

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FLUIDMASTER, INC.
Petitioner

v.

DANCO, INC.
Patent Owner

Case No.: IPR2024-00635
U.S. Patent No. 10,934,698 B1

DECLARATION OF DR. KIMBERLY CAMERON

TABLE OF CONTENTS

TABLE OF CONTENTS.....	i
LIST OF REPORT APPENDICES AND EXHIBITS	iv
I. INTRODUCTION	- 1 -
II. EDUCATION AND WORK EXPERIENCE	- 1 -
III. SCOPE OF WORK	- 5 -
IV. DOCUMENTS RELIED ON	- 6 -
V. SUMMARY OF OPINIONS.....	- 6 -
VI. RELEVANT LEGAL PRINCIPLES AND GUIDELINES.....	- 6 -
A. LEVEL OF SKILL	- 7 -
B. CLAIM CONSTRUCTION	- 8 -
1. “means for adjusting water flow”	- 12 -
C. PRIOR ART AND PRIORITY DATE FOR THE ’698 PATENT -	13 -
D. OBVIOUSNESS	- 15 -
VII. BACKGROUND AND OVERVIEW OF THE ’698 PATENT	- 21 -
A. TECHNOLOGICAL BACKGROUND.....	- 21 -
B. PURPORTED INVENTION OF THE ’698 PATENT.....	- 27 -
C. SUMMARY OF THE PROSECUTION HISTORY OF THE ’698 PATENT.....	- 28 -
D. SUMMARY OF THE PROSECUTION HISTORIES OF THE RELATED PATENTS	- 30 -
VIII. VALIDITY ANALYSIS OF THE CHALLENGED CLAIMS	- 31 -
A. BRIEF OVERVIEW OF THE PRIOR ART REFERENCES	- 32 -
1. Registered Utility Model Publication Number CN2447417Y to Guoxin (“Guoxin”)	- 32 -
2. U.S. Patent No. 5,862,538 to Ho (“Ho”)	- 32 -
3. U.S. Patent No. 5,249,830 to Calmettes, et al. (“Calmettes”)-	32 -
4. U.S. Patent No. 989,251 to Hall (“Hall”)	- 32 -
5. Canadian Patent No. 1,320,235 to Kimber (“Kimber”).....	- 33 -

B.	Claims 1-14 Are Obvious Under 35 U.S.C. §103 Over Guoxin in view of Ho.....	- 33 -
1.	Independent Claim 1 is Obvious Over Guoxin in View of Ho and Further in View of the Quick Connection Art	- 39 -
a.	Claim Element 1[Pre]	- 42 -
b.	Claim Element 1[A1].....	- 42 -
c.	Claim Element 1[A2].....	- 43 -
d.	Claim Element 1[A3].....	- 44 -
e.	Claim Elements 1[B1]	- 45 -
f.	Claim Element 1[B2].....	- 48 -
g.	Claim Element 1[B3].....	- 48 -
h.	Claim Elements 1[B4]	- 50 -
i.	Claim Element 1[B5].....	- 55 -
j.	Claim Element 1[B6].....	- 55 -
k.	Claim Element 1[C].....	- 57 -
l.	Independent Claim 1 Summary	- 58 -
2.	Independent claims 8 and 12 are obvious over Guoxin in view of Ho and Further in View of the Quick Connection Art....	- 58 -
a.	Claim Elements 8[Pre] & 12[Pre]	- 58 -
b.	Claim Elements 8[A] & 12[A]	- 58 -
c.	Claim Elements 8[B] & 12[B].....	- 59 -
d.	Claim Elements 8[C] and 12[C]	- 59 -
e.	Claim Elements 8[D] and 12[D].....	- 59 -
f.	Claim Elements 8[E] and 12[E]	- 60 -
g.	Independent Claims 8 and 12 Summary.....	- 60 -
3.	Independent claim 10 is obvious over Guoxin in view of Ho and Further in View of the Quick Connection Art	- 60 -
a.	Claim Element 10[Pre]	- 61 -
b.	Claim Element 10[A].....	- 62 -
c.	Claim Element 10[B1].....	- 62 -

d.	Claim Element 10[B2].....	- 62 -
e.	Claim Element 10[B3].....	- 62 -
f.	Claim Element 10[B4].....	- 63 -
g.	Claim Element 10[C].....	- 63 -
h.	Independent Claim 10 Summary	- 63 -
4.	Dependent Claims 2-7, 9, 11, and 13-14 Are Obvious.....	- 64 -
a.	Claims 2 and 9	- 64 -
b.	Claim 3.....	- 65 -
c.	Claim 4.....	- 69 -
d.	Claim 5.....	- 69 -
e.	Claims 6 and 7	- 71 -
f.	Claims 11 and 13	- 73 -
g.	Claim 14.....	- 74 -
IX.	MOTIVATION TO COMBINE REFERENCES.....	- 75 -
X.	SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS	- 77 -
XI.	CONCLUDING REMARKS	- 77 -

LIST OF REPORT APPENDICES AND EXHIBITS

Appendix	Description of Exhibit
A	Curriculum Vitae of Kim Cameron

Exhibit No.	Description of Exhibit
EX1001	U.S. Patent No. 10,934,698 to Schuster et al.
EX1002	Prosecution History of U.S. Patent No. 10,934,698 to Schuster et al. (Application No. 16/686,328, filed March 2, 2021)
EX1003	Complaint (Dkt. 1) in <i>Danco, Inc. v. Fluidmaster, Inc., et al.</i> , Case No. 8:23-cv-01156 (C.D. Cal.), filed June 28, 2023
EX1005	U.S. Patent No. 9,103,105 to Schuster et al.
EX1006	Prosecution History of U.S. Patent No. 9,103,105 (Application No. 14/457,697 filed August 12, 2014)
EX1007	U.S. Patent No. 9,139,993 to Schuster et al.
EX1008	Prosecution History of U.S. Patent No. 9,139,993 to Schuster et al. (Application No. 14/164,424, filed January 27, 2014)
EX1009	Prosecution History of U.S. Patent No. 8,650,671 to Schuster et al. (Application No. 13/346,355, filed January 9, 2012)
EX1010	Prosecution History of U.S. Patent No. 8,104,105 to Schuster et al. (Application No. 12/786,904, filed on May 25, 2010)
EX1011	Prosecution History of U.S. Patent No. 7,743,436 to Schuster et al. (Application No. 10/958,797, filed October 5, 2004)
EX1012	Prosecution History of U.S. Patent No. 6,823,889 to Schuster (Application No. 10/798,606, filed on Mar. 11, 2004)
EX1013	Amended Complaint (Dkt. 35) in <i>Danco, Inc. v. Fluidmaster, Inc., et al.</i> , Case No. 8:23-cv-01156 (C.D. Cal.), filed October 2, 2023

EX1014	U.S. Patent No. 6,546,568 B1 to Schuster issued April 15, 2003 from Application No/ 09/969,320 filed October 1, 2001, as a continuation of Application No. 09/634,249 filed August 8, 2000 (now U.S. Patent No. 6,295,660)
EX1015	Registered Utility Model Publication Number CN2447417Y to Guoxin published September 12, 2001
EX1016	Certified Translation (together with a statement that the translation is true and accurate) of Registered Utility Model Publication Number CN2447417Y to Guoxin published September 12, 2001
EX1017	U.S. Patent No. 5,926,868 to Bjerke issued July 27, 1999
EX1018	U.S. Patent No. 5,249,830 to Calmettes, et al. issued October 5, 1993
EX1019	U.S. Patent No. 989,251 to Hall issued April 11, 1911
EX1020	Canadian Patent No. 1,320,235 to Kimber granted and published July 13, 1993
EX1021	U.S. Patent No. 3,086,546 to Brown issued April 23, 1963
EX1022	U.S. Patent No. 5,862,538 to Ho issued June 26, 1999
EX1023	U.S. Patent No. 4,980,932 to Stemples issued January 1, 1991
EX1024	U.S. Patent No. 5,708,991 to DeMarco issued January 20, 1998
EX1025	U.S. Patent No. 5,715,860 to Horad issued February 10, 1998
EX1026	U.S. Patent No. 5,134,729 to Shaw issued August 4, 1992
EX1027	U.S. Patent No. 5,855,025 to Williams issued January 5, 1999
EX1028	U.S. Patent No. 6,219,856 to Alles issued April 24, 2001
EX1029	Infringement Contentions in <i>Danco, Inc. v. Fluidmaster, Inc., et al.</i> , Case No. 8:23-cv-01156 (C.D. Cal.), served February 24, 2024

I. INTRODUCTION

1. This declaration regarding U.S. Patent No. 10,934,698 (the “’698 patent”) is submitted in connection with the proceeding identified above. I have been retained by counsel for Fluidmaster, Inc. (“Petitioner”) as an independent expert to evaluate claims 1-14 of the ’698 patent (“Challenged Claims”), and to provide opinions in connection with a petition for inter partes review before the Patent Trial and Appeal Board (“the Petition”).

2. I have been requested to compare the Challenged Claims to different prior art references and to consider whether the Challenged Claims are invalid.

3. I am being compensated by Petitioner at my standard hourly consulting rate of \$570 for my time spent on this matter. My compensation is not contingent on the outcome of the IPR or on the substance of my opinions.

4. I have no financial interest in Petitioner or Patent Owner.

II. EDUCATION AND WORK EXPERIENCE

5. In formulating my opinions, I have relied on my knowledge, training, and experience in the relevant field, which I will summarize briefly.

6. I am a Principal Engineer at Engineering Systems Incorporated (ESi), a leading scientific and engineering firm. I specialize in mechanical engineering, materials science and metallurgy, and have extensive experience with materials

evaluation, mechanical design, mechanical testing, stress analysis, failure analysis, fatigue analysis, and fracture mechanics.

7. I graduated with high honors from Princeton University with a degree in Mechanical Engineering and minors in Materials Science, Applied Mathematics and Engineering Physics. I have also received a master's and doctorate in Mechanical Engineering with a minor in Materials Science and Engineering from Stanford University. I have received numerous awards including fellowships from the Department of Defense, the National Science Foundation, and Lucent Technologies. I am a Registered Professional Engineer in both Mechanical Engineering and Metallurgy in the State of California. I am also a registered patent agent. I have taught classes for engineers studying to take the fundamentals of engineering exam and the licensing exam for mechanical engineering.

8. Throughout my career, I have applied my deep understanding of the fundamentals of metallurgy, materials science, engineering physics, computational mathematics, and engineering mechanics to help understand and solve complex problems. Particularly relevant to my declaration here, I have worked on numerous projects across a wide variety of industries related to mechanical systems involving fluid systems and their components as well as mechanical and electrical connectors.

9. For example, related to process piping, I have evaluated joints, their fittings, valves, and support structures. I have also done failure analysis of various

oil and gas distributions systems. This includes evaluating both welded connections as well as joints such as compression couplings. I have also evaluated leak detection systems and integrity management programs for oil and gas distribution systems. I have also consulted on the design and done failure analysis related to water distribution systems. This includes smaller water distribution systems as well as large water mains.

10. As another example, I have experience related to fluid flow in the area of large-scale power generation. I have evaluated the design of hydro generators, turbines, and cooling systems. This includes performing stress analysis of various components under different loading conditions.

11. Also related to fluid flow, I have experience in fire protection systems, including design evaluations and failure analysis. In particular, I have assessed grooved fittings and sprinklers. I have evaluated designs for ease of installation.

12. Relatedly, I have experience in HVAC systems (including the heat exchanger, blower, condenser, etc.) and plumbing systems. I have done design analysis and failure analysis of numerous plumbing components and fixtures, including toilets.

13. I have also performed numerous patent validity and infringement analyses related to piping and connectors. These projects include, but are not limited

to, design evaluation, materials selection, stress analysis, failure analysis, as well as patent validity and infringement analyses.

14. I have done failure analysis of consumer products such as refrigerators, washing machines, dishwashers that involve fluid flow, connectors, hoses and tubing. I have consulted on the design of reinforced hoses for air and water.

15. In the area of medical devices, I have worked on various connectors, valves, pumps and tubing. For example, I consulted on the design of Continuous Positive Airway Pressure (CPAP) machines for sleep apnea that deliver air and medicine, as well as other gaseous drug delivery devices, both of which raise tubing airflow issues. I also consulted on the design of a device that combines an angioplasty balloon with nitrous oxide cooling – a device that also involves connectors, tubing and flow. As another example, I have worked on anesthesia delivery systems that involve fluid flow, tubing and connectors. I have also consulted on the design of valves and pumps for drug delivery.

16. I also have extensive experience on connectors more generally, including mechanical connectors (including male and female connectors) for consumer products, consumer electronics, and medical devices as well as electrical connectors for consumer electronic devices, high speed electrical connectors, photovoltaic connectors, electrical power connectors, and medical devices.

17. I have also performed patent validity and infringement analyses related to piping, fluid flow and connectors. In connection with a lawsuit against the United States Patent and Trademark Office (“USPTO”), I have also been retained as a technical expert in the area of pipes by the USPTO.

18. A copy of my curriculum vitae is attached as Appendix A to this declaration.

III. SCOPE OF WORK

19. I have reviewed the ’698 patent, and the prosecution file history, and references cited therein. I have also reviewed other prior art documents as discussed below.

20. I was requested to consider issues regarding validity of the Challenged Claims in this matter and specifically address the following topics in this opening Report: the level of skill of persons who would have worked in the field around the time of the alleged invention; and if the Challenged Claims are invalid as obvious or anticipated.

21. My work described in detail below involved a comparison of the subject matter recited for the Challenged Claims and the subject matter described in publications, patents, and systems that predate the earliest priority date Challenged Claims are entitled to, which I understand to be April 13, 2015. I have also been asked to opine on the differences, if any exist, between the subject matter recited in

the Challenged Claims and the prior art. To the extent my conclusion is that differences do exist, I have also been asked to opine on whether the subject matter recited in those claims would have been obvious to a person of ordinary skill in the art for the '698 patent in light of information available at the earliest priority date.

22. My detailed analysis for each ground asserted is included below.

IV. DOCUMENTS RELIED ON

23. In preparing for and writing this Report and forming the opinions expressed herewith, I reviewed the '698 patent, the prosecution file history for the '698 patent and other family members (described in more detail below), the references cited in the prosecution of the '698 patent, additional prior art and other documents referred to herein, and various documents that discuss or refer to the subject matter of these references.

V. SUMMARY OF OPINIONS

24. After analyzing the prior art references and systems discussed herein, the knowledge of a person of skill in the art at the filing date of the '698 patent, and my experience, I conclude that the Challenged Claims are invalid because they are rendered obvious by one or more of the prior art references cited in this Report.

VI. RELEVANT LEGAL PRINCIPLES AND GUIDELINES

25. I have been informed of certain legal standards by Fluidmaster's attorneys and describe my understanding of those standards in this section. I am relying only on instructions from Fluidmaster's attorneys for these legal standards.

A. LEVEL OF SKILL

26. I understand that patents and prior art are evaluated from the perspective of a hypothetical person of ordinary skill in the art with respect to the subject matter of the '698 patent and prior art.

27. I consider the '698 patent to be within the technological field related to valves and other components of fluid systems, which is supported by the specification of the '698 patent. For example, the '698 Patent is titled "Toilet Valve" and the specification explains that "[a] toilet fill valve in a toilet typically includes a water outlet that provides water for refilling a toilet bowl during a flush cycle," but that such outlets waste water by providing more water than necessary to the toilet bowl during the flush cycle. *See* '698 Patent (EX1001), 1:28-36. The '698 patent purports to solve this problem using a system with a toilet fill valve, a water flow regulator that regulates the flow of water to the toilet bowl, and a tube that directs water from the water flow regulator to the overflow tube of a toilet tank. *See*, e.g., '698 Patent (EX1001), 1:15-12:27.

28. A person of ordinary skill in the art ("POSITA") with respect to the subject matter of the '698 patent at the time of the priority date, March 11, 2004, would have had an undergraduate degree in mechanical engineering, or other technical training in product design or equivalent work experience. This person would also possess at least one year of experience in developing and/or evaluating

mechanical aspects of fluid systems. I consider myself a person of ordinary skill in the art under this definition.

29. My opinion on the background of a POSITA is based on consideration of the following factors: (1) type of problems encountered in the art; (2) prior art solutions to those problems; (3) rapidity with which inventions are made; (4) sophistication of the technology; and (5) educational level of active workers in the field.

30. I have considered the issues and arrived at the conclusions discussed in my Report from the perspective of this person of ordinary skill. I am, therefore, discussing what I believe a person of ordinary skill would have understood to be disclosed or suggested by a prior art reference during the relevant time period when analyzing that reference's disclosure.

B. CLAIM CONSTRUCTION

31. I have applied my understanding of the legal standards concerning claim construction, as discussed below, when analyzing the Challenged Claims.

32. I have been instructed by counsel that claim construction is a matter of law for the arbiter of law to decide. I understand that in an *inter partes* review, claims are construed using the same claim construction standard that would be used to construe the claims in a civil action.

33. I understand that claim terms should be assigned their ordinary and customary meaning within the context of the asserted patent. In other words, a claim term is supposed to be given the meaning that the claim term would have to a person of ordinary skill in the art at the time of the invention in light of the teachings of the patent. I also understand that in some circumstances, a claim term may not have an ordinary and customary meaning to a person of ordinary skill in the art.

34. I understand that you look to sources such as the words of the claim, the asserted patent's specification, the prosecution history of the asserted patent (all of which are considered intrinsic evidence), as well as extrinsic evidence concerning the meaning of technical terms, the state of the art at the time of the invention, and relevant scientific principles, to determine how a person of ordinary skill in the art would understand a claim term. I understand that the intrinsic evidence is the primary evidence considered, but that it is also useful to look at extrinsic evidence when the intrinsic evidence is not sufficient so long as the extrinsic evidence is consistent with, and not contradictory to, the intrinsic evidence.

35. I understand that the patentee can act as her own lexicographer to provide special meaning to claim terms or to intentionally disclaim any claim scope.

36. I understand that claims define the scope of the patent and the subject matter of the invention. Because of this, I understand that claim construction begins and remains focused on the claim language. I also understand that the context in

which claim terms are used is very instructive in construing the claim. For example, the same term is given a consistent meaning throughout the patent, and the use of one term in a claim can provide meaning of the same term in other claims. Differences between the terms used in a claim are also useful. I further understand that when a claim lists elements separately, those elements are typically construed as distinct components of the invention.

37. I understand that a person of ordinary skill in the art also reads claim terms in the context of the entire patent, including the specification, so claims must be construed in light of the entire specification. At the end, the interpretation of a claim term must be confirmed in view of a full understanding of what the inventors actually invented.

38. I understand that the purpose of the specification is to describe and enable the invention so a claim term cannot have broader scope than the invention that is described in the patent. I also understand that the full scope of the claims must be supported by the specification.

39. I understand that the prosecution history is also part of the intrinsic evidence. The prosecution history can provide evidence of how the Patent Office and inventors understood the terms of the patent in light of the prior art. I also understand that a patentee could make arguments or amendments during prosecution that narrow the scope of a claim term or scope of the invention.

40. I understand that extrinsic evidence including testimony from experts and inventors, dictionaries, and treatises can be considered to determine the meaning of a claim term. I understand that extrinsic evidence should not be considered when it is not in the context of the intrinsic evidence. I also understand that extrinsic evidence should not be considered unless a claim term is ambiguous after consideration of intrinsic evidence. I further understand that extrinsic evidence is given less weight than intrinsic evidence.

41. I understand that a preamble term or phrase is not limiting when a complete invention is described in the claim body and the preamble is only used to state the purpose or use of the invention. I understand that the preamble can be limiting if it recites structure or steps that are essential or gives meaning to the claim. To determine whether the preamble is limiting, you should review the entire patent to determine what the inventors intended to have the claims encompass.

42. I understand that the preamble can be limiting if the claim is dependent on a preamble phrase and indicates it through use of an antecedent basis to define the invention, if the reference is necessary to understand the terms of the claim, and if the preamble provides additional structure or steps that is important to the claim.

43. I understand that claims can be written in means-plus-function form where the claim receives a feature of the invention by what it does rather than what it is. I understand that a claim element is a means-plus-function element when it is

defined as a means or step for performing a function without description of the corresponding structure. I also understand that “mechanism,” “structure” or other generic words can also signal that a limitation is written in means-plus-function form. I understand that means-plus-function claims only cover the corresponding structure, material, or acts that are described in the specification, as well as any equivalents.

44. I also understand that generally a claim should not be limited to a preferred embodiment described in the specification, but that, in certain cases, the scope of the right to exclude may be limited by a narrow disclosure.

1. “means for adjusting water flow”

45. I understand that the expression “means for adjusting water flow” is a means-plus-function limitation under §112 (pre and post AIA). The specification of the ’698 patent discloses that this water flow adjustment function is performed by a “water flow adjustment handle” of the bowl fill valve. *See* EX1001, Abstract (“The bowl fill valve can include...a water flow adjustment handle.”); 2:22-24 (“In addition, the bowl fill valve 109 includes a handle 119 that facilitates a manual adjustment of the bowl fill valve 109.”); 4:28-32 (“Next, the bowl fill valve handle 119 is adjusted so that the bowl fill valve 109 is placed in a predefined position that allows a predefined flow of water to refill the toilet bowl. In this manner, one adjusts the actual flow of water that refills the toilet bowl.”); 5:38-44; 6:32-43. The ’698

patent does not describe any other structures or mechanisms for adjusting the water flow through the bowl fill valve.

46. Patent Owner served infringement contentions asserting that the “means for adjusting water flow” covers (i.e., read on) a “water flow adjustment handle.” *See* EX1029, Exhibit I, p. 15. For purposes of this petition, Petitioner adopts Patent Owner’s construction of “means for adjusting water flow” to denote a handle.

47. To the extent that PO proposes a different construction, I reserve the right to respond and provide further analysis of the claims.

C. PRIOR ART AND PRIORITY DATE FOR THE '698 PATENT

48. I understand that a patent, publication, or product must qualify as prior art before it can be used to invalidate claims in a patent.

49. I understand that the America Invents Act (“AIA”), which changed the United States from a “first-to-invent” to “first-to-file” system, changed the law on what qualifies as prior art. I understand that pre-AIA law will be used to determine what qualifies as prior art here based on the March 11, 2004 priority date. If there turns out to be a dispute about the priority date, I reserve the right to respond further.

50. I understand that a prior art patent or published patent application qualifies as prior art if the effective filing date of that reference is prior to the effective filing date of the asserted patent.

51. I understand that a prior art product qualifies as prior art if the product was in public use, on sale, or otherwise available to the public before the effective filing date of the asserted patent.

52. I understand that a reference qualifies as a printed publication if it was publicly accessible prior to the effective filing date of the asserted patent. I also understand that public accessibility is determined on a case-by-case basis, but that a publication is generally publicly accessible if it was distributed or otherwise made available, where interested persons ordinarily skilled in the art could locate it by exercising reasonable diligence.

53. Unless explicitly noted, I have applied the March 11, 2004 priority date in my analysis of the prior art. So, in my analysis of the prior art, I include patents, printed publications, and products in public use, on sale, or otherwise available to the public prior to March 11, 2004. To the extent it is determined that the '698 patent is entitled to a priority date other than March 11, 2004, I reserve the right to supplement my analysis in light of the different priority date. However, as noted below, the Guoxin, Ho, and the Quick Connection Art references qualify as prior art even in view of the earliest potential priority date on the face of the '698 patent—on its face, the '698 patent claims priority through a series of continuations and one continuation-in-part to U.S. Application No. 10/798,606, filed on March 11, 2004, now U.S. Patent No. 6,823,889.

54. I understand that patents, printed publications, products, and other materials that qualify as prior art can invalidate an asserted claim as anticipated or obvious.

55. I understand that invalidity must be shown by clear and convincing evidence.

D. OBVIOUSNESS

56. I understand that under 35 U.S.C. § 103, if a prior art reference discloses fewer than all limitations of an asserted claim, the claim is still invalid if the differences between the subject matter of the claim and the prior art reference would have been obvious at the time of the invention to a person of ordinary skill in the art. I understand that obviousness can be based on a single prior art reference or a combination of references that disclose all of the limitations of an asserted claim, whether expressly or inherently.

57. I understand that the prior art reference and subject matter of the claim should be viewed from the perspective of one of ordinary skill in the art. I also understand that hindsight bias and insight cannot be used when determining whether a claim is obvious.

58. I understand that the following standards, which were provided by the Supreme Court of the United States in *KSR v. Teleflex*, may be applied during an obviousness analysis: (1) combining the prior art elements according to known

methods to yield predictable results; (2) simple substitution of one known element for another to obtain a predictable result; (3) using a known technique to improve similar devices or methods in a similar way; (4) applying a known technique to a known device or method that is ready for improvement where the application produces predictable results; (5) “obvious to try” i.e., choosing from a limited, finite, number of predictable solutions with a reasonable expectation of success; (6) variations of known work in one field of endeavor applied in the same field or a different field based on market forces such as design incentives, if the variations would have been predictable to a person of ordinary skill; and (7) a teaching, suggestion, or motivation to combine the prior art reference disclosure to arrive at the claimed invention, where the teaching, suggestion, or motivation could be supplied by the knowledge of a person of ordinary skill in the art.

59. I understand that relevant factual considerations for an obviousness analysis include: (1) the scope and content of the prior art; (2) differences between the prior art and subject matter of the invention; and (3) the level of a person of ordinary skill in the art.

60. I understand that, in certain circumstances, secondary considerations of non-obvious can rebut a prima facie showing of obviousness including: (1) a long-felt need unmet in the prior art but met by the invention claimed in the asserted patent; (2) the commercial success or lack thereof of products or processes covered by the

asserted patent; (3) unexpected results achieved by the invention claimed in the asserted patent; (4) licenses of the asserted patent by third parties; and (5) deliberate copying of the invention claimed in the asserted patent. I also understand that secondary indicia are only considered if there is a relationship between the indicia and the invention. I also understand that independent invention of the subject matter by others at the time of the invention supports a finding of obviousness.

61. I understand that it can be important to describe a reason that would motivate a person of ordinary skill in the art to combine elements of the prior art in the way as claimed in the asserted patent, although this is not required by 35 U.S.C. § 103.

62. I understand that, ultimately, obviousness is a legal conclusion supported by factual considerations, which is based on a showing that all of the limitations of an asserted claim are present in the prior art and that the combination of the elements disclosed in the prior art is a predictable variation prompted by a known problem, design incentives, other market factors, or the knowledge of a person of ordinary skill, who would have implemented the combination with a reasonable expectation of success.

63. I understand that an obviousness analysis can be based on a combination of multiple prior art references. I also understand that the teaching, suggestion, motivation, or other reason to combine the references may be supplied

by the references themselves or the common sense of a person or ordinary skill in the art. I also understand that market forces often drive innovation compared to scientific literature, and that a motivation to combine may be supplied by these market forces.

64. I understand that a person of ordinary skill in the art would recognize that a technique used to improve one device could be used to improve similar devices in the same way unless actual application of that technique is beyond the person's skill.

65. I understand that an obviousness analysis should be guided by practicality and common sense because sometimes familiar items have obvious uses beyond their primary purpose. I also understand that a person of ordinary skill is often able to combine the teachings of publications similar to pieces of a puzzle, where a person of ordinary skill in the art can also employ inferences and creative steps.

66. I understand that obviousness can be shown where it would have been obvious for a person of ordinary skill to try the combination, such as when market forces pressure a resolution to a problem for which there are a finite number of known, predictable solutions, or when a person of ordinary skill has reason to pursue known options because the result is the product of application of ordinary skill and common sense.

67. I understand that the combination of familiar elements according to known methods leading to predictable results that discloses all limitations of a claim can render the claim obvious. I understand that market forces can also drive variations of a limitation, whether in the same field of endeavor or a different one. If a person of ordinary skill in the art can implement the predictable variation, the limitation is rendered obvious.

68. I understand that the relevant question when combining prior art references is whether the techniques taught by the prior art are interoperable with each other such that a person of ordinary skill in the art would view them as a design choice or whether they could apply the techniques into a new combined system.

69. I understand that an obviousness analysis focuses on what was known or obvious to a person of ordinary skill in the art and is not limited to a patentee. Therefore, any need or problem known in the field of endeavor at the time of the invention that is addressed by the asserted patent can provide a reason for combining the elements found in the prior art.

70. I understand that a single prior art reference can render a claim obvious if the missing elements of the reference are supplied by the knowledge of a person of ordinary skill in the art.

71. I understand that the inherent teachings of the prior art are also applicable to the determination of obviousness.

72. I understand that prior art teachings can be combined when a person of ordinary skill in the art, using their understanding and knowledge would have combined the elements recited in the claims motivated by the general problem facing the inventor of the asserted patent. Under this analysis, the prior art references themselves, or any need or problem known in the field of endeavor at the time of the invention, can provide a reason for combining the elements of multiple prior art references in the claimed manner.

73. I understand that a comparison of the disclosure of the prior art versus properly construed limitations of an asserted claim is necessary to performing an obviousness analysis.

74. I understand that a means-plus-function limitation can be rendered obvious when a prior art reference, in combination of the knowledge of one of skill in the art, or a combination of references address both the function and corresponding structure of the limitation-at-issue, or an equivalent of the structure. The function and corresponding structure of the means-plus-function limitation must have been obvious at the time the invention was made to a person having ordinary skill in the relevant art in light of the teachings of the prior art.

VII. BACKGROUND AND OVERVIEW OF THE '698 PATENT

A. TECHNOLOGICAL BACKGROUND

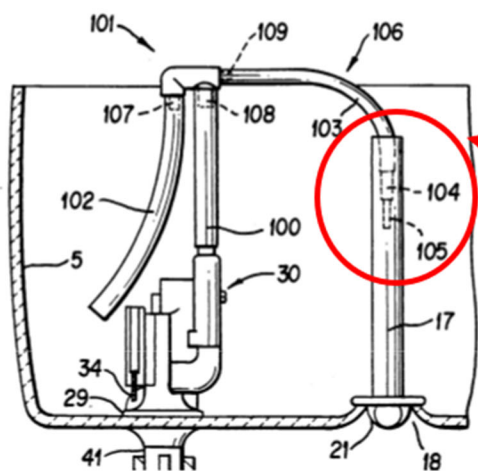
75. The '698 patent is directed to a purported improvement to a toilet fill valve for a flush toilet. *See* '698 patent (EX1001), Abstract. Toilet fill valves are not new. *See, e.g.,* Brown (EX1021), which was filed March 6, 1959. Rather, toilet fill valves with various mechanisms to control the flow of water to the toilet bowl during a flush cycle were well known in the art. After a toilet is flushed, the toilet fill valve is responsible for refilling the water stored in the toilet's tank and in the toilet's bowl. The toilet fill valve is connected to the water supply line for the toilet and allows water to flow (1) into the tank and (2) into the bowl through a connection to the toilet's overflow tube. The toilet fill valve controls the amount of water used to refill the tank and the bowl and closes the valve once the flush cycle is complete.

76. Brown discloses two water saving mechanisms. The first mechanism is a valve attached directly to the bowl refill outlet on the toilet fill valve that allows the amount of water flowing into the toilet bowl to "be reduced to the necessary minimum." Brown (EX1021), 3:65-68. The second mechanism is a U-shaped tube extending from the bowl refill outlet of the toilet fill valve that has a smaller (restricted) diameter than conventional refill tubes but lacks the "feature of adjustability." *Id.*, 4:20-44. Brown therefore informs a POSITA that both a bowl fill

valve and a reduced diameter bowl fill tube can reduce the flow of water to the overflow tube, but that the reduced diameter bowl fill tube lacks adjustability.

77. Once a bowl fill restrictor is inserted and in place, it is no longer adjustable. I list several examples of flow restrictors from the prior art below.

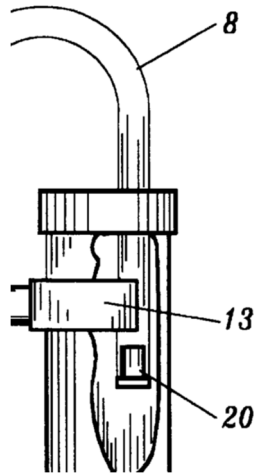
78. As shown in annotated Figure 3 below, U.S. Patent No. 5,134,729 to Shaw ("Shaw," EX1026) discloses flow restrictors (104, 105) having varied decreased diameters. *See, e.g.*, Shaw (EX1026), 8:8-20; Fig. 3 annotated (below).



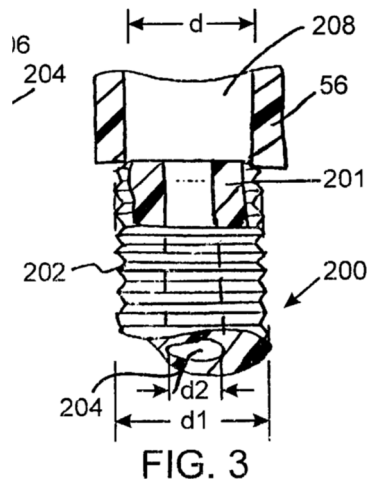
The free end of bowl fill assembly **106** is inserted in overflow tube **17**. Bowl fill assembly **106** comprises bowl fill tube **103** and optional flow control inserts **104** and **105**.

Tubes **100** and **102** are plastic tubes having an interior diameter of approximately one half inch. Bowl fill tube **103** has an interior diameter of three-eighths of an inch and flow control inserts **104** and **105** have interior diameters of one-quarter inch and three-sixteenths inches, respectively. Flow control inserts **104** and **105** are retained in bowl fill tube assembly **106**, when used, by frictional contact between their outer surface and the inner surface of the tube in which they are inserted.

79. As shown below in Figure 1 of U.S. Patent No. 5,855,025 to Williams ("Williams," EX1027) below, discloses a bowl refill restrictor (20) to divert a lower amount of water to the bowl than to the tank. *See* Williams (EX1027), 3:8-17, Fig. 1.



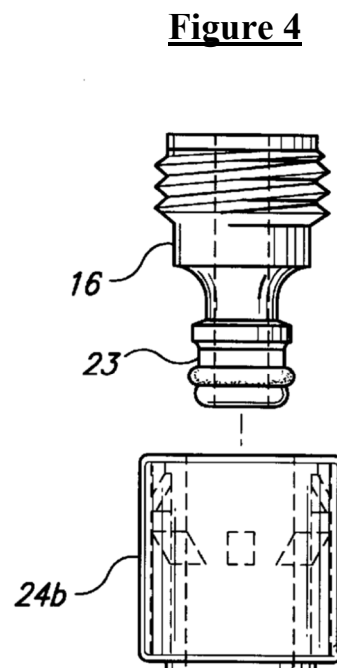
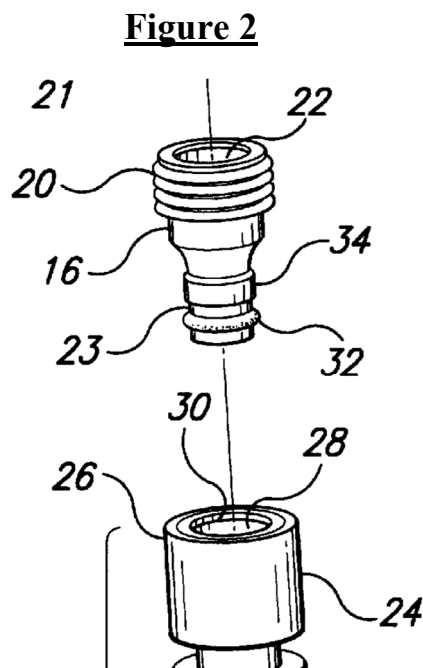
80. As shown below in Figure 3 of U.S. Patent No. 6,219,856 to Alles (EX1028), a bowl refill restrictor (200) reduces the flow of water into the bowl. *See* Alles (EX1028), 3:6-36, Fig. 3.



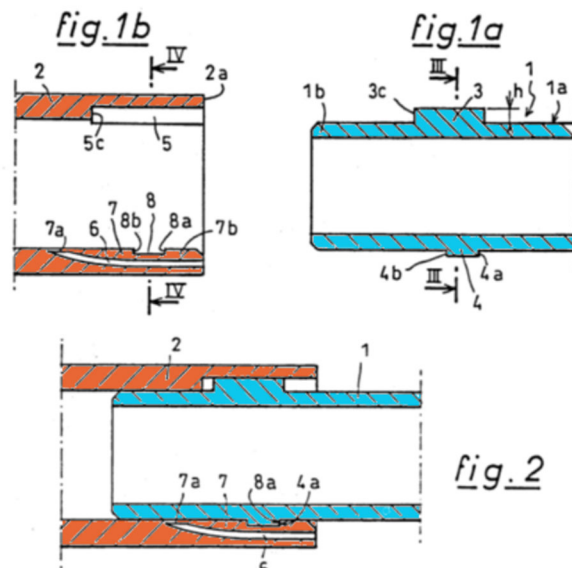
81. In addition to restrictors, different ways of connecting components of a fluid system were well known - including quick connect couplings used in systems for water flow. While the '698 patent is directed to a toilet component, the underlying technology generally consists of techniques, mechanisms, and apparatuses (e.g., pipes, valves, connectors, fixtures, etc.) to deliver and transport

fluid in a controlled manner. Thus, a POSITA would look more generally to fluid flow components, including the art similar to that described below, in the design of toilet components. I will generally refer to this art related to quick connect couplings as the Quick Connection Art.

82. As an example, during prosecution of the '698 patent, the Examiner cited U.S. Patent No. 5,926,868 to Bjerke ("Bjerke," EX1017) as disclosing a conventional quick-connect coupling for a water flow system. *See* '698 File History (EX1006) at 64-65. Bjerke's quick connector, adapted for use in a bathtub shower system, is shown in Figs. 2 and 4 below.



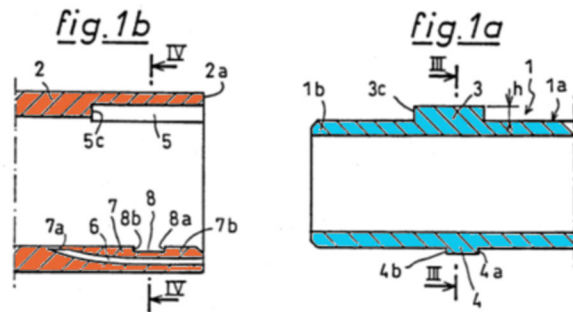
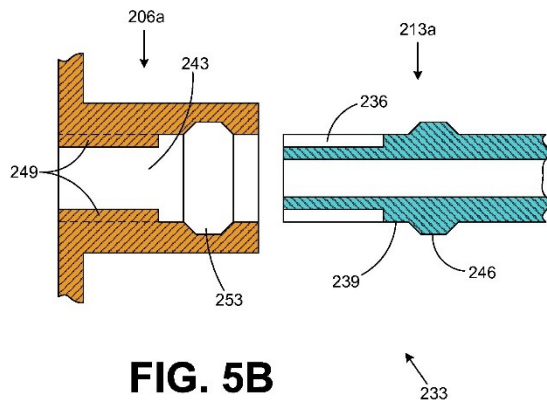
83. Similarly, U.S. Patent No. 5,249,830 to Calmettes (“Calmettes,” EX1018) discloses a coupling device to lock snap-fit and lock two coaxial fluid flow tubes. *See* annotated Figures 1a (orange tube), 1b (blue tube), and 2 (tubes coupled together) of Calmettes reproduced below. Calmettes also teaches that “the immobilization of two coaxial tubes may be sought after, both with regard to a relative rotation and to a translation, whenever it is desired to obtain an efficient mechanical connection between the two tubes.” Calmettes (EX1018), 1:17-22, 1:58-64.



84. Calmettes’ snap fit connection is the same type of connection illustrated in Figures 5A and 5B of the ’698 patent. *See*, e.g., ’698 patent (EX1001), Figure 5B (reproduced below), compared to Calmettes (EX1018), Figs. 1a and 1b.

'698 Patent

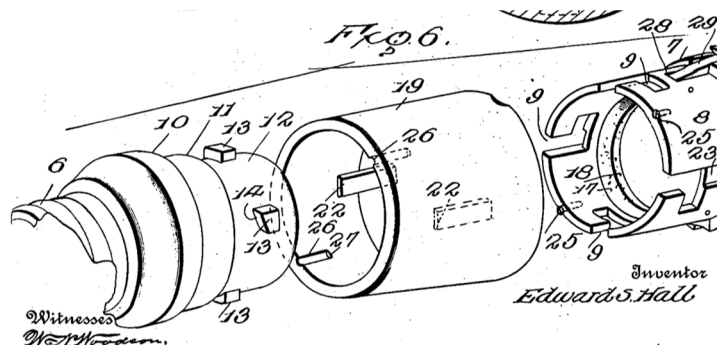
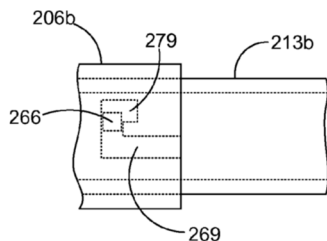
Calmettes



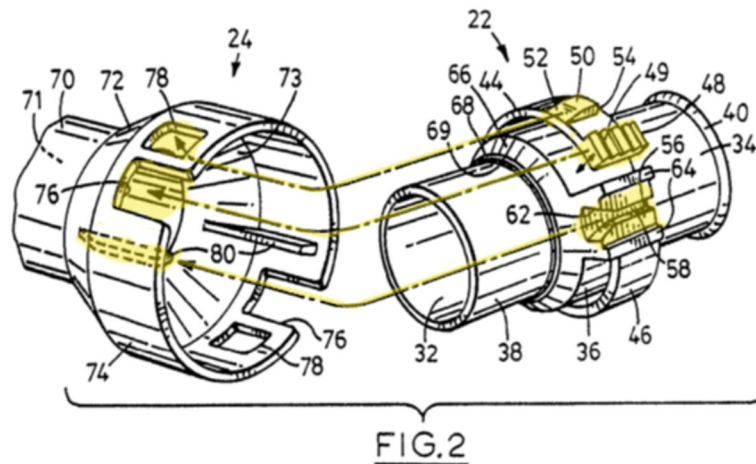
85. U.S. Patent No. 989,251 to Hall ("Hall," EX1019) discloses a fluid flow coupler in which axial protrusions 13 (lugs) on the male portion mate with grooves 9 (bayonet slots) formed in the female portion, and can be rotated to lock in place. See Hall (EX1019), Figure 6 (reproduced below). Notably, Hall's coupling is the same as that shown in Figures 6A-6C of the '698 patent. See, e.g., '698 patent (EX1001), Figure 6B (reproduced below), compared to Hall, Fig. 6 (below).

'698 Patent

Hall



86. Canadian Patent No. 1,320,235 to Kimber (“Kimber,” EX1020) discloses a pipe coupling that comprises a male fitting and a tubular female fitting. As shown in annotated Figure 2 below, Kimber illustrates the coupling arrangement between male fitting 22 and tubular female fitting 24 where tabs can snap into apertures and axial grooves mate with ribs to prevent axial and rotational movement.



B. PURPORTED INVENTION OF THE '698 PATENT

87. The purported invention recited by the Challenged Claims concerns a toilet system with an adjustable bowl fill valve, which refills the toilet bowl, and that is connected directly to a toilet fill valve with a snap fit connection, and which refills the toilet tank. '698 patent (EX1001), Abstract, Claims 1-14. Because the adjustable valve could create a pressure head in a hose connecting it to the toilet fill valve, the '698 patent eliminates the hose and directly connects the bowl fill valve to the toilet valve. PO argued this direct connection and preventing a pressure head as a feature distinguishing the claims from the cited art. '698 patent (EX1001), 4:13-21;

Prosecution History for the '671 patent (EX1009), 72-73. The '698 patent further discloses that the bowl fill valve: has a protrusion that is configured to insert into a recess of the toilet fill valve in order to retain the bowl fill valve; a slot that receives an extension of the toilet fill valve; and a water flow adjustment handle. *Id.*, Abstract.

C. SUMMARY OF THE PROSECUTION HISTORY OF THE '698 PATENT

U.S. Application No. 16/686,328 (the "'328 application") was filed on November 18, 2019, and issued on March 2, 2021 as the '698 patent. '698 patent (EX1001) at 1. The '328 application claims priority as a continuation of U.S. Application No. 14/856,901, filed on September 17, 2015, which claims priority through a series of continuations and one continuation-in-part to U.S. Application No. 10/798,606, filed on March 11, 2004, now U.S. Patent No. 6,823,889. *Id.*

The '328 application claims were rejected, *inter alia*, as anticipated by U.S. Patent No. 5,708,991 ("DeMarco") and for obviousness based on (1) DeMarco over U.S. Patent No. 6,409,221 ("Robinson") and (2) DeMarco over U.S. Patent No. 4,100,928 ("Schoepe"). File History for the '698 Patent (EX1002), 98-102. With respect to the obviousness rejections, the Examiner stated that while DeMarco taught nearly all aspects of the claims, it was silent on the specifics of the clamp, snap-fit, and slot structures of the bowl fill valve and the extension of the toilet fill valve. *Id.*, 102-03. However, the Examiner found that these details were taught in Robinson. *Id.*, 102-03. With respect to then pending claim 8, the Examiner also stated that

while DeMarco addressed most of the claimed limitations, Shoepe further taught a toilet fill valve extending through a float. *Id.*, 103.

PO responded by amending various claims, canceling claims, and providing additional remarks. *Id.*, 73–92. PO traversed the examiner’s anticipation rejection by amending the claims to recite to “the protrusion being a snap fit into the recess,” a feature PO alleged was not disclosed in DeMarco. *Id.*, 87. PO stated that DeMarco’s reseal hose 22 lacked a “recess” and instead conformed to the surface of the tubular stem 44, leading to a pressure head buildup that could eventually dislodge the hose from the stem. *Id.*, 85–87.

Regarding the §103 rejections, PO argued that Robinson’s design, where the male joint member 200 fits into the female joint member 300 with interlocking tabs 210 and 310 through a twist/rotation and thus did not suggest a snap fit or a slot and rib arrangement. *Id.*, 87–90. PO also argued that DeMarco and Schoepe did not cover the system of claim 1 with a snap fit connection. *Id.*, 91.

In a final rejection, the pending claims were rejected due to obviousness. *Id.*, 61–70. Examiner noted while DeMarco covers most claimed elements, it lacked the “snap fit connection” which Bjerke compensates for with its quick connection type. *Id.* at 63–67. The Examiner also noted that it would be obvious to a POSITA to substitute DeMarco’s connection with Bjerke’s quick connection as a matter of substituting one alternative equivalent connection for another. *Id.*, 64. Finally, the

Examiner stated that while DeMarco does not include elements such as the slot, male and female receptacles, annular protrusion, and annular recess, Bjerke does. *Id.*, 63–67.

PO responded by requesting continued examination, canceling some claims, amending others, and adding new ones. *Id.*, 46–59. Claim 1 was amended to include a slot limitation to prevent rotation. *Id.*, 54–57. PO stated Bjerke’s backflow prevent assembly 18 does not equate to the “toilet fill valve,” lacking a slot that engages with an extension of the toilet fill valve. *Id.*, at 56. Additionally, PO argued that Bjerke does not suggest a configuration to “prevent rotation of the bowl fill valve relative to the toilet fill valve.” *Id.*

88. PO later filed a terminal disclaimer, which was approved, and Examiner allowed all claims. *Id.*, 26–27, 30–31, 10–16. No substantive reasons for allowance were provided by Examiner.

D. SUMMARY OF THE PROSECUTION HISTORIES OF THE RELATED PATENTS

89. The ’698 patent claims priority to a number of issued patents, and PO has obtained later patents claiming priority to the same family of applications. Petitioner refers to all patents issued from applications in the same family tree as “related patents.” The prosecution histories of the related patents are provided at EX1006, EX1008-EX1012.

VIII. VALIDITY ANALYSIS OF THE CHALLENGED CLAIMS

90. In this section, I provide an overview of the most relevant prior art references and then provide a detailed explanation of how the references invalidate the Challenged Claims.

91. I have also indicated where the knowledge of a person of ordinary skill in the art at the time the alleged invention was made would have made various limitations obvious. The citations below are illustrative, not exhaustive, of the disclosure contained within that reference or demonstrated by that product. For any particular citation or disclosure, I reserve the right to introduce additional disclosure or images to the extent allowed. I further reserve the right to introduce other text, figures, or disclosure from the same or other documents concerning that reference to provide additional context for the citation. Where I provide a citation to a particular figure, the citation should be understood to encompass the disclosure relating to that figure and vice versa. I also reserve the right to rely upon other documentation or information produced in this proceeding, such as deposition testimony or evidence relied on by Patent Owner's experts, to explain or provide additional context to the cited portion of each reference discussed herein.

A. BRIEF OVERVIEW OF THE PRIOR ART REFERENCES

1. Registered Utility Model Publication Number CN2447417Y to Guoxin (“Guoxin”)

92. Registered Utility Model Publication Number CN2447417Y to Guoxin was published on September 12, 2001 (EX1015, Certified Translation at EX1016, “Guoxin”). I understand that Guoxin is prior art under 35 U.S.C. § 102 (both pre and post AIA) because it is a printed publication filed before the earliest claimed priority date for the Challenged Claims.

2. U.S. Patent No. 5,862,538 to Ho (“Ho”)

93. U.S. Patent No. 5,862,538 to Ho issued on June 26, 1999 (EX1022, “Ho”). I understand that Ho is prior art under 35 U.S.C. § 102 (both pre and post AIA) because it is a printed publication filed before the earliest claimed priority date for the Challenged Claims.

3. U.S. Patent No. 5,249,830 to Calmettes, et al. (“Calmettes”)

94. U.S. Patent No. 5,249,830 to Calmettes, et al. issued on October 5, 1993 (EX1018, “Calmettes”). I understand that Calmettes is prior art under 35 U.S.C. § 102 (both pre and post AIA) because it is a printed publication filed before the earliest claimed priority date for the Challenged Claims.

4. U.S. Patent No. 989,251 to Hall (“Hall”)

95. U.S. Patent No. 989,251 to Hall issued on April 11, 1911 (EX1019, “Hall”). I understand that Hall is prior art under 35 U.S.C. § 102 (both pre and post

AIA) because it is a printed publication filed before the earliest claimed priority date for the Challenged Claims.

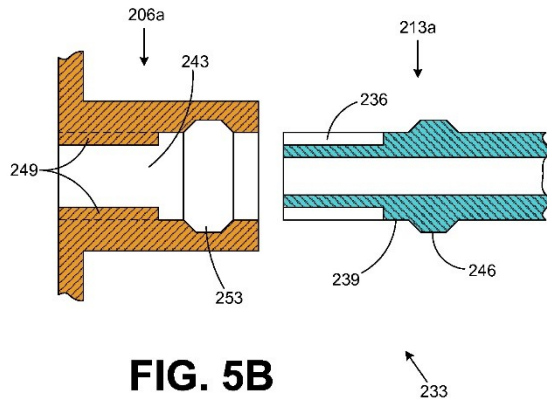
5. Canadian Patent No. 1,320,235 to Kimber (“Kimber”).

96. Canadian Patent No. 1,320,235 to Kimber was granted on and published on July 13, 1993 (EX1020, “Kimber”). I understand that Kimber is prior art under 35 U.S.C. § 102 (both pre and post AIA) because it is a printed publication filed before the earliest claimed priority date for the Challenged Claims.

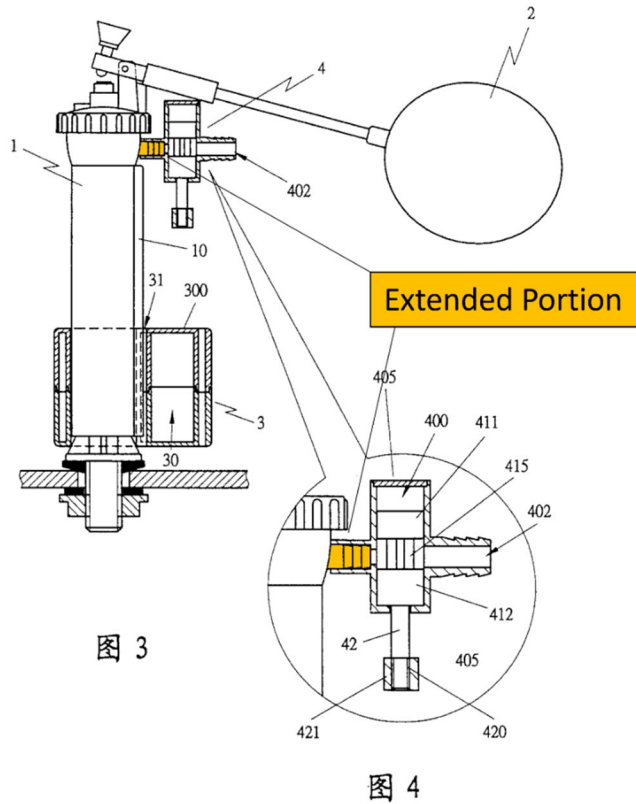
B. Claims 1-14 Are Obvious Under 35 U.S.C. §103 Over Guoxin in view of Ho

97. Guoxin (EX1015-EX1016) was not considered during prosecution of the '6983 patent and is more material than the prior art considered. Guoxin discloses a coupling arrangement between the bowl fill valve and the toilet fill valve where the toilet fill valve has an extension that forms the bowl fill outlet port (male connector), which is inserted into the bowl fill valve inlet port (female connector), in order to regulate the amount of water flowing into the toilet bowl. This is the reverse of the mating arrangements depicted in the '698 patent, but as explained below, is the same arrangement claimed in the patent. *See* '698 patent (EX1001), annotated Fig. 5B; Guoxin (EX1016), annotated Figure 4.

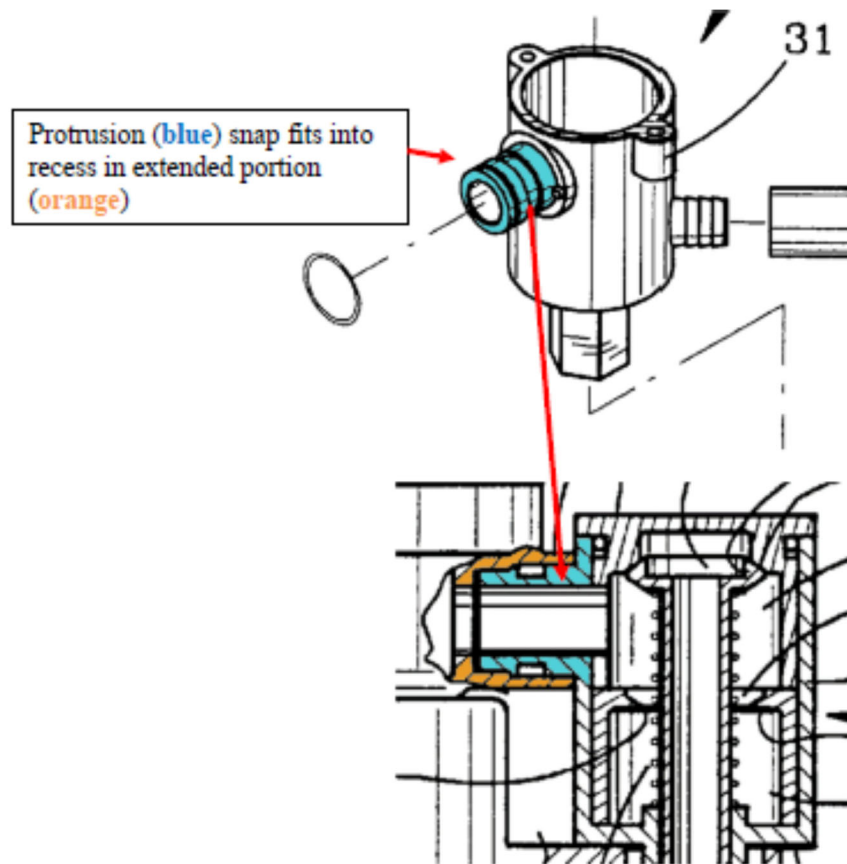
'698 Patent



Guoxin



98. Ho discloses an extended portion on a toilet fill valve with a recess (female connector) into which a bowl fill valve inlet port (male connector) of a bowl fill valve is inserted and locked into place. *See* Ho (EX1022), annotated Figs. 3 and 5 below.



99. Ho was not considered during prosecution of the '698 patent and is more material than the art considered. Both Guoxin and Ho are directed to toilet valve systems. *See, e.g.*, Guoxin (EX1016), p. 2 (title “Toilet Water Tank Water Supply Switching Device”); Ho (EX1022), p. 1 (title “Toilet Flushing Device”). The systems of both Guoxin and Ho utilize and describe bowl fill valves (e.g., “switching mechanism 4” in Guoxin and “diverter valve means 30” in Ho) that attach directly to the toilet fill valve to accurately control the amount of water that flows from the toilet fill valve into the toilet bowl. *See, e.g.*, Guoxin (EX1016), 5:1-2 (“By adopting the said solution: This achieves more accurate control of the switching valve for the water supply...”), Figs. 1-4; Ho (EX1022), 1:6-9 (“This invention relates to a toilet

flushing device, more particularly to a toilet flushing which has a diverter valve unit for directing water from the water supplying pipe to the rim flushing conduit of the toilet bowl.”), Figs. 1-5.

100. Using Ho’s connection instead of Guoxin’s would have been obvious to a POSITA as a matter of design preference, as they are well-known substitute structures for performing the same function in their known and expected manner. Similarly, the snap fit and slot/rib (or slot/extension) connections between the two fluid channels recited by the claims are well-known fluid flow connections disclosed by numerous documents such as Calmettes, Hall, and Kimber—the Quick Connection Art. Indeed, the ’698 patent acknowledges that any of a variety of well-known snap fit and sealing configurations could be used for the connection: “Also, other snap fit and sealing configurations may be employed beyond those specifically described herein.” ’698 patent (EX1001), 10:6-7.

101. One of ordinary skill in the art would understand that male and female fluid flow connectors are generally interchangeable and the decision to make one component a male connector and the other a female connector is a matter of design preference. For example, Bjerke (EX1017) shows that male and female connectors can be reversed in relation to each other and are thus interchangeable. *See, e.g.,* Bjerke (EX1017), 7:15-24, Figs. 5-6 (below) (reversal/interchangeability of male 66/64a and female 66/66a portions of quick connect/disconnect system).

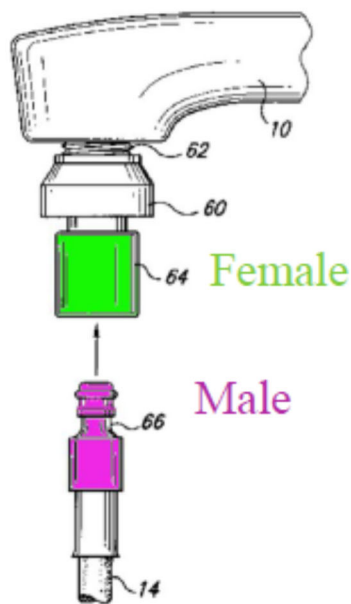


Fig. 5

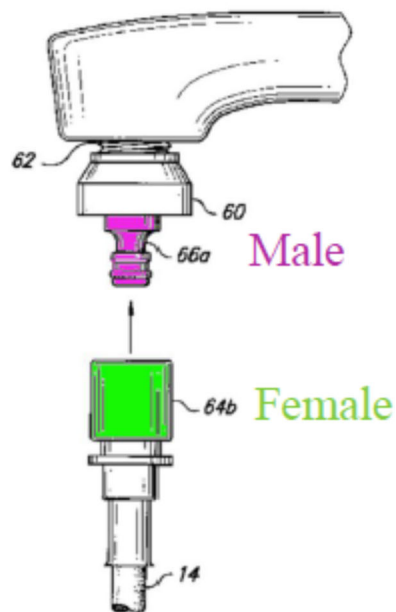


Fig. 6

102. As another example of the interchangeability of male and female connectors, and specifically connectors for toilet fill valves, the obviousness of such a substitution is also supported by the prosecution of the '698 patent, where PO presented claim 3, which recited the precise arrangement disclosed by Guoxin (e.g., male protrusion as the bowl fill outlet port and female receptacle at the bowl fill inlet port) and referred to paragraphs [0033] and [0042] of the specification as support. Prosecution History for the '698 Patent (EX1002), 80-81. In particular, Paragraph [0033] states:

...the bowl fill outlet port 206 may comprise a female receptacle and, correspondingly, the bowl fill valve inlet

port 213 may comprise a male end compatible with a female receptacle. Alternatively, the bowl fill valve inlet port 213 may comprise a female receptacle and the bowl fill outlet port 206 may comprise a male end compatible with such female receptacle.

Id.

103. Paragraph [0042] also states with respect to the connectors shown in Figs. 5A and 5B that “**it is possible that this arrangement may be reversed....**”

Id. (emphasis in original). It is clear from the ’698 patent specification and the intrinsic evidence that PO placed no criticality on which portion of the coupling was the male portion and which portion was the female portion. Placing a protrusion on the bowl fill restriction or on the toilet fill valve bowl fill outlet port therefore would have been an obvious design choice to a POSITA.

104. The toilet fill valve connectors at issue here are likewise interchangeable. Thus, a toilet fill valve with a male connector that mates to a female connector on a bowl fill restriction (as in Guoxin) is equivalent to a toilet fill valve with female connector that mates to a male connector on a bowl fill restriction (as in Ho). Indeed the ’698 patent confirms the obvious interchangeability of protrusions, ribs, recesses, etc., on the respective couplings. ’698 patent (EX1001), 7:36-48 (“it is possible that this arrangement may be reversed....in a reverse arrangement”).

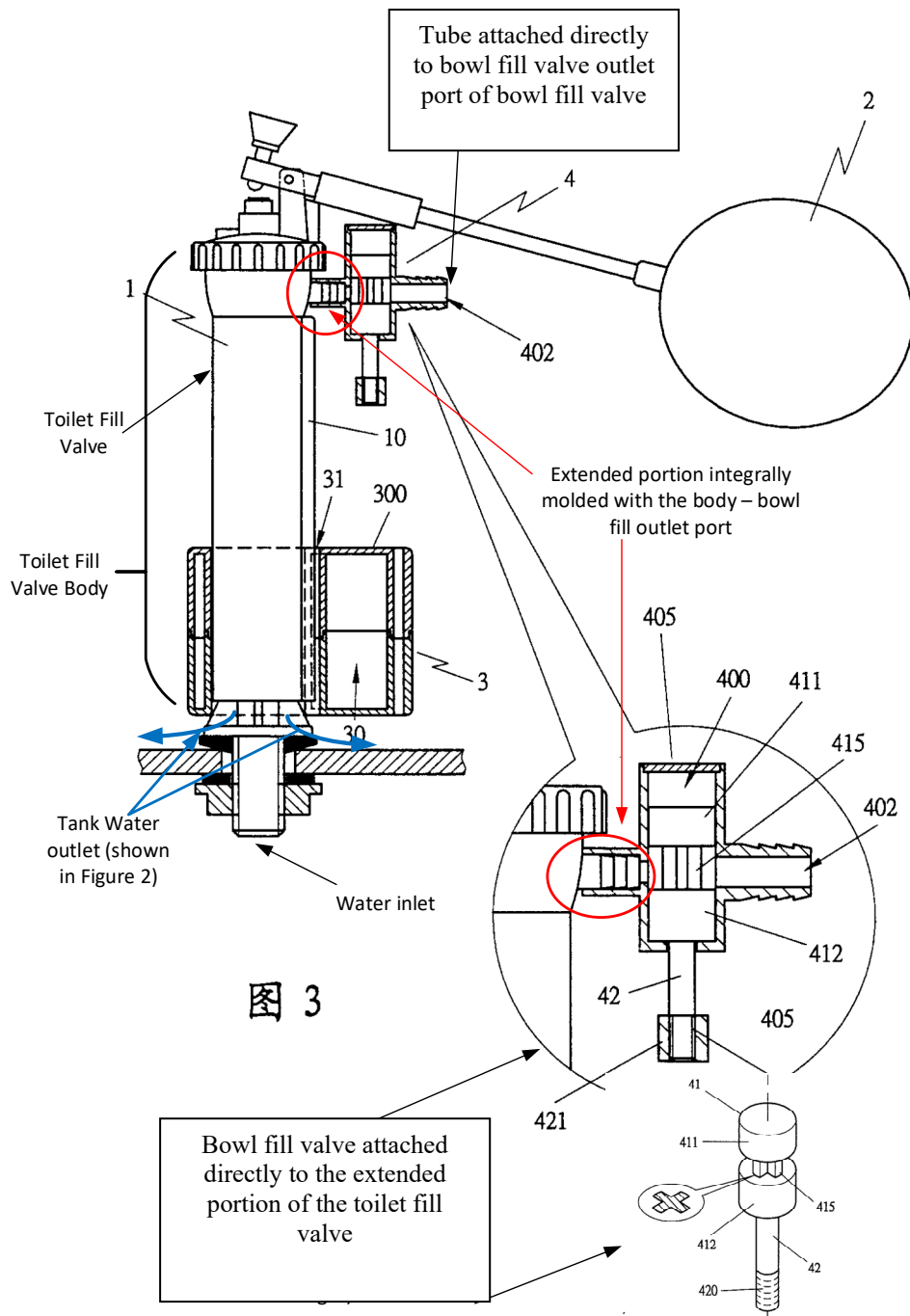
105. In view of the foregoing, using a male connector on the bowl fill restriction, such as the one shown in Ho, instead of the female connector, such as the

one shown in Guoxin, would have been obvious to a POSITA as a matter of design preference. Likewise, the choice of whether a male or female connector has a protrusion or a recess for creating a connection would be obvious to a POSITA as a matter of design preference. They are well-known substitute structures for performing the same function in their known and expected manner and would require only a simple substitution of one known coupling arrangement for another to obtain predictable results.

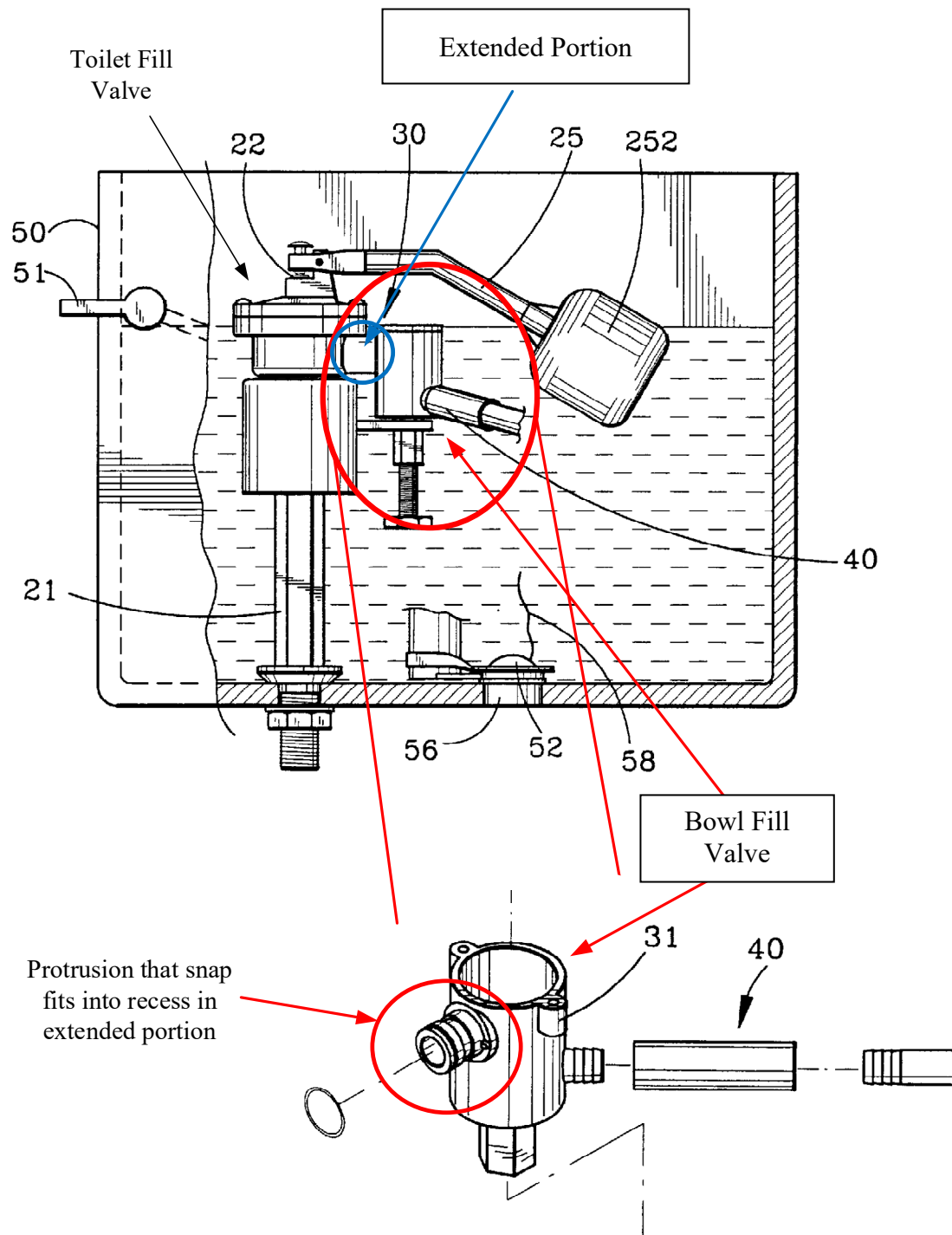
106. Thus, as explained below, Guoxin, alone or in combination with Ho, and further in view of the Quick Connection Art renders the Challenged Claims obvious.

1. Independent Claim 1 is Obvious Over Guoxin in View of Ho and Further in View of the Quick Connection Art

107. In connection with my analysis, I refer to the following annotated figures from Guoxin and Ho provided below, and additional annotated figures introduced later.



Guoxin (EX1016), 2:8-20, Figs. 2-5, Annotated Figs. 3 and 5 above.



Ho (EX1022), annotated Figs. 2 and 5 above.

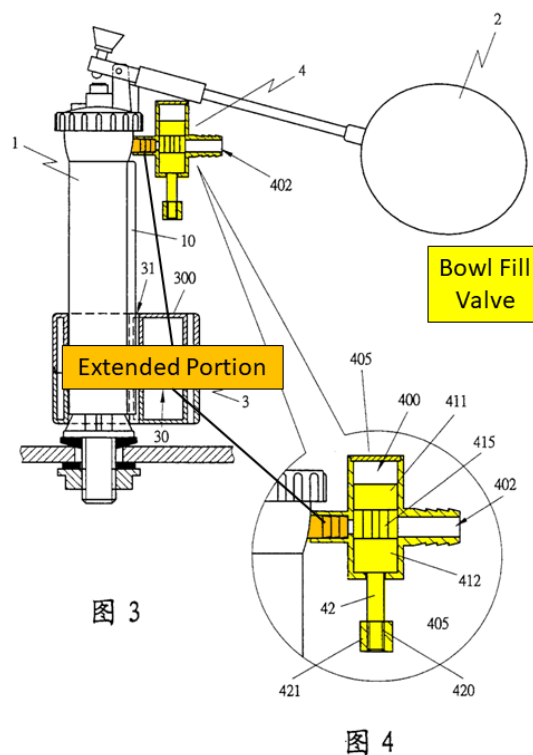
a. Claim Element 1[Pre]

108. Claim 1 recites “A toilet system, comprising: a toilet fill valve ...; a bowl fill valve ...; and a tube ...” As illustrated in the annotated figures, Guoxin and Ho each disclose a system including these three elements.

b. Claim Element 1[A1]

109. Claim element **1[A1]** recites “a toilet fill valve that comprises: a body comprising an extended portion that forms a bowl fill outlet port....” ’698 patent, claim 1.

110. Guoxin discloses a toilet fill valve having an extended portion that is integrally molded with the water inlet device 1, as shown in Figure 3 and the exploded view of Figure 4. The extended portion of Guoxin’s toilet fill valve forms a bowl fill outlet port. Similarly, Ho discloses a toilet fill valve having an extended portion that is integrally molded with the toilet fill valve body, as shown in Figures 2-6 (see annotated Figures 2 and 5 above), and which forms a bowl fill outlet port for connection to diverter valve means 30. Thus, Guoxin and Ho each satisfy element **1[A]**.

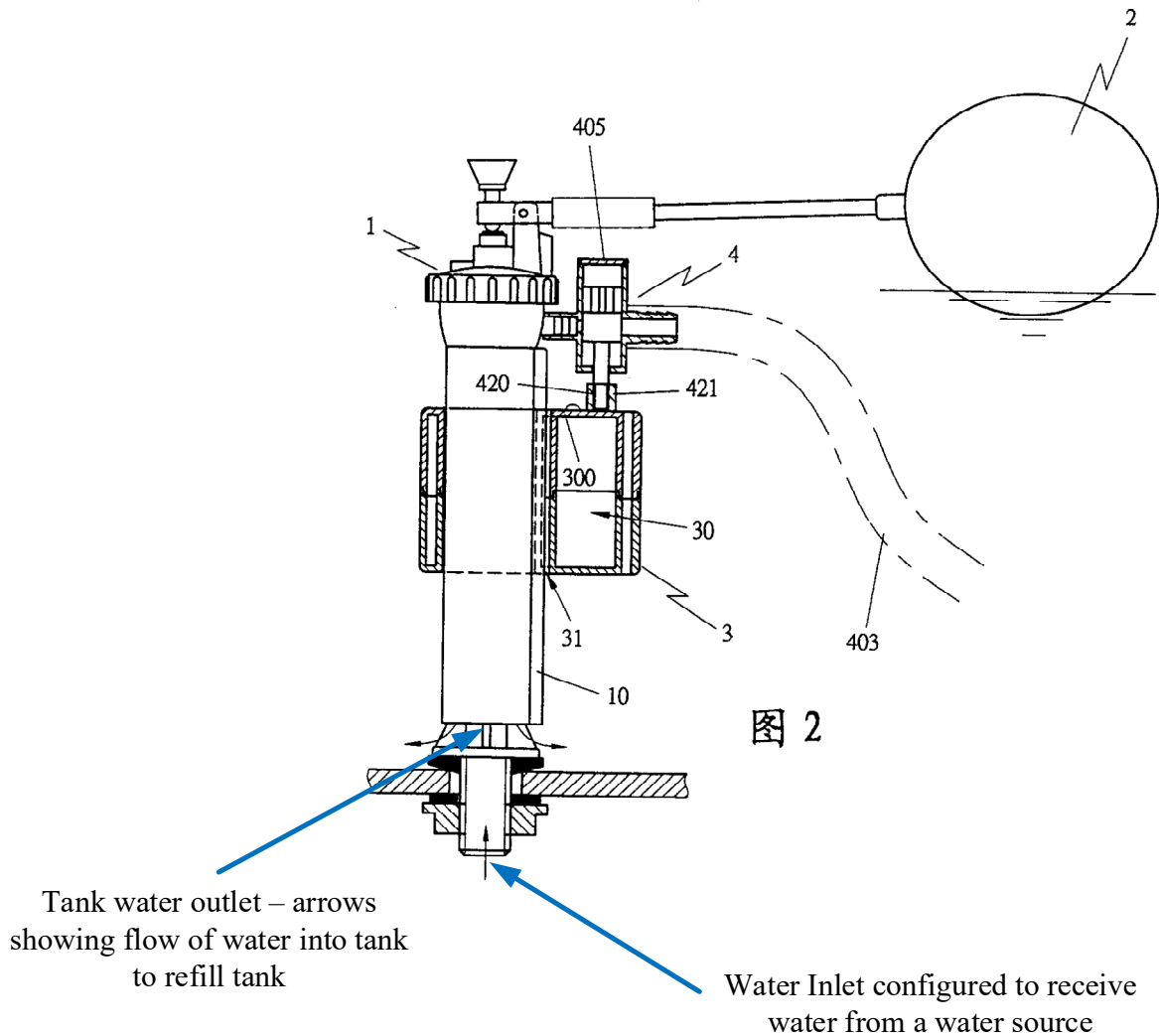


c. Claim Element 1[A2]

111. Claim element 1[A2] recites “a water inlet configured to couple to a water source; and....” ’698 patent, claim 1.

112. Guoxin discloses a water inlet device 1 configured to receive water from a water source. *See* Guoxin (EX1016), 2:8-9, Fig. 2 below. Ho discloses a water supplying pipe 21 configured to receive water from a water source. *See* Ho (EX1022), 2:56, Fig. 10 below. Thus, Guoxin and Ho each discloses a water inlet, as is conventional in the art, configured to receive water from a water source. Further, annotated Guoxin (EX1016) Figure 2 below includes an arrow pointing upwards

(black arrow in the original) that shows the flow of water at the water inlet. In view of the foregoing, Guoxin and Ho each satisfy these elements.



d. Claim Element 1[A3]

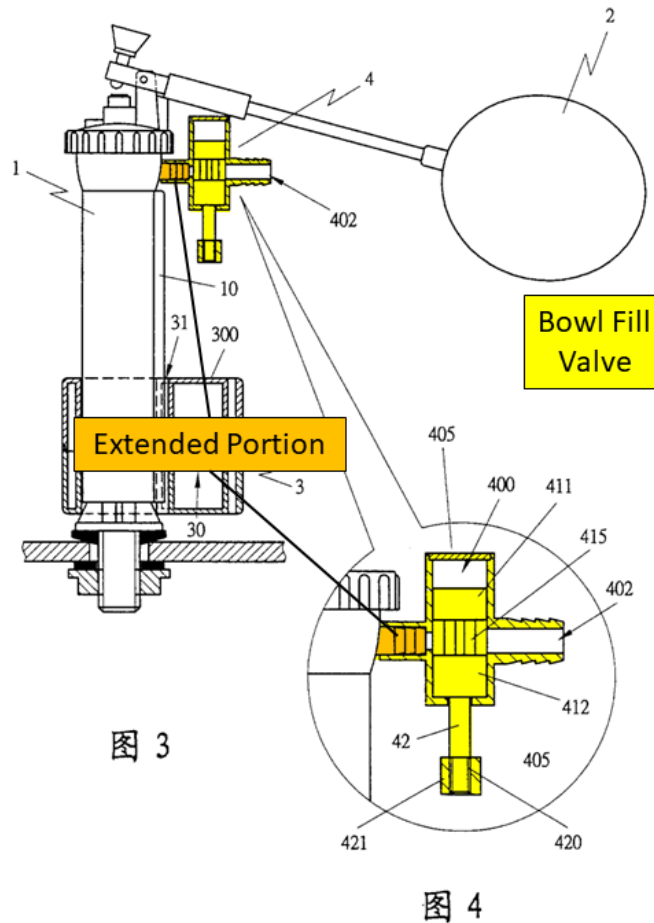
113. Claim element 1[A3] recites “a tank water outlet configured to output water to a toilet tank....” ’698 patent, claim 1.

114. Guoxin illustrates the tank water outlet as shown in annotated Figure 2 above (black arrows showing the flow at the tank water outlet in original). Ho discloses a tank water outlet via passage 321 of valve rod 32. *See* Ho (EX1022), 4:32-39, Fig. 10. As such, Guoxin and Ho each disclose a tank water outlet, as is conventional in the art, and satisfy these elements.

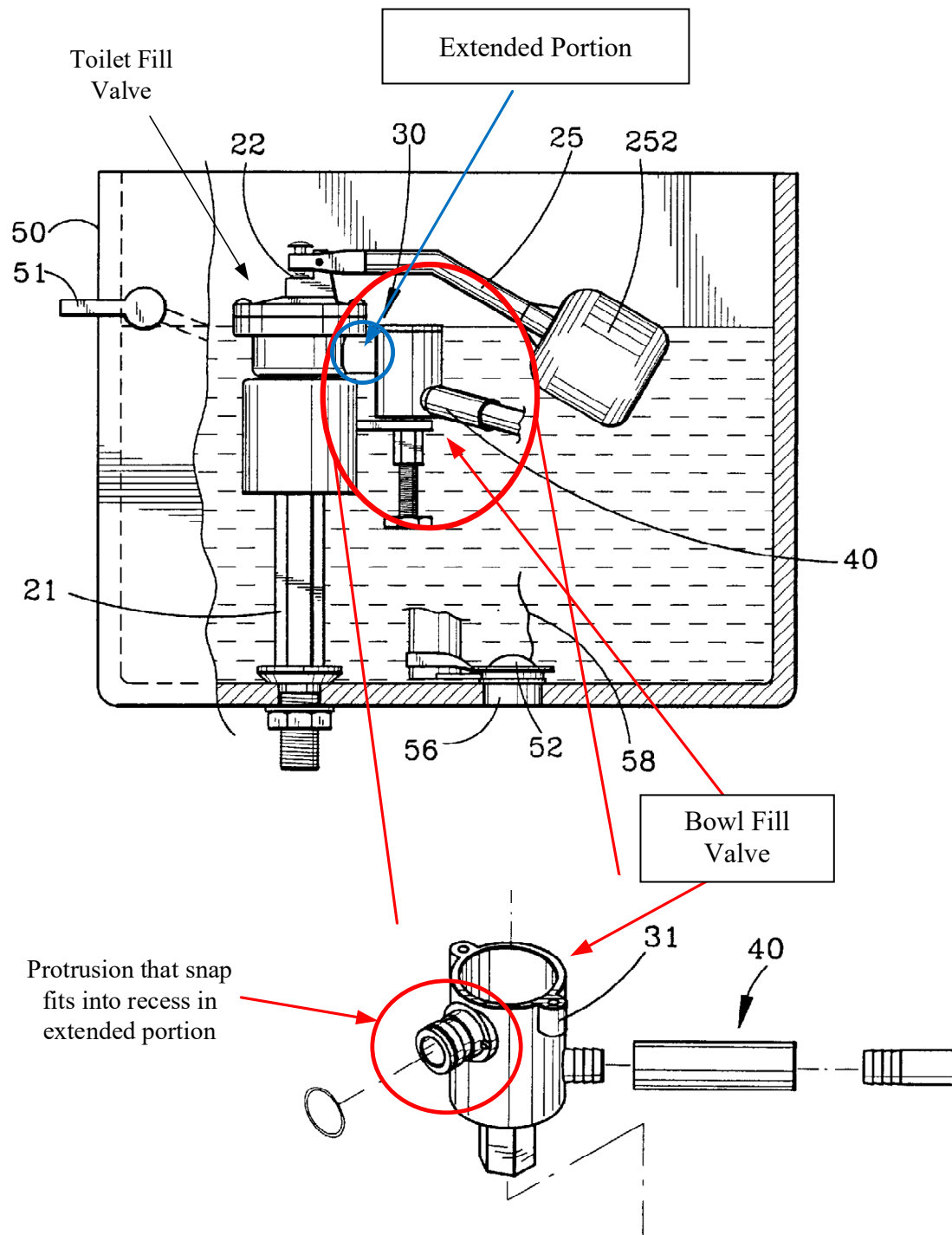
e. Claim Elements 1[B1]

115. Claim element **1[B1]** recites “a bowl fill valve configured to attach directly to the body of the toilet fill valve, the bowl fill valve comprising:.... ” ’698 patent, claim 1.

116. Guoxin discloses a bowl fill valve in the form of switching mechanism 4 that attaches directly to the extended portion of the body of the toilet fill valve via the mating engagement of switching valve inlet 401, and the extended portion on water inlet device 1. *See* Guoxin (EX1016), 2:8-20, Figs. 2-5; *see also*, Guoxin annotated Figs. 3-5 below.



117. Ho discloses bowl fill valve (diverter valve means 30) that attaches directly to the extended portion of the toilet fill valve. *See* Ho (EX1022), 3:8-13, Fig. 5 and 8-11; *see*, annotated Figs. 2 & 5 below.



118. In view of the forgoing, Guoxin and Ho each satisfy these elements.

f. Claim Element 1[B2]

119. Claim element **1[B2]** recites “a bowl fill valve inlet port configured to mate directly to the bowl fill outlet port of the body of the toilet fill valve....” ’698 patent, claim 1.

120. As discussed above with respect to elements **1[A1]** and **1[B1]**, Guoxin discloses a bowl fill valve (switching mechanism 4) with an inlet port that mates directly to the bowl fill outlet port created by the extended portion of the body of the toilet fill valve (water inlet device 1). *See* Guoxin (EX1016), annotated Figs. 3 and 4.

121. Ho also discloses a bowl fill valve (diverter valve means) with an inlet port that mates to the bowl fill outlet port created by the extended portion of the body of the toilet fill valve (water supplying pipe 21). *See* Ho (EX1022), Figs. 3 and 5

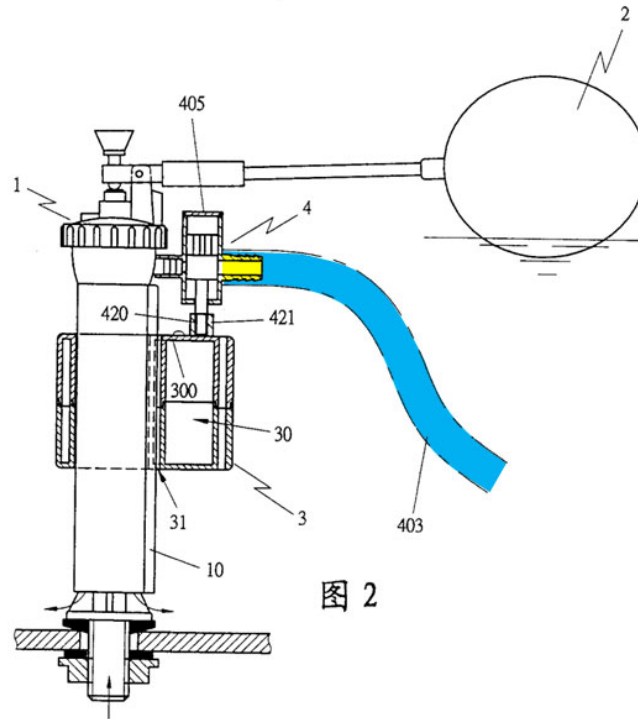
122. Guoxin and Ho each satisfy this element.

g. Claim Element 1[B3]

123. Claim element **1[B3]** recites “a bowl fill valve outlet port....” ’698 patent, claim 1.

124. Guoxin discloses a tube 403 configured to attach directly to the bowl fill valve outlet port of the bowl fill valve (switching mechanism 4). *See* Guoxin (EX1016), annotated Fig. 2 below, p. 2 (“The valve seat 40 has water inlet and outlet 401 and 402, where the water outlet 402 can be connected to the water supply

pipeline 403, and the water supply line 403 is directed to the toilet to directly provide water supply to the toilet.”).



125. Ho also discloses a tube (supply line 40) configured to attach directly to the bowl fill valve outlet port of the bowl fill valve (diverter valve means 30). Ho (EX1022), 3:6-17, 4:5-7..

126. In view of the foregoing, Guoxin and Ho each satisfy this element.

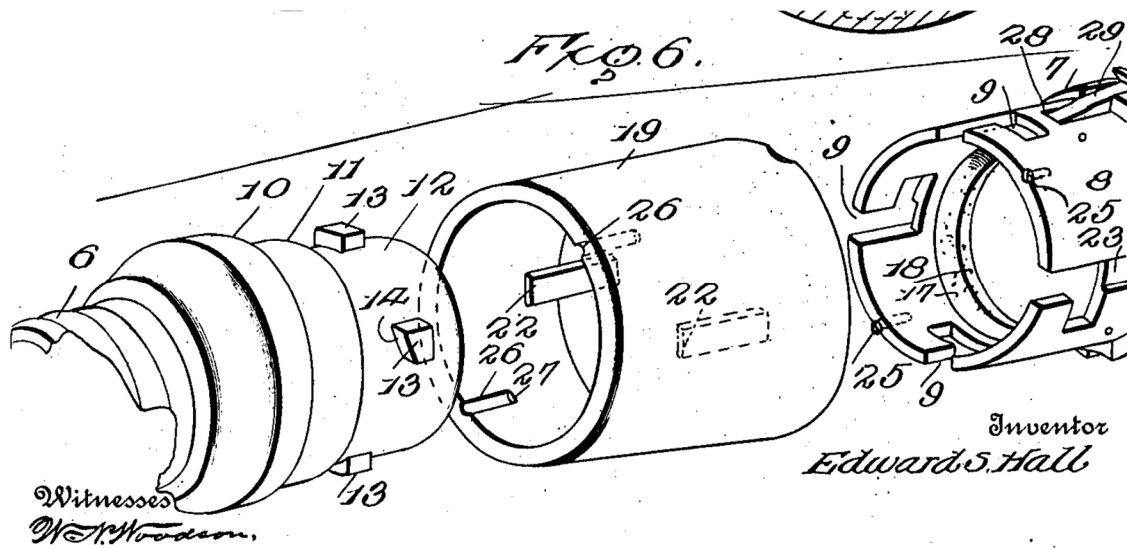
h. Claim Elements 1[B4]

127. Claim element 1[B4] recites “a protrusion configured to insert into a recess of the toilet fill valve and retain the bowl fill valve to the toilet fill valve, the protrusion being configured to snap fit into the recess” ’698 patent, claim 1.

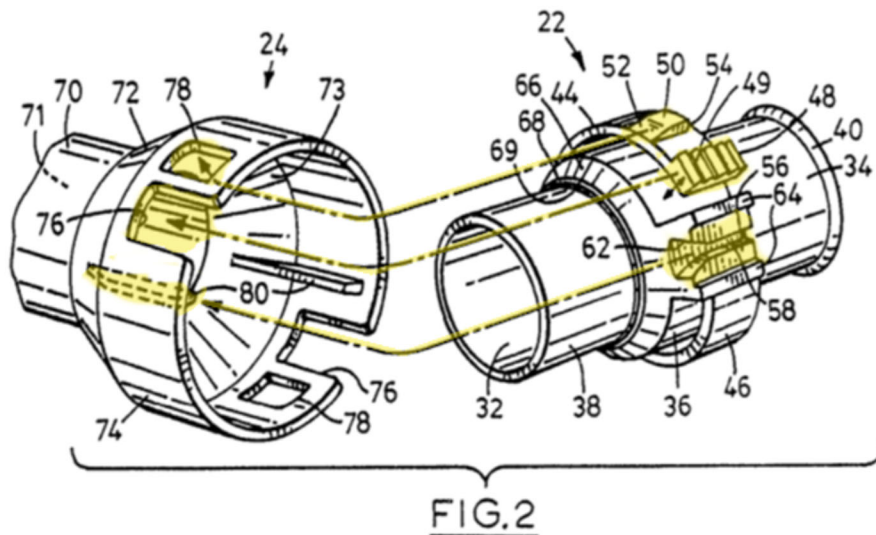
128. Guoxin discloses a protrusion in the form of annular ridges on the extended portion of the toilet fill valve that forms the bowl fill outlet port. The bowl fill outlet port of Guoxin is a male connector that inserts into the female connector of the bowl fill valve inlet port. The annular ridges of Guoxin retain the bowl fill valve to the toilet fill valve. *See* Guoxin (EX1016), annotated Figs. 3 and 4 below.

129. As discussed above, swapping the mating surfaces such that a protrusion is located on the bowl fill valve and inserts into a recess in the toilet fill valve would have been obvious to a POSITA as a matter of design preference.

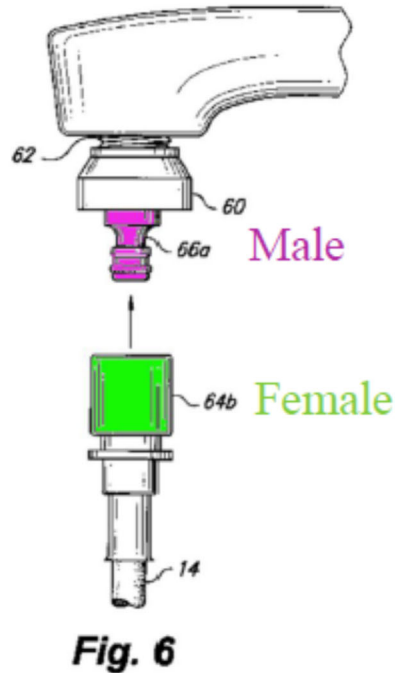
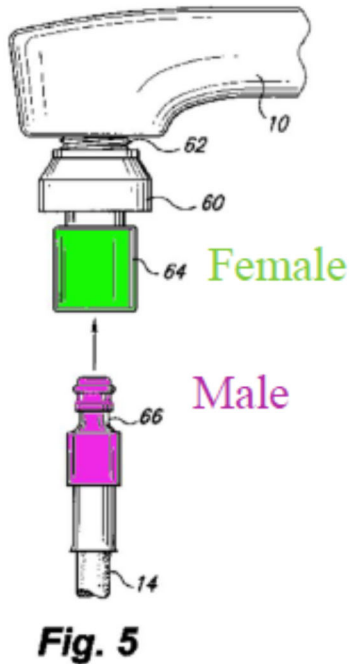
130. For example, with reference to Figure 6 of Hall (EX1019), Hall discloses a fluid flow coupler with a coupling sleeve/collar 19 (female connector) in which locking plates 22 are secured to the inner wall sleeve/collar 19 and insert into recesses 23 on cylindrical member 8 (male connector) in order to secure the connector components together. *See* Hall (EX1019), 1:100-2:7, Figure 6 (reproduced below).



131. As another example, Kimber (EX1020) also discloses a pipe coupling that comprises a male fitting 22 and a tubular female fitting 24 where the female fitting has protrusions (referred to as keying members 80) within the inner surface of the fitting that insert into recesses on the male fitting (referred to as guide slots 58) in order to maintain the connection between the two components. See Kimber (EX1020), 6-7.



interchangeability of male 66/64a and female 66/66a portions of a quick connect system. *See, e.g.*, Bjerke (EX1017), 7:15-24, Figs. 5-6 (below). Annotated Figures 5 and 6, demonstrate the ease with which male and female connectors can be swapped in a given arrangement and disclose the use of protrusions on the inner surface of a female connector and recesses on the outer surface of a male connector in order to create a snap fit connection that retains two components together. Figure 4 of Bjerke provides a view of the protrusions on the inner surface of the female connector 24b that fit into a recess on the outer surface of the male connector 23 in order to retain the components together. *Id.*, Fig. 4 below.



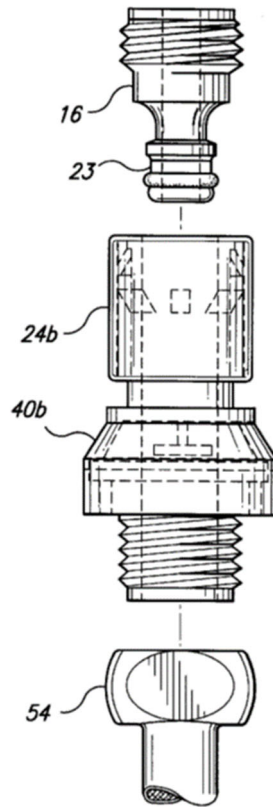


Fig. 4

133. The connections between the two fluid channels recited by the claims are well-known fluid flow connections disclosed by numerous documents such as Hall and Kimber. As such, using the mating engagements of Hall or Kimber to attach the extended portion of Guoxin's toilet fill valve to switching mechanism 4 would have been obvious to a POSITA as a matter of design preference, as they are well-known simple substitute structures for performing the same function (i.e., coupling and retaining fluid flow components together) in their known and expected manner to obtain predictable results.

134. Indeed, during prosecution of the '698 patent, PO presented claim 3, which recited the precise arrangement disclosed by Guoxin (e.g., male protrusion as the bowl fill outlet port and female receptacle at the bowl fill inlet port) and referred to paragraphs [0033] and [0042] of the specification as support. EX1002, 80-81.

Paragraph [0033] states:

...the bowl fill outlet port 206 may comprise a female receptacle and, correspondingly, the bowl fill valve inlet port 213 may comprise a male end compatible with a female receptacle. Alternatively, the bowl fill valve inlet port 213 may comprise a female receptacle and the bowl fill outlet port 206 may comprise a male end compatible with such female receptacle.

Id.; *see also, id.*, [0042] (stating with respect to the connectors shown in Figs. 5A and 5B that “**it is possible that this arrangement may be reversed...**”) (emphasis in original). It is clear from the '698 patent specification and the intrinsic evidence that PO placed no criticality on which portion of the coupling was the male portion and which portion was the female portion—and consequently, no criticality on whether the protrusion is on the bowl fill valve or on the toilet fill valve bowl fill outlet port.

135. Accordingly, the combination of Guoxin and the Quick Connection Art renders obvious a protrusion on a bowl fill valve that snaps into a recess in the toilet fill valve, thereby satisfying this element.

i. Claim Element 1[B5]

136. Claim element 1[B5] recites “a water flow adjustment handle.” ’698 patent, claim 1.

137. Guoxin discloses an adjustable bowl fill valve that adjusts the water flow rate through the valve based on a setting of the bowl fill valve. Guoxin (EX1016), 2:25-27; The water level is set by adjusting the T-shaped nut (water flow adjustment handle) to change the position of how the switching valve’s stem is driven—this in turn alters the amount of water that can leave the bowl fill restriction before the float valve stops water from entering the water inlet. Guoxin (EX1016), 2:27-33. To the extent it is argued that the T-shaped nut is not a handle, it would have been obvious to add material to one side of the nut to create a handle. A POSITA would have found it obvious to do so in order to make the nut easier to manipulate by hand. Thus, Guoxin satisfies this element.

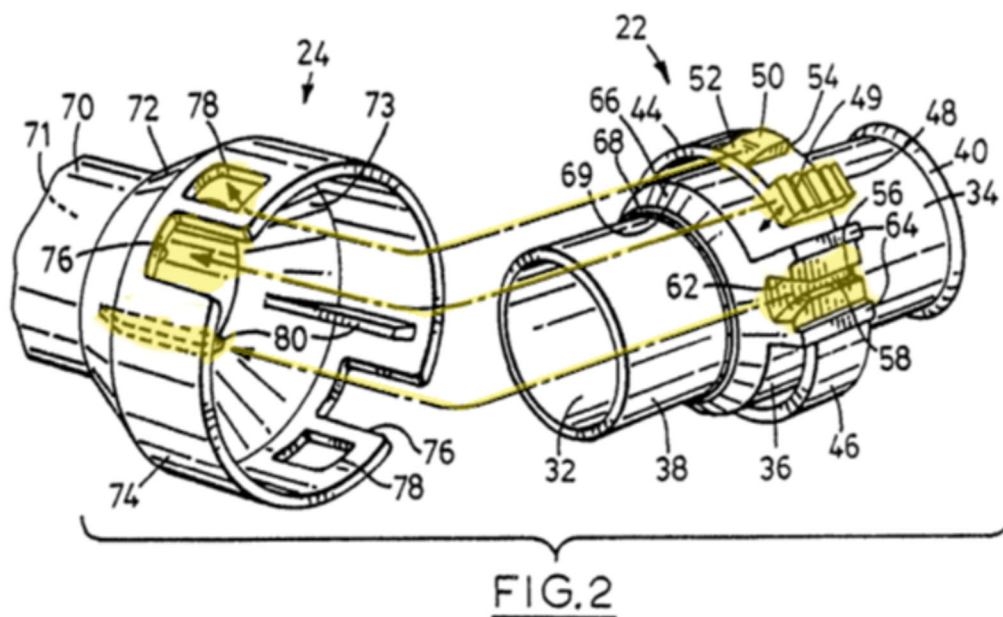
j. Claim Element 1[B6]

138. Claim element 1[B6] recites “a slot configured to receive an extension of the toilet fill valve and prevent rotation of the bowl fill valve relative to the toilet fill valve; and....” ’698 patent, claim 1.

139. As discussed above and also with respect to element 1[B4], snap fit couplings were known in the art. Furthermore, a POSITA would be motivated to select a connection that prevented detachment of the bowl fill valve from the toilet

fill valve. Similarly, a POSITA would also be motivated to select a connection that prevented relative rotation of the bowl fill valve with respect to the toilet fill valve. For example, Calmettes teaches that “the immobilization of two coaxial tubes may be sought after, both with regard to a relative rotation and to a translation, whenever it is desired to obtain an efficient mechanical connection between the two tubes.” Calmettes (EX1018), 1:17-22, 1:58-64.

140. Furthermore, within the Quick Connection Art, Kimber (EX1020) discloses a snap fit pipe coupling that comprises a male fitting and a tubular female fitting where the male fitting has slots configured to receive an extension of the toilet fill valve and prevent rotation of the bowl fill valve relative to the toilet fill valve. Annotated Figure 2 below illustrates the coupling arrangement between male fitting 22 and tubular female fitting 24 where tabs can snap into apertures and axial grooves 62 mate with ribs 80 to prevent axial movement and rotation.



141. Accordingly, the combination of Guoxin and the Quick Connection Art renders obvious this element.

k. Claim Element 1[C]

142. Claim element 1[C] recites “a tube configured to attach directly to the bowl fill valve outlet port of the bowl fill valve.” ’698 patent, claim 1.

143. As discussed above with respect to element 1[B3], Guoxin discloses a tube 403 configured to attach directly to the bowl fill valve outlet port of the bowl fill valve (switching mechanism 4). Guoxin (EX1016), Fig. 2. Ho also discloses a tube (supply line 40) configured to attach directly to the bowl fill valve outlet port of the bowl fill valve (diverter valve means 30). Ho (EX1022), 3:6-17, 4:5-7. Guoxin and Ho each satisfy this element

1. Independent Claim 1 Summary

144. In view of the foregoing, the combination of Guoxin, alone or with Ho and the Quick Connection Art renders obvious independent claim 1.

2. Independent claims 8 and 12 are obvious over Guoxin in view of Ho and Further in View of the Quick Connection Art

145. Independent claims 8 and 12 are obvious over Guoxin in view of Ho and the Quick Connection Art for the generally the same reasons as claim 1 is obvious as described above. The elements of independent claims 8 and 12 largely mirror the bowl fill valve elements of claim 1, omit the toilet fill valve elements, and fail to recite any additional elements.

a. Claim Elements 8[Pre] & 12[Pre]

146. Claim elements **8[Pre]** and **12[Pre]** each recites “A bowl fill valve, comprising...” ’698 patent, claims 8 and 12.

147. For the reasons discussed above with respect to **1[Pre]** and **1[B1]**, Guoxin and Ho each satisfy these preambles.

b. Claim Elements 8[A] & 12[A]

148. Elements **8[A]** and **12[A]** both recite “a bowl fill valve inlet port configured to mate directly to a bowl fill outlet port of a body of a toilet fill valve.” ’698 patent, claims 8 and 12. For the reasons discussed above with respect to **1[B2]**, Guoxin and Ho each satisfy these elements.

c. Claim Elements 8[B] & 12[B]

149. Elements **8[B]** and **12[B]** both recite “a bowl fill valve outlet port configured to attach directly to a tube that provides water from the bowl fill valve outlet port to an overflow tube.” For the reasons discussed above with respect to **1[B3]** and **1[C]**, Guoxin and Ho each satisfy these elements.

d. Claim Elements 8[C] and 12[C]

150. Claim element **8[C]** recites “a protrusion configured to insert into a recess of the toilet fill valve and retain the bowl fill valve to the toilet fill valve, the protrusion being configured to snap fit into the recess....” ’698 patent, claim 8.

151. Claim element **12[C]** recites “a protrusion on the bowl fill valve configured to snap fit into a recess of the toilet fill valve and retain the bowl fill valve to the toilet fill valve....” ’698 patent, claim 12.

152. Elements **8[C]** and **12[C]** both require “a protrusion” on the bowl fill valve that is configured to snap fit into a recess of the toilet fill valve and retain the bowl fill valve to the toilet fill valve. For the reasons discussed above with respect to **1[B1]**, **1[B2]**, and **1[B4]**, Guoxin in view of the Quick Connection Art renders these elements obvious

e. Claim Elements 8[D] and 12[D]

153. Elements **8[D]** and **12[D]** both require “a slot configured to receive an extension of the toilet fill valve and prevent rotation of the bowl fill valve relative to the toilet fill valve.” ’698 patent, claims 8 and 12. For the reasons discussed above

with respect to **1[B6]**, Guoxin in view of the Quick Connection Art render these elements obvious.

f. Claim Elements 8[E] and 12[E]

154. Claim element **8[E]** requires “a water flow adjustment handle being configured to adjust water flow from the bowl fill valve inlet port to the bowl fill valve outlet port.” ’698 patent, claim 8.

155. Claim element **12[E]** requires “means for adjusting water flow out of the bowl fill valve outlet port.” ’698 patent, claim 12.

156. As discussed above in Section IV.B.3, the “means for adjusting water flow” expression is construed to mean a water flow adjustment handle. For the reasons discussed above with respect to **1[B5]**, Guoxin, alone or with Ho, and the Quick Connection Art render these elements obvious

g. Independent Claims 8 and 12 Summary

157. In view of the above discussion, the combination of Guoxin, Ho, and the Quick Connection Art disclose or renders obvious all of the elements recited by independent claims 8 and 12.

3. Independent claim 10 is obvious over Guoxin in view of Ho and Further in View of the Quick Connection Art

158. Independent claim 10 is obvious over Guoxin in view of Ho and the Quick Connection Art for the generally the same reasons as claim 1 is obvious as described above. Claim 10 is fundamentally nothing more than the method (steps)

performed when assembling the system of claim 1. Regarding assembly, toilet fill valves have been made easier to assemble and replace by homeowners, and consequently, toilet fill valve replacement kits were readily available at hardware and home improvement stores long before the earliest effective filing date of the '698 patent. Fabricating various parts separately and designing the separate parts for easy assembly would have been considered obvious design parameters and/or obvious and routine optimization to a POSITA prior to the '698 patent filing date. There is nothing unique, unexpected, or unobvious in the method steps recited by method 14. Indeed, claim 3 of Guoxin specifically recites that the water flow regulator (switching mechanism 4) and valve stem are “integrally formed, *making assembly and combination exceedingly convenient and fast.*” Guoxin (EX1016), 3:3-4, emphasis added.

a. Claim Element 10[Pre]

159. Claim element **10[Pre]** recites “[a] method, comprising....” ’698 patent, claim 14.

160. To the extent any of the respective pieces of the toilet fill valve and bowl fill valves disclosed by Guoxin and Ho are assembled prior to operation of the toilet fill valve, the cited art inherently discloses a method of assembling the respective parts. As noted above, claim 3 of Guoxin specifically recites that the bowl fill valve (switching mechanism 4) and valve stem are “integrally formed, making

assembly and combination exceedingly convenient and fast.” Guoxin (EX1016), 3:3-4.

b. Claim Element 10[A]

161. Claim element **10[A]** recites “coupling a water inlet of a toilet fill valve to a water source....” ’698 patent, claim 10.

162. For the same reasons discussed above with respect to elements **1[A2]**, Guoxin and Ho each disclose or render obvious this element.

c. Claim Element 10[B1]

163. Claim element **10[B1]** recites “attaching a bowl fill valve directly to a body of the toilet fill valve by at least:....” ’698 patent, claim 10.

164. For the same reasons discussed above with respect to elements **1[B1]**, Guoxin and Ho each disclose or render obvious this element.

d. Claim Element 10[B2]

165. Claim element **10[B2]** recites “mating a bowl fill valve inlet port of the bowl fill valve directly to a bowl fill outlet port that extends from the body of the toilet fill valve;....” ’698 patent, claim 10.

166. For the same reasons discussed above with respect to element **1[B2]** above, Guoxin and Ho each disclose this element.

e. Claim Element 10[B3]

167. Claim element **10[B3]** recites “snap fitting a protrusion of the bowl fill valve into a recess of the toilet fill valve; and....” ’698 patent, claim 10.

168. For the same reasons discussed above with respect to elements **1[B3]** and **1[B4]**, the combination of Guoxin, alone or with Ho, and the Quick Connection Art renders obvious this element.

f. Claim Element 10[B4]

169. Claim element **10[B4]** recites “inserting an extension of the toilet fill valve into a slot of the bowl fill valve, wherein the slot is configured to prevent rotation of the bowl fill valve relative to the toilet fill valve; and....” ’698 patent, claim 10.

170. For the same reasons discussed above with respect to elements **1[B4]** and **1[B6]**, the combination of Guoxin, alone or with Ho, and the Quick Connection Art renders obvious this element.

g. Claim Element 10[C]

171. Claim element **10[C]** recites “attaching a tube directly to a bowl fill valve outlet port of the bowl fill valve.” ’698 patent, claim 10.

172. For the same reasons discussed above with respect to element **1[E]**, Guoxin and Ho each disclose or render obvious this element.

h. Independent Claim 10 Summary

173. The combination of Guoxin and the Quick Connection Art or the combination of Guoxin, Ho, and the Quick Connection Art disclose or renders obvious all of the elements recited by independent claim 10.

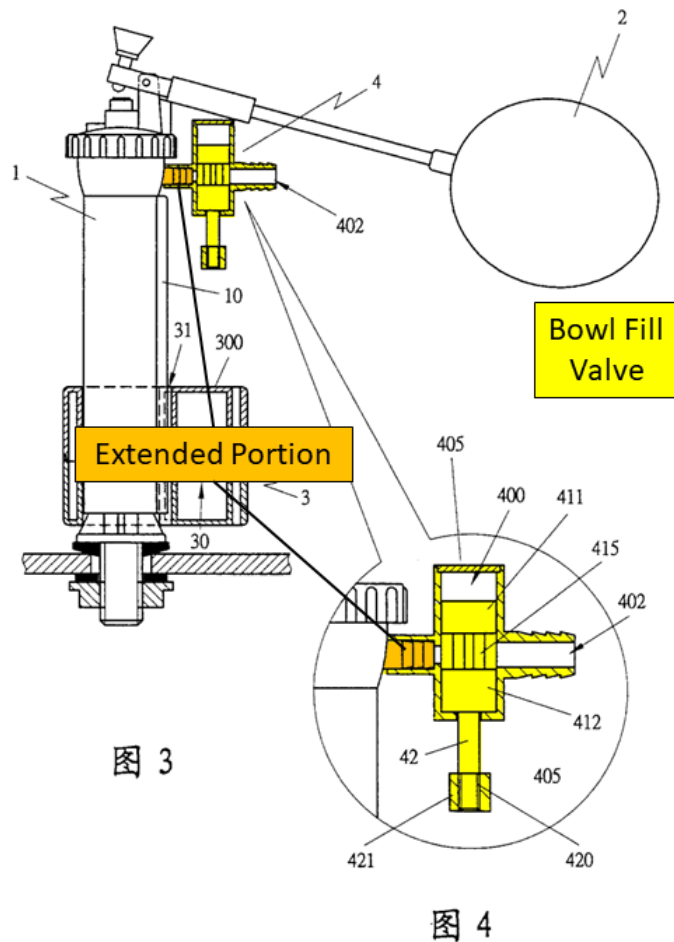
4. Dependent Claims 2-7, 9, 11, and 13-14 Are Obvious

a. Claims 2 and 9

174. Dependent claim **2** recites “[t]he toilet system of claim 1, wherein the bowl fill outlet port comprises a male end, and wherein the bowl fill valve inlet port comprises a female receptacle for the male end of the bowl fill outlet port.” ’698 patent, claim 2.

175. Dependent claim **9** recites “[t]he bowl fill valve of claim 8, wherein the bowl fill valve inlet port comprises a female receptacle for a male end of the bowl fill outlet port.” ’698 patent, claim 9.

176. Dependent claims 2 (which depends from claim 1) and 9 (which depends from claim 8) recite that the bowl fill outlet port of the toilet fill valve is a male connector and the bowl fill valve inlet port of the water flow regulator is a female connector. As discussed above with respect to element **1[B1]** and **1[B4]**, Guoxin discloses an extended portion (bowl fill outlet port) on water inlet device 1 that forms a male connector and a corresponding female connector in the form of switching valve inlet 401 (bowl fill valve inlet port) on switching mechanism 4 (bowl fill valve) that surrounds the extending portion forming the male connector. Guoxin (EX1016), 2:8-20, Figs. 2-5. Thus, combination of Guoxin and the Quick Connection Art disclose or render obvious claims 2 and 9.



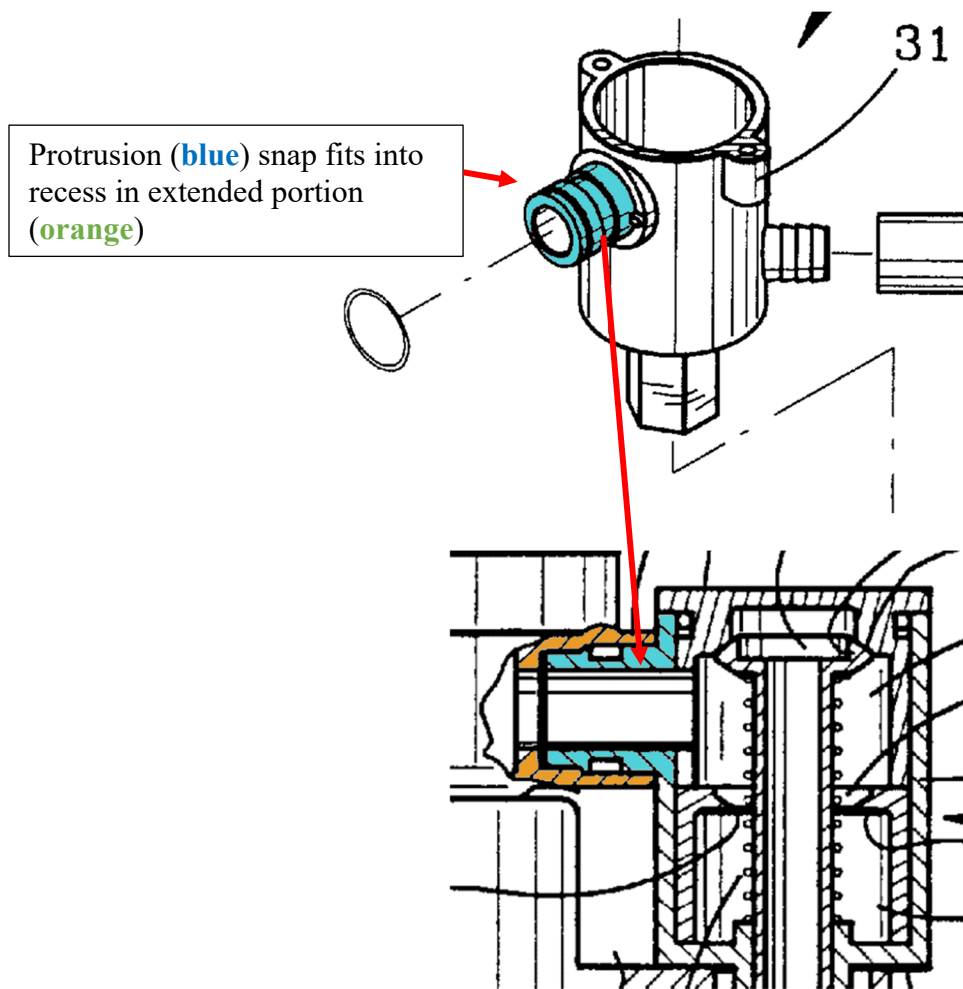
b. Claim 3

177. Dependent claim 3 recites “[t]he system of claim 1, [3A] wherein the protrusion of the bowl fill valve is an annular protrusion located on a bowl fill valve side wall of the bowl fill valve, [3B] wherein the recess of the toilet fill valve is an annular recess located on a bowl fill outlet port side wall of the bowl fill outlet port, [3C] wherein the slot of the bowl fill valve is located on the bowl fill valve side wall,

and wherein the extension of the toilet fill valve is a rib on the bowl fill outlet port side wall.” ’698 patent, claim 3.

178. As discussed above with respect to elements **1[B4]** and **1[B6]**, the combination of Guoxin, alone or with Ho, and the Quick Connection Art renders obvious this claim. I also note the following with respect to dependent claim 3.

179. As shown in Figures 3 and 5, Ho discloses a bowl fill valve with an annular protrusion located on the side wall of the valve that is configured to snap fit within an annular recess on the side wall of the bowl fill outlet port of the toilet fill valve. *See* EX1022, annotated Figs. 3 and 5 below.



180. As discussed above, it would have been obvious to use the mating engagement of Ho to attach the extended portion of Guoxin's toilet fill valve with switching mechanism 4 of Guoxin, as a simple substitution of one known coupling arrangement for another to obtain predictable results. Accordingly, the combination of Guoxin and Ho or the combination of Guoxin, Ho, and the Quick Connection Art satisfies elements 3[A] and 3[B].

183. Accordingly, the combination of Guoxin, alone or with Ho, and the Quick Connection Art renders obvious this element.

c. Claim 4

184. Claim 4 recites “[t]he toilet system of claim 1, wherein the bowl fill outlet port extends radially from a longitudinal axis of the body of the toilet fill valve.” ’698 patent, claim 4.

185. Dependent claim 4 recites the bowl fill outlet port extending radially from a longitudinal axis of the body of the toilet fill valve. These features are discussed above with reference to elements **1[A1]**, **1[B1]**, and **1[B2]**. Thus, claim 4 is rendered obvious for the same reasons discussed above.

d. Claim 5

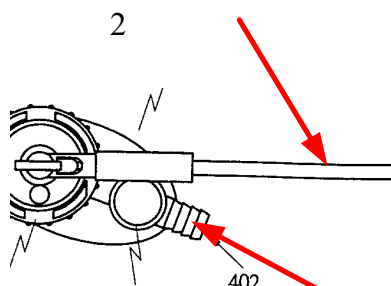
186. Claim 5 recites “[t]he toilet system of claim 4, wherein the toilet fill valve further comprises an actuation arm that extends radially from the longitudinal axis of the body of the toilet fill valve, and wherein the actuation arm is angularly offset relative to the bowl fill outlet port.” ’698 patent, claim 5.

187. Dependent claim 5 recites an actuation arm that extends radially from the longitudinal axis of the body of the toilet fill valve and in which the actuating arm is angularly offset relative to the bowl fill outlet port. The features recited by claim 5 are disclosed and illustrated in each of Guoxin and Ho, and would have been obvious to a POSITA—who would not seek to design a toilet fill valve with a

conventional float attached to a translational arm that was obstructed in some manner from freely translating. See EX1016, Fig. 1 below; EX1022, Fig. 6 below.

Guoxin

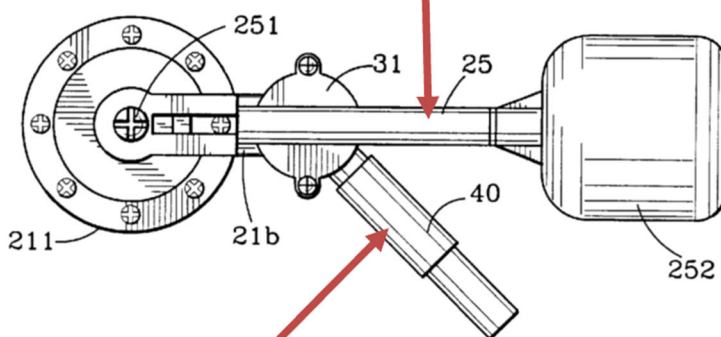
Translational arm attached to float



Bowl fill valve attaches here,
offset at an angle from float arm

Ho

Translational arm attached to float



Bowl fill valve attaches here, offset
at an angle from float arm

B.

Offset at an angle from float arm

188. Guoxin and Ho each disclose the features of dependent claim 5, thereby rendering this claim obvious.

e. Claims 6 and 7

189. Claim 6 recites “[t]he toilet system of claim 1, wherein the toilet fill valve further comprises a float configured to move along at least a portion of the body of the toilet fill valve.” ’698 patent, claim 6.

190. Claim 7 recites “[t]he toilet system of claim 6, wherein the at least a portion of the body of the toilet fill valve extends through the float.” ’698 patent, claim 7.

191. Dependent claim 6 recites a float configured to move along at least a portion of the body of the toilet fill valve. Similarly, dependent claim 7 further recites that at least a portion of the body of the toilet fill valve extends through the float. Further to the discussion above with respect to element **1[B5]**, I note that both Guoxin and Ho disclose floats that move along at least a portion of the body of the toilet fill valve where at least a portion of the body of the toilet fill valve extends through the float. As shown in Figure 2 of Guoxin below, ball float 3 moves along guide rail 10 of water inlet device 1 (toilet fill valve) and surrounds water inlet device 1 such that at least a portion of the valve body extends through the float. Guoxin (EX1016), 2:10-16.

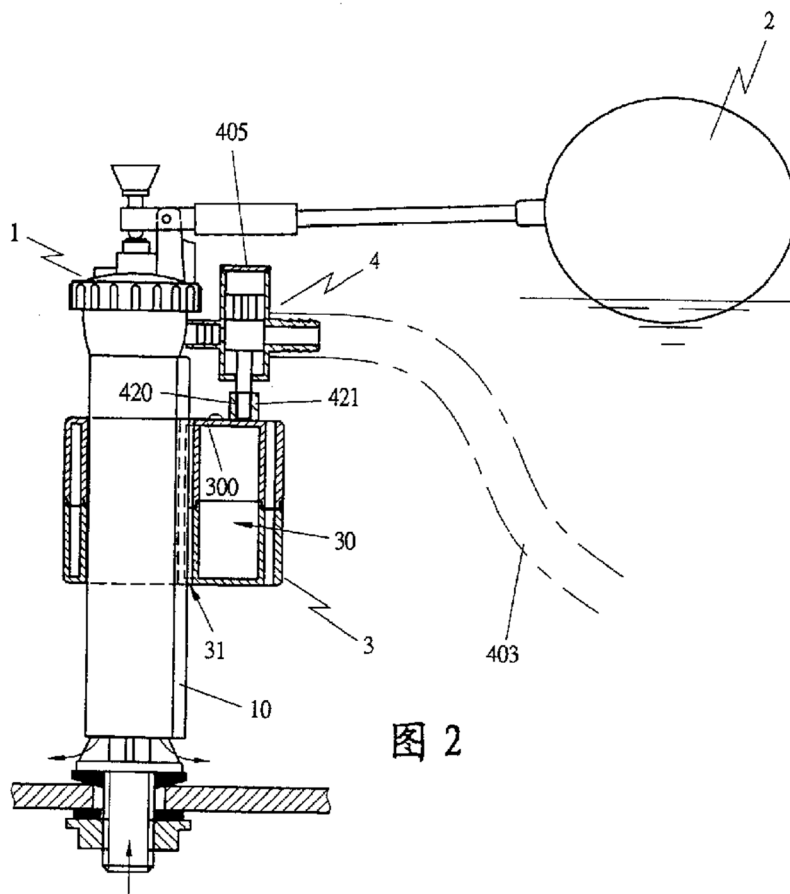
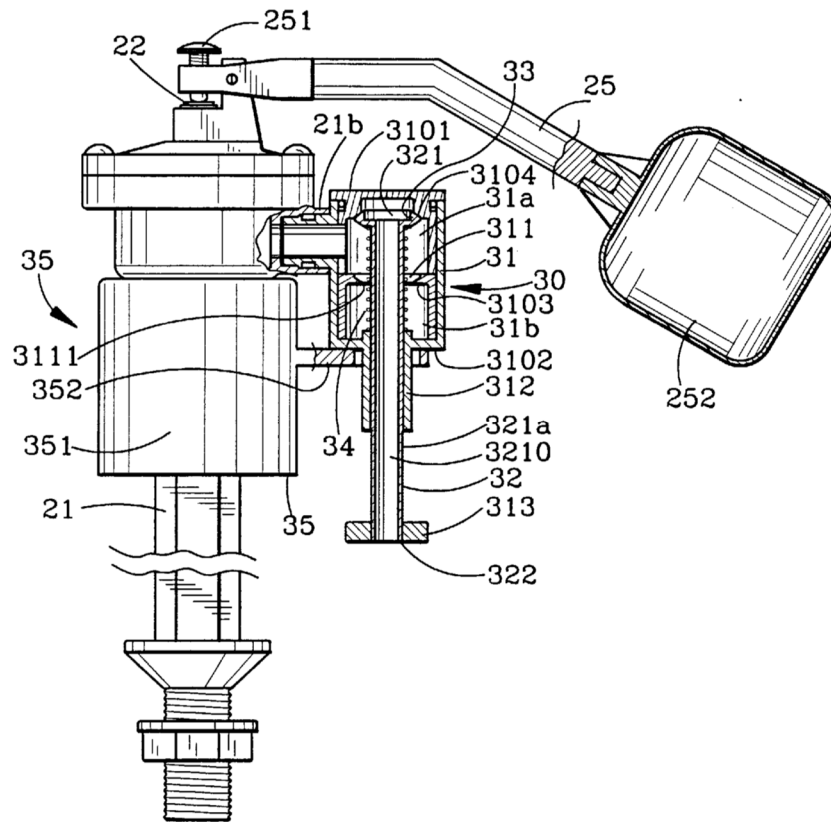


图 2

192. Similarly, Figure 3 of Ho (reproduced below) shows float member 35 sleeved onto water supplying pipe 21 (toilet fill valve) such that at least a portion of the valve body extends through the float. Ho (EX1022), 3:53-60.



193. Guoxin and Ho each disclose the features of dependent claims 6 and 7, thereby rendering these claims obvious.

f. Claims 11 and 13

194. Claim 11 recites “[t]he method of claim 10, further comprising adjusting a flow of water out of the bowl fill valve.” ’698 patent, claim 11.

195. Claim 13 recites “[t]he bowl fill valve of claim 12, wherein the means for adjusting water flow out of the bowl fill valve outlet port comprises an adjustment handle.” ’698 patent, claim 13.

196. Dependent claim 11 recites adjusting a flow of water out of the bowl fill valve. Dependent claim 13 recites means for adjusting water flow out of the bowl fill valve outlet port comprises an adjustment handle. Claims 11 and 13 are thus rendered obvious for the reasons discussed above with respect to elements **1[B5]**, **8[E]**, and **12[E]**.

g. Claim 14

197. Claim 14 recites “[t]he toilet system of claim 1, wherein the bowl fill valve inlet port is configured to be inserted within a portion of the bowl fill outlet port.” ’698 patent, claim 14.

198. Dependent claim 14 recites a bowl fill valve inlet port that is configured to be inserted within a portion of the bowl fill outlet port. As discussed above with respect to elements **1[A1]**, **1[B1]**, **1[B2]** and **1[B4]**, and claims 2 and 9, Ho discloses a bowl fill valve inlet port with a male connector that is inserted into the female connector of the bowl fill outlet port. Furthermore, as discussed above, it would have been obvious to use the mating engagement of Ho to attach the extended portion of Guoxin’s toilet fill valve with switching mechanism 4 of Guoxin, as a simple substitution of one known coupling arrangement for another to obtain predictable results. ’698 patent File History (EX1002), 80-81, [0042] (stating with respect to the connectors shown in Figs. 5A and 5B that “**it is possible that this arrangement may be reversed...**”) (emphasis in original). Accordingly, the combination of

Guoxin, alone or with Ho, and the Quick Connection Art renders obvious dependent claim 14.

IX. MOTIVATION TO COMBINE REFERENCES

199. I understand that one consideration made when determining whether prior art references can be combined is whether the products or subject matter described in the printed publications are within the same class or category of devices, addressing the same problem or market need, and would benefit from the same improvement or innovation. I considered these questions when forming my opinions about motivations to combine the prior art references and products discussed herein.

200. I am of the opinion that all of the prior art references and products considered in this declaration teach or disclose devices that fall within the same category—flush toilet components or components that can be used with a flush toilet.

201. The developers of these references faced similar technical and design challenges and decisions. For example, Quick Connection Art are similar enough to the other references discussed to share similar mechanical design issues, and a POSITA would have understood how to apply the teachings of Quick Connection Art to the issues presented by a fluid flow coupling designed to work with the fill valves of the other prior art references discussed.

202. To the extent PO alleges that one of the primary prior art references discussed herein do not disclose a limitation of the Challenged Claims, the limitation

would be rendered obvious by a secondary prior art reference and its teachings cited above, as well as in view of the knowledge of a person of ordinary skill in the art. The combination would render the challenged claim obvious for the reasons stated in this declaration.

203. A person of ordinary skill in the art would be familiar with a variety of possible mechanical designs to implement a valve for a toilet, and more generally, mechanical designs for connecting valves and fluid flow components. One of skill in the art would understand that substituting the structure in a prior art reference with the exact structure recited in this claim element was an obvious design choice, requiring no more than routine experimentation. Such a modification would simply apply one of a finite number of well-known techniques or structural features in a predictable manner, to achieve well-known, predictable results.

204. A person of ordinary skill in the art would be motivated to combine the primary prior art reference with the references discussed herein and/or with the knowledge of a person of ordinary skill in the art at least because they address common problems and provide overlapping teachings, such that it would have been obvious for a person of ordinary skill in the art to try, and because it is also a combination of prior art elements using known methods, or substitution of one prior art element for another, to yield predictable results.

205. To the extent Patent Owner contends that any other limitation is missing from a primary prior art reference, it would have been obvious for a person of skill in the art to modify the reference and include that limitation for the reasons discussed herein.

X. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

206. I understand that that secondary considerations of non-obviousness are not part of the prima facie obviousness analysis but can be used to rebut allegations of obviousness.

207. To the extent Patent Owner attempts to rely on any secondary considerations of non-obviousness, I reserve the right to address those at a later time.

XI. CONCLUDING REMARKS

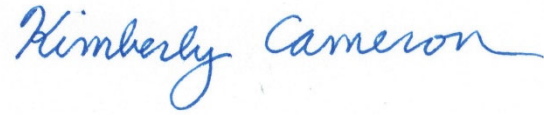
208. I understand that any additional rulings regarding claim construction, any change in position on claim construction by the parties, or on receipt of any additional relevant information, may require me to amend or supplement my opinions. I will do so in a timely manner should a response to that additional information, changed position on claim construction, or ruling relevant to claim construction be warranted.

209. I hereby 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 and that such willful false statements may jeopardize the results of these proceedings.

[SIGNATURE ON FOLLOWING PAGE]

Dated: March 4, 2024



Kimberly K. Cameron, Ph.D.

APPENDIX A



KIMBERLY K. CAMERON, Ph.D., P.E.
PRINCIPAL

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Dr. Kimberly Cameron is a Principal for ESi in the Mechanics and Materials practice. She specializes in design, failure analysis, and risk assessments of engineering structures and components. She has conducted hundreds of investigations on a wide variety of engineering structures, from miniature biomedical devices to large scale process equipment. She has also taught classes for engineers preparing to take the fundamentals of engineering exam and the professional engineering licensing examination in both Civil Engineering and Mechanical Engineering.

Dr. Cameron has performed multidisciplinary investigations on biomedical devices, pipelines, consumer electronics, consumer products, aircraft structures, industrial machinery, heat exchangers and cooling fins, refrigeration products, power-plant components, solar panels, pressure vessels, and vehicle components. The common thread in each of Dr. Cameron's investigations is the application of the fundamentals of metallurgy, materials science, engineering physics, computational mathematics, and engineering mechanics to help understand and solve complex problems.

Dr. Cameron is a registered patent agent, with experience in both the patent application process, as well as intellectual property disputes. In particular, she has experience in biomedical, automotive, electrical, mechanical, and materials science fields and has provided numerous invalidity and infringement reports. She has testified in federal and state court as well as in front of the ITC and in arbitration.

Areas of Specialization

Metallurgy	Product Design	Biomedical Devices
Plastics & Composites	Structural Engineering	Oil & Gas
Corrosion	Product Recalls	Energy & Power
Materials Selection	Root Cause Investigations	Consumer Products & Electronics
Mechanical Engineering	Regulatory Compliance	Automotive & Aviation
Intellectual Property Matters	Failure Analysis	Electrical Equipment

Education

Ph.D. Mechanical Engineering, minor Materials Science & Engineering, Stanford University, CA, 2004
M.S. Mechanical Engineering, Stanford University, CA, 2000
B.S.E. Mechanical and Aerospace Engineering. Certificates: Engineering Physics, Applied & Computational Mathematics, Materials Science & Engineering, Woodrow Wilson School of Public Policy & International Affairs, Princeton University, NJ, 1999

Licensed Professional Engineer (P.E.)

Mechanical Engineer, State of California License No. 33732
Metallurgical Engineer, State of California.....License No. 1969

Professional Affiliations/Honors

American Society of Mechanical Engineers

Member

TMS

Member

Department of Defense

Fellowship

National Science Foundation

Fellowship

Lucent Technologies

Graduate Fellowship

Positions Held

Engineering Systems Inc., Sunnyvale, California

Principal, Mechanics, 2011 – Present

Exponent, Menlo Park, California

Senior Engineer, Mechanics & Metallurgy, 2004 – 2011

Publications/Presentations

“Crack Growth and Arrest in Steam Turbine Casings,” EPRI 3002003504, EPRI, Palo Alto, CA, December 2014.

M. H. Anderson, D. Cislo, J. Saavedra, and **K. Cameron**, Why International Inventors Might Want to Consider Filing Their First Patent Application at the United States Patent Office & the Convergence of Patent Harmonization and E-Commerce, 30 Santa Clara High Tech. L.J. 555 (2014).

“Increasing Reliability of Small Punch Fracture Toughness Testing with Acoustic Emission Monitoring,” Proceedings, 3rd International Conference on Small Sample Test Techniques, September 2014. (with D. Purdy and J. Foulds).

“Small Punch Fracture Toughness Evaluation of Combustion Turbine Materials,” EPRI 3002001468, EPRI, Palo Alto, CA, December 2013. (with D. Purdy, J. Foulds and J. Rodgers).

“Small Punch Testing for Fracture Toughness” by J. Foulds, J. Rodgers, **K. Cameron** and P. Sullivan, EPRI, Palo Alto, CA: 2013. 3002000250.

“The Effect of Low Sulfur Content on the Weldability of Linepipe Steel” by **K. Cameron** and A.M. Pettinger, Proceedings of the 9th International Pipeline Conference, September 2012.

- “Effectiveness of Hydrostatic Testing for High Strength Pipe Material” by **K.K. Cameron** & A.M. Pettinger, Proceedings, 8th International Pipeline Conference, October 2010.
- “Axial Loads from Soil Movement Challenge Pipeline Integrity” by **K.K. Cameron** & A.M. Pettinger, PipeLine Gas Technology, November 2009.
- “Assessing Pipeline Integrity Using Fracture Mechanics and Currently Available Inspections Tools” by **K.K. Cameron** & A.M. Pettinger, Journal of Pipeline Engineering, October 2009.
- “Assessing Pipeline Integrity Using Fracture Mechanics and Currently Available Inspections Tools” by **K.K. Cameron** & A.M. Pettinger, Proceedings, 2008 Evaluation and Rehabilitation of Pipelines Conference, Clarion Technical Conferences, Scientific Surveys Ltd., Prague, Czech Republic, October 2008.
- “Fatigue Damage in Bulk Metallic Glass I: Simulation” by **K.K. Cameron** & R. Dauskardt, Scripta Materialia 2006; 54(3):349–353.
- “Fundamentals of Engineering in a Flash” by **K.K. Cameron**, PPI, August 2006.
- “Transmission Electron Microscopy Structure and Platinum-like Temperature Coefficient of Resistance in a Ruthenate-Based Thick Film Resistor with Copper Oxide” by **K.K. Cameron**, G. Crosbie, J. Jiang, & X. Pan, J. Appl. Phys. 2000; 88:1124–1128.

Selected Project Experience

Failure analysis, design analysis, material selection, mechanical testing, finite element analysis, fatigue and fracture evaluation, and development of various implantable medical devices including cardiovascular implants (heart valves, stents, catheters, pacemakers), orthopedic implants (screws, plates, pins, hip implants, spinal implants), cranial implants, etc.

Design and failure analysis of various fluid and drug delivery systems including implantable pumps, drug eluting stents, syringes, patches, microneedles, CPAP machines, anesthesia machines, insulin and other drug delivery pumps, balloon respirators, etc.

Design and failure analysis of other types of medical devices including surgical tools, scooters, hospital beds, physical therapy equipment, refrigerated portable coolers, etc.

Performed analyses to support FDA submissions.

Evaluated the design, pipeline integrity management program, in-line inspection tools, leak detection systems, control room management and operation and maintenance practices, of both liquid and gas pipeline systems under both 49 CFR 195 and 192.

Evaluated pipeline construction practices of various pipeline systems and performed pipeline failure investigations after various landslide events.

Assisted the Inter-American Development Bank with a pipeline integrity study and supervision of implementing a pipeline integrity management program. This included geotechnical site investigations, fracture mechanics, metallurgical investigations, in-line inspection data, and external inspection data.

Evaluated welding procedures and determined the effect of welding defects and other construction factors on pipeline integrity.

Evaluated pipe-soil interactions, mechanical and welded joints, welding procedures, in-line inspection tools, regulatory compliance, and the overall integrity of pipeline systems.

Failure analysis of various insulated steel oil and water pipeline systems, including behavior of the polyurethane foam and jacket materials.

Design evaluation and failure analyses of pipe couplings and fittings, including finite element analyses, as well as analysis of various plumbing fixtures and components.

Performed design and failure analyses of various gas distribution systems made of polyethylene and steel pipe, including the evaluation of compression couplings.

Retained as an expert for the United States Patent and Trademark Office in the evaluation of a patent claim dispute relating to large diameter pipes.

Evaluated the design of a hydrogenerator system. Performed a finite element analysis and fatigue analysis of the rotors, thrust bridge, and head cover to assess the design.

Evaluated the design of various pumps, rotors, bearings, seals and insulation systems.

Thermal analyses of industrial heat exchangers and cooling fins, nuclear reactor heads, and welds.

Failure analysis of various refrigeration systems and components and HVAC system components.

Performed design analysis of various solar panel system components and assisted in design changes to meet standardized safety testing.

Developed testing protocols and conducted failure analyses and design reviews for various consumer electronic devices and accessories, electrical connectors, power cords, and jacket sleeves.

Design of electrical connectors and various components of several consumer electronic devices including phones, tablets, and computers.

Design evaluation of various consumer products, including washing machines, refrigerators, various child containment products, hand and power tools, security and display systems, coffee machines, exercise machines, cooling sleeves and pads, consumer electronic accessories, breast pumps, baby bottles, etc.