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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FRESH PRODUCTS, LLC

Petitioner

v.

SANASTAR, INC., d/b/a WIZKID PRODUCTS

Patent Owner

IPR2025-01366

Patent 10,294,649

**DECLARATION OF RANDY C. HURD Ph.D.
IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,294,649**

TABLE OF CONTENTS

	Page No.
I. BACKGROUND	3
A. Professional Background.....	3
B. Relevant Legal Standards.....	4
1. Claim Construction	5
C. Claim Construction	5
1. “elongated”.....	5
2. “longitudinal”.....	5
3. “rectangular-like” and “circular-like”.....	6
4. Other Claim Constructions	6
5. Obviousness	6
D. Person Having Ordinary Skill in the Art.....	8
II. THE ’649 PATENT.....	10
A. Specification and Figures.....	10
B. Claims.....	14
III. PRIOR ART URINAL ANTI-SPLASH DEVICES	16
A. Fushimi.....	17
B. Brown ’098.....	19
C. Brown ’394.....	21
D. Valadez.....	23

TABLE OF CONTENTS
(cont'd)

	Page No.
E. Wise.....	26
IV. GROUND 1: CLAIMS 1, 2, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, AND 20 WOULD HAVE BEEN OBVIOUS OVER FUSHIMI, BROWN '394, AND BROWN '098 IN LIGHT OF THE KNOWLEDGE OF A PERSON OF ORDINARY SKILL IN THE ART	29
A. Claim 1 would have been obvious over Fushimi and Brown '398 in light of the knowledge of a person of ordinary skill.....	30
1. Preamble: “A urinal anti-splash device”	30
2. 1[A]: “an anti-splash body configured to be mounted vertically on a back wall of a urinal and having a plurality of protrusions that extend from a front surface of the anti-splash body”	31
3. 1[B]: “a base attached to the anti-splash body at a coupling region formed between the base and the anti-splash body, the base being configured to cover at least a portion of a urinal drain and having a plurality of protrusions extending away from the base on a surface of the base that is contiguous with the front surface of the anti-splash body”	35
4. 1[C]: “the coupling region is configured [to] allow the base to move between a first position including the base oriented in a direction parallel to the anti-splash body and a second position including the base oriented in a direction substantially perpendicular from the base”	39

TABLE OF CONTENTS
(cont'd)

	Page No.
B. Claim 2 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	46
C. Claim 5 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	51
D. Claim 6 would have been obvious over Fushimi and Brown '394 in light of the knowledge of a person of ordinary skill.....	55
E. Claim 8 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	61
1. Preamble: “A urinal anti-splash device comprising”	61
2. 8[A]: “an anti-splash body configured to be mounted on a back wall of a urinal, the anti-splash body including a plurality of protrusions extending from a front surface of the anti-splash body, wherein at least some of the protrusions have a base at the front surface of the anti-splash body that is wider than a top of the protrusion at the opposite end of the protrusion”	61

TABLE OF CONTENTS
(cont'd)

	Page No.
3. 8[B]: “a base that is attached to the anti-splash body and which is configured to extend in a direction substantially perpendicular from the anti-splash body to at least partially cover a drain of a urinal, and which further includes a plurality of protrusions extending outwardly from the base which are arranged to extend in a direction substantially perpendicular to plurality of protrusions of the anti-splash body”	62
F. Claim 9 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	63
G. Claim 10 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	63
H. Claim 11 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	65
I. Claim 13 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	65
J. Claim 14 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	70
K. Claim 15 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	71

TABLE OF CONTENTS

(cont'd)

	Page No.
L. Claim 16 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	75
M. Claim 17 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	76
N. Claim 18 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	78
1. Preamble: "A method of mounting a urinal anti-splash device within a urinal"	78
2. 18[A]: "providing a urinal anti-splash device"	79
3. 18[A][1]: "an anti-splash body configured to be mounted on a back wall of a urinal, the anti-splash body including a plurality of protrusions extending from a front surface of the anti-splash body, wherein at least some of the protrusions have a base at the front surface of the anti-splash body that is wider than a top of the protrusion at the opposite end of the protrusion;"	79
4. 18[A][2]: "a base that is attached to the anti-splash body and which is configured to extend in a direction substantially perpendicular from the first portion to cover a drain of a urinal, and which further includes a plurality of protrusions extending outwardly from the base, the second plurality of protrusions are arranged to extend in a direction substantially perpendicular from plurality of protrusions of the anti-splash body;"	80

TABLE OF CONTENTS
(cont'd)

	Page No.
5. 18[B]: “mounting the anti-splash body on the back wall of a urinal”	81
6. 18[C]: “placing the base over a urinal drain”	81
O. Claim 20 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.	83
V. GROUND 2: CLAIMS 6, 10, 15, AND 17 WOULD HAVE BEEN OBVIOUS OVER FUSHIMI, BROWN '394, BROWN '098, AND EITHER ONE OF VALADEZ AND WISE IN LIGHT OF THE KNOWLEDGE OF A PERSON OF ORDINARY SKILL IN THE ART.....	84
A. Claim 6 would have been obvious over the art of Ground 1 in combination with Valadez and/or Wise in light of the knowledge of a person of ordinary skill.....	85
1. It would have been obvious to a person of ordinary skill to combine Valadez with the art of Ground 1	85
2. It would have been obvious to a person of ordinary skill to combine Wise with the art of Ground 1.....	89
B. Claim 10 would have been obvious over the art of Ground 1 in combination with Valadez and/or Wise in light of the knowledge of a person of ordinary skill.....	92
C. Claim 15 would have been obvious over the art of Ground 1 in combination with Valadez in light of the knowledge of a person of ordinary skill	94

TABLE OF CONTENTS
(*cont'd*)

	Page No.
D. Claim 17 would have been obvious over the art of Ground 1 in combination with Wise in light of the knowledge of a person of ordinary skill	96
VI. CONCLUSION.....	99

1. I, Randy Hurd, PhD, am making this declaration at the request of Fresh Products, LLC (“Petitioner”) in support of its Petition for *Inter Partes* Review (“IPR”) of U.S. Patent No. 10,294,649 (“the ’649 patent”). I understand that this declaration will be submitted as Exhibit 1003 to the IPR petition.

2. I am being compensated at my customary hourly rate for my work in this matter, and I am being reimbursed at cost for my reasonable expenses. My compensation does not depend in any way on the outcome of this proceeding. I have no financial interest in any of the parties to this proceeding.

3. In conducting the analysis and forming the opinions set forth in this Declaration, I considered, in addition to my knowledge and expertise in the relevant field, the following materials, which I understand will be submitted as Exhibits to the IPR petition:

Exhibit No.	Description
1001	U.S. Patent No. 10,294,649 (“the ’649 patent”)
1002	Sanastar District Court Complaint dated March 3, 2025, in <i>Sanastar, Inc. d/b/a/ WizKidProducts v. Fresh Products, LLC</i> , No. 3:25-cv-00418 (N.D. Ohio)
1003	*Intentionally Omitted*
1004	Certified English Translation of Japanese Publication No. JPS 60-190865 to Fushimi (“Fushimi”)

Fresh Products v. Sanastar
 IPR Petition – U.S. Patent 10,036,649

Exhibit No.	Description
1005	United States Patent No. 10,145,098 to Brown, et al. (“Brown ’098”)
1006	United States Patent No. 9,243,394 to Brown, et al. (“Brown ’394”)
1007	United States Patent Application Publication No. 2005/0144711 to Valadez, et al. (“Valadez”)
1008	United States Patent Application Publication No. 2007/0044221 to Wise (“Wise”)
1009	United States Patent Application Publication No. 2014/0075663 to Irwin, et al. (“Irwin”)
1010	United States Patent Application Publication No. 2009/0070923 to Ruedas (“Ruedas”)
1011	United States Patent No. 6,055,681 to Lyons (“Lyons”)
1012	United States Patent No. 5,809,590 to Williams, et al. (“Williams”)
1013	United States Patent No. 7,398,565 to Chou (“Chou”)
1014	*Intentionally Omitted*
1015	United States Patent No. 639,628 to Thomsen (“Thomsen”)
1016	United States Patent No. 3,559,353 to Partridge (“Partridge”)
1017	United States Patent No. 7,886,958 to Smith (“Smith”)
1018	United States Patent No. 3,599,677 to O’Brien (“O’Brien”)
1019	United States Patent No. 4,615,926 to Hsu (“Hsu”)
1020	United States Patent No. 5,665,439 to Andersen (“Andersen”)

Exhibit No.	Description
1021	Kota, Sridhar, and G. K. Ananthasuresh. "Designing compliant mechanisms." Mechanical Engineering-CIME 117.11 (1995): 93-97. ("Kota")
1022	British Plastics Federation, <i>Ethylene Vinyl Acetate (EVA)</i> , https://www.bpf.co.uk/plastipedia/polymers/EVA.aspx (last accessed July 22, 2025)
1023	Translation Certificate for Japanese Publication No. JPS 60-190865 to Fushimi
1024	Japanese Publication No. JPS 60-190865 to Fushimi

I. BACKGROUND

A. Professional Background

4. In 2012 and 2015, I received my Bachelor of Science and Master of Science degrees in mechanical engineering from Brigham Young University. I subsequently received my Ph.D. in mechanical engineering from Utah State University, where my research focused on investigating the impact dynamics of highly deformable spheres with water free surfaces.

5. I am currently an assistant professor of mechanical engineering at Weber State University in Ogden, UT, where I teach courses including Introduction to Engineering, Statics, Fluid Mechanics, and Mechanical Measurement. My research involves studying water impact and splash mechanics in varying contexts.

For example, I am involved in international collaborations involving research for urinal splash prevention.

6. Appendix A to this declaration is a copy of my curriculum vitae, which further expands on my qualifications and expertise and includes a list of my publications and prior testimony.

B. Relevant Legal Standards

7. I have been asked to provide my opinion as to whether certain claims of the '649 patent were anticipated by the prior art and/or would have been obvious to a person of ordinary skill in the art at the time of the claimed invention—which I will refer to as a “person of skill in the art,” “one skilled in the art,” or “person of ordinary skill” throughout this declaration—in view of the prior art.

8. I am an engineer, a scientist, and an academic by training and profession. My opinions in this declaration come from applying my technical education, knowledge, training, and experience to evaluate certain prior art with respect to the '649 patent.

9. While I have experience acting as an expert in patent proceedings, I am not a lawyer or expert in patent law. Therefore, Fresh Products' attorneys from Knobbe, Martens, Olson & Bear, LLP advised me as to the legal principles to be

applied in this case. The following paragraphs express my understanding of how I must apply these principles in forming my opinions.

1. Claim Construction

10. I understand that, in assessing the patentability of a patent claim, the language of the claim generally should be given its plain and ordinary meaning as would be understood by a person having ordinary skill in the art at the time of the patented invention consistent with the patent specification and prosecution history.

11. I understand that a patentee may define terms in the specification. Certain terms in the '649 patent claims have been defined. The definitions are set forth below and I have used these definitions herein.

C. Claim Construction

1. “elongated”

12. The specification defines “elongated” as “having a length that is at least twice as long as a width.” Ex. 1001, 6:23-25.

2. “longitudinal”

13. The specification states that “‘longitudinal’ should be understood to mean in a direction corresponding to an elongated direction of the body of the urinal anti-splash device in a direction from a ground surface toward a ceiling.” Ex. 1001, 4:49-52.

3. “rectangular-like” and “circular-like”

14. The specification defines “rectangular-like” as “having at least one pair of opposing parallel sides of equal length,” Ex. 1001, 6:34-36. “Circular-like” is defined as “having at least two round edges.” *Id.*, 8:51-52.

4. Other Claim Constructions

15. Unless otherwise noted, I have given claim terms their plain and ordinary meaning.

5. Obviousness

16. I understand that a claim is “obvious” if the subject matter of the claim as a whole would have been obvious to one skilled in the art at the time of the claimed invention. I understand that a determination of obviousness takes into account the scope and content of the prior art, the differences between the claimed subject matter and the prior art, and the level of ordinary skill in the art at the time of the invention. I understand that an obviousness analysis also considers whether there are additional factors that would indicate that the invention would not have been obvious. Such factors include whether the invention satisfied a long-felt need in the industry; whether the invention produced any unexpected results; whether the invention was met with skepticism by those in the relevant field; whether the prior art taught away from the invention; whether the invention was a commercial success; and whether the invention was praised or copied by others.

17. I understand that, in determining the scope and content of the prior art, a reference is considered analogous (i.e., appropriate) prior art if: (1) it falls within the field of the inventor's endeavor; or (2) it is reasonably pertinent to the particular problem the inventor was involved with. I have been informed that a reference is reasonably pertinent if it logically would have commended itself to an inventor's attention in considering the problem—put another way, if one skilled in the art would reasonably have consulted those references and applied their teachings in seeking a solution to the problem that the inventor was attempting to solve. I understand that, if a reference relates to the same problem as the claimed invention, that supports use of the reference as prior art in an obviousness analysis. The prior art I have relied on herein satisfies this standard.

18. I understand that, to assess the differences between prior art and the claimed subject matter, the claimed invention is to be considered as a whole, such that one skilled in the art at the time of invention, confronted by the same problems as the inventor and with no knowledge of the claimed invention, would have selected the elements from the prior art and combined them in the claimed manner.

19. I understand that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter, including:

- combining prior art elements according to known methods to yield predictable results;
- simple substitution of one known element for another to obtain predictable results;
- a predictable use of prior art elements according to their established functions;
- applying a known technique to a known device (method or product) ready for improvement to yield predictable results;
- choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and
- some teaching, suggestion, or motivation in the prior art that would have led one skilled in the art to modify the prior art reference or to combine the prior art reference teachings to arrive at the claimed invention.

20. I understand that the obviousness analysis is performed from the perspective of one skilled in the art at the time of the patented invention. To avoid using impermissible hindsight in my analysis, I have not used the claims of the patent as a road map for obviousness.

D. Person Having Ordinary Skill in the Art

21. I understand that when interpreting the claims of the '649 patent and evaluating the prior art, I must do so based on the perspective of a person having ordinary skill in the art at the relevant priority date of the '649 patent. I have been asked to assume that the priority date for the patent is November 3, 2016.

22. I understand that the person of skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. I understand it is a person of ordinary creativity and is not an automaton.

23. I understand that, in determining the level of ordinary skill in the art, several factors are considered, including: the type of problems encountered in the art; prior art solutions to those problems; the rapidity with which innovations are made; the sophistication of the technology; and the educational level of active workers in the field. I understand that one skilled in the art must be capable of understanding the scientific and engineering principles applicable to the pertinent art.

24. The '649 patent describes the use of well-known technologies for designing anti-splash urinal inserts. Based on my review of the '649 patent, it is my opinion that a person of ordinary skill would have had an undergraduate degree in mechanical engineering or equivalent coursework, as well as one or more years of experience in designing, prototyping, and/or manufacturing urinal inserts or similar products.

25. More work experience may substitute for less education, and vice versa. For example, a person of ordinary skill would have had a formal education in some

field other than mechanical engineering, as well as 5 or more years of experience in designing, prototyping, and/or manufacturing urinal inserts or similar products.

26. It is my opinion that the above definition of a person of ordinary skill is not necessary to reach the same opinions I have in this declaration. I believe that under any reasonable definition for a person of ordinary skill, the claims would have been obvious from the perspective of a person of ordinary skill at the time of the alleged invention.

27. I have based my opinions on the qualifications of a person of ordinary skill on my review of the '649 Patent, the relevant prior art, and my experience. By 2016 I was familiar with design principles common in the mechanical arts. I had the requisite knowledge and experience to make and use the articles described in the '649 Patent. Based on my experience and knowledge, I believe that people of the above-defined level of education and skill would have the capability to interpret and understand the invention claimed in the '649 patent and the scientific and engineering principles applicable to the pertinent art.

II. THE '649 PATENT

A. Specification and Figures

28. The '649 Patent is titled, "Urinal anti-splash device," and discloses a urinal insert with a base and an anti-splash body. Ex. 1001, Abstract. The base is

the portion covering the drain. The anti-splash body is the vertical portion covering a part of the back of the wall of the urinal. An exemplary embodiment of the anti-splash device disclosed in the '649 patent is shown below, installed in a urinal.

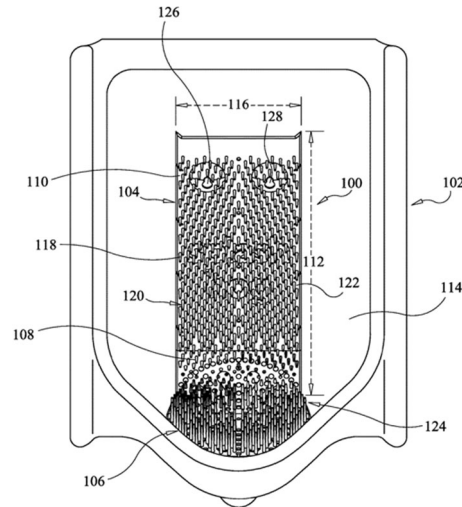
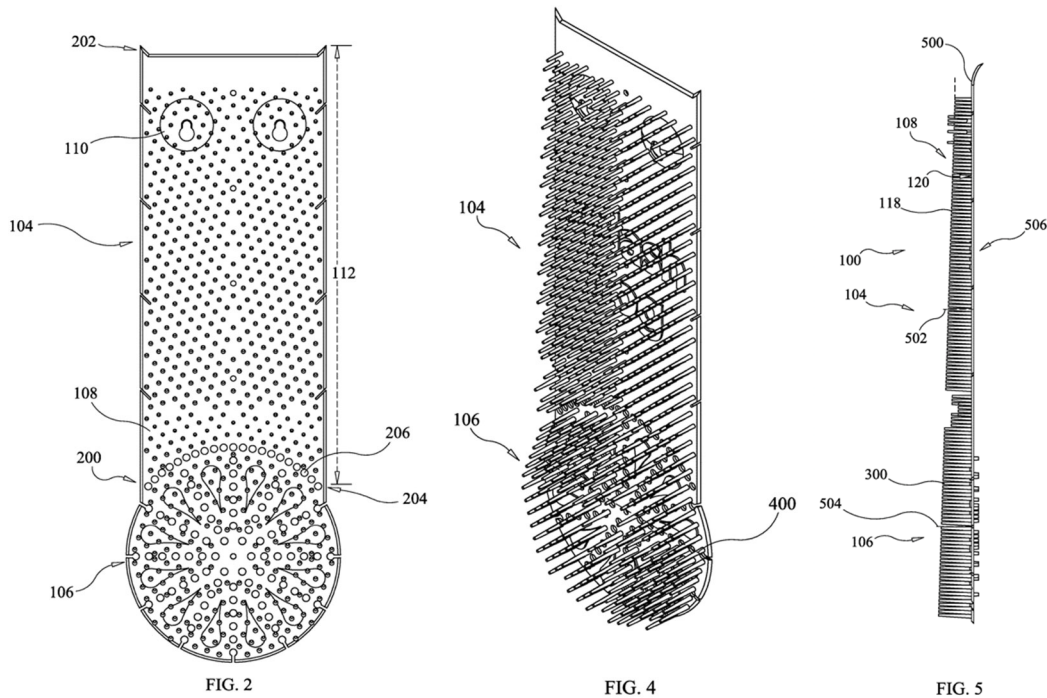


FIG. 1

Ex. 1001, Fig. 1.

29. Both the base and anti-splash body of the anti-splash device disclosed in the '649 Patent are covered with protrusions extending away from the device. *Id.*, 10:40-44. Per the specification, the protrusions break apart urine streams before they strike the base or anti-splash body. *Id.* 9:14-16. This prevents the urine from reflecting off of those surfaces toward the user, and instead the urine flows through the spaces between the protrusions, which the '649 patent calls “protrusion voids” to the urinal drain. *Id.*, 8:29-38. Several views of the device shown below illustrate the arrangement of the protrusions.



Id., Figs. 2, 4, 5.

30. The '649 patent discloses three “configurations” of the anti-splash device. The “straight” configuration, shown above, seems to be the default, or uninstalled configuration. In this configuration, the base and anti-splash body extend contiguously along a single plane. The two components are connected by “perforated coupling region 204.”

31. The second configuration, the “bent” configuration, can be used to install the device in a urinal. In this configuration, the device is bent at “perforated coupling region 204,” such that the base extends roughly perpendicularly away from the anti-splash body. This configuration is shown below.

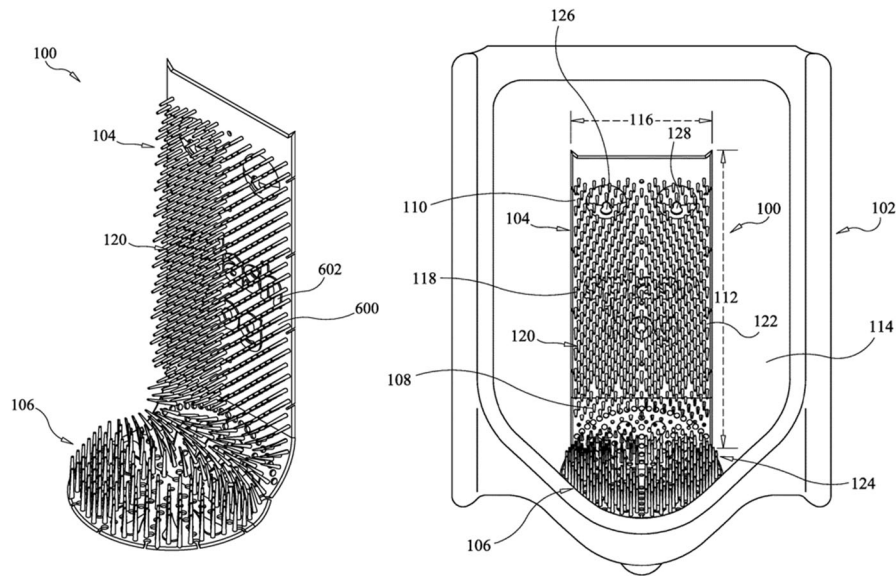


FIG. 6

FIG. 1

Id., Figs. 1, 6.

32. The final configuration, the “detached” configuration, is similar to the bent configuration, but instead of bending the device at “perforated coupling region 204,” the base is separated from the anti-splash body so the two parts can be installed separately. The ’649 patent does not show the detached configuration installed in a urinal, but Figure 3 shows the configuration without context.

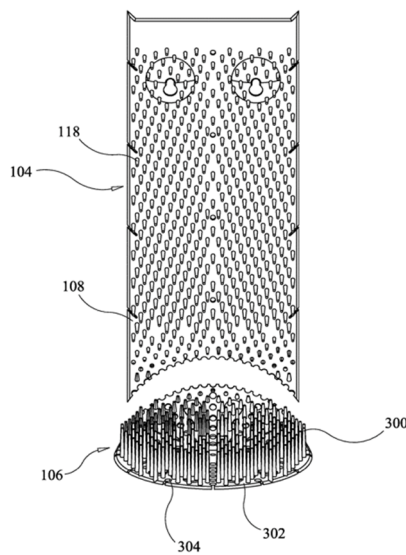


FIG. 3

Id. Fig. 3.

B. Claims

33. The '649 patent includes 20 claims. Claims 1, 8, and 18 are the only independent claims. I understand that a claim that depends from another claim includes all the limitations of the claim from which it depends and the additional limitations of that dependent claim.

34. Independent Claims 1, 8, and 18 of the '649 patent are set forth below (with bracketed labels added for reference):

Claim 1	
Preamble	A urinal anti-splash device, comprising:
1[A]	an anti-splash body configured to be mounted vertically on a back wall of a urinal and having a plurality of protrusions that extend from a front surface of the anti-splash body;

Claim 1	
1[B]	a base attached to the anti-splash body at a coupling region formed between the base and the anti-splash body, the base being configured to cover at least a portion of a urinal drain and having a plurality of protrusions extending away from the base on a surface of the base that is contiguous with the front surface of the anti-splash body;
1[C]	the coupling region is configured allow the base to move between a first position including the base oriented in a direction parallel to the anti-splash body and a second position including the base oriented in a direction substantially perpendicular from the base.

Claim 8	
Preamble	A urinal anti-splash device comprising:
8[A]	an anti-splash body configured to be mounted on a back wall of a urinal, the anti-splash body including a plurality of protrusions extending from a front surface of the anti-splash body, wherein at least some of the protrusions have a base at the front surface of the anti-splash body that is wider than a top of the protrusion at the opposite end of the protrusion; and
8[B]	a base that is attached to the anti-splash body and which is configured to extend in a direction substantially perpendicular from the anti-splash body to at least partially cover a drain of a urinal, and which further includes a plurality of protrusions extending outwardly from the base which are arranged to extend in a direction substantially perpendicular to plurality of protrusions of the anti-splash body.

Claim 18	
Preamble	A method of mounting a urinal anti-splash device within a urinal comprising:
18[A]	providing a urinal anti-splash device including:
18[A][1]	an anti-splash body configured to be mounted on a back wall of a urinal, the anti-splash body including a plurality of protrusions extending from a front surface of the anti-splash body, wherein at least some of the protrusions have a base at the front surface of the anti-splash body that is wider than a top of the protrusion at the opposite end of the protrusion;
18[A][2]	a base that is attached to the anti-splash body and which is configured to extend in a direction substantially perpendicular from the first portion to cover a drain of a urinal, and which further includes a plurality of protrusions extending outwardly from the base, the second plurality of protrusions are arranged to extend in a direction substantially perpendicular from plurality of protrusions of the anti-splash body;
18[B]	mounting the anti-splash body within a back wall of a urinal; and
18[C]	placing the base over a urinal screen.

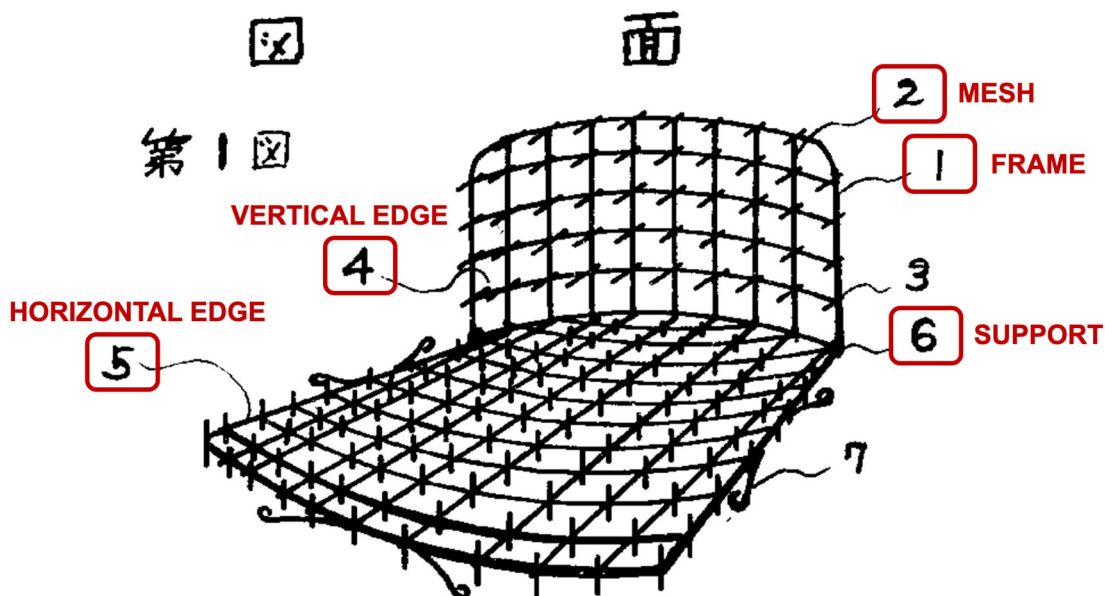
III. PRIOR ART URINAL ANTI-SPLASH DEVICES

35. Anti-splash devices for insertion in urinals have long been known. Urinal inserts that include a base that at least partially covers the urinal drain, and a vertical portion that extends along the rear wall of a urinal have also been known since well before the '649 Patent's priority date. I briefly summarize certain references below, each of which would have been known to a person of skill in the

art and would have informed that person's knowledge of the structure, components, and materials that could be used in the design of urinal anti-splash devices. I note, however, that these references are merely exemplary, and are not exhaustive of the prior art that would have been known to and relied upon by a person of ordinary skill in the art in the design of urinal anti-splash devices.

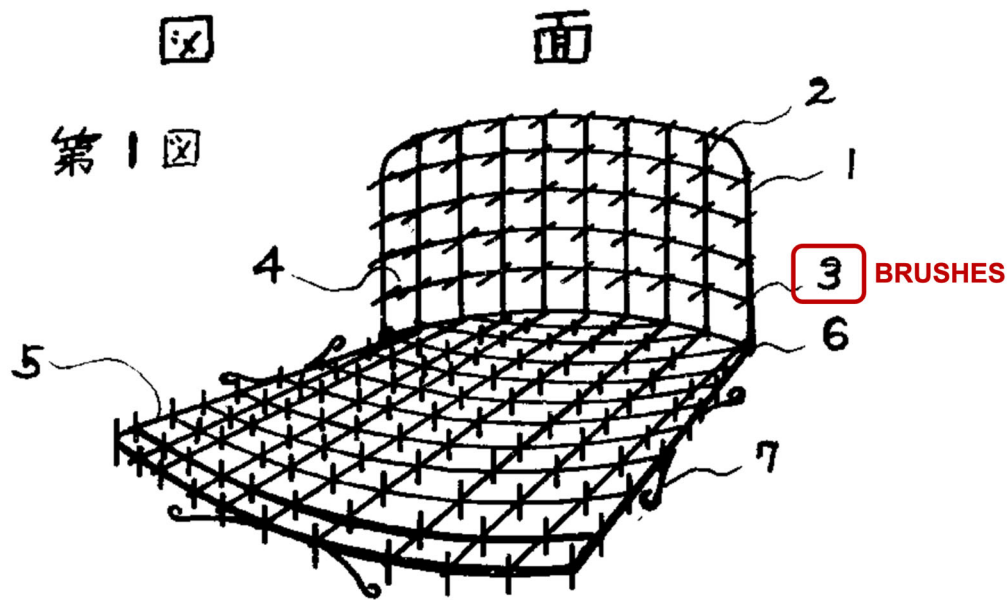
A. Fushimi

36. Fushimi (Ex. 1004) discloses a urinal anti-splash device comprising a frame 1 to which a mesh 2 is attached to provide a body having a base (bottom side 5) and an anti-splash body (vertical side 4). Fushimi's base and anti-splash body are joined at support 6. Ex. 1004, 1.



Id., Fig. 1 (annotated).

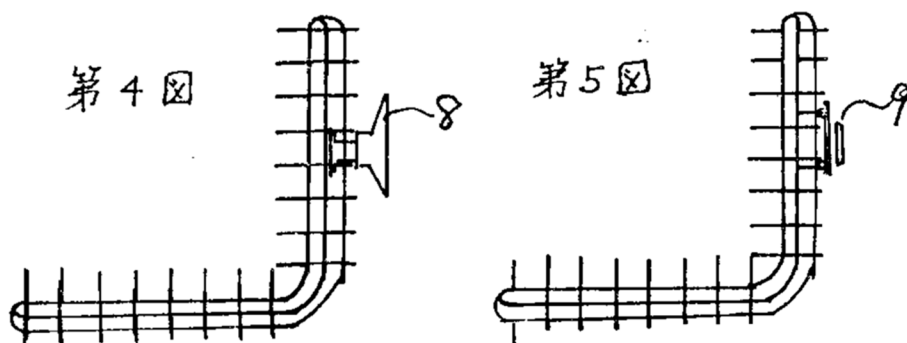
37. Fushimi's mesh 2 includes an array of protrusions referred to as brushes 3. *Id.*, 2. These protrusions extend perpendicularly from the front and rear surfaces of the anti-splash body (vertical side 4). Likewise, the base (bottom side 5) is covered with protrusions extending perpendicularly from its top and bottom surfaces. *Id.*



Id., Figs 1 (annotated).

38. Fushimi's urinal anti-splash device includes fasteners (fastening members 7) for installation in a urinal. *Id.*, 2. The fasteners include suction cup(s)

8 and/or magnet(s) 9¹ that attach to the rear wall of a urinal. Specifically, Fushimi discloses that “[t]he following are some possible implementations of this device: Attachment of a fastener (7) with a suction cup. Attachment of the fastener (7) with a magnet.” *Id.*, 3.

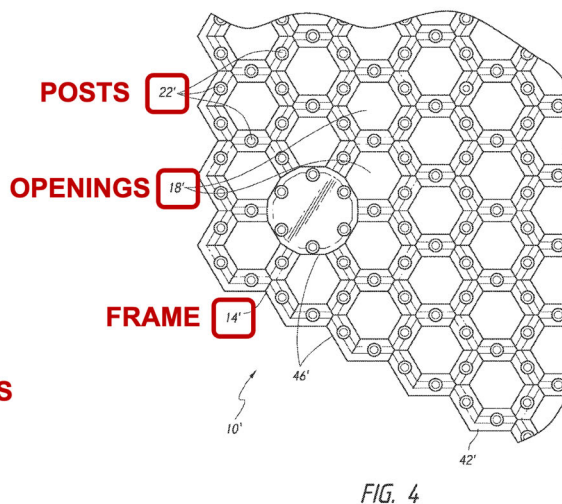
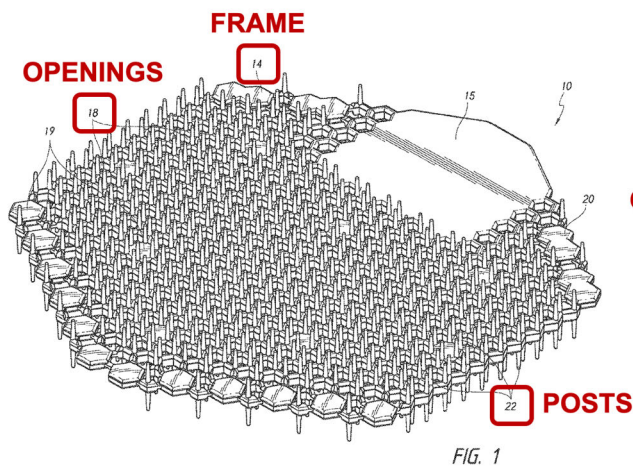


Id., Figs. 4, 5.

B. Brown '098

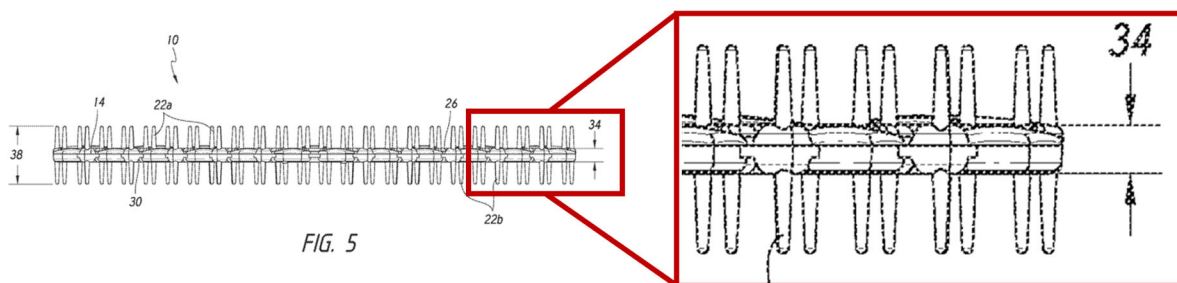
39. Brown '098 (Ex. 1005) issued from an application filed October 28, 2015 and discloses a urinal screen 10 having a frame 14 defining a plurality of openings 18. Ex. 1005, 3:66-4:8. A plurality of posts 22 extend from the top and bottom surface of the frame. *Id.* Figure 1 is a perspective view of the urinal screen and Figure 4 is a close up view of a portion of the top of the urinal screen.

¹ Fushimi's suction cup and magnet are numbered 8 and 9, respectively, in Figures 4 and 5. The specification refers to these components by name, not number.



Id., Figs. 1, 4 (annotated).

40. As shown in Figure 5, Brown '098's protrusions are tapered, i.e., they are more narrow at their tip than their base.



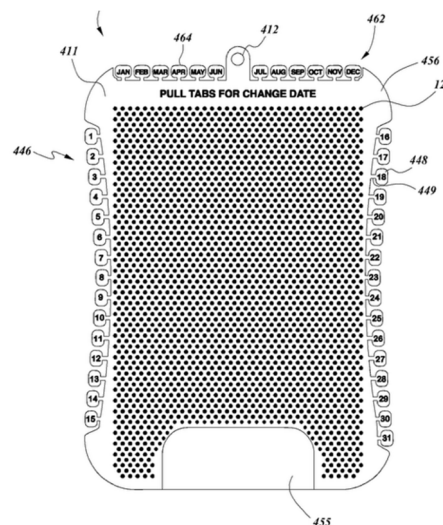
Id., Fig. 5 (annotated).

41. Brown '098 describes that the urinal screen can be molded using, for example, a plastic or EVA (ethylene-vinyl acetate). *Id.*, 4:16-34. EVA is a well-known polymer that is easily molded to make various lightweight flexible objects,

e.g., flexible tubing, product packaging film, and hinged food containers. *See* Exs. 1018, 1019, 1020.

C. Brown '394

42. Brown '394 (Ex. 1006) discloses a variety of urinal anti-splash devices. For example, Brown '394 discloses that “a urinal screen can be configured to be installed on the back wall of a urinal.” Ex. 1006, 11:14-15. For example, Figure 12, below, shows a generally rectangular urinal screen with “protrusions 456 configured to reduce splashing.” *Id.* 11:50-51. This embodiment is designed for placement on the back wall of a urinal. It includes an attachment structure 412 that can “releasably engage with a hook or other protrusion on the back wall 302 of a urinal 300.” *Id.* 11:45-47.

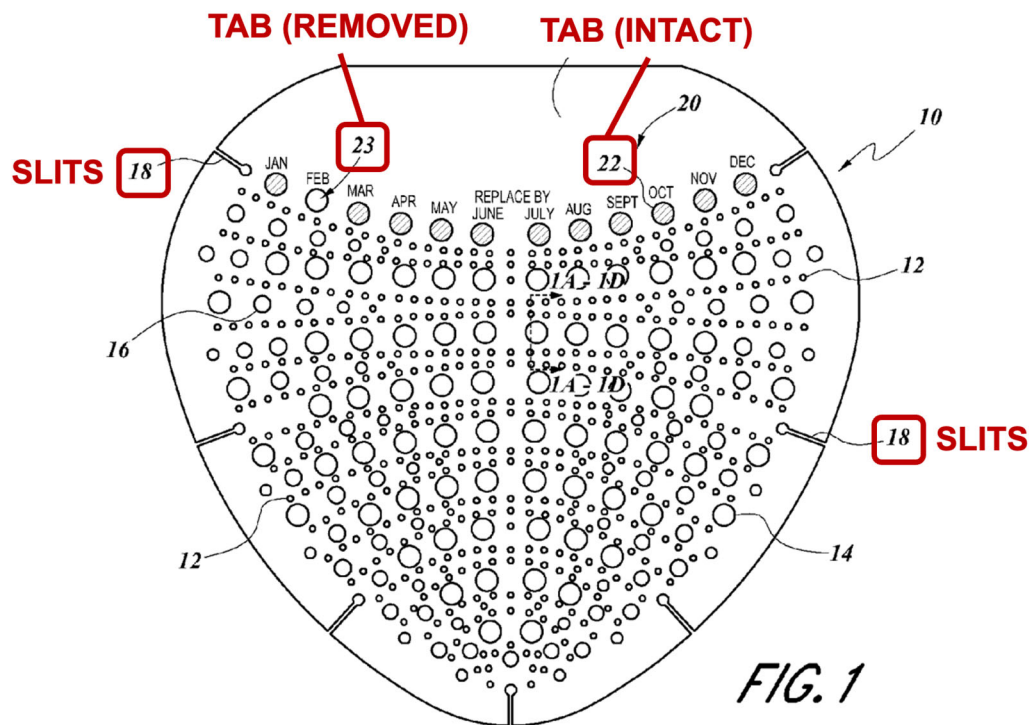


Id., Fig. 12.

43. Brown '394 also discloses the use of two screens in a urinal: “a plurality of urinal screens can be used in a urinal 300. For example, a urinal screen 110, 210, 460 can be placed on the back wall 302 of the urinal 300 and an additional urinal screen 110, 210, 460 can be placed adjacent to or covering a drain 304 of the urinal 300.” *Id.*, 12:1-5.

44. Brown '394 also describes the use of perforations to detach a portion of the urinal screen. In particular, date tabs may be perforated from the screen body such that the date tabs can be separated from the screen body. *Id.*, 5:50-54 (the tab “may be. . . pulled off, or cut off with a knife”); *see also id.*, 5:30-32 (“tab may be attached to the urinal assembly or perforated in a manner such that it may act as a flap”). The use of perforation to enable a user to separate parts of a device would have been well known to a person of ordinary skill.

45. Figure 1, below, shows an embodiment of a urinal screen with the perforated date tab feature. Tabs corresponding the months of the year, are arranged across the top portion of the device. Brown '394 explains that the removed tab may correspond to the month when the device was installed in a urinal, or the month when the device must be replaced. *Id.* 5:57-60.



Id., Fig 1 (annotated).

46. Brown '394 also discloses slit openings 18, which allow the screen to fold and conform to the shape of a urinal. *Id.*, 4:7-9; *see also* 3:60-64. One of ordinary skill would understand that the uppermost slits on the left and right of the embodiment above are intended to and do allow the top portion of the screen to fold up against the vertical back wall of a urinal.

D. Valadez

47. Valadez (Ex. 1007) discloses a urinal anti-splash device with an anti-splash body (anti-splash guard 120) and base (deodorant pouch 500). Ex. 1007, ¶0003. The base and anti-splash body are made of a porous mesh of fibrous strands

that absorb fluid and prevent urine from splashing off of the urinal surface. *Id.*, ¶0031. The body is a single layer of mesh, and the base has a deodorizer sandwiched between two mesh layers which are joined around their edges. *Id.*, ¶0033.

48. Valadez discloses two main configurations for its anti-splash body and base. In the first configuration, shown in Figure 1 below (left), the base and body are a single unit; the base rests on the bottom of the urinal while the anti-splash body extends upwardly along the urinal's rear wall. In the second configuration, shown in Figure 8 below (right), the base and body are separate. The base sits on the bottom of the urinal, while the body is mounted on the urinal's rear wall, extending vertically, substantially perpendicular to the base.

Figure 1

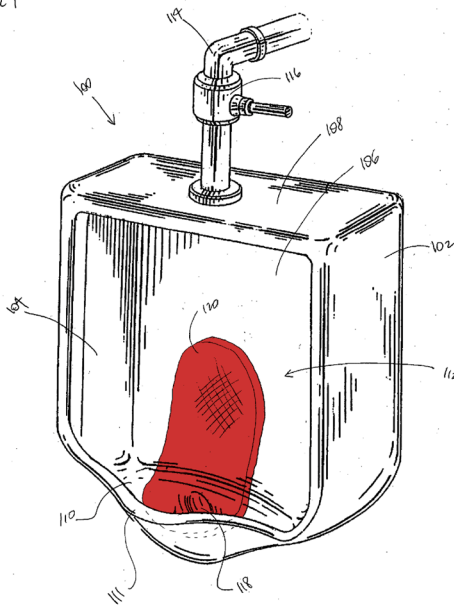
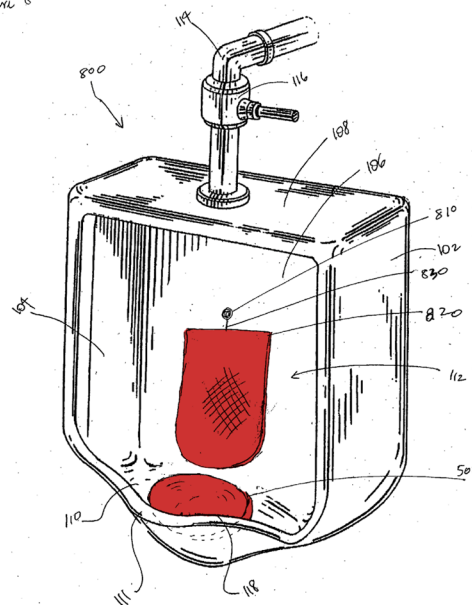
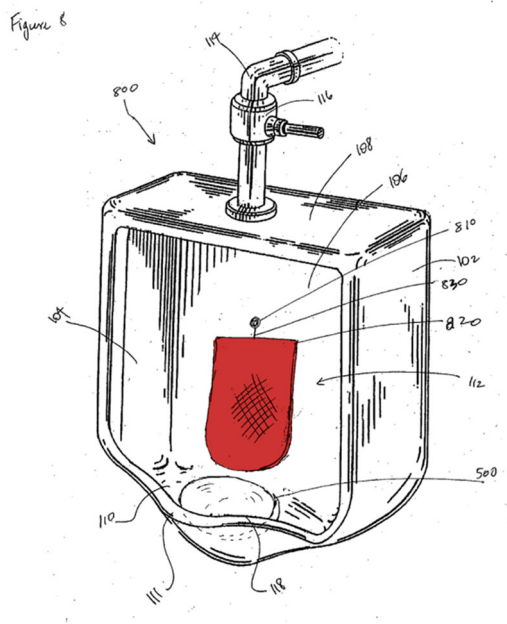


Figure 8



Id., Figs. 1, 8 (annotated).

49. Valadez discloses an anti-splash body (anti-splash guard 820) that hangs vertically along the rear wall of a urinal “by means of a suction cup 810 and a hook 830” *Id.*, ¶0038. As shown below, a length running from the bottom of Valadez’s anti-splash guard to its top extends in a direction from a ground surface toward a ceiling.



Id., Fig. 8 (annotated).

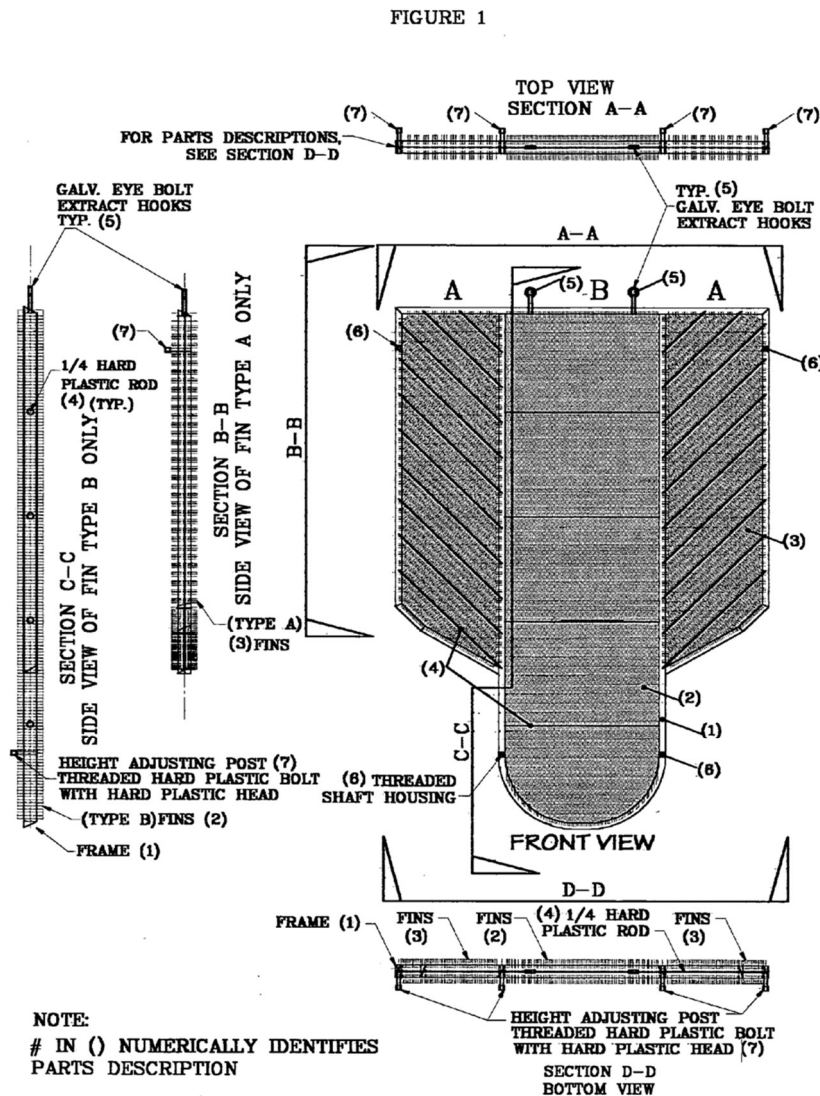
50. Valadez also discloses that its anti-splash body can be adapted to fit in a wide variety of urinals. *Id.*, ¶0032. To that end, Valadez discloses a range of possible sizes. “[A]nti-splash guard 120 comprises dimensional characteristics including length 122, width 124, and thickness 126. In one embodiment, the length

122 of the anti-splash guard 102² is between about 8-16 inches, preferably between about 11-13 inches, and more preferably about 12 inches. Additionally, in one embodiment, the width 124 of the anti-splash guard 102 is between about 8-16 inches, preferably between about 11-13 inches, and more preferably about 12 inches.” *Id.*, ¶0024. The disclosed ranges include, for example, an embodiment with a length of twice its width (16 inches long by 8 inches wide).

E. Wise

51. Wise (Ex. 1008) discloses a urinal anti-splash insert for vertical urinals. The insert is a flat shape divided into three main sections, a center section containing vertical fins, and two wings containing angled fins on either side of the center section. The insert reduces urine splashback via the fins in each section, “which serve in slicing urine streams.” Ex. 1008, ¶0012. Figure 1 is shown below.

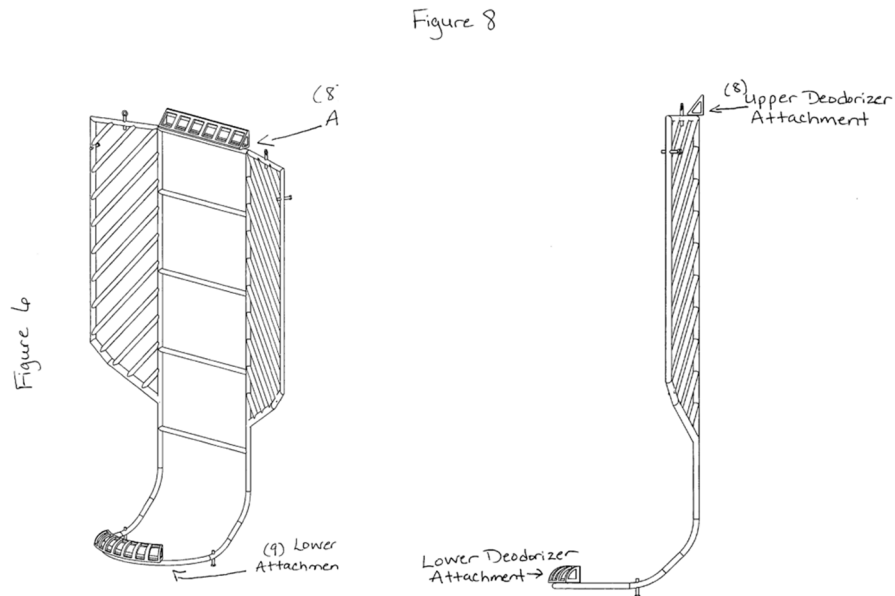
² The number 102 appears to be a mistake. In all other paragraphs and figures, the anti-splash guard is numbered 120 (or 820, for the embodiment depicted in Figure 8). Elsewhere, the number 102 represents the second sidewall of urinal 100. *See* Ex. 1007, ¶0020.



Id., Fig. 1

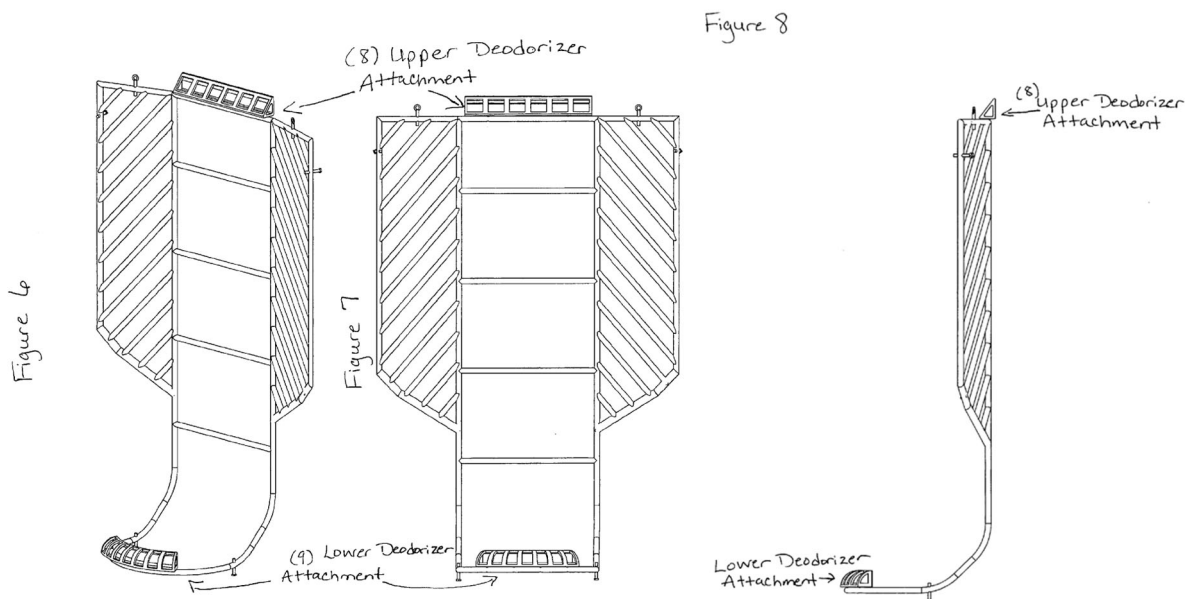
52. Wise's insert has several configurations. Figure 1, above, shows Wise's "flat" configuration. As the TOP VIEW SECTION A-A' shows, in its flat configuration, Wise's device extends horizontally along a single plane. However, as shown below, Wise also has a "bent" configuration, where its wings are bent

slightly forward, giving the device a contour that generally matches the shape of a typical urinal's rear wall.



Ex. 1008, Figs. 6 (rotated counterclockwise), 8.

53. Additionally, Wise discloses optional top and bottom deodorizer attachments. Figures 6-8, below, show the device with both deodorizer attachments installed.



Id., Figs. 6, 7 (rotated counterclockwise), 8.

54. As depicted in Figures 6-8, the Wise insert comprises a horizontal base and a vertical anti-splash body, connected at a coupling region. Additionally, with the upper deodorizer attachment attached, the Wise insert has an angled portion “which serves to smoothly channel water onto the finned surface of the insert thereby assisting in preventing water splashing during the urinal flush cycle.” *Id.*, ¶0018.

IV. GROUND 1: CLAIMS 1, 2, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, AND 20 WOULD HAVE BEEN OBVIOUS OVER FUSHIMI, BROWN '394, AND BROWN '098 IN LIGHT OF THE KNOWLEDGE OF A PERSON OF ORDINARY SKILL IN THE ART

55. As I explain below, Fushimi, Brown '394, and Brown '098 expressly disclose or at least suggest all the elements of Claims 1, 2, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, and 20. To the extent Fushimi, Brown '394, and Brown '098 do not

expressly disclose any element of Claims 1, 2, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, and 20, the claims would have been obvious over Fushimi, Brown '394, and Brown '098 in view of the knowledge of one skilled in the art at the time of the '649 Patent invention. Accordingly, in my opinion, each of Claims 1, 2, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, and 20 would have been obvious to a person of ordinary skill in the art over Fushimi, Brown '394, and Brown '098.

A. Claim 1 would have been obvious over Fushimi and Brown '398 in light of the knowledge of a person of ordinary skill.

56. I address below how both Fushimi and Brown '398 independently disclose or render obvious a device meeting all limitations of Claim 1, and, in any event, Claim 1 is obvious over the combination of Fushimi and Brown '394 in view of the knowledge of a person of ordinary skill.

1. Preamble: “A urinal anti-splash device”

57. The preamble to Claim 1 recites a “[a] urinal anti-splash device[.]” I understand that patent preambles are not always limiting. I have not been asked to render an opinion on whether the preamble of Claim 1 is limiting. Regardless, Fushimi and Brown '398 both disclose “urinal anti-splash devices.”

58. For example, Fushimi discloses that its invention is named “Urine splash prevention device,” and is “formed to fit the shape of the inner periphery of [a] urinal. Ex. 1004, 1. One skilled in the art would have understood that the “[u]rine

splash prevention device” in Fushimi is a urinal anti-splash device because it is designed to be inserted into a urinal in order to ensure that “the urine flows away without splashing elsewhere and so that “splashes can be completely prevented.” *Id.* at 2.

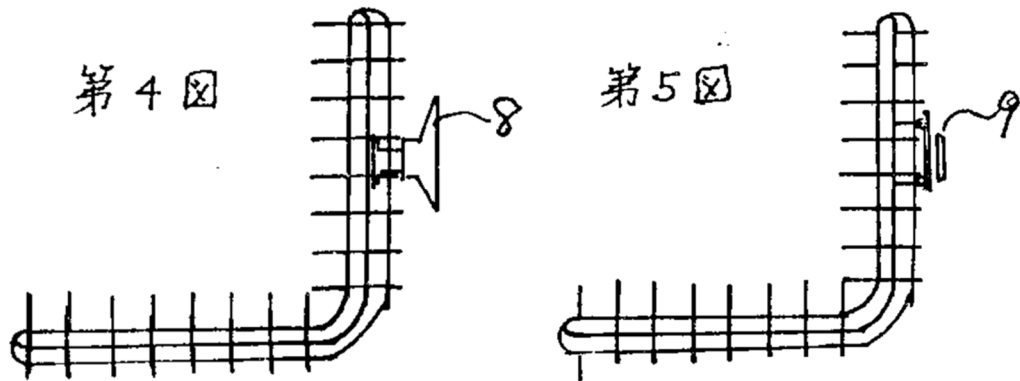
59. Likewise, Brown ’394 “provides a urinal anti-splash device.” Ex. 1006, 1:63.

2. **1[A]: “an anti-splash body configured to be mounted vertically on a back wall of a urinal and having a plurality of protrusions that extend from a front surface of the anti-splash body”**

60. Limitation 1[A] recites, “an anti-splash body configured to be mounted vertically on a back wall of a urinal and having a plurality of protrusions that extend from a front surface of the anti-splash body[.]” As I explain below, both Fushimi and Brown ’394 disclose this limitation, and, in any event, this limitation would have been obvious over the combination of Fushimi and Brown ’394 in light of the knowledge of a person of ordinary skill.

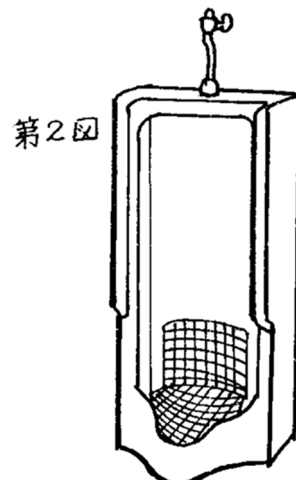
61. Fushimi discloses that its urine splash prevention device includes an anti-splash body, namely vertical side (4).” Fushimi’s device “. . . is attached to the inside of the urinal for use.” Ex. 1004, 1. Fushimi discloses several methods of accomplishing this attachment. “The following are some possible implementations of this device: Attachment of a fastener (7) with a suction cup. Attachment of the

fastener (7) with a magnet.” *Id.*, 3. Embodiments with the disclosed suction cup and magnet are shown in figures 4 and 5, below.



Id. Figs. 4, 5.

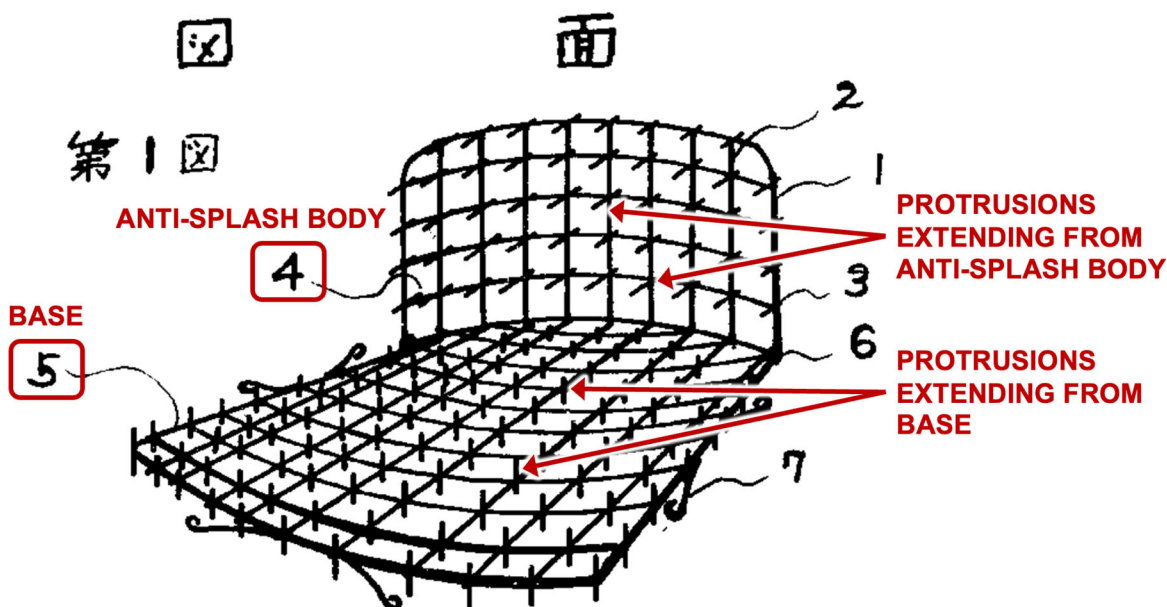
62. Additionally, Fushimi discloses that, when installed in a urinal, its anti-splash body is mounted vertically on the back wall of a urinal. This is shown in Figure 2, below.



Id., Fig. 2.

63. Finally, Fushimi’s anti-splash body (vertical side 4), has protrusions

extending from its front surface, namely brushes (3). Fushimi describes that its device is covered by “an elastic brush and fine mesh, so the urine is diverted and depressurized by the brush and the mesh, the pressure is reduced, the sound is reduced and muffled, and the urine flows away without splashing elsewhere.” *Id.*, 2 Figure 1, below, shows brushes (3) extending from Fushimi’s anti-splash body.



Id., Fig. 1.

64. Likewise, Brown '394 discloses this limitation. Brown '394 discloses an embodiment of a urinal screen that is configured to be mounted vertically on a back wall of a urinal. “The urinal screen 460 can include an attachment structure 412. The attachment structure 412 can be a hang hole configured to releasably engage with a hook or other protrusion on the back wall 302 of a urinal 300.” Ex.

1006, 11:43-47. This embodiment is shown in Figure 12, below.

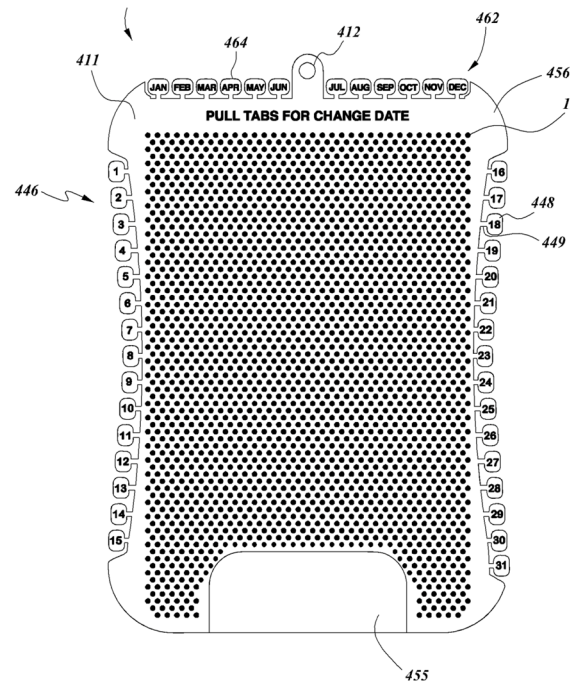


FIG. 12

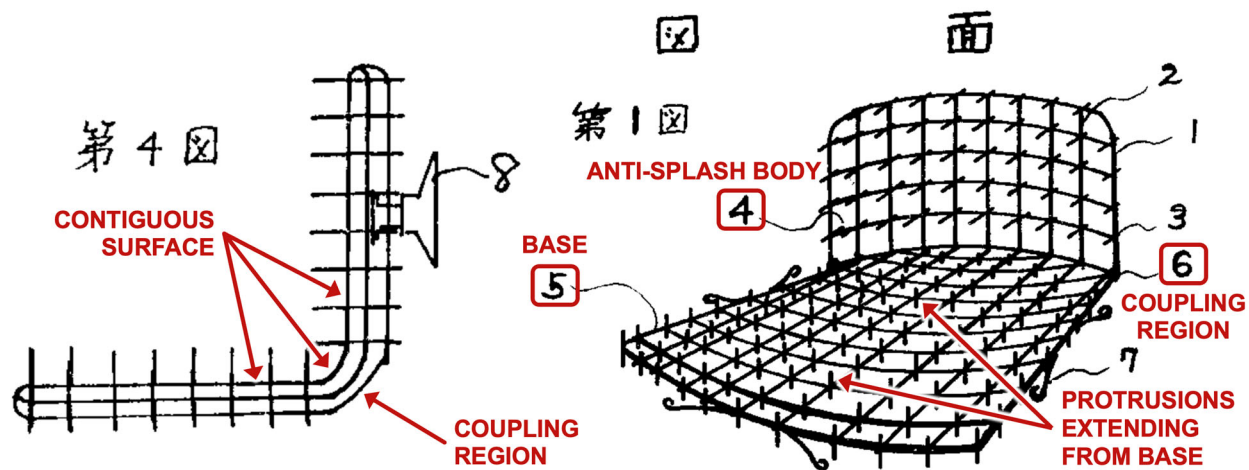
Id., Fig. 12. A person of ordinary skill would understand that a urinal screen that could be vertically mounted on the back wall of a urinal is an “anti-splash body” as defined by the ’649 Patent.

65. Brown ’394 further discloses that its anti-splash body includes protrusions extending from its surface. “As illustrated in FIG. 12, in some embodiments, a urinal screen 460 can have a screen body 411. The screen body 411 can include a plurality of openings or protrusions 12 on at least one side of the screen body 411.” *Id.* 40-43.

3. **1[B]: “a base attached to the anti-splash body at a coupling region formed between the base and the anti-splash body, the base being configured to cover at least a portion of a urinal drain and having a plurality of protrusions extending away from the base on a surface of the base that is contiguous with the front surface of the anti-splash body”**

66. Limitation 1[B] recites, “a base attached to the anti-splash body at a coupling region formed between the base and the anti-splash body, the base being configured to cover at least a portion of a urinal drain and having a plurality of protrusions extending away from the base on a surface of the base that is contiguous with the front surface of the anti-splash body[.]” As I explain below, Fushimi discloses this limitation. Additionally and separately, Brown ’394 renders this limitation obvious in view of the knowledge of a person of ordinary skill.

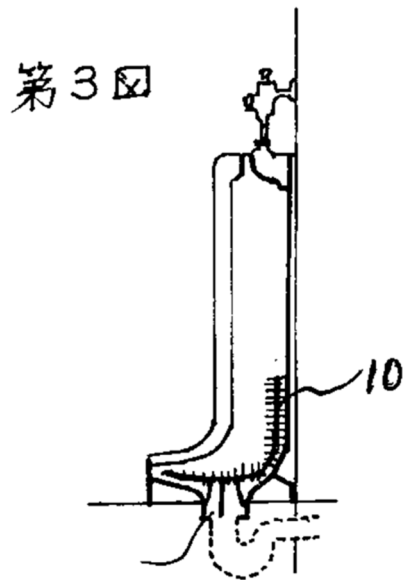
67. As I discussed in Claim 1[A], above, Fushimi discloses an anti-splash body (vertical side 4). Fushimi also discloses a base (horizontal side 5), which is attached to the anti-splash body at a coupling region (support 6). Fushimi discloses that its device has “a vertical side (4). . . and a bottom side (5) being [fit] together by a support (6)[.]” Ex. 1004, 1. Figures 1 and 4, below, show Fushimi’s base and anti-splash body connecting at its coupling region. Figure 4 additionally shows that a surface of Fushimi’s base is contiguous with the front surface of its anti-splash body.



Id., Figs. 1, 4 (annotated).

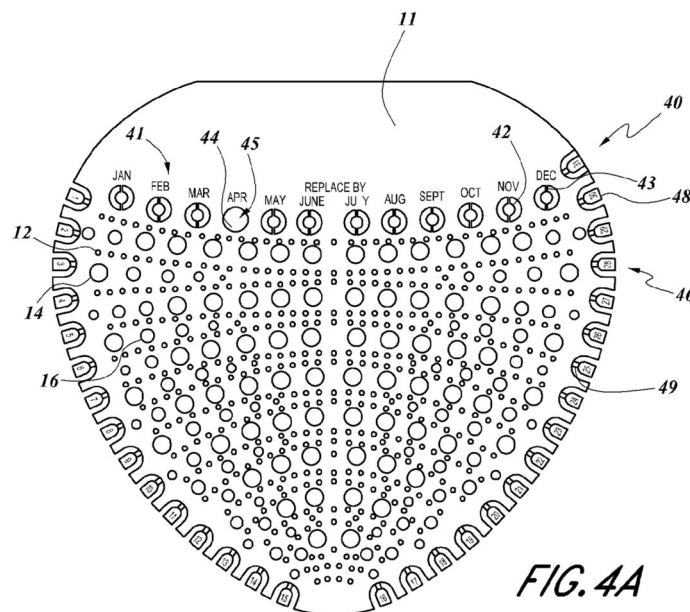
68. I also discussed that Fushimi’s anti-splash body included protrusions extending from its front surface. As shown above, these same protrusions extend from Fushimi’s base. Fushimi’s device includes a “fine mesh (2) [which] is stretched over the entire vertical edge (5) and bottom edge (6) of an L-shaped frame (1). . . which has a brush (3) attached[.]” *Id.* 2.

69. Finally, Fushimi discloses that its base is sized and shaped to cover at least a portion of a urinal drain. One embodiment of Fushimi’s device can be attached to a urinal by “stretching it into the drainage cavity of the urinal.” *Id.*, 4. As shown in Figure 3, below, when attached in this way, the base covers at least a portion of the drain.



Id., Fig. 3.

70. This limitation is also obvious over Brown '394 in light of a person of ordinary skill. Brown '394 discloses many of the same features disclosed by Fushimi. For example, Brown '398 discloses a base, namely urinal screen 10, with a screen body 11 that “. . . may be sized and shaped to be placed over a portion or the entire portion of a drain of a urinal or toilet.” Ex. 1006, 3:40-41. Brown '394 discloses embodiments of its urinal screen with protrusions. “The screen body 11 “may have openings or protrusions 12, 14 and 16. In one embodiment, the openings 12, 14 and 16 are openings, or drain holes. . . . In another embodiment, protrusions 12, 14 and 16 may be protrusions that extend from the surface of the screen body 11.” *Id.*, 3:45-51.



Id., Fig. 4.

71. As I discussed above, Brown '394 discloses an anti-splash body mountable to a rear wall of a urinal. Brown '394 additionally discloses using two or more urinal screens in a single urinal, including a two-part urinal screen that includes both a base covering the drain and an anti-splash body covering the back wall of the urinal: "In some embodiments, a plurality of urinal screens can be used in a urinal 300. For example, a urinal screen 110, 210, 460 can be placed on the back wall 302 of the urinal 300 and an additional urinal screen 110, 210, 460 can be placed adjacent to or covering a drain 304 of the urinal 300." *Id.* 12:1-5.

72. A person of ordinary skill designing a two-part urinal screen or a two-screen assembly as disclosed in Brown '394 would have been motivated to

manufacture the device as a single unitary assembly, with the two parts connected by a coupling region. It would have been obvious to do so because use of one-piece construction is well known, and is merely a matter of obvious engineering choice. Additionally, a person of ordinary skill would have recognized that manufacturing costs could be reduced by reducing the number of separate molded parts required for each unit. For example, “[s]tudies have indicated that in a wide variety of industries, assembly costs account for about 40 to 50 percent of the total product cost. Designers, therefore, are always trying to reduce the part count to keep assembly costs down and improve product quality.” Ex. 1021, 2. A person of ordinary skill manufacturing a two-part urinal screen with a base and an anti-splash body as a unitary assembly would have understood that the base and the anti-splash body would have shared a contiguous surface.

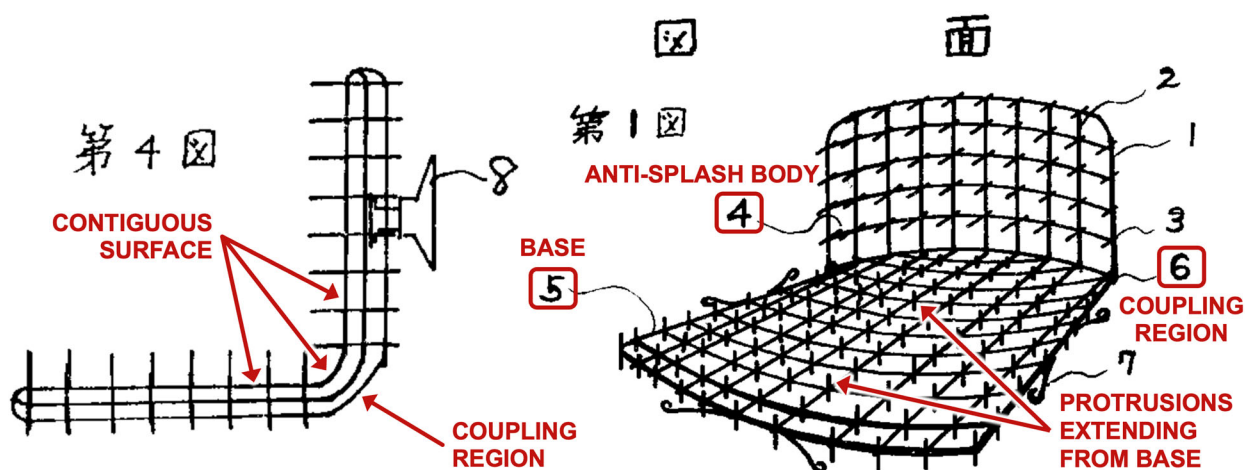
4. **1[C]: “the coupling region is configured [to] allow the base to move between a first position including the base oriented in a direction parallel to the anti-splash body and a second position including the base oriented in a direction substantially perpendicular from the base”**

73. Limitation 1[C] recites “the coupling region is configured [to]³ allow

³ In my analysis, I have treated limitation 1[C] as if the word “to” were present after the word “configured.”

the base to move between a first position including the base oriented in a direction parallel to the anti-splash body and a second position including the base oriented in a direction substantially perpendicular from the base⁴.” As I explain below, Fushimi discloses this limitation. Additionally and separately, Brown ’394 renders this limitation obvious in view of the knowledge of a person of ordinary skill..

74. As I discussed in Claims 1[A] and 1[B], above, Fushimi’s device includes a base and an anti-splash body joined at a coupling region (support 6). Figures 1 and 4, below, show the device with its base in the second position, where it is substantially perpendicular from the anti-splash body.



⁴ The reference to “base” here appears to be a typo. In my analysis, I have treated limitation 1[C]’s “second position” as including the base oriented in a direction substantially perpendicular from the *anti-splash body*, rather than from itself.

Ex. 1004, Figs. 1, 4.

75. A person of ordinary skill would understand the coupling region at the bend (support 6) is configured to translate the base from a position parallel to the anti-splash body to a position substantially perpendicular to the anti-splash body. As described above, Fushimi teaches the it can be “bent freely” at this region “to make it easy to handle.” *Id.*, 2. A person of ordinary skill would further understand Fushimi to teach that, because support 6 can be bent freely, the base and anti-splash body of its device can be configured such that the device is flat for handling and then can be reconfigured (i.e. bent) to a perpendicular configuration for use as depicted above. Thus, it is my opinion that Fushimi teaches limitation 1[C].

76. Brown ’394 also teaches, or at least suggests, this limitation. As I discussed in Claim 1[B], above, it would have been obvious to a person of skill in the art to manufacture the two-part urinal screen or two-screen assembly taught by Brown ’394 as a unitary assembly with the two parts joined at a coupling region, which would be used to configure the relative orientation of the two parts.

77. Likewise, it would have been obvious to a person of ordinary skill to manufacture such a device in a flat configuration for ease of handling and transporting the product, e.g., when packing, storing, and shipping the product. Persons of ordinary skill understand that flat products consume less usable space in

a box or shipping container compared to three-dimensional products. It is customary, when shipping products that will ultimately be bent or reconfigured for use, to ship the products in a flat configuration, possibly with instructions for a retailer or user to bend or re-configure them prior to use.

78. Examples of this technique are common and have been known for decades. For example, Thomsen (Ex. 1015) issued in 1899 and discloses “ a light, simple, and durable coop especially adapted for poultry and capable of being conveniently folded for shipment when empty and of being quickly set up when required for use.” Ex. 1015, 1:8-13. Partridge (Ex. 1016) issued in 1971 and discloses “ collapsible buildings which can be erected easily and collapsed at will for movement to another site or for storage or transportation.” Ex. 1016, 1:24-26. Smith (Ex. 1017) issued in 2011 and discloses “an empty container [that] can be shipped in a knocked-down flat state and opened to form an assembled container that is ready for use. Shipping and storing containers in a knocked-down flat state saves money and space.” Ex. 1017, 1:21-25. Further, foldable stadium-style seats, such as the one shown below, offer an everyday example of a product that can be folded into a flat configuration (below, left) for shipping and storage. Before use, users reconfigure the base and back support sections in an orthogonal configuration (below, right).



79. Thus, it is my opinion that a person of ordinary skill would understand Fushimi to teach a device as recited in limitation 1[C] because (1) Fushimi specifically teaches that the device is adjustable to make it easy to handle; (2) a person of ordinary skill would have recognized configuring the device in a flat configuration for shipping and handling would have been desirable; (3) in such flat configuration the base would be parallel to the anti-splash body, and (4) for use the base would be perpendicular to the anti-splash body. The combination of Fushimi and Brown '394 teaches limitation 1[C].

80. In any event, it would have been obvious to a person of ordinary skill to combine the devices of Fushimi and Brown '394 for several reasons.

81. First, A person of ordinary skill would have understood that Fushimi

and Brown '394 disclose the same type of devices. They provide similar structures that perform similar functions in similar ways. Both devices are inserted into urinals to screen debris and reduce splashing. Both devices accomplish these ends using a screen (Fushimi's frame 1 and mesh 2, Brown '394's screen body 11) that defines a plurality of openings, and a plurality of protrusions extending from the screen (Fushimi's brushes 3 and Brown's protrusions 12). Ex. 1006, 3:54-55 (disclosing "one embodiment where the screen body 11 has protrusions 12 and openings 14"). The protrusions of both devices extend from the upper surface of the device, and help reduce splashing by breaking apart a urine stream before it impacts against the urinal's rear wall.

82. Second, Fushimi is more terse and its figures less detailed than Brown '394. A person of ordinary skill would have looked to Brown '394 for its more specific disclosures including manufacturing instructions and material selection. For example, Brown'394 discloses the use of injection molding. Ex. 1006, 8:52-54. Additionally, Brown '394 discloses many examples of thermoplastic resins that may be used to manufacture its device, *id.* 7:30-51, and manufacturing instructions including specific temperatures and material percentages. *Id.* 12:6-18.

83. Third, A person of ordinary skill would have looked to Brown '394 for features of the device, including Brown '394's screen body, protrusions, and

openings in view of the generically described mesh and brushes of Fushimi. Using Brown’s screen body, protrusions, and openings for Fushimi’s mesh and brushes would have constituted no more than a routine design choice. *Id.*

84. Fourth, a person of ordinary skill would have understood that using Brown ’394’s screen body for Fushimi’s mesh would have constituted nothing more than a simple substitution of one known element—Brown ’394’s screen body, with its protrusions and openings—for another known element—Fushimi’s more generically described mesh, with its brushes.

85. Fifth, Fushimi generally describes that the mesh is “attached” to the frame, thus suggesting a two-piece assembly. Ex. 1004, 1 (“an L-shaped frame (1)... to which a mesh (2) is attached. . .”)” A person of ordinary skill would have been motivated to combine Fushimi with Brown ’394 for the additional reason that Brown ’394 describes a device molded as a single piece. Ex. 1003, ¶73

86. Finally, a person of ordinary skill also would have had a reasonable expectation of success in modifying Fushimi to use Brown ’394’s screen body, protrusions, and openings. *Id.*, ¶74. Such a person would have understood that using Brown ’394’s screen body, protrusions, and openings would provide as good or better performance when combined with Fushimi to provide a urinal screen with both a horizontally oriented base and a vertically oriented anti-splash body. *Id.*

Using Brown '394's screen body, protrusions, and openings would require minimal design changes and advantageously provide a single-piece, molded urinal screen device. *Id.* A person of ordinary skill would have additionally recognized that the device would be configurable to have a base that was perpendicular to an anti-splash body either by using perforations to separate the base from the anti-splash body or by simply folding the two portions using slits as disclosed in Brown '394.

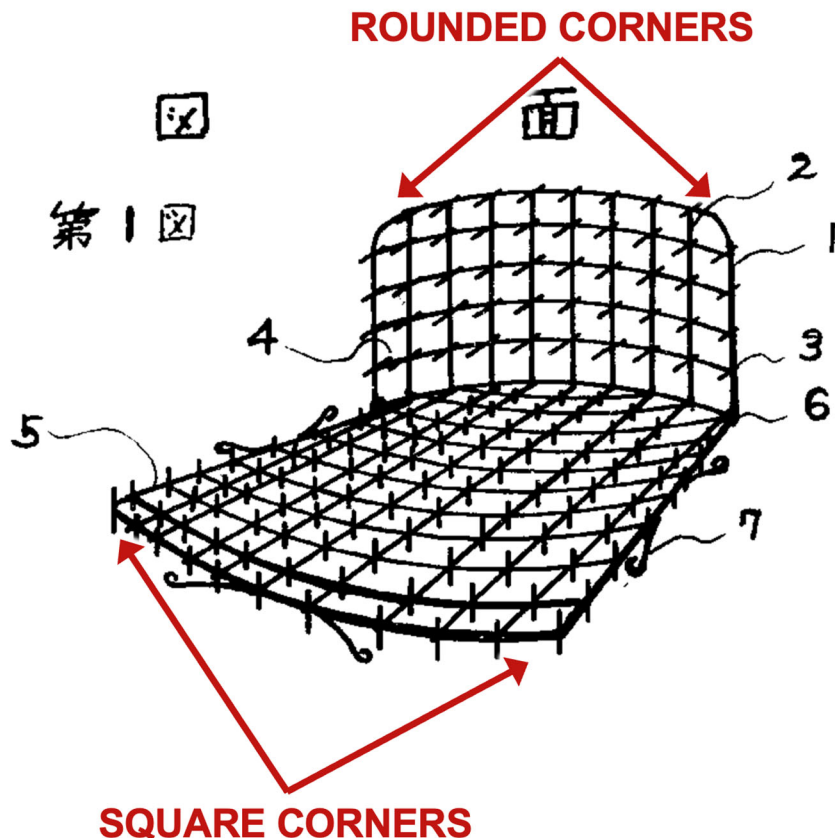
87. Accordingly, it is my opinion that the both Fushimi and Brown '394 independently disclose or teach each limitation of Claim 1, and, in any event, the combination of Fushimi and Brown '394 discloses or teaches each limitation of Claim 1, and therefore the invention claimed therein would have been obvious.

B. Claim 2 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

88. Claim 2 depends from Claim 1, and thus incorporates the limitations of Claim 1. Claim 2 further recites, “wherein the anti-splash body is of a shape different than a shape of the base” As I explain below, Fushimi discloses this additional limitation, and in any event, it would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

89. Fushimi discloses a base (horizontal side 5) and an anti-splash body (vertical side 4), the shapes of which differ in at least two ways. First, vertical side 4 and bottom side 5 have differently shaped corners on their edges distal to support

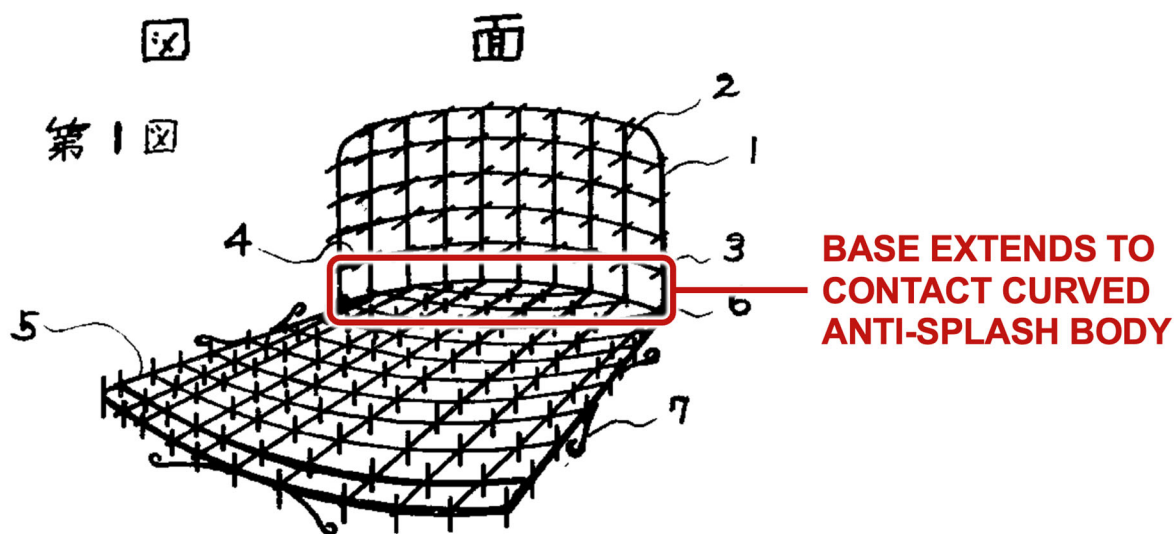
6. Vertical side 4 has rounded corners, whereas bottom side 5 has square corners. Second, the orientations of the shapes of base and anti-splash body are oriented differently (horizontally and vertically, respectively).



Ex. 1004, Fig. 1 (annotated).

90. Third, the surfaces of vertical side 4 and bottom side 5 are shaped and curved differently. Vertical side 4 is generally rectangular, with two sets of parallel edges, and a slightly concave curvature to conform to the shape of a urinal's rear wall. However, while the lateral edges of horizontal side 5 are generally parallel, the

front and rear edges are not. The front edge extends between the two lateral edges, distal to support 6 and vertical side 4. This edge is rounded downward, in the direction of the urinal floor, but is otherwise generally perpendicular to the parallel, lateral sides, i.e. it does not curve toward or away from vertical side 4 on the horizontal plane. The rear edge is opposite the front edge, proximal to support 6 and vertical side 4, and also extends between the two lateral edges. Unlike the front edge, the rear edge is not generally perpendicular to the lateral sides on the horizontal plane; it extends beyond the ends of the lateral edges, as it must in order to be in continuous contact with the entire interior periphery of vertical side 4's concave surface.



Id., Fig. 1 (annotated).

91. Moreover, it would have been obvious to a person of ordinary skill to

make Fushimi's base and anti-splash body with different shapes even if doing so were not already taught by Fushimi. There are only two choices – to make the shapes the same or not. A person of ordinary skill would understand that both options were predictable solutions, and would have had a reasonable expectation of success with either one. It would have been obvious to try both, making the shapes of the base and anti-splash body the same, and making them different.

92. A person of ordinary skill would have recognized the desirability of adjusting the shapes for various urinal designs, and also of making the vertical anti-splash body with a longer shape to cover a greater portion of the urinal back. A person of ordinary skill would understand that because Fushimi's device would be attached to the rear wall of a urinal with a suction cup or a magnet, there would have been no concerns associated with the use of a lengthened shape. For example, there would be no concern of a taller device falling forward because of its higher center of gravity.

93. Further, a person of ordinary skill would have recognized that the rear wall and drain area of a urinal are often different shapes and would have adjusted the shapes of the urinal screens accordingly. For example, Brown '394 discloses a generally rectangular urinal screen for placement on the back wall of a urinal, Ex. 1006, Fig. 12, and other shapes for the urinal drain area. *Id.*, Figs. 1, 4A, 4B, and 7.

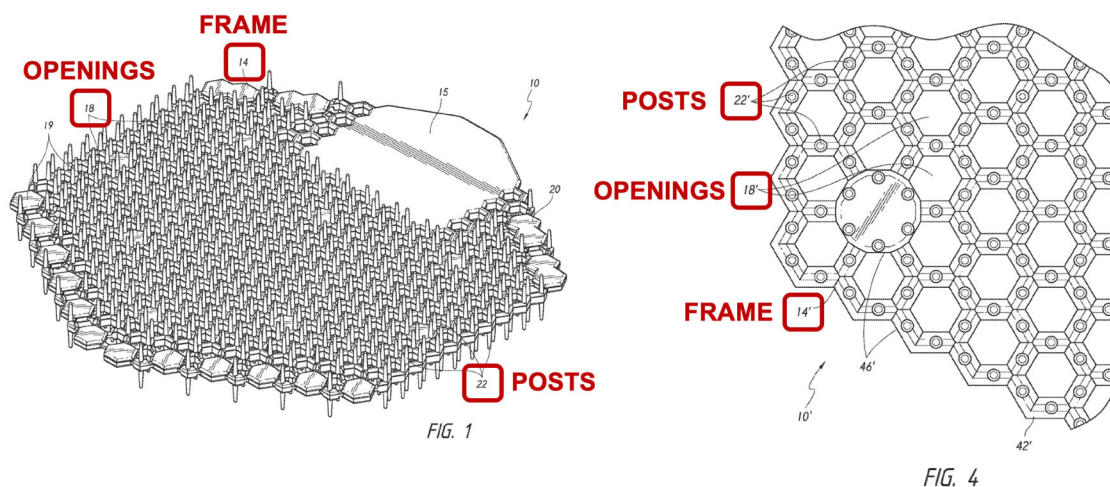
94. Additionally, Brown '098 discloses that urinal screens can be made in a variety of shapes, and specifically formed according to the specific shape of a urinal where the screen will be installed. “In some embodiments, the screen 10 has a polygonal, elliptical, circular, or other overall shape. For example, as illustrated in FIG. 2, the screen 10 can have a generally hexagonal shape, though many other shapes are contemplated (e.g., rectangles, pentagons, triangles, circles, or some combination thereof). In some embodiments, the screen 10 is shaped to fit a particular urinal or toilet.” Ex. 1005, 4:9-15. A person of ordinary skill would understand that urinal screens with bases and anti-splash bodies would frequently have bases and bodies of different shapes, i.e., the base would be shaped according to the dimensions and contours of the urinal drain area, whereas the body would have a different shape according to the dimensions and contours of the urinal’s rear wall.

95. Accordingly, it is my opinion that Fushimi discloses the additional limitations of Claim 2, and, in any event, it would have been obvious over Fushimi, Brown '394 and Brown '098 in light of the knowledge of a person of ordinary skill. Therefore the invention claimed therein would have been obvious over Fushimi, Brown '394, and Brown '098 in view of the knowledge of a person of ordinary skill in the art.

C. Claim 5 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

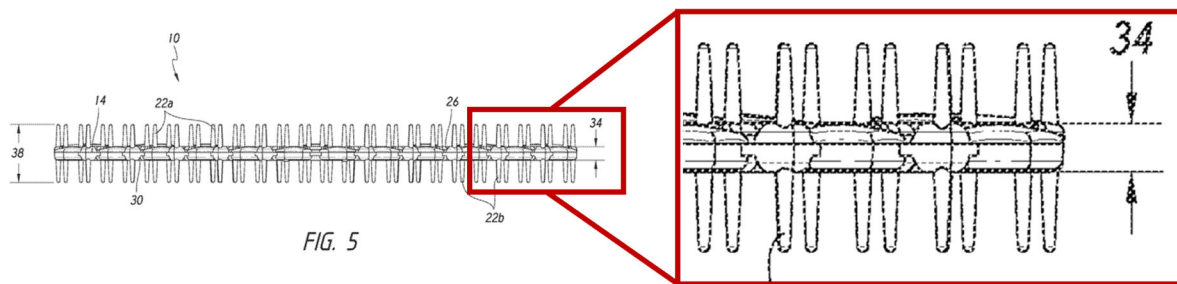
96. Claim 5 depends from Claim 1, and thus incorporates the limitations of Claim 1. Claim 5 further recites, “wherein the plurality of protrusions taper downwardly in a direction toward an [sic] front surface of the anti-splash body and the base.” As I explain below, Brown '098 discloses this limitation.

97. Brown '098 discloses a urinal screen including frame 14 with openings 18 and a plurality of protrusions (posts 22) extending from the surface of the frame.



Ex. 1005, Figs 1, 4 (annotated).

98. As shown in Figure 5, below, the protrusions (posts 22a on the top side and 22b on the bottom side) are tapered because they are wider at their base than their tip.



Id., Fig. 5 (annotated).

99. One skilled in the art would have been motivated to combine the frame and posts of Brown '098 with Fushimi's urinal anti-splash device to achieve the invention of the '649 Patent for several reasons.

100. First, a person of ordinary skill would have understood that Brown '098 and Fushimi disclose similar devices, with similar structures that perform similar functions in similar ways. Both devices are inserted into a urinal to prevent splashing, and to prevent debris from clogging the drain. Both contain a lattice-like structure (Fushimi's frame 1 and mesh 2, and Brown '098's frame 14) defining a plurality of openings. Both also include a plurality of protrusions (Fushimi's brushes 3, and Brown '098's posts 22) that extend from the upper surface of the device and break apart a stream of urine to reduce splashing.

101. Fushimi is more terse and its figures are less detailed than those of Brown '098. Fushimi discloses scant details about the materials and manufacture of the device, whereas Brown '098's more detailed description identifies

manufacturing techniques (e.g. injection molding) and specific materials that can be used to make its device, along with manufacturing instructions. *See, e.g., Id.*, 4:16-34. Brown '098's specification also includes more detailed drawings.

102. A person of ordinary skill would have looked to Brown '098 for features of the device, including the use of Brown '098's more defined frame and tapered posts, to use in place of Fushimi's generically described mesh and brushes. Likewise, a person of ordinary skill would have recognized that choosing to use Brown '098's frame and posts rather than Fushimi's mesh and brushes would have constituted no more than a routine design choice.

103. Second, a person of ordinary skill would have understood that substituting Brown '098's frame and posts for Fushimi's mesh and brushes would have constituted nothing more than a simple substitution of one known element—Brown '098's frame and posts—for another known element—Fushimi's more generically described mesh and brushes.

104. Third, Fushimi generally describes that the mesh is “attached” to the frame, thus suggesting a two-piece assembly. Ex. 1004, 1 (“an L-shaped frame (1)... to which a mesh (2) is attached[.]”) A person of ordinary skill would have been motivated to combine Fushimi with Brown '098 for the additional reason that Brown '098 describes a device molded as a single piece. A person of ordinary skill would

have recognized that manufacturing costs could be reduced by reducing the number of separate molded parts required for each unit. For example, “[s]tudies have indicated that in a wide variety of industries, assembly costs account for about 40 to 50 percent of the total product cost. Designers, therefore, are always trying to reduce the part count to keep assembly costs down and improve product quality.” Ex. 1021, 2.

105. A person of ordinary skill also would have had a reasonable expectation of success in modifying Fushimi to use Brown ’098’s frame and posts. A person of ordinary skill would have understood that using Brown ’098’s frame and posts would provide as good or better performance when combined with Fushimi to provide a urinal screen with both a horizontally oriented base to cover a urinal drain and a vertically oriented anti-splash body to cover the back wall of the urinal. Using Brown ’098’s frame and posts would require minimal, design changes and advantageously provide a single piece molded urinal screen device.

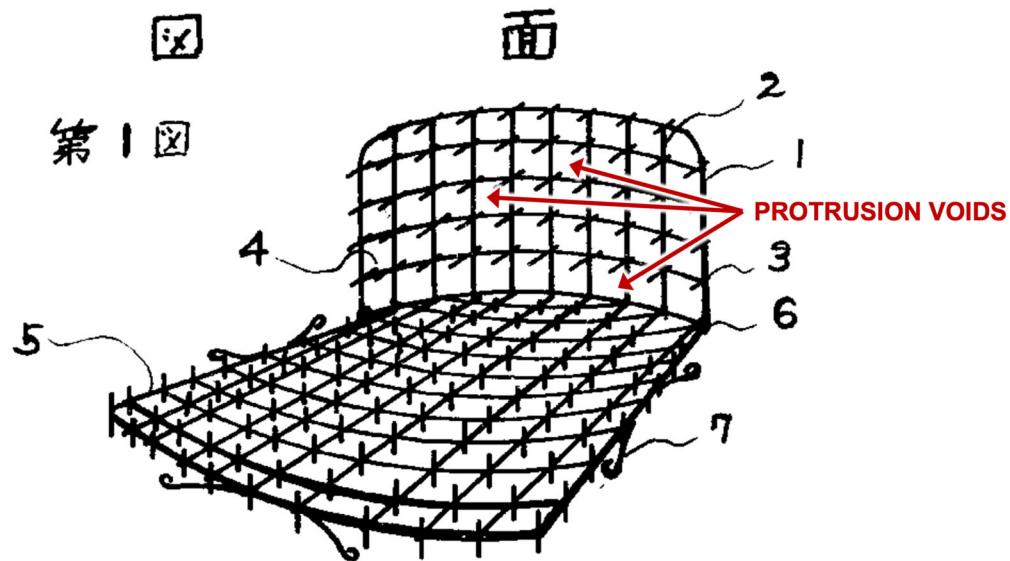
106. Accordingly, it is my opinion that Brown ’098 discloses the additional limitation of Claim 5, and therefore the invention claimed therein would have been obvious over Fushimi, Brown ’394, and Brown ’098 in view of the knowledge of a person of ordinary skill in the art.

D. Claim 6 would have been obvious over Fushimi and Brown '394 in light of the knowledge of a person of ordinary skill.

107. Claim 6 depends from Claim 1, and thus incorporates the limitations of Claim 1. Claim 6 further recites, “wherein the plurality of protrusions on the anti-splash body substantially span a longitudinal length of the anti-splash body and define a plurality of protrusion voids between the protrusions of the plurality of protrusions.” As I explain below, this limitation would have been obvious over Fushimi in the light of the knowledge of a person of ordinary skill.

108. According to the '649 Patent, protrusion voids “permit the urine to effectively flow in the downward direction toward the urinal drain,” Ex. 1001, 8:29-37, and “may also provide space for the protrusions 118 to bend and deflect when struck by the urine.” *Id.*, 7:11-13. Fushimi discloses protrusions that define protrusion voids.

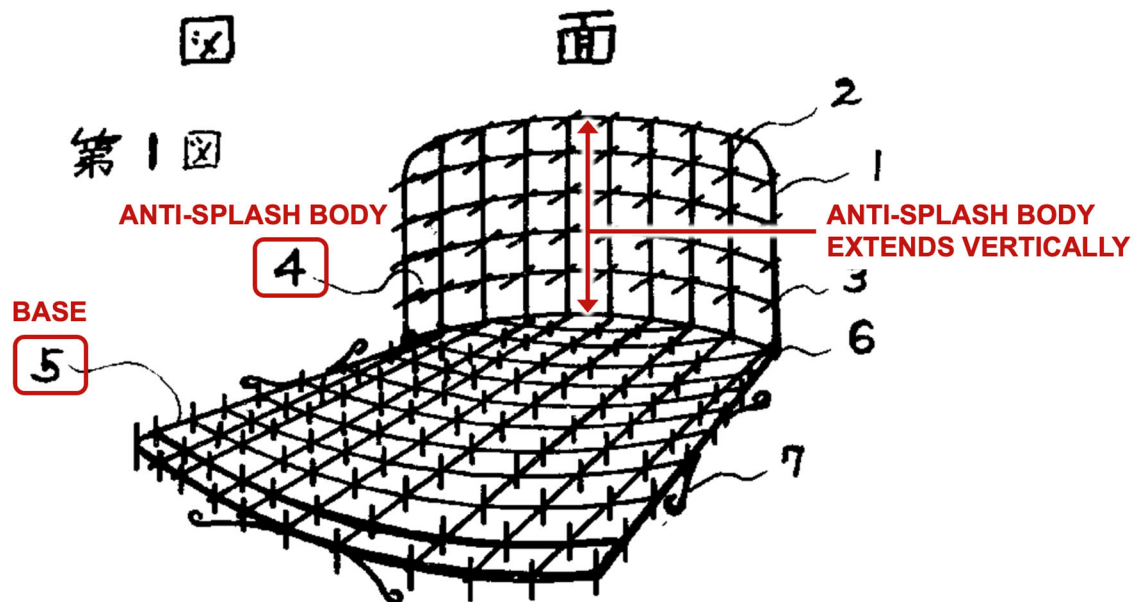
109. Fushimi’s device “is a urine splash prevention device in which a fine mesh (2) is stretched over the entire vertical edge (5) and bottom edge (6) of an L-shaped frame (1). . . .” Ex. 1004, 2. As shown in Figure 2, below, mesh 2 with protrusions (brushes 3) extends across the entire surface of Fushimi’s anti-splash body.



Id., Fig. 1.

110. A person of ordinary skill would understand that the spaces between Fushimi's protrusions are "protrusion voids" because, for example, they are open spaces, i.e., voids, and they allow urine to flow toward the drain, and provide space for Fushimi's protrusions to bend and deflect when struck by urine.

111. Fushimi's protrusions and voids span a length of Fushimi's anti-splash body (vertical side 4). Fushimi's vertical side 4 as depicted is not "elongated" because it does not have a length at least twice as long as a width, and so the depicted length is not "longitudinal" because it does not extend in an elongated direction.



Ex. 1004, Fig. 1 (annotated).

112. It would have been obvious to a person of ordinary skill to elongate the anti-splash body to increase the compatibility of Fushimi's device with a variety of urinals. Such a sizing adjustment would not affect functionality and would have been a simple design alternative obvious to a person of ordinary skill, who would have understood how to size, scale, and otherwise form the device taught by Fushimi for use in various urinals.

113. Further, anti-splash devices with anti-splash bodies extending vertically along the back wall of a urinal, as described by the '649 Patent, were known well before time of the '649 Patent's invention. For example, such a device was disclosed

by Fushimi in 1985, over three decades before 2016, when the '649 Patent's application was filed. *See* Exs. 1001; 1004. Further, the anti-splash body will produce the desired reduced splashing result for a wide range of sizes. A person of ordinary skill would have known that making the anti-splash body longer or taller would provide increased surface area thereby increasing the likelihood a user's urinal stream would impact the body that covers a larger portion of the urinal's back wall.

114. A person of ordinary skill would have been motivated to modify the shape of the anti-splash body because Fushimi teaches that its shape is “formed to match the inside shape of [the] urinal” Ex. 1004, 1. A person of ordinary skill would have understood that a single shape would not match the inner periphery of all urinals, and thus understood that Fushimi teaches modifying the shape and size of the depicted embodiment.

115. A person of ordinary skill would have been further motivated because, as such a person would have recognized, altering the shape of the anti-splash body would improve the functionality of the device. Urine splashing is reduced when the urine stream passes through Fushimi's mesh (2) and brushes (3). *Id.*, 2. A person of ordinary skill would have recognized that increasing the surface area of the anti-

splash body would reduce the exposed surface area of the urinal rear wall and increase the likelihood the urine stream contacted the anti-splash body.

116. A person of ordinary skill would also have understood that elongating the anti-splash body would have constituted nothing more than the use of a known technique—varying the size of a component—to improve Fushimi’s known anti-splash device.

117. A person of ordinary skill would have expected success in modifying the size of Fushimi’s anti-splash body because it was common to adapt the dimensions of urinal screens to the dimensions of urinals at the time of the ’649 Patent’s invention. For example, Valadez (Ex. 1007) was published in 2005, and discloses that its “anti-splash guard 120 may be adapted to comprise various other geometrical shapes, such as triangular, diamond, pentagonal, hexagonal, etc.” and that “the length 122 of the anti-splash guard 102 is between about 8-16 inches [and]. . . the width 124 of the anti-splash guard 102 is between about 8-16 inches. . . .” Ex. 1007, ¶¶0023-24. *See also, e.g.*, Irwin, Ex. 1009, ¶0027 (“The support structures 18 located along two or more sides of the urinal screen 10 allow the urinal screen 10 to be set up in accordance with a specific shape and size of the selected urinal.”); Ruedas, Ex. 1010, ¶0021 (“The receptacle 102 may be sized and adapted to conform to the dimensions of any type of urinal 201.”); Lyons, Ex. 1011, 2:8-12 (“The present

invention further provides anti-splash-back kits... which are readily adaptable to different size and shapes of urinal configurations.”); Williams, Ex. 1012, 2:53-64 (“Edges 8 of the mat 4 are cut or formed to allow the mat 4 to fit a urine receiving drain cavity 9 of the urinal 2.... Scribe lines 13 might also be included to facilitate folding and fitting the mat 4 to the urinal.”); Chou, Ex. 1013, 2:61-65 (“In the preferred embodiment the base (1) has notches (6) [that] are there to make the invention easier for an installer to break or trim it to size to fit any urinal.”).

118. A person of ordinary skill would understand that because Fushimi’s device would be attached to the rear wall of a urinal with a suction cup or a magnet, there would have been no concern to lengthen it to accommodate taller urinals or to cover more of the rear wall of the urinal. For example, there would be no concern of a taller device falling forward because of its higher center of gravity.

119. Accordingly, it is my opinion that Fushimi discloses the additional limitation of Claim 6, and, in any event, it would have been obvious over Fushimi in light of the knowledge of a person of ordinary skill, and therefore the invention claimed therein would have been obvious over Fushimi, Brown ’394, and Brown ’098 in view of the knowledge of a person of ordinary skill in the art.

E. Claim 8 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

120. Claim 8 is repetitive of claims addressed above. I address below how Fushimi and Brown '394, in view of the knowledge of a person of ordinary skill in the art, render obvious the claimed invention of Claim 8.

1. Preamble: “A urinal anti-splash device comprising”

121. The preamble to Claim 8 recites a “[a] urinal anti-splash device.” I understand that patent preambles are not always limiting. I have not been asked to render an opinion on whether the preamble of Claim 8 is limiting. Regardless, as I discussed in Claim 1, above, Fushimi and Brown '398 both disclose “urinal anti-splash devices.” Additionally, Brown '098 discloses a urinal screen that can reduce splashing. Ex. 1005, 5:4-9.

2. 8[A]: “an anti-splash body configured to be mounted on a back wall of a urinal, the anti-splash body including a plurality of protrusions extending from a front surface of the anti-splash body, wherein at least some of the protrusions have a base at the front surface of the anti-splash body that is wider than a top of the protrusion at the opposite end of the protrusion”

122. Limitation 8[A] recites, “an anti-splash body configured to be mounted on a back wall of a urinal, the anti-splash body including a plurality of protrusions extending from a front surface of the anti-splash body, wherein at least some of the protrusions have a base at the front surface of the anti-splash body that is wider than a top of the protrusion at the opposite end of the protrusion [.]” As I explained in

Claims 1[A] and 5, above, the combination of Fushimi and Brown '098 renders this limitation obvious in view of the knowledge of a person of ordinary skill.

3. **8[B]: “a base that is attached to the anti-splash body and which is configured to extend in a direction substantially perpendicular from the anti-splash body to at least partially cover a drain of a urinal, and which further includes a plurality of protrusions extending outwardly from the base which are arranged to extend in a direction substantially perpendicular to plurality of protrusions of the anti-splash body”**

123. Limitation 8[B] recites, “an anti-splash body configured to be mounted on a back wall of a urinal, the anti-splash body including a plurality of protrusions extending from a front surface of the anti-splash body, wherein at least some of the protrusions have a base at the front surface of the anti-splash body that is wider than a top of the protrusion at the opposite end of the protrusion [.]” As I explained in Claim 1[B], above, Fushimi discloses this limitation. Further, Brown '394 in combination with Fushimi renders this limitation obvious in view of the knowledge of a person of ordinary skill.

124. Accordingly, it is my opinion that the combination of Fushimi, Brown '394, and Brown '098 discloses or teaches each limitation of Claim 8, and therefore the invention claimed therein would have been obvious over Fushimi, Brown '394, and Brown '098 in view of the knowledge of a person of ordinary skill in the art.

F. Claim 9 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

125. Claim 9 depends from Claim 8, and thus incorporates the limitations of Claim 8. Claim 9 further recites, “wherein the base is of a shape different than a shape of the anti-splash body.” As I discussed in Claim 2, above, Fushimi, Brown '394, and, Brown '098 all disclose this additional limitation, and in any event, it would have been obvious over any of those three references in light of the knowledge of a person of ordinary skill.

126. Accordingly, it is my opinion that Fushimi Brown '394, and, Brown '098 all disclose or teach the additional limitation of Claim 9, and therefore the invention claimed therein would have been obvious over Fushimi, Brown '394, and Brown '098 in view of the knowledge of a person of ordinary skill in the art.

G. Claim 10 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

127. Claim 10 depends from Claim 8, and thus incorporates the limitations of Claim 8. Claim 10 further recites, “wherein the anti-splash body includes an elongated shape of a flexible material.” This additional limitation would have been obvious over Fushimi in light of the knowledge of a person of ordinary skill.

128. As I discussed in Claim 6, above, it would have been obvious to a person of ordinary skill to extend Fushimi’s anti-splash body to include an elongated length in light of the knowledge of a person of ordinary skill.

129. Additionally, Fushimi discloses that it is made of a flexible material. Fushimi’s device comprises “a fine mesh (2) stretched over... an L-shaped frame (1) formed to fit the inside perimeter of the urinal[.]” Ex. 1004, 2. A person of ordinary skill would understand that mesh (2) must have been flexible in order to be “stretched over” a frame (1) that was formed to match the curved geometry of a urinal’s rear wall.

130. Likewise, both Brown ’394 and Brown ’098 describe urinal screens can be molded using, for example, EVA (ethylene-vinyl acetate). Ex. 1005, 4:16-34; Ex. 1006, 7:30-52. EVA is a well-known polymer that is easily molded to make various lightweight flexible objects, e.g., flexible tubing, product packaging film, and hinged food containers. *See* Exs. 1018, 1019, 1020.

131. Accordingly, it is my opinion that Fushimi, Brown ’394, and Brown ’098 all disclose the additional limitation of Claim 10, and therefore the invention claimed therein would have been obvious over Fushimi, Brown ’394, and Brown ’098 in view of the knowledge of a person of ordinary skill in the art.

H. Claim 11 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

132. Claim 11 depends from Claim 8, and thus incorporates the limitations of Claim 8. Claim 11 further recites, “at least one fastener that is sized and shaped to orient the anti-splash body in a vertical direction parallel to a vertical direction of a urinal wall.” As I explained in Claim 1[A], above, both Fushimi and Brown '394 disclose this additional limitation

133. Accordingly, it is my opinion that both Fushimi and Brown '394 disclose this limitation, and therefore the invention claimed therein would have been obvious over Fushimi, Brown '394, and Brown '098 in view of the knowledge of a person of ordinary skill in the art.

I. Claim 13 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

134. Claim 13 depends from Claim 8, and thus incorporates the limitations of Claim 8. Claim 13 further recites, “a perforated coupling region disposed between the anti-splash body and the base, the perforated coupling region configured to allow the base move from a first position parallel to the anti-splash body to a second position including the base being in the direction substantially perpendicular from

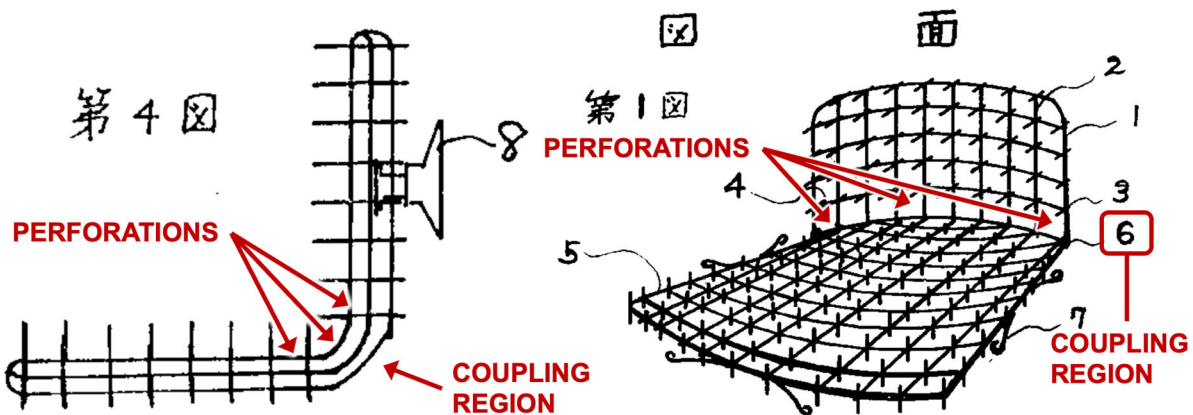
the first portion⁵ of the anti-splash body.” As I explain below, Fushimi discloses this additional limitation, and, in any event, it would have been obvious over Brown ’394, with or without Fushimi, in light of the knowledge of a person of ordinary skill.

135. The ’649 Patent describes that “‘perforated’ is defined herein as visibly displaying a hole, perforation, puncture, or other visible marking such that the user is provided with a visual indication of where the anti-splash body 104 may be uncoupled, i.e., separated, from the base 106. Said another way, the anti-splash body 104 may be removably coupled from the base 106.” Ex. 1001, 7:48-53. The specification also states that the coupling region can “allow the base to move between a first position, including the base oriented in a direction parallel to the anti-splash body, and a second position including the base oriented in a direction substantially perpendicular from the base.” *Id.* 2:17-21.

136. Fushimi includes a perforated coupling region between the base and anti-splash body. As depicted in the side views of the Fushimi embodiments below,

⁵ In my analysis, I have treated limitation 18[A][2]’s “first portion” as the bottom portion of the anti-splash body.

the area between the anti-splash body (vertical side 4) and base (bottom side 5) includes openings.

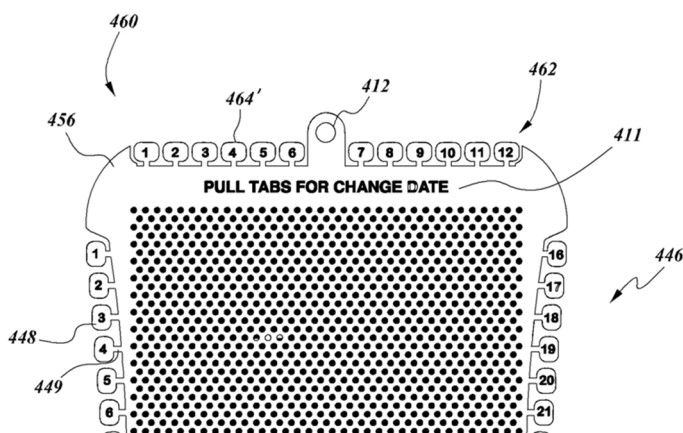


Ex. 1004, Figs. 1, 4 (annotated).

137. A person of ordinary skill would understand the coupling region at the bend (support 6) is configured to translate the base from a position parallel to the anti-splash body to a position substantially perpendicular to the anti-splash body. As described above, Fushimi teaches the it can be “bent freely” at this region “to make it easy to handle.” *Id.*, 2. A person of ordinary skill would further understand Fushimi to teach that the base and anti-splash body of its device can be configured such that the device is flat for handling and then can be bent to a perpendicular configuration for use as depicted above. Thus, it is my opinion that Fushimi teaches the limitation of Claim 13.

138. Brown '394 also teaches, or at least suggests, the added limitation of Claim 13. Brown '394 discloses a perforated coupling region. As discussed above, Brown '394 discloses urinal screens with perforations to separate portions of the screen. In some embodiments, “the date tab may not be an actual tab, but rather may be a portion of a perforated cutout or hole.” Ex. 1006, 5:9-10. One advantage of this type of tab “is the simplicity of the construction, i.e., the date tabs may be formed by perforating the cutouts or holes, without the need to mold other structures such as ribs or webbing.” *Id.*, 5:13-16. A person of ordinary skill would understand the date tabs to be attached to the body of the urinal screen at a perforated coupling region.

139. Additionally, as shown in Figure 12 below, Brown '394 also discloses a visible marking indicating to the user that the date tabs may be uncoupled from the urinal screen.



Id., Fig. 12 (cropped).

140. Finally, Brown '394 discloses the use of two-part urinal screens in a single urinal, namely one part on the back wall and one covering the drain. *Id.*, 12:1-5. It would have been obvious to a person of ordinary skill, at the time of the '649 Patent's invention, to join the two parts at a perforated coupling region based on the teachings of Brown '394 and Fushimi.

141. A person of ordinary skill designing a two-part urinal screen as disclosed in Brown '394 would be motivated to manufacture the device as a single unitary assembly, which would then be bent or separated by the user prior to installation in a urinal. It would have been obvious to do so because use of one-piece construction is well known, and is merely a matter of obvious engineering choice. Additionally, a person of ordinary skill would have recognized that manufacturing costs could be reduced by reducing the number of separate molded parts required for each unit. For example, "[s]tudies have indicated that in a wide variety of industries, assembly costs account for about 40 to 50 percent of the total product cost. Designers, therefore, are always trying to reduce the part count to keep assembly costs down and improve product quality." Ex. 1021, 2.

142. A person of ordinary skill would understand that a perforated region, as taught by Brown '394, would provide the user with the ability to separate the two parts of a two-part urinal (vertical and horizontal as taught by Brown '394, Ex. 1006,

12:1-5) if it were manufactured as a unitary assembly. Likewise, the perforated region would provide an indication to the user about where the two parts could be separated. Additionally, a person of ordinary skill would understand that Brown '394 also teaches slits 18 that provide the user with an indication of where the user of a two-part urinal screen manufactured as a unitary assembly would translate the two parts from parallel to perpendicular while they remained coupled.

143. Accordingly, it is my opinion that Fushimi and Brown '394 both disclose this additional limitation, and, in any event, it would have been obvious in light of the knowledge of a person of ordinary skill. Therefore the invention claimed therein would have been obvious over Fushimi, Brown '394, and Brown '098 in view of the knowledge of a person of ordinary skill in the art.

J. Claim 14 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

144. Claim 14 depends from Claim 8, and thus incorporates the limitations of Claim 8. Claim 14 further recites, “wherein the base is made of buoyant material.” As I explain below, Brown '098 discloses this additional limitation.

145. A person of ordinary skill would generally understand that a “buoyant” material, in the context of designing and manufacturing urinal screens, to mean a material which floats in water at regular temperatures and pressures. In that

environment, water has a density of 1g/cm^3 , so a buoyant material would have a density less than 1g/cm^3 .

146. Brown '098 discloses that its frame and posts can be made molded from ethylene vinyl acetate (EVA). Ex. 1005, 4:22-25. A person of ordinary skill would know EVA is buoyant. EVA has a density between 0.926 and 0.950 g/cm^3 . Ex. 1022, 1. Brown '098 is therefore made of buoyant material.

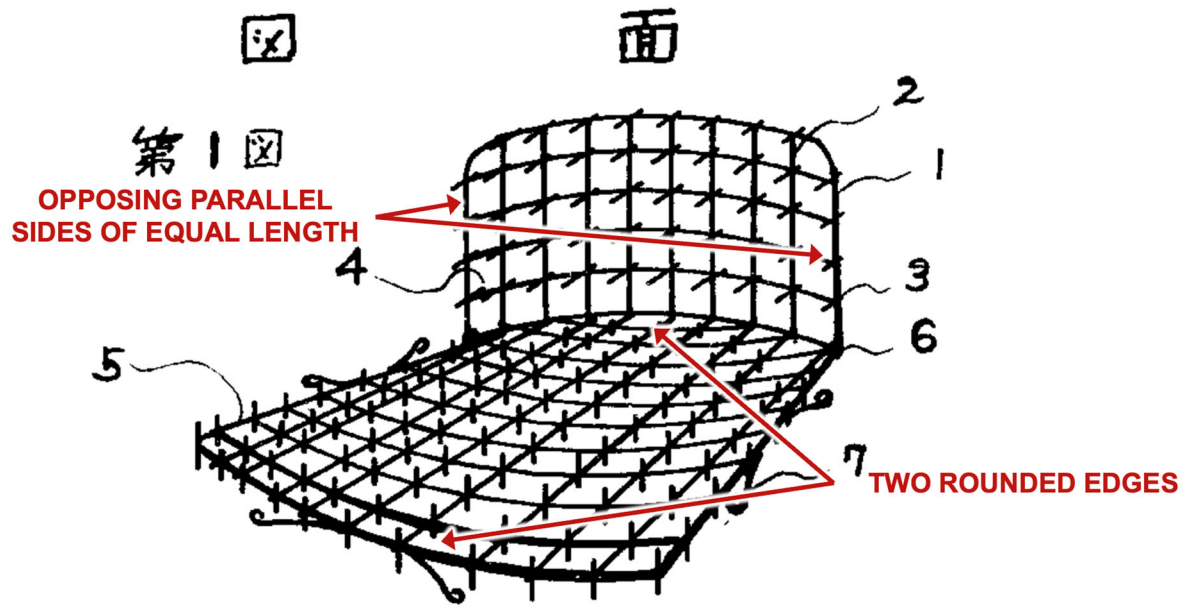
147. Accordingly, it is my opinion that Brown '098 discloses this limitation, and therefore the invention claimed therein would have been obvious over Fushimi, Brown '394, and Brown '098 in view of the knowledge of a person of ordinary skill in the art.

K. Claim 15 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

148. Claim 15 depends from Claim 8, and thus incorporates the limitations of Claim 8. Claim 15 further recites, “wherein the anti-splash body is a rectangular-like shape, and the base is a circular-like shape.”

149. As I discussed in Claim 1, above, Fushimi includes an anti-splash body (vertical side 4) and a base (horizontal side 5). As shown below, Fushimi's base is “circular-like” because, using the definition of the '649 Patent, it has at least two round edges. Likewise, Fushimi's anti-splash body is “rectangular-like” because,

using the definition of the '649 Patent, it has at least one pair of opposing parallel sides of equal length.



Ex. 1004, Fig. 1 (annotated).

150. To the extent there were any question as to the circular-like shape of Fushimi's base, it would have been obvious to one of skill to make it so.

151. A person of ordinary skill would have been motivated to shape a urinal screen according to the shape of the urinal in which it would have been installed, which was common at the time of the '649 Patent's invention. *See, e.g.* Ex 1005, 4:14-15 ("In some embodiments, the screen 10 is shaped to fit a particular urinal or toilet."); Ex. 1004, 2 ("a fine mesh (2) is stretched over... an L-shaped frame (1) formed to fit the inside perimeter of the urinal . . .").

152. A person of ordinary skill would have recognized that urinal drains are typically round. Ex. 1001, 8:23-25. Accordingly, using round urinal screens to cover round drains was common at the time. *See, e.g.*, Ex. 1005, 4:11-14 (disclosing a round urinal screen is round, among other shapes); Ex. 1006, 3:44-45 (disclosing a urinal screen that “may have a *circular*, oblong, square, rectangular, or polygonal shape.”) (emphasis added); Ex. 1007, ¶0036 (disclosing a base (pouch 500) which “may have a generally round configuration”).

153. Similarly, A person of ordinary skill would have recognized that a urinal’s back wall is generally rectangular, having two parallel sides extending vertically. Brown ’394 discloses a rectangular embodiment, shown below, “configured to be installed on the back wall of a urinal.” Ex. 1006, 11:14-15.

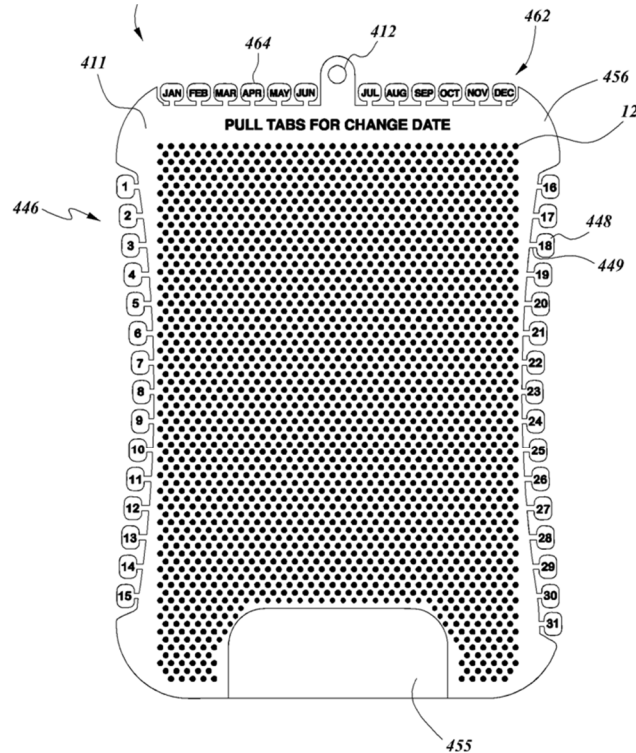


FIG. 12

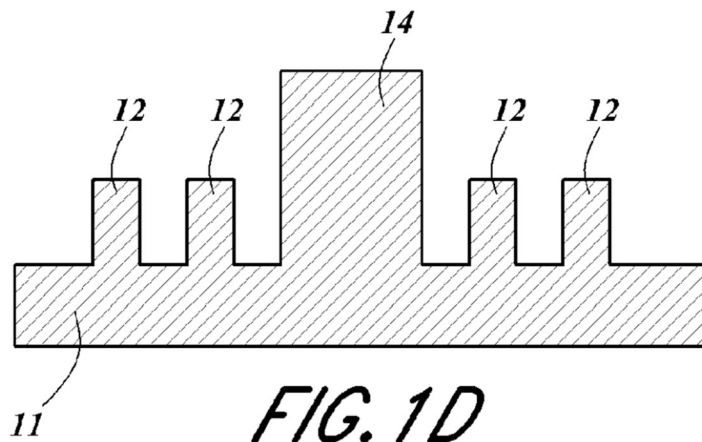
Id., Fig. 12. This embodiment has a pair of opposing, parallel sides, and is therefore rectangular-like. *See also, e.g.*, Ex. 1009 (disclosing a rectangular-like urinal screen for installation on the rear wall of a urinal); Ex. 1011 (same); Ex. 1012 (same); Ex. 1013 (same).

154. Accordingly, the claimed invention of Claim 15 would have been obvious over Fushimi, Brown '394, and Brown '098 in view of the knowledge of a person of ordinary skill in the art.

L. Claim 16 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

155. Claim 16 depends from Claim 8, and thus incorporates the limitations of Claim 8. Claim 16 further recites, “wherein the plurality of protrusions on the anti-splash body are of a variable length.” As I explain below, both Brown '394 and Brown '098 disclose this additional limitation.

156. Brown '394 discloses that its “protrusions 12, 14 and 16 may vary in size, shape, and pattern.” Ex. 1006, 3:51-52. Figure 1D, below, shows protrusions of two different lengths.



Id., Fig. 1D.

157. Likewise, Brown '098 discloses that its protrusions (posts 22) can be a variety of lengths. “In some cases, each post is at least 1/5 shorter, at least 1/10 shorter, at least 1/8 shorter, at least 1/4 shorter, at least 1/3 shorter, at least 1/2 taller, at least 1/4 taller, at least 1/8 taller, at least 1/10 taller, and/or at least 1/16 taller than

at least one of the 3 closest posts 22, at least one of the 5 closest posts 22, at least one of the 7 closest posts 22, at least one of the 9 closest posts 22, at least one of the 10 closest posts 22, at least one of the 12 closest posts 22, and/or at least one of the 15 closest posts 22.” Ex. 1005, 6:10-18. Although Brown ’098’s urinal screens are generally placed over the urinal’s drain, using protrusions of variable length on the anti-splash body of a urinal screen with a base and an anti-splash body would have been obvious to a person of ordinary skill based on the disclosures in Fushimi, Brown ’394, Brown ’098, and the knowledge of a person of ordinary skill.

158. Accordingly, it is my opinion that Claim 16 would have been obvious over Fushimi, Brown ’394, and Brown ’098 in view of the knowledge of a person of ordinary skill in the art.

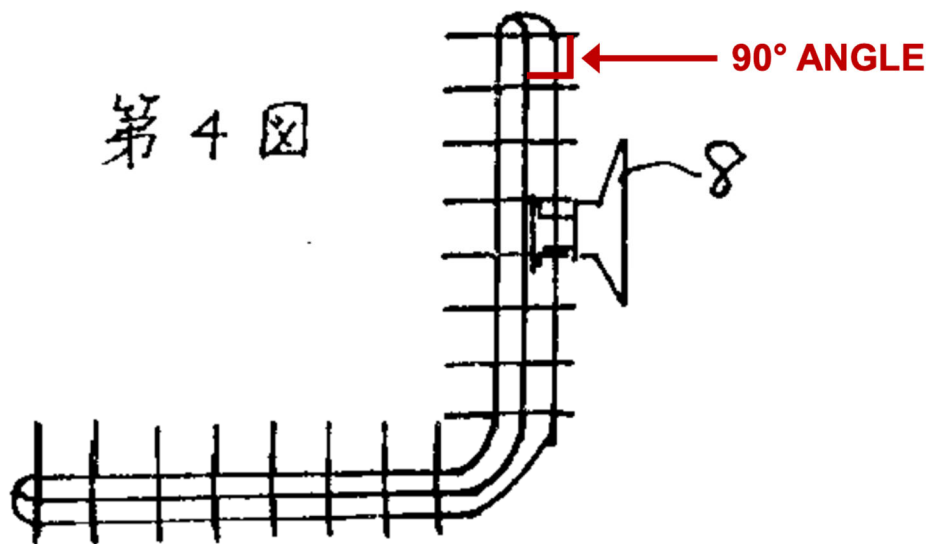
M. Claim 17 would have been obvious over Fushimi, Brown ’394, and Brown ’098 in light of the knowledge of a person of ordinary skill.

159. Claim 17 depends from Claim 8, and thus incorporates the limitations of Claim 8. Claim 17 further recites, “an angled surface at a top of the anti-splash body that is configured to direct a flow of water from the back wall of the urinal over the front surface of the anti-splash body when the anti-splash device is mounted in the urinal.” As I explain below, Fushimi discloses this additional limitation.

160. Fushimi discloses that its shape, shown below, facilitates the flow of water along the entire anti-splash device. “The shape is formed to fit the inside

periphery of the urinal, so the flushing water flowing out of the flushing pipe falls easily over the entire device, keeping it always clean. . . .” Ex. 1004, 3. One aspect of Fushimi’s shape that ensures water flows across the entire device are the horizontal protrusions (brushes 3) extending away from vertical side 4. The projections help to direct water onto vertical edge 4 which may otherwise pass just barely in front of or behind the surface of mesh 2 without contacting it. Additionally, the rear projections push vertical edge 4 away from the wall, preventing contact that may block flowing water.

161. As shown below, brushes 3 create an angled portion as they extend away from vertical edge 4.



Id., Fig. 4 (annotated).

162. Accordingly, it is my opinion that Fushimi discloses the additional limitations of Claim 17, and therefore the invention claimed therein would have been obvious over Fushimi, Brown '394, and Brown '098 in view of the knowledge of a person of ordinary skill in the art.

N. **Claim 18 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.**

163. Claim 18 is generally directed to a method of installing the device of Claim 8. I address below how Fushimi, Brown '394, and Brown '098, in view of the knowledge of a person of ordinary skill in the art, renders obvious the claimed invention of Claim 18.

1. **Preamble: “A method of mounting a urinal anti-splash device within a urinal”**

164. The preamble to Claim 18 recites a “[a] method of mounting a urinal anti-splash device within a urinal.” I understand that patent preambles are not always limiting. I have not been asked to render an opinion on whether the preamble of Claim 18 is limiting. Regardless, as I explain below, Fushimi discloses a method for installing a urinal anti-splash device within a urinal.

165. As I discussed in Claim 1, above, Fushimi discloses a urinal anti-splash device. Further, Fushimi discloses that “[w]hen the urinal is attached to the inner periphery of the urinal by sliding and pressing the tip of the tensioning legs, the

entire unit is composed of an elastic brush and fine mesh, so the urine is diverted and depressurized by the brush and the mesh, the pressure is reduced, the sound is reduced and muffled, and the urine flows away without splashing elsewhere.” Ex. 1004, 2. A person of ordinary skill would understand that Fushimi’s device would be attached (i.e. installed) in a urinal by first placing the device in a urinal, and then “sliding and pressing the tip of the tensioning legs.” Fushimi also teaches mounting to the back wall of the urinal with a suction cup. Therefore, it is my opinion that Fushimi discloses a method for installing a urinal anti-splash device within a urinal.

2. 18[A]: “providing a urinal anti-splash device”

166. Limitation 18[A] recites “providing a urinal anti-splash device.” As I discussed in Claims 1 and 8, above, Fushimi, Brown ’098, and Brown ’394 all disclose “urinal anti-splash devices.”

3. 18[A][1]: “an anti-splash body configured to be mounted on a back wall of a urinal, the anti-splash body including a plurality of protrusions extending from a front surface of the anti-splash body, wherein at least some of the protrusions have a base at the front surface of the anti-splash body that is wider than a top of the protrusion at the opposite end of the protrusion;”

167. Limitation 18[A][1] recites “an anti-splash body configured to be mounted on a back wall of a urinal, the anti-splash body including a plurality of protrusions extending from a front surface of the anti-splash body, wherein at least some of the protrusions have a base at the front surface of the anti-splash body that

is wider than a top of the protrusion at the opposite end of the protrusion.” As I explained in Claims 1 and 8, this limitation would have been obvious over Fushimi, Brown ’394, and Brown ’098 in light of the knowledge of a person of ordinary skill.

4. **18[A][2]: “a base that is attached to the anti-splash body and which is configured to extend in a direction substantially perpendicular from the first portion to cover a drain of a urinal, and which further includes a plurality of protrusions extending outwardly from the base, the second plurality of protrusions are arranged to extend in a direction substantially perpendicular from plurality of protrusions of the anti-splash body;”**

168. Limitation 18[A][2] recites “a base that is attached to the anti-splash body and which is configured to extend in a direction substantially perpendicular from the first portion⁶ to cover a drain of a urinal, and which further includes a plurality of protrusions extending outwardly from the base, the second⁷ plurality of protrusions are arranged to extend in a direction substantially perpendicular from plurality of protrusions of the anti-splash body.” As I discussed in Claims 1 and 8,

⁶ In my analysis, I have treated limitation 18[A][2]’s “first portion” as the bottom half of the anti-splash body.

⁷ In my analysis, I have treated limitation 18[A][2]’s “second plurality of protrusions” as the plurality of protrusions extending from the base.

above, this limitation would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

5. 18[B]: “mounting the anti-splash body on the back wall of a urinal”

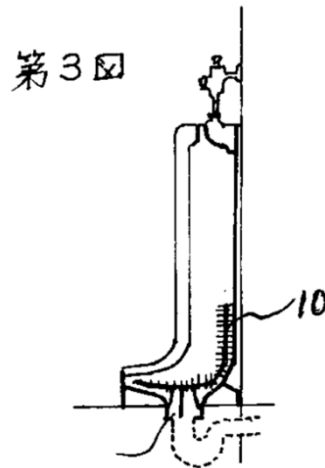
169. Limitation 18[B] recites “mounting the anti-splash body on the back wall of a urinal.” Fushimi discloses this method step.

170. As I discussed in Claims 1[A] and 8[A], above, Fushimi discloses that it can be mounted to a urinal for use, and that it can be mounted to a urinal by pressing a suction cup, positioned on the rear face of its anti-splash body, against the back wall of a urinal.

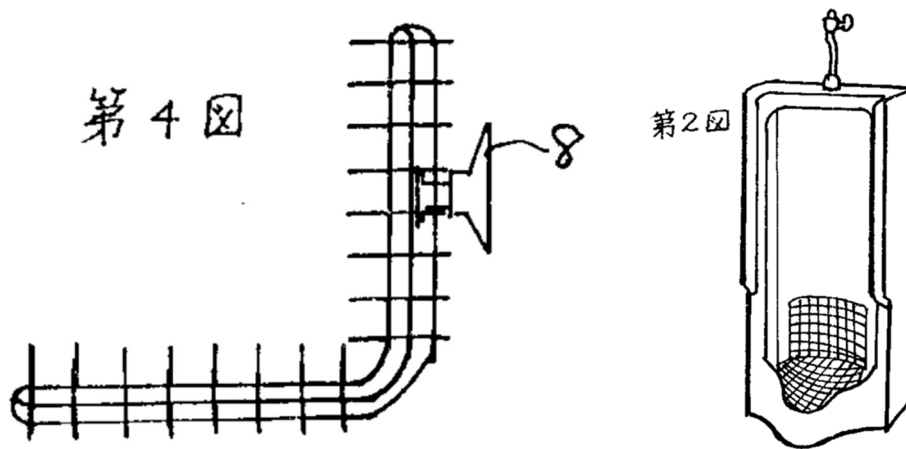
6. 18[C]: “placing the base over a urinal drain”

171. Limitation 18[C] recites “placing the base over a urinal drain.” Fushimi discloses this method step.

172. As I discussed in Claims 1[B] and 8[B], above, Fushimi discloses that its base is sized and shaped to cover at least a portion of a urinal drain. When installed in a urinal, Fushimi’s base would cover at least a portion of the urinal’s drain, as shown below.



Ex. 1004, Fig. 3. In this configuration, the device is attached by “stretching it into the drainage cavity of the urinal.” *Id.*, 4. However, Fushimi also discloses that it can be attached to the rear wall of a urinal with a magnet or suction cup, *id.*, 3, as shown in Figures 2 and 4, below.



Id., Figs. 2, 4.

173. A person of ordinary skill would understand that when Fushimi's device was attached using a suction cup instead of stretching the device into the drainage cavity, the base would extend over, but not into, the urinal's drain.

174. Accordingly, it is my opinion that the combination of Fushimi, Brown '394, and Brown '098 discloses or teaches each limitation of Claim 18, and therefore the invention claimed therein would have been obvious over Fushimi, Brown '394, and Brown '098 in view of the knowledge of a person of ordinary skill in the art.

O. Claim 20 would have been obvious over Fushimi, Brown '394, and Brown '098 in light of the knowledge of a person of ordinary skill.

175. Claim 20 depends from Claim 18, and thus incorporates the limitations of Claim 18. Claim 20 further recites the step of “bending the urinal anti-splash device at a perforated coupling region disposed between the anti-splash body and the base, the perforated coupling region configured to allow the base to move relative to the anti-splash body, including to move from a first position parallel to the anti-splash body to a second position substantially perpendicular from the anti-splash body.” As I discussed in Claim 13, above, Fushimi discloses this additional limitation, and, in any event, it would have been obvious over Brown '394, with or without Fushimi, in light of the knowledge of a person of ordinary skill.

176. Accordingly, it is my opinion that the invention claimed in Claim 20 would have been obvious over Fushimi, Brown '394, and Brown '098 in view of the knowledge of a person of ordinary skill in the art.

V. GROUND 2: CLAIMS 6, 10, 15, AND 17 WOULD HAVE BEEN OBVIOUS OVER FUSHIMI, BROWN '394, BROWN '098, AND EITHER ONE OF VALADEZ AND WISE IN LIGHT OF THE KNOWLEDGE OF A PERSON OF ORDINARY SKILL IN THE ART

177. As described above, certain of the challenged claims address the “elongated” nature of the anti-splash body. Challenged Claim 6 requires an anti-splash body with a “longitudinal length.” Per the '649 Patent, a “longitudinal length” is a length in an “elongated direction.” Challenged Claim 10 requires an anti-splash body with an “elongated shape.” These claim would have been obvious over the prior art of Ground 1 as I have described above. Further, to the extent there were any question regarding the obviousness Claims 6 and 10 in view of the prior art of Ground 1, these claims would have been obvious in view of the prior art of Ground 1 in combination with Valadez and/or Wise. Valadez and Wise explicitly teach the claimed “longitudinal length” and “elongated shape” features. Valadez and Wise also further demonstrate features of other claims addressed in Ground 1 and these are also addressed below.

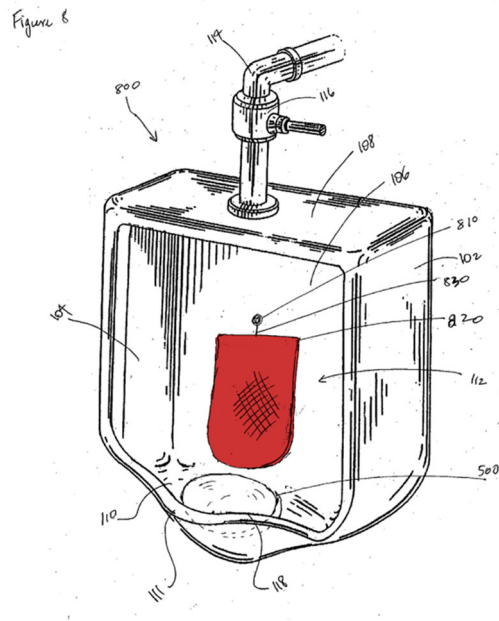
A. Claim 6 would have been obvious over the art of Ground 1 in combination with Valadez and/or Wise in light of the knowledge of a person of ordinary skill

178. Claim 6 depends from Claim 1, and thus incorporates the limitations of Claim 1. Claim 6 further recites, “wherein the plurality of protrusions on the anti-splash body substantially span a longitudinal length of the anti-splash body and define a plurality of protrusion voids between the protrusions of the plurality of protrusions.” This limitation would have been obvious over the art of Ground 1 in combination with Valadez and/or Wise, in light of the knowledge of a person of ordinary skill. Valadez and Wise each explicitly disclose urinal anti-splash devices having a longitudinal length as that term is used in the ’649 Patent.

179. It would have been obvious to a person of ordinary skill to combine the art of Ground 1 with Valadez and/or Wise to provide an anti-splash body having a longitudinal length.

1. It would have been obvious to a person of ordinary skill to combine Valadez with the art of Ground 1

180. Valadez discloses several embodiments of anti-splash guards, including the one shown below, which includes an anti-splash body that hangs vertically along the rear wall of a urinal “by means of a suction cup 810 and a hook 830.” Ex. 1007, ¶10038. The anti-splash body has a first portion (its bottom half), a second portion (its top half), and a length separating the two portions.



Id., Fig. 8 (annotated).

181. Additionally, Valadez discloses that its anti-splash body can be vertically elongated, making its length longitudinal. Valadez discloses a range of dimensions for its anti-splash guard. “In one embodiment, the length 122 of the anti-splash guard 102 is between about 8-16 inches, preferably between about 11-13 inches, and more preferably about 12 inches. Additionally, in one embodiment, the width 124 of the anti-splash guard 102 is between about 8-16 inches, preferably between about 11-13 inches, and more preferably about 12 inches.” Ex. 1007, ¶10024. An embodiment of Valadez’s anti-splash guard like the one pictured above in Figure 8, measuring 16 inches tall and 8 inches wide, (i.e. twice as long as wide)

is within the ranges disclosed by Valadez, and is elongated according to the '649 Patent. Accordingly, it is my opinion that Valadez discloses a longitudinal length.

182. A person of ordinary skill would be motivated to combine Fushimi's anti-splash device with the range of dimensions taught by Valadez, based on the teachings of Fushimi and Valadez, as well as the knowledge of a person of ordinary skill.

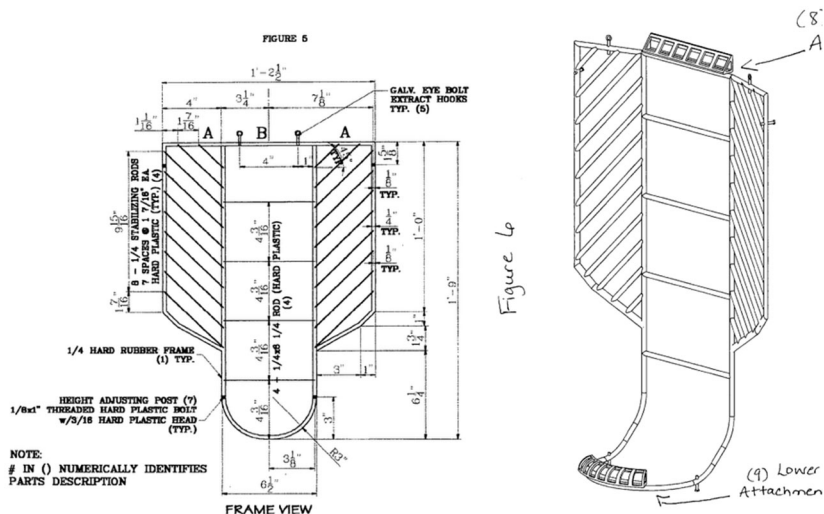
183. A person of ordinary skill would understand the desirability of combining the adaptable dimensions of Valadez's anti-splash body with Fushimi based on complimentary teachings in both references. According to Fushimi's teachings, it is important to adapt the shape of an anti-splash to match the shape of the urinal in which it will be installed. Fushimi's frame is "formed to fit the shape of the inner periphery of the urinal." Ex. 1004, 1. Valadez likewise teaches that it is important to adapt the shape of its anti-splash body according to the shape of the urinal in which it will be used. "[A]nti-splash guard 120 ... can be contoured and/or adapted to fit various types of urinals [including] an Innsbrook 0.5 Urinal 200, a Lynbrook 0.85 Urinal 202. . . . [and] may also be contoured and/or adapted to fit various other types of generally known lavatory devices and/or urinals including waterless urinals, dual-flush urinals, and high efficiency urinals." Ex. 1007, ¶0032.

184. A person of ordinary skill would have understood that combining Fushimi with Valadez in this way would have constituted nothing more than a simple substitution of one well-known element—the dimensions for an anti-splash body designed to fit a variety of urinals—for another well-known element—Fushimi’s anti-splash designed to fit a variety of urinals, albeit without calling out specific dimensions. Likewise, a person of ordinary skill would also have understood that doing so would have constituted nothing more than the use of a known technique—varying the size of an anti-splash body—to improve Fushimi’s anti-splash body.

185. A person of ordinary skill would have had a reasonable expectation of success in modifying Fushimi to use the range of dimensions taught by Valadez. Such a person would have understood that a variety of sizes were useful for the Fushimi anti-splash body, including the sizes within the ranges specified by Valadez. Moreover, a person of ordinary skill would understand that, because Fushimi’s device could be attached to the rear wall of a urinal with a suction cup or a magnet, there would have been no concerns associated with the use of a lengthened shape. For example, there would be no concern of a taller device falling forward because of its higher center of gravity.

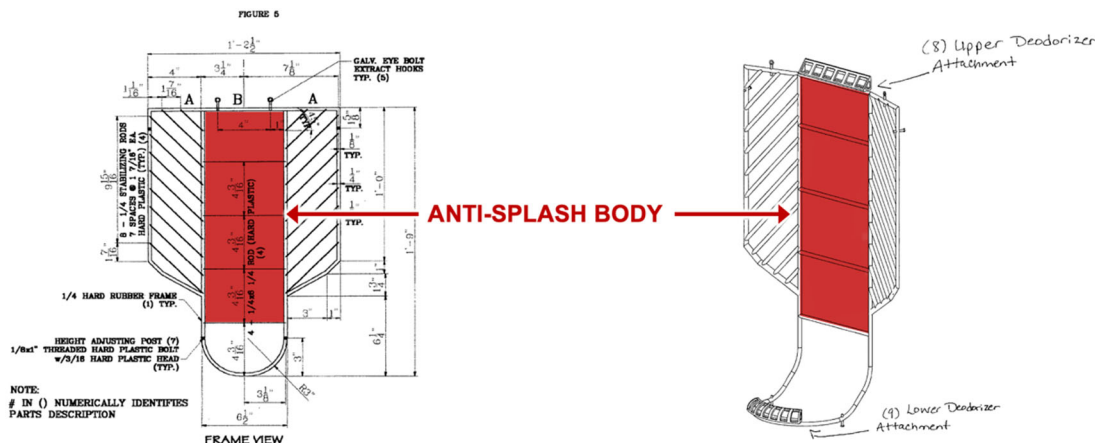
2. **It would have been obvious to a person of ordinary skill to combine Wise with the art of Ground 1**

186. Wise discloses an anti-splash urinal insert, shown below in Figures 5 (without optional deodorant attachments) and 6 (including deodorant attachments).



Ex. 1008, Figs. 5 (unaltered), 6 (rotated counter clockwise).

187. As shown below, Wise discloses an anti-splash body including a first and second portion separated by a longitudinal length.

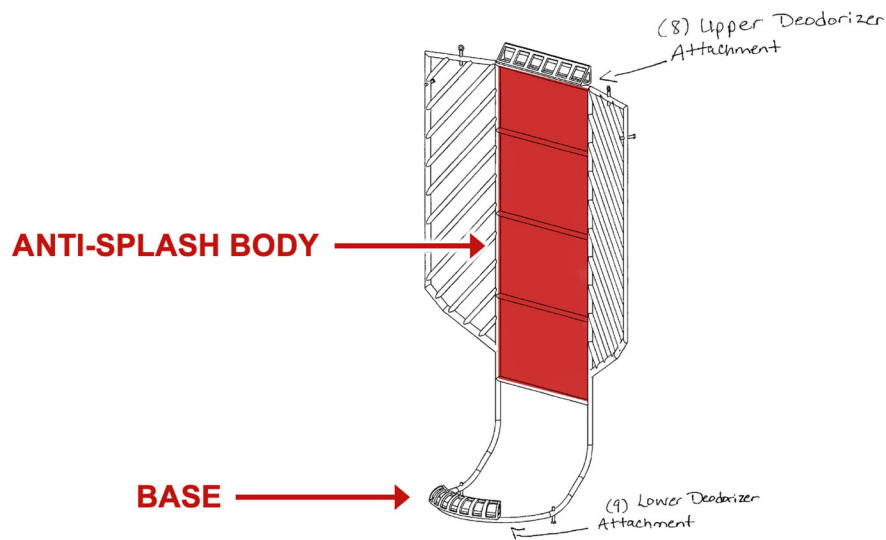


Id. Figs. 5 (annotated), 6 (rotated counterclockwise and annotated).

188. Figure 5 of Wise includes detailed measurements for its insert. The center section, highlighted in red above, is elongated because it has a width of 6 1/2 inches, and a height of over 16 inches (i.e., a length at least twice as long as a width). The length running from the bottom of the anti-splash body to its top is, therefore, longitudinal.

189. A person of ordinary skill would have been motivated to combine Wise's vertically elongated anti-splash body with Fushimi's urinal anti-splash device based on the teachings of Fushimi and Wise, as well as the knowledge of a person of ordinary skill.

190. A person of ordinary skill would understand the desirability of combining the vertically elongated anti-splash body disclosed by Wise with Fushimi's urinal anti-splash device based on the complimentary teachings in both references. According to Fushimi's teachings, it is important to adapt the shape of an anti-splash body to match the shape of the urinal in which it will be installed. Fushimi's frame is "formed to fit the shape of the inner periphery of the urinal." Ex. 1004, 1. Similarly, the Wise anti-splash device "employs an insert designed to fit into a variety of styles of conventional upright urinals." Ex. 1008, ¶0002. Wise also has a vertical anti-splash body and a horizontal base for covering a urinal drain, as shown below.



Id., Fig. 6 (annotated).

191. A person of ordinary skill would understand that the vertically elongated anti-splash body of Wise would provide additional anti-splash protection by increasing the proportion of the rear wall's surface that was covered by the anti-splash body, while remaining compatible with a variety of urinals.

192. Further, a person of ordinary skill would recognize that using a longer anti-splash body, as taught by Wise, with the Fushimi anti-splash device would have constituted nothing more than a simple substitution of one well-known element—a longer anti-splash body of Wise—for another well-known element—the anti-splash body of Fushimi. A person of ordinary skill would also have understood that doing so would have constituted nothing more than the use of a known technique—varying the size of an anti-splash body—to improve Fushimi's known anti-splash body.

193. Finally, a person of ordinary skill would have had a reasonable expectation of success in modifying Fushimi to provide a vertically elongated anti-splash body as taught by Wise. Such a person would have understood that a variety of sizes were useful for the Fushimi anti-splash body, including the size of Wise’s anti-splash body. Moreover, a person of ordinary skill would understand that, because Fushimi’s device could be attached to the rear wall of a urinal with a suction cup or a magnet, there would have been no concerns associated with the use of a lengthened shape. For example, there would be no concern of a taller device falling forward because of its higher center of gravity.

194. Accordingly, it is my opinion that Claim 6 would have been obvious over the art of Ground 1 in combination with Valadez and/or Wise in view of the knowledge of a person of ordinary skill in the art.

B. Claim 10 would have been obvious over the art of Ground 1 in combination with Valadez and/or Wise in light of the knowledge of a person of ordinary skill

195. Claim 10 depends from Claim 8, and thus incorporates the limitations of Claim 8. Claim 10 further recites, “wherein the anti-splash body includes an elongated shape of a flexible material.” This limitation would have been obvious over Fushimi, alone or in combination with Valadez and/or Wise, in light of the knowledge of a person of ordinary skill.

196. As I discussed above in Ground 1, Claim 6, above, Fushimi discloses an anti-splash body with a plurality of protrusions spanning its length and defining protrusion voids. Furthermore, it would have been obvious to a person of ordinary skill to elongate Fushimi's anti-splash body.

197. Likewise, as I discussed in this Ground 2, Claim 6, above, it would have been obvious to a person of ordinary skill to adapt Fushimi's anti-splash body to use the dimensions of the elongated anti-splash bodies disclosed by Valadez and/or Wise.

198. Valadez discloses that it is made of a flexible material. "As further illustrated in FIG. 2, the anti-splash guard 120 comprises fibrous strands 124 that are arranged, positioned, or joined together so as to define a porous mesh or lattice configuration. In one embodiment, the fibrous strands 124 may comprise translucent or opaque materials formed of a semi-rigid or flexible material, such as polyethylene (PE), polypropylene (PP), polyvinyl-chloride (PVC), polyethylene-terephthalate (PET), various types of synthetic polyester meshes, etc." Ex. 1007, ¶0025.

199. Likewise, Wise discloses that its frame is "made of a plastic or hard rubber material." Ex. 1008, ¶0013. The '649 Patent discloses that its "anti-splash body 104 may be made of a material that is flexible and tough, such as DuPoint Elvax®250, PVC plastic, or the like." Ex. 1001, 6:41-43. A person of ordinary skill

would understand that hard rubber, while rigid enough to function as a frame for a device like Wise, was at least as flexible as the materials disclosed in the '649 Patent.

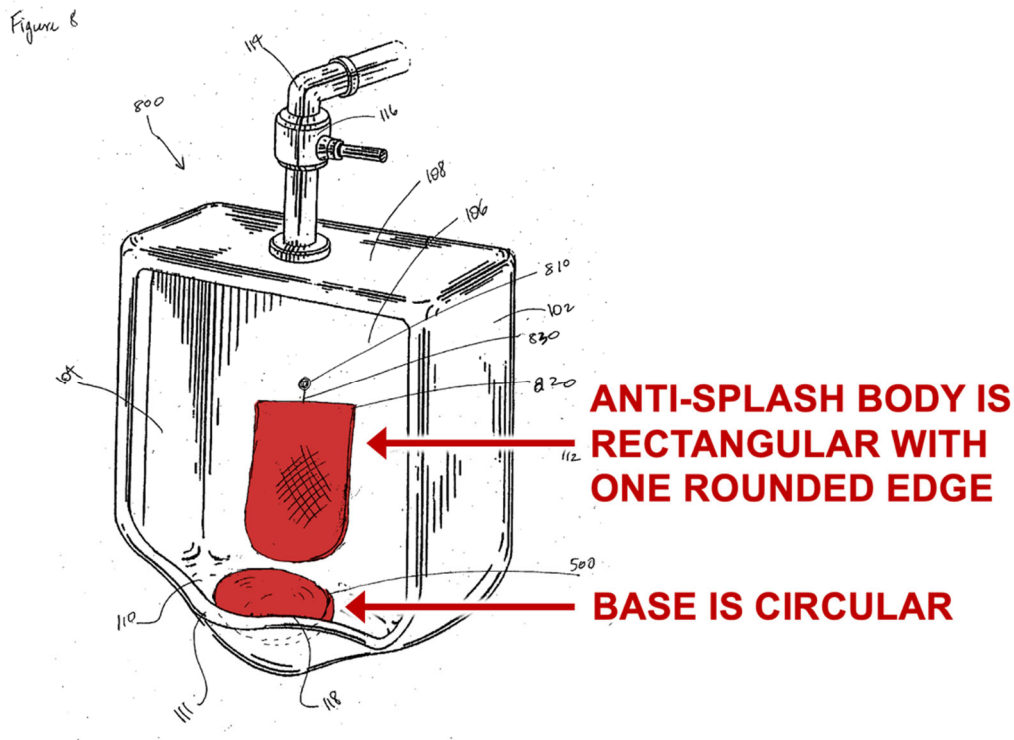
200. Accordingly, it is my opinion that Claim 10 would have been obvious over the art of Ground 1 in combination with Valadez and/or Wise in view of the knowledge of a person of ordinary skill in the art.

C. Claim 15 would have been obvious over the art of Ground 1 in combination with Valadez in light of the knowledge of a person of ordinary skill

201. Claim 15 depends from Claim 8, and thus incorporates the limitations of Claim 8. Claim 15 further recites, “wherein the anti-splash body is a rectangular-like shape, and the base is a circular-like shape.” This limitation would have been obvious over Fushimi alone, or in combination with Brown '394, Brown '098, and/or Valadez, in light of the knowledge of a person of ordinary skill.

202. As I discussed in Ground 1, Claims 2 and 15, above, it would have been obvious to a person of ordinary skill to make Fushimi's anti-splash body and base in different shapes, including a rectangular-like anti-splash body and a circular-like base, based on the disclosures in Fushimi, Brown '394, and Brown '098, and the knowledge of a person of ordinary skill.

203. Valadez also discloses a rectangular-like anti-splash body and a circular-like base, as shown in Figure 8, below.



Ex. 1007, Fig. 8 (annotated).

204. As I discussed in this Ground 2, Claim 6, above, it would have been obvious to a person of ordinary skill to adapt Fushimi's anti-splash guard to the range of sizes disclosed by Valadez. In doing so, it would have been obvious to also adapt the shapes of Fushimi's anti-splash guard and base for the same reasons discussed in Ground 1, Claims 2 and 15, above.

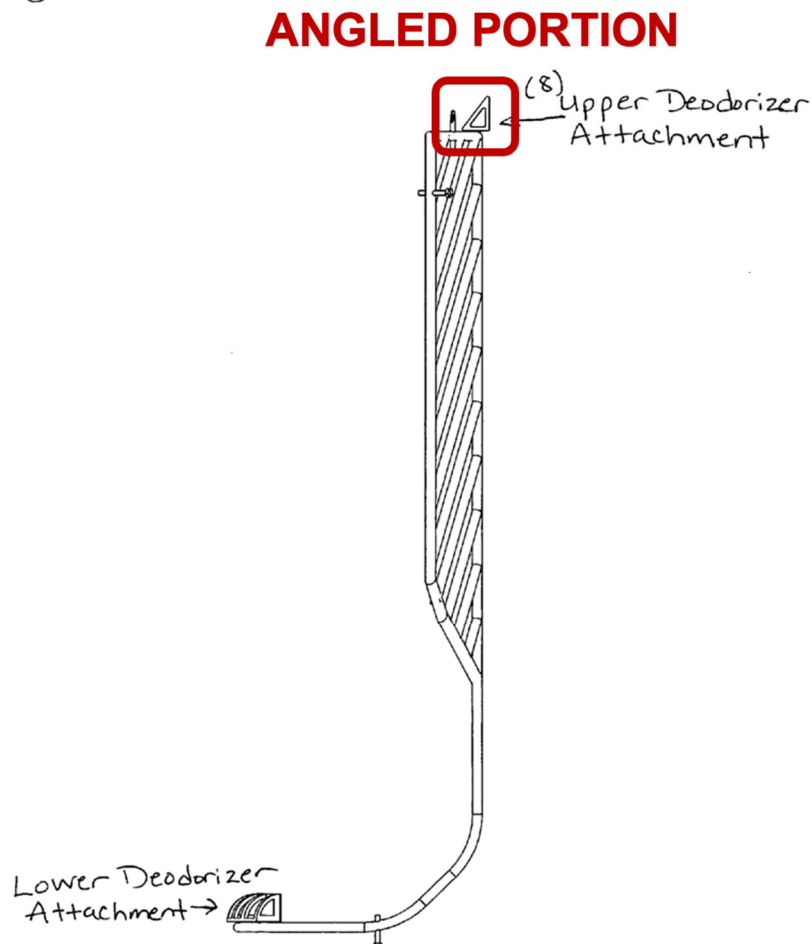
205. Accordingly, it is my opinion that Claim 15 would have been obvious over Fushimi, Brown '394, Brown '098, and Valadez in view of the knowledge of a person of ordinary skill in the art.

D. Claim 17 would have been obvious over the art of Ground 1 in combination with Wise in light of the knowledge of a person of ordinary skill

206. Claim 17 depends from Claim 8, and thus incorporates the limitations of Claim 8. Claim 17 further recites, “an angled surface at a top of the anti-splash body that is configured to direct a flow of water from the back wall of the urinal over the front surface of the anti-splash body when the anti-splash device is mounted in the urinal.” As I discussed in Ground 1, Claim 17, above, this limitation is disclosed by Fushimi. As I discuss below, Wise also discloses this limitation.

207. As shown below, Wise’s optional upper deodorizer attachment is an angled portion, and is attached to the top of the anti-splash body.

Figure 8



Ex. 1008, Fig. 8 (annotated). Further, Wise discloses that “[t]he upper deodorizer attachment₈ has a wedge shape which serves to smoothly channel water onto the finned surface of the insert thereby assisting in preventing water splashing during the urinal flush cycle.” *Id.*, ¶0018.

208. As I discussed in discussed in Ground 2, a person of ordinary skill would have been motivated combine the larger anti-splash body disclosed by Wise

with Fushimi’s urinal anti-splash device based on complimentary teachings in both references, and the knowledge of a person of ordinary skill. In making this modification, a person of ordinary skill would have also been motivated to include an upper deodorizer attachment disclosed by Wise.

209. A person of ordinary skill would understand that the wedge-shaped angle of the Wise attachment would more effectively channel water over the front surface of the larger anti-splash body than the approximately 90-degree angle of Fushimi’s angled portion. Additionally, a person ordinary skill would understand that the improved channeling would be important, because enlarging the anti-splash body would increase the surface area to be cleaned during each flush without a corresponding increase to the amount of water dispensed per flush.

210. A person of ordinary skill would also understand that, because the Wise anti-splash body is at least 16 inches tall and extends upward, a deodorizer with a fragrance placed at the top of the body would be positioned much closer to a user’s nose than a base made of fragranced material disclosed by Brown ‘098. Ex. 1005, 4:22-27 (“One method of manufacturing an embodiment of the urinal screen 10 can include... loading the plastic or EVA with at least 15% to about 75% by weight of fragrance material to produce a fragranced plastic or EVA. . . .”).

211. A POSITA making this modification would expect success, because Wise already discloses attaching an upper deodorizer to a vertical anti-splash body.

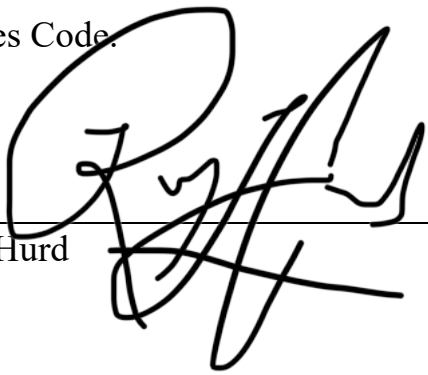
212. Accordingly, it is my opinion that Fushimi and Wise both disclose the additional limitation of Claim 17, and therefore the invention claimed therein would have been obvious over the art of Ground 1 in combination with Wise in view of the knowledge of a person of ordinary skill in the art.

VI. CONCLUSION

213. For the above reasons, it is my opinion that Claims 1, 2, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, and 20 of the '649 Patent would have been obvious over the prior art.

214. 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; and further 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: July 30, 2025

By: 
Randy C. Hurd

APPENDIX A

Randy Craig Hurd

randyhurd@weber.edu · 1704 Lakeview Way; Ogden, UT 84403 · 801-735-6173

EDUCATION

Utah State University, Logan, UT

Ph.D. in Mechanical Engineering: December 2017

- Dissertation: *Water surface impact and ricochet of deformable elastomeric spheres*

Brigham Young University, Provo, UT

M.S. in Mechanical Engineering: June 2015

- Thesis: *The free surface impact dynamics of highly deformable spheres*

B.S. in Mechanical Engineering: August 2012

EXPERIENCE

Assistant Dean, College of Engineering, Applied Science & Technology (2023 – present)

Assistant Professor (2020 – present)

Weber State University (WSU) --- Ogden, UT

- Courses Taught: Materials Science, Fluid Mechanics, Instrumentation, Numerical Methods
- Perform research in fluid dynamics, high-speed imaging, and engineering education

Professional Consultant (2019 – present)

- Provided technical consulting for Knobbe Martens for patent infringement litigation
- Provided high speed imaging and physical analysis for SIM-X

Research Scientist, (2017 – 2020)

Naval Undersea Warfare Center (NUWC) --- Keyport, WA, 2017 – 2020

- Developed and performed land-based acoustic testing and drafted reports on resulting analysis

AWARDS/SERVICE/ACCOMPLISHMENTS

- Naval Undersea Research Program funding recipient, M.S & Ph.D. (2013)
- Milton Van Dyke Award for APS DFD Gallery of Fluid Motion (2014, 2016, 2017)
- Best Presentation Award at ASEE Rocky Mountain Section conference (2016)
- Co-director of Utah Underwater Robotics, STEM outreach program (2012 - 2015)
- WSU RSPG Funding Recipient (2020, 2021, 2022)
- WSU ARCC Funding Recipient (2021)
- WSU Office of Undergraduate Research College Mentor of the Year Award (2022, 2023)
- Served as EAST college representative for WSU Office of Undergraduate Research (2020-23)
- Elected as an EAST college representative for WSU Faculty Senate (2021-23)
- WSU Honors Program Eccles Fellowship (2022)
- WSU EAST College Merit Scholar Award Recipient (2022)
- WSU STAR (Sustainability) Funding Recipient (2024)

PROFESSIONAL SOCIETY/COMMUNITY ASSOCIATIONS

- Tau Beta Pi, ASEE, ASME, APS Division of Fluid Dynamics
- Reviewed articles for the following scientific journals:
Physics of Fluids, J. of Fluids & Structures, Applied Ocean Research

REFERENCES

- **Dr. Barton Smith** – Professor of Mech. Engineering at Utah State University
 - o bartonleesmith@gmail.com (435)-770-8139
- **Dr. Zhao Pan** – Assistant Professor of Mech. Engineering at University of Waterloo
 - o panzhao0417@gmail.com (337)-258-6071
- **Dr. Travis Omer** – Head Data Scientist at Noah
 - o travis.omer@gmail.com (518)-590-3481

RESEARCH

Journal Papers (Peer-Reviewed)

1. **Hurd, R. C.**, Belden, J., Bower, A. F., Holekamp, S., Jandron, M. A. & Truscott, T. T. "Water walking as a new mode of free surface skipping," Scientific Reports 9, article number 6042, 2019.
2. Speirs, N. B., Mansoor, M. M., **Hurd, R. C.**, Sharker, S.I., Robinson, W.G., Williams, B. J., Truscott, T. T. "Entry of a sphere into a water-surfactant mixture and the effect of a bubble layer," Physical Review Fluids, vol. 3 (10) 2018.
3. Smith, D. T., Cook, S. L., Gillespie, M. A., Stevens, K. A., Reynolds, H. C., **Hurd, R. C.**, & Wisco, J.J. "High-speed video capture of anterior cruciate ligament tearing in human and porcine ex vivo specimens," Biology, Engineering and Medicine, vol. 3 (2) 2018.
4. **Hurd, R. C.**, Speirs, N., Belden, J., Pan, Z., Lovett, B., Robinson, W., Zamora, M., Sharker, S., Mansoor, M., Merritt, A., & Truscott, T. T. "Shear joy of watching paint dry," Physical Review Fluids, 2, 090503, 2017.
5. Pan, Z., Kiyama, A., Tagawa, Y., Daily, J., Thomson, S., **Hurd, R. C.**, Truscott, T. "Cavitation onset caused by acceleration," Proceedings of the National Academy of Sciences, 201702502, 2017.
6. **Hurd, R. C.**, Belden, J., Jandron, M. A., Bower, A. F., Fanning, D. T., & Truscott, T. T., "Water entry of deformable elastic spheres," Journal of Fluid Mechanics, vol. 824, pp. 912-930, 2017.
7. Belden, J., **Hurd, R. C.**, Jandron, M. A., Fanning, D. T., Bower, A. F. & Truscott, T. T., "Elastic spheres can walk on water," Nature Communications, 7, 1055, 2016.
8. **Hurd, R. C.**, Fanning, T., Pan, Z., Mabey, C., Bodily, K., Hacking, K., Speirs, N., & Truscott, T. T. "Matryoshka cavity", Physics of Fluids, 27, 091104, 2015.
9. **Hurd, R. C.**, Hacking, K. S., Damarjian, J. L., Wright, G. A., & Truscott, T. T., "Underwater robots surface in Utah", Technology Engineering Teacher, 2015.
10. Truscott, T. T., Belden J. & **Hurd, R. C.**, "Water-skipping stones and spheres." Physics Today, 67 (12), 70-71, Dec. 2014.
11. Daily, D. J., Pendlebury, J., Langley, K., **Hurd, R. C.**, Thomson, S., & Truscott, T. T., "Catastrophic cracking courtesy of quiescent cavitation." Physics of Fluids, 26, DOI: 10.1063/1.4894073, 2014.
12. Mazzeo, B. A., Patil, A. N., **Hurd, R. C.**, Klis, J. M., Truscott, T. T. & Guthrie, W. S., "Air-coupled impact-echo delamination detection in concrete using spheres of ice for excitation", Journal of Nondestructive Evaluation (JONE), December 2013.

Conference Papers (Peer-Reviewed)

1. **Hurd, R. C.**, Khadka, S., Lewis, Y., Christensen, A. & Grote, D. M., "First-Year Bridge Program at Western Teaching University", ASEE Rocky Mountain Section Conference, Boulder, CO, May 15-17, 2024.
2. **Hurd, R. C.**, & Grote, D. M., "Smartphone-Based Labs for Engineering Vibration Class", ASEE Rocky Mountain Section Conference, Golden, CO, May 15-17, 2023.

3. **Hurd, R. C.**, Weiss, D. M., Graham, J. J., & Truscott, T. T., “Future time perspective and problem-based learning in a senior thermo-fluids engineering lab”, ASEE Rocky Mountain Section Conference, Provo, UT, Sept. 22-23, 2017.
4. Graham, J. J., **Hurd, R. C.** & Truscott, T. T., “Adding a new dimension to a traditional conduction lab”, ASEE Rocky Mountain Section Conference, Cedar City, UT, Sept. 30-Oct. 1, 2016. (**Best presentation award**)
5. Wright, G. A., **Hurd, R. C.**, Hacking, K. S. & Truscott, T. T., “A remotely operated vehicle scaffolded activity is increasing student and teacher interest in STEM – a reporting on a three-year study funded by the Office of Naval Research”, 122nd Annual Meeting of the American Society of Engineering Education (ASEE), Seattle, WA, June 14-17, 2015.
6. Jandron, M. A., **Hurd, R. C.**, Belden, J., Bower, A. F., Fennell, W. & Truscott, T. T., “Modeling of Hyperelastic Water-Skipping Spheres using Abaqus/Explicit.” 2014 SIMULIA Community Conference. www.3ds.com/simulia
7. Wright, G. A., **Hurd, R. C.**, Hacking, K. S. & Truscott, T. T., “Using ROVs to teach a blended STEM curriculum.” 121st Annual Meeting of the American Society of Engineering Education (ASEE), Indianapolis, IN, June 15-18, 2014.

Patents

1. **Hurd, R.C.**, Pan, Z., “Splash reducing surfaces
FR 57242-0002001. (**Filed with U.S. Patent Office**)
2. **Hurd, R.C.**, Truscott, T. T., Pan, Z. & Merritt, A., “Splash prevention apparatus.”
U.S. Patent No. 10,612,226. 7 Apr. 2020.

Conference & Symposium Presentations

1. Barlow, E. A., Pan, Z., & **Hurd, R. C.**, “Eliminating Urine Stream Splatter through Fluid Dynamics.” Weber State University - Office of Undergraduate Research Symposium, Ogden, UT. April 12, 2023.
2. **Hurd, R. C.**, Belden, J., Jandron, M., Bower, A., Holekamp, S., & Truscott, T. T., “Water walking – an evolution of water surface skipping.” 70th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Denver, CO. November 19-21, 2017.
3. **Hurd, R. C.**, Belden, J., Pan, Z., Merritt, A. & Truscott, T. T., “Water entry” 69th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Portland, OR. November 20-22, 2016.
4. **Hurd, R. C.**, Belden, J. & Truscott, T. T., “Skipping elastic spheres IV”, Naval Undersea Research Program Annual Meeting, Seattle, WA. June 2016.
5. **Hurd, R. C.**, Belden, J., Pan, Z., Merritt, A. & Truscott, T. T., “Creating a urine black hole.” 68th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Boston, MA. November 22-24, 2015.
6. **Hurd, R. C.**, Belden, J. & Truscott, T. T., “Skipping elastic spheres III”, Naval Undersea Research Program Annual Meeting, Arlington, VA. June 2015.
7. **Hurd, R. C.**, Belden, J. & Truscott, T. T., “Performance enhancing water skipping.” 67th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Francisco, CA. November 23-25, 2014.

8. Belden, J., **Hurd, R. C.**, Jandron, M., Bower, A., & Truscott, T. T., "Oblique impact of water-skipping elastic spheres." 67th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Francisco, CA. November 23-25, 2014.
9. Fanning, D. T., **Hurd, R.**, Belden, J. & Truscott, T. T., "Water Entry of Deformable Spheres." 67th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Francisco, CA. November 23-25, 2014.
10. **Hurd, R. C.**, Belden, J. & Truscott, T. T., "Skipping elastic spheres II", Naval Undersea Research Program Annual Meeting, Naval Undersea Warfare Center, Newport, RI. June 2014.
11. Presented at conference: Truscott, T. T., **Hurd, R. C.**, Jandron, M. & Belden, J., "Water Bouncing Balls: how material stiffness affects water entry." Department of Mechanical Engineering Shell Lecture, University of Colorado, Boulder, CO. April 2014
12. Presented at conference: Truscott, T. T., **Hurd, R.**, Jandron, M. & Belden, J., "Water Bouncing Balls: how material stiffness affects water entry." American Physical Society, Denver, CO. March 2014
13. **Hurd, R. C.**, Hacking, K. & Truscott, T. T., "Urinal dynamics." 66th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Pittsburg, PA. November 24-26, 2013.
14. Hacking, K. S., **Hurd, R. C.**, Wright, G. & Truscott, T. T., "Under-graduate ROV outreach." 66th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Pittsburg, PA. November 24-26, 2013.
15. **Hurd, R. C.**, Belden, J. & Truscott, T. T., "Skipping elastic spheres I", Naval Undersea Research Program Annual Meeting, National Harbor, MD. June 2013.

Conference Posters/Videos

1. Lepus, J., Richardson, P., Blanchard, C., Foremaster, B., Haacke, B., Tenoria, J. & **Hurd, R. C.**, "Electric Powertrain Conversion Kit." Weber State University - Office of Undergraduate Research Symposium, Ogden, UT. December 5, 2023.
2. **Hurd, R. C.**, Barlow, E. A., Pan, Z., Speirs, N. B., Belden, J., Truscott, T.T. "Urine Splatter Patterns. American Society of Mechanical Engineers – Fluids Engineering Division Summer Meeting. August 3-5, 2022.
3. S. Akhmedov, D. Carter, S. Hallows, P. Hunt, B. Kozak, P. Mackay, R. Nielson, Z. Pan, **R. Hurd**. "Vortex Ring Generator," Weber State University - Office of Undergraduate Research Symposium. March 28, 2022.
4. Speirs, N., Mansoor, M., Belden, J., **Hurd, R.**, Pan, Z., & Truscott, T. T., "Fluted films." 70th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Denver, CO. November 19-21, 2017. (*Milton Van Dyke Award*)
5. **Hurd, R. C.**, Speirs, N., Belden, J., Pan, Z., Lovett, B., Robinson, W., Boyer, M., Sharker, S., Mansoor, M., Merritt, A. & Truscott, T. T., "The shear joy of watching paint dry." 69th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Portland, OR. November 20-22, 2016. (*Milton Van Dyke Award*)
6. Pan, Z., **Hurd, R. C.**, Speirs, N., Pitt, W., Wu, N., Zhang, Y. & Truscott, T. T., "Desert dessert." 69th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Portland, OR. November 20-22, 2016.

7. Texier, B., Pan, Z., Lovett, B., Brandenbourger, M., Sharker, S., Maquet, L., Gilet, T., Sampara, N., Le Boulengé, B., Marchiori, K., Belden, J., Dorbolo, S., Strivary, D., **Hurd, R. C.**, Robinson, W. & Truscott, T. T., “Modern art entanglement: comment s’emmêler les pinceaux.” 68th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Boston, MA. November 22-24, 2015.
8. Pan, Z., **Hurd, R. C.**, Merritt, A., Speirs, N., & Truscott, T. T., “Fogged up films.” 68th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Boston, MA. November 22-24, 2015.
9. Fanning, T., Mabey, C., Bodily, K., Pan, Z., Hacking, K., **Hurd, R. C.** & Truscott, T. T., “Matryoshka cavity.” 67th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Francisco, CA. November 23-25, 2014.
(Milton Van Dyke Award)
10. Pan, Z., **Hurd, R. C.**, Pendlebury, J., Fanning, Wilcox, B., Boyer, M. & Truscott, T. T., “Smoke and bubbles”, 67th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Francisco, CA. November 23-25, 2014.
11. Pendlebury, J., **Hurd, R. C.**, Jafek, A., Wilcox, B., & Truscott, T. T., “Spark induced cavitation”, 67th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Francisco, CA. November 23-25, 2014.
12. **Hurd, R. C.**, Mabey, C., Bodily, K., Jafek, Z., Hacking, K., & Truscott, T. T., “Confessions of a sitzpinkler.” 66th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Pittsburg, PA. November 24-26, 2013.
13. **Hurd, R. C.**, Bodily, K., Mabey, C., Townsend, E., Belden, J. & Truscott, T. T., “Squishy spheres spawn sinuous sub-surfaces.” 66th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Pittsburg, PA. November 24-26, 2013.

Grant Writing

As a PhD student I contributed to the preparation of the following awarded proposal:
Office of Naval Research (ONR) Young Investigator Award (YIP), \$499,363, 06/2015 to 09/2018, “Natural swarms and crowds: observation and modeling.” Truscott, T.T. (PI).
 Abstract: Addresses the question of how individual-group coupling gives rise to the often times mystifying collective behavior of animal groups.

Media Coverage

In response publication, “Water entry of deformable spheres,” (Journal of Fluid Mech.).

- Phys.org. “A smoother ride over troubled water.” Aug. 2017.
- Cosmos (Australia). “Building boats from soft materials could make for a smoother ride.” Aug. 2017.
- E&T.org (UK). Hillary Lamb “Smoother boat rides ahoy thanks to water impact research.” Aug. 2017.

In response publication, “Elastic spheres can walk on water,” (Nature Communications).

- Spektrum (Germany). “Why balls jump so well over the water.” May 2016.
- Scholastic Science World. Joanna Klein. “Skipping-Stone Science.” Mar. 2016.
- Wired. “Scientists have made the perfect skimming stone.” Feb. 2016.
- Discover Magazine. Nathaniel Scharping. “Scientists Perfect the Skipping Stone.” Feb. 2016.
- The Times of India. “What’s the science behind water skipping spheres.” Feb. 2016.
- China Times. “What’s the science behind water skipping spheres” Feb. 2016.

In response to hosting first annual competition for Utah Underwater Robotics.

- Deseret News. Ben Lockhart. "Robot Swim: Students test mechanical skills under water." Mar. 2013.
- KSL. "Lehi students build, race robots in underwater obstacle course." Mar. 2013.
- Fox 13. Mark Green. "Children compete with underwater robots." Mar. 2013

MENTORING

A. Mentored Students

Student E.B.

I met Ethan in my ENGR 2010 class and he expressed a strong interest in attending graduate school. We began collaborating on research projects in October 2022. Since that time, Ethan has been instrumental in designing experiments, collecting data and analyzing results for several of my ongoing research projects. His work has predominantly focused on understanding the physics of water droplets impacting a rigid surface and the resulting splash. I encouraged Ethan to apply for a long-term grant from the Office of Undergraduate Research, which he was awarded in 2021 (*Eliminating urine stream splatter through fluid dynamics*). We have not yet submitted our findings from this study due to considerations of intellectual property, but we plan on having Ethan present this work at an appropriate conference very soon. Ethan is currently coordinating a follow-up research effort; we plan on submitting the resulting article to the Journal of Biomimetics.

Student S.N.

Sarah was a standout student in several of my engineering classes. I recently approached her with an idea to research an approach for implementing a small-scale plastic recycling effort on campus. She worked diligently to gain a better understanding of plastic recycling and possible uses for recycled material in engineering labs. She went above and beyond to help me draft a proposal for student funding from RSPG, which we were awarded in February 2022 (*Planning a successful on-campus plastic recycling community*). Sarah is planning on presenting her findings at the 2023 Intermountain Sustainability Summit.

Student J.B.

Jordan and I have been working together since April 2022 to study the unique music produced by a group of women from Vanuatu. The women stand waist deep in the water and strike the surface with their hands to create different tones. We have been analyzing how various hand shapes and striking techniques can influence the tone produced.

Student C.P. & H.B.

We have been working together since September 2022 to measure the efficiency of sprinklers that produce significant amounts of fine mist. The students received funding from OUR to pursue this project. An experimental apparatus was created with successfully measured that the mass fraction of water lost through wind and evaporation can be on the order of 20% during daytime summer conditions in Utah. A summary of this project has been submitted to the Weber State undergraduate journal ERGO.

Student P.L.

P.L. and I have been working together to understand the variation in performance of pickle balls. We are researching options for creating pickleballs using recycled polypropylene. Our work is ongoing, but this effort is in association with a Weber State project to involve high-achieving freshmen in research projects. This effort is funded by the Office of Undergraduate Research.

21-22 Senior Project Group

All mechanical engineering students must complete a two-semester capstone or senior project series to qualify for graduation. For the 2021-2022 academic year, I felt that my students had a strong concept for their project, but would need a significant amount of funding to produce a viable proof-of-concept. I encouraged the students to apply for a long-term grant from the Office of Undergraduate Research, which they received in November 2021 (*Vortex ring generator*). The students have done a tremendous job designing a novel device for mixing a tank with a unique approach. They plan on presenting their results at the 2022 Undergraduate Research Symposium.

22-23 Senior Project Group

For the 2022-2023 academic year my group proposed designing a process to convert a gas-powered gokart to electric power. A viable process could only be guaranteed with testing, which would require a reasonable amount of funding for the conversion. They received funding from the Office of Undergraduate Research and are currently working out the details of their design.

2024 Senior Project Group

For the summer of 2024 to the fall, my group was given the assignment of designing a system which functioned similar to a human kidney to function as an instructional aid for the college of health science. The project was a large success in that the requesting professor was extremely pleased with the final result and repeatedly listed ways he could use the final project to demonstrate to students how the kidneys behaves in certain situations.

B. Research Outcomes

- a. S. Akhmedov, D. Carter, S. Hallows, P. Hunt, B. Kozak, P. Mackay, R. Nielson, Z. Pan, **R. Hurd**. “Vortex Ring Generator,” Weber State University - Office of Undergraduate Research Symposium. March 28, 2022.
- b. **Hurd, R. C.**, Barlow, E. A., Pan, Z., Speirs, N. B., Belden, J., Truscott, T.T. “Urine Splatter Patterns. American Society of Mechanical Engineers – Fluids Engineering Division Summer Meeting. August 3-5, 2022.
- c. Barlow, E. A., Pan, Z., & **Hurd, R. C.**, “Eliminating Urine Stream Splatter through Fluid Dynamics.” Weber State University - Office of Undergraduate Research Symposium, Ogden, UT. April 12, 2023.
- d. (In Preparation) – Pantle, C., Barry, H. Presentation on *Designing a more efficient sprinkler head*. (Target audience – Undergraduate Research Symposium)
- e. Lepus, J., Richardson, P., Blanchard, C., Foremaster, B., Haacke, B., Tenoria, J. & **Hurd, R. C.**, “Electric Powertrain Conversion Kit.” Weber State University - Office of Undergraduate Research Symposium, Ogden, UT. December 5, 2023.
- f. Henderson, Jackson. “Practical Exam Curriculum for Materials Science Class.”