Seaman L. Methods for modeling damage in finite element calculations. IA'99 - Proceedings, International Seminar on Numerical Analysis in Solid and Fluid Dynamics in 1999, pp. 79-86, Osaka University, Japan, November 15-16, 1999.

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Klopp RW, Crocker JE. Dynamic fracture behavior of SCS 6/Ti-15-3 metal-matrix composite. *International Journal of Fracture* 1993; 61(R77-R83).

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Klopp RW, Clifton RJ, Shawki T. Pressure-shear impact and the dynamic viscoplastic response of metals. *Mechanics of Materials* 1985; 4(3&4):375-385.

### **Reports (Exclusive of FaAA Work Product)**

Klopp RW, Kirkpatrick SW, Shockey DA. Damage assessment of tank cars involved in accidents: Phase II—modeling and validation. Final Report DOT/FRA/ORD-02/04, Federal Railroad Administration, Office of Research and Development, 2002.

Klopp RW, Shockey DA, Curran DR, Cooper T. A granular flow model for developing smart armor ceramics. Final Report to Army Research Office on Contract DAAH04-94-K-0001, January 1998.

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### **Book Chapters**

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### **Presentations and Published Abstracts**

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Klopp RW, Davis BR. The advantages of pressure-testing electrofusion saddle tees prior to tapping the main. American Gas Association Operations Conference & Biennial Exhibition, Orlando, FL. May 2-5, 2017.

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## **Invited Lectures**

Klopp, RW. Techniques of failure analysis. In: Failure Analysis: The Science of What Went Wrong, ASME Professional Development Seminar/Webinar, Santa Clara, CA, March 23, 2013.

Guest lecturer, Engineering 448 - Electrical Power Systems, San Francisco State University, December 7, 2013.

Klopp, RW. Techniques of failure analysis. In: Failure Analysis: The Science of What Went Wrong, ASME Professional Development Seminar/Webinar, Santa Clara, CA, April 5, 2014.

## **Project Experience**

### **Intellectual Property**

Analyzed semiconductor wafer chemical mechanical polishing patents. Developed opinions relating to enablement and written description.

Characterized thermal strains in ball-grid-array semiconductor packages using Moiré interferometry for an International Trade Commission matter. Prepared interferograms that demonstrated infringement.

Characterized the adhesion between coatings and medicines for an IP dispute involving gel-coated pills.

Analyzed laser surgery fiber optic connector patents for infringement and invalidity. Testified in deposition.

Analyzed claim construction in gemstone laser micro-inscribing equipment patents and then analyzed the patents for infringement and invalidity. Testified in deposition, at a Markman hearing, and at trial.

Demonstrated that a patent on granular pesticide morphology claimed a natural phenomenon.

Analyzed design patent claims to folding pocketknives for functional features. Court adopted sections of expert report in summary judgment ruling of noninfringement.

Performed analysis supporting a successful Daubert motion to exclude reports and testimony relating to testing of handheld power tools for patent infringement. Demonstrated that plaintiff's testing was improper and conclusions based on them lacked sufficient basis.

Analyzed claims for a web-cam support asserted by a Patent Assertion Entity for anticipation and obviousness in light of prior art.

Analyzed linkage motion in fruit-pitting machinery in light of prior art linkages extending back to the time of James Watt and his steam engine.

Analyzed allegations that dimensions and manufacturing methods for sleeve bolts used in aerospace applications were trade secrets. Showed that dimensions easily could be reverse engineered from samples and public standards. Showed that manufacturing methods were commonly known in industry, easily reverse-engineered, and optional methods were known.

Deconstructed a WiFi-connected countertop smart oven and compared the physical parts with CAD files to determine the use of others' proprietary designs deep within the oven.

Demonstrated the detailed, microscopic structure of a high-speed data connector assembly during a trial, using live, unscripted 3D CAD fly-throughs and cross-sectioning.

Analyzed coal pulverizer designs to determine the extent of similarities between competitors' designs and the likelihood that similarities were due to happenstance versus copying.

### **Machine Tools**

Demonstrated the impact strength of CNC lathe guard windows by launching simulated workpieces at them using Exponent's automotive crash rail.

Surveyed a large lathe and identified numerous design and manufacturing defects.

Examined and tested a high-speed milling machine to diagnose and resolve an intermittent control fault.

Analyzed shop-wide machine tool lubrication system failures in light of the design and construction of such systems and oil contamination.

Analyzed the root cause of vacuum workholding failure and high-speed ejection of a workpiece from a CNC milling machine enclosure.

Assessed a manufacturer's and operator's care and use of a large engine lathe in view of industry standards of care and use. Assessed the design of the lathe's safety features in view of features on peer machines.

### **Cranes, Elevators, Escalators, and Mining Equipment**

Performed a critical safety assessment of the controls for the cableways used to construct the Mike O'Callaghan – Pat Tillman Memorial Bridge (Hoover Dam Bypass), recommended modifications, and performed extensive testing.

Identified a critical design issue with the tower luffing bearings on the Hoover Dam Bypass cableways, and proposed a solution that avoided dismantling the cranes for repairs.

Determined the root cause of escalator chain failures involving lateral movement of connector pins that ostensibly were press-fit and secured with clips.

Assisted in machinery damage assessment after a fire at a facility for processing iron ore into pig iron via direct reduction.

Analyzed the root causes of failures of machinery plant-wide at an iron ore concentrator facility based on computer plant historian records and physical evidence, in light of claims of overall plant under-performance.

Analyzed damage to and repair of the world's largest tunnel boring machine being used to mine a tunnel to replace the Alaskan Way Viaduct in Seattle.

### **Food Machinery**

Analyzed bearing failure in an ice cream freezer that resulted in a recall to address plastic material in the product.

Analyzed the rebuilding and subsequent failure of positive-displacement butter pumps that resulted in a recall to address plastic material in the product.

Analyzed contributions of mechanical component defects to fires in cracker baking and drink powder packaging lines.

Analyzed failures of wine fermenter heat exchangers leading to product contamination with coolant, and failures of wine fermenter tank hardware resulting in product spills.

### **Medical Devices and Equipment**

Developed special machines to test the durability of neonatal warmer support arms and portable ventricular assist device pneumatic hoses.

Developed a time-lapsed cinematography technique to characterize micron-level motion of an insulin pump plunger at low dosage rates.

Analyzed the effect on dosage accuracy of insulin pump systems subjected to altitude changes.

Analyzed the collapse failure of an endoscope support arm during brain surgery, and collapse failure of a medical bed during eye surgery.

### **Water Supply, Wastewater, Natural Gas Piping and Plumbing**

Determined that hydraulic jump due to improperly configured waste piping in a 42-story hotel/condominium building was the root cause of sewer backups.

Performed successful field testing of a large sewer line bladder plug in a remote location, coordinating with contractors sight-unseen.

Investigated numerous instances of cracking failure of enameled steel bathtubs used in hotels.

Tested the effect of out-of-tolerance polyethylene gas pipe on the integrity of a wide range of coupling methods.

Determined that water hammer associated with rapid closing of a fire hydrant was the root cause of underground pipe joint failures.

Led a multi-year, multi-million-dollar study on the design, manufacture, and maintenance of fire hydrants and the effect of different food-grade greases on corrosion of the valve operating mechanism.

Investigated multi-million-dollar hospital flood. Determined root cause was failure of ductile iron pipe bell and spigot joints due to lack of axial restraint. Identified actions by the designers, plumbers, and inspectors that, in combination, created conditions leading to the failure.

Investigated the root cause of erosion-corrosion failures of copper piping in a condominium complex with a hybrid domestic/hydronic hot water circulating system. Developed a flow model to demonstrate that the system could function correctly when properly balanced.

Successfully performed laboratory testing to replicate the slow crack growth field failure of a high-density polyethylene (HDPE) water main fitting at a fusion weld.

Investigated the root cause of electrofusion saddle fitting field failures and replicated failures in the laboratory.

Performed testing of gas distribution valves according to consensus standards, in order to qualify the valves for a public utility application.

## **Automotive Technology and Engines**

Analyzed the depreciation of peer brands and models of cars in light of recall publicity.

Developed an analytical model for the behavior of truck power steering systems under impact conditions.

Determined the root cause of cylinder liner cracking in Fairbanks-Morse opposed-piston Diesel and gas engines.

Determined the root cause of the catastrophic failure of a Caterpillar marine engine.

Determined that repeated crankshaft fatigue failures in automobile engines used in an industrial application were due to vibrations peculiar to four-cylinder engines.

Determined the root cause of the catastrophic failure of a state-of-the-art piston engine powered by anaerobic digester gas at a wastewater treatment facility.

## **Consumer Products**

Tested window shade cord strangulation safety release devices as part of a Consumer Product Safety Commission (CPSC) inquiry.

Authored proposed Window Covering Manufacturers Association test standards for roll-up window coverings (shades). Standards are being revised to incorporate tests for cord release devices intended to reduce risk of child strangulation.

Analyzed existing and improved designs for pocketknife safety latch mechanisms as part of a CPSC inquiry.

Analyzed the design and manufacturing of tract home air conditioner coils in light of allegations of premature failure due to corrosion.

Tested automotive service jacks and jack stands according to industry consensus standards and representative misuse. Subjected jack stands to gross overload until failure, showing that a hypothesized failure event was inconsistent with facts.

## **Electricity Generation and Energy Transport**

Determined the cause of malfunction of a generator brush spring mechanism that led to a flashover event and outage.

Analyzed the catastrophic over-speed failure of a steam turbine generator due to the combination of trip valve oxidation and governor valve wear.

Identified the root cause of gas turbine compressor blade damage in sister turbines based on physical evidence inspection, finite element analysis, and review of operating records.

Analyzed weld cracking due to vibration-induced fatigue that led to a flashover event in a steam turbine generator. Subsequently assessed the efficacy of tuning masses added to the generator housing to reduce vibration amplitudes.

Performed ISO 281 bearing capacity and life analysis for wind turbine main rotor bearings, considering bearing clearances and preloads.

Determined the failure of a steam turbine babbitt bearing was due to insufficient cooling and turning gear rotation following emergency shutdown.

Consulted on the analysis and repair of a steam turbine generator that was significantly damaged by an over-speed event and subsequent thermal shock.

Analyzed the root cause of lubrication system failure and ensuing damage in an 8,000-horsepower gas transmission turbo-compressor. Evaluated near-miss of a catastrophic gas explosion due to overheated rotating components in the presence of leaked gas. Provided recommendations for a simple hardware upgrade that would have mitigated the lubrication failure risk.

**APPENDIX B: LIST OF MATERIALS CONSIDERED**

| <b>Exhibit</b> | <b>Description</b>                                                                                                                                                                                                                                                                             |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| N/A            | IPR2024-00700, Petition for <i>Inter Partes</i> Review, March 25, 2024                                                                                                                                                                                                                         |
| 1001           | U.S. Patent No. 10,393,363                                                                                                                                                                                                                                                                     |
| 1002           | File History of U.S. Patent No. 10,393,363                                                                                                                                                                                                                                                     |
| 1003           | Declaration of J. Chris Cook                                                                                                                                                                                                                                                                   |
| 1004           | U.S. Pub 2015/0354186 (Tseng)                                                                                                                                                                                                                                                                  |
| 1005           | WO 2009/000109 (Tse)                                                                                                                                                                                                                                                                           |
| 1006           | U.S. Pub. 2010/0046199 (Carter)                                                                                                                                                                                                                                                                |
| 1007           | JP 2003027537A (Mizuno)                                                                                                                                                                                                                                                                        |
| 1008           | Translation of JP 2003027537A to Mizuno et al. and associated translator's declaration                                                                                                                                                                                                         |
| 1009           | U.S. Pub. 2015/0221206 (Schneider)                                                                                                                                                                                                                                                             |
| 1010           | U.S. Pub. 2005/0264529 (Morgan)                                                                                                                                                                                                                                                                |
| 1011           | U.S. Pub. 2015/0208897 (Kangas)                                                                                                                                                                                                                                                                |
| 1012           | U.S. Design Patent D540,424 S                                                                                                                                                                                                                                                                  |
| 1013           | U.S. Patent No. 9,199,252 (Schorn)                                                                                                                                                                                                                                                             |
| 1014           | U.S. Pub. 2013/0299608 (Spangler)                                                                                                                                                                                                                                                              |
| N/A            | IPR2024-00700, Patent Owner's Preliminary Response, July 11, 2024                                                                                                                                                                                                                              |
| N/A            | IPR2024-00700, Paper 9 (Institution Decision), October 4, 2024                                                                                                                                                                                                                                 |
| 2001           | <i>Delvie's Plastics</i> , "What's The Difference Between Transparent & Translucent?" available at <a href="https://www.delviesplastics.com/blog/transparent-vs-translucent.html">https://www.delviesplastics.com/blog/transparent-vs-translucent.html</a> . (last accessed July 6, 2024)      |
| 2002           | <i>United States Plastic Corp.</i> , "Definitions of opaque, translucent, and transparent." available at <a href="https://www.usplastic.com/knowledgebase/article.aspx?contentkey=824">https://www.usplastic.com/knowledgebase/article.aspx?contentkey=824</a> . (last accessed July 11, 2024) |
| 2005           | Deposition Transcript for Mr. J. Chris Cook                                                                                                                                                                                                                                                    |

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|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2007 | Merriam-Webster's Collegiate Dictionary, 11th Ed. (2003), pp. 1258-1259                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 2009 | U.S. Patent No. 7,467,874                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 2010 | University Physics, Part II, Addison-Wesley Publishing, 5th ed. (1977)                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 2012 | Delta, Allentown Single Handle Pull-Down Kitchen Faucet, available at <a href="https://www.deltafaucet.com/kitchen/product/19935L-SPSD-DST.html">https://www.deltafaucet.com/kitchen/product/19935L-SPSD-DST.html</a> (last accessed Jan. 17, 2025)                                                                                                                                                                                                                                                 |
| 2013 | Delta, H <sub>2</sub> Okinetic Pendant Raincan Shower Head, available at <a href="https://www.deltafaucet.com/bathroom/product/57140-BL25-L.html">https://www.deltafaucet.com/bathroom/product/57140-BL25-L.html</a> (last accessed Jan. 17, 2025)                                                                                                                                                                                                                                                  |
| 2015 | Home Depot, Allentown Single Handle Pull-Down Kitchen Faucet, available at <a href="https://www.homedepot.com/p/Delta-Allentown-Single-Handle-Pull-Down-Sprayer-Kitchen-Faucet-with-TempSense-Indicator-and-Soap-in-SpotShield-Stainless-19935L-SPSD-DST/303230771#overlay">https://www.homedepot.com/p/Delta-Allentown-Single-Handle-Pull-Down-Sprayer-Kitchen-Faucet-with-TempSense-Indicator-and-Soap-in-SpotShield-Stainless-19935L-SPSD-DST/303230771#overlay</a> (last accessed Jan 17. 2025) |
| 2017 | Merriam-Webster's Collegiate Dictionary, 11th Ed. (2003), p. 720                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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