

Declaration of Nathaniel Polish, Ph.D. in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 8,115,731 B2

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NINTENDO CO., LTD., and
NINTENDO OF AMERICA INC.,
Petitioners

v.

MALIKIE INNOVATIONS LTD.,
Patent Owner

Case IPR2026-00004
U.S. Patent No. 8,115,731 B2
Issue Date: February 14, 2012

Title: METHOD OF OPERATING A HANDHELD DEVICE FOR
DIRECTIONAL INPUT

DECLARATION OF NATHANIEL POLISH, PH.D.

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I, Nathaniel Polish, Ph.D., declare as follows:

I. INTRODUCTION

1. I prepared this declaration as an expert on behalf of Petitioner Nintendo Co., Ltd., and Nintendo of America Inc. (“Petitioner”).

2. I provide my opinions in this declaration regarding the invalidity of claims 1, 2-3, 11, and 13-14 of U.S. Patent No. 8,115,731 B2 (“the ’731 patent”) (**EX1001**).

A. Qualifications

3. My qualifications are set forth in my curriculum vitae (**Appendix A**).¹

4. I have a Ph.D. in Computer Science from Columbia University. I hold the following degrees from Columbia, spanning the years 1980 to 1993:

- Ph.D. in Computer Science, May 1993;
- M.Phil. in Computer Science, December 1989;
- M.S. in Computer Science, December 1987; and
- B.A. in Physics, Columbia College, May 1984.

5. For over thirty years, I have run a computer technology development

¹ Appendix A includes a list of my publications and a list of cases in which I have testified during the last five years.

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firm that I co-founded, called Daedalus Technology Group. I develop hardware and software as well as supervise others who do so. My business involves understanding the business objectives of customers, designing products to suit their needs, and supervising the building, testing, and deployment of products.

6. I have significant expertise developing a series of devices used for tracking and monitoring Adelie penguins. The systems were deployed to Antarctica over the course of more than 20 years. These systems contained sensors and signal processing systems that I developed for the particular needs of the field study teams. I also developed many signal processing systems to monitor and analyze the data collected in the field.

7. In 2019, I started a company called SuperAlert that develops, manufactures, and deploys a wide variety of sensors used in large residential buildings. These sensors measure temperature, vibration, light, humidity, and air composition amongst other things. Our software both inside the sensors and at the remote servers analyzes the returned data to detect anomalies in the operation of the building systems.

8. From time to time, I have started other companies in order to pursue particular product opportunities. Most of my business activity, however, is as a consulting product developer. From time to time, I have also served as an expert

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witness on computer and software-related cases, which are listed in my CV.

B. Materials Considered

9. My opinions in this declaration are based on my professional and academic experience, as well as documents I have considered. In forming my opinions, I have read and considered U.S. Patent No. 8,115,731 B2 (**EX1001**) and its prosecution history (**EX1003**). The following documents are cited in this declaration:

Exhibit No.	Description of Document
1001	U.S. Patent No. 8,115,731 B2 to Marcelo Varanda (filed Oct. 3, 2005, issued Feb. 14, 2012) (“731” or “731 patent”)
1003	Prosecution history of U.S. Patent No. 8,115,731
1004	U.S. Patent No. 6,937,272 B1 to Christopher R. Dance (filed Nov. 8, 2000, issued Aug. 30, 2005) (“Dance”)
1005	U.S. Patent No. 6,400,471 B1 to David Kuo and Eric Anderson (filed Feb. 11, 1999, issued June 4, 2002) (“Kuo”)
1006	U.S. Patent No. 5,910,797 to Leonardus G. M. Beuk (filed Feb. 13, 1996, issued June 8, 1999) (“Beuk”)
1007	International Publication No. WO 00/17848 to Arthur L. Zwern et al. (filed Sep. 22, 1999, issued Mar. 30, 2000) (“Zwern”)
1008	U.S. Patent No. 5,232,223 to Larry Dornbusch (filed Mar. 24, 1992, issued Aug. 3, 1993) (“Dornbusch”)

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Exhibit No.	Description of Document
1009	English translation of Japanese Patent Publication No. H11-188182 to Takatsugu Uragami (filed Dec. 25, 1997, published July 13, 1999) (“Uragami”)
1010	U.S. Patent No. 6,589,117 B1 to Yasuyuki Moritome et al. (filed Dec. 7, 1998, issued July 8, 2003) (“Moritome”)
1011	U.S. Patent No. 5,955,713 to John S. Titus et al. (filed Oct. 3, 1997, issued Sep. 21, 1999) (“Titus”)
1012	Claim Construction Report by Gavin T. Garner, PhD served in <i>Malikie Innovations Ltd. v. Nintendo Co.</i> , No. 2:24-cv-01490-JLR (W.D. Wash.), dated August 6, 2025 (“8/6/2025 Garner Decl.”)
1013	Declaration of Dr. Nathaniel Polish Regarding Claim Construction of U.S. Patent No. 8,115,731 served in <i>Malikie Innovations Ltd. v. Nintendo Co.</i> , No. 2:24-cv-01490-JLR (W.D. Wash.), dated August 6, 2025 (“8/6/25 Polish Decl.”)
1014	Report by Gavin T. Garner, PhD in Response to the August 6, 2025 Declaration of Dr. Nathaniel Polish regarding Claim Construction of U.S. Patent No. 8,115,731 served in <i>Malikie Innovations Ltd. v. Nintendo Co.</i> , No. 2:24-cv-01490-JLR (W.D. Wash.), dated September 5, 2025 (“9/5/2025 Garner Decl.”)
1015	Japanese Patent Publication No. H11-188182 to Takatsugu Uragami (filed Dec. 25, 1997, published July 13, 1999)
1016	U.S. Patent No. 6,200,219 B1 to Elliot Rudell et al. (filed Nov. 9, 1998, issued Mar. 13, 2001) (“Rudell”)
1017	Excerpts from <i>Microsoft Press Computer Dictionary</i> (2d ed. 1994) (“Microsoft Computer Dictionary”)
1018	The Black Bass Instruction Manual (1989)

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Exhibit No.	Description of Document
1019	Excerpts from John Potter Shields, <i>Novel Experiments with Electricity</i> (1970)
1020	U.S. Patent No. 5,209,343 to Robert P. Romano and James L. Weaver (filed Jan. 21, 1992, issued May 11, 1993) (“Romano”)
1021	Excerpts from Steven W. Smith, <i>The Scientist and Engineer’s Guide to Digital Signal Processing</i> (1997) (“Smith”)
1022	Excerpts from John Hedgecoe, <i>The Art of Digital Photography</i> (2006)
1023	Excerpts from Mark Edward Soper, <i>Unleashing Microsoft Windows Vista Media Center</i> (2009)
1024	Excerpts from John R. Newport, <i>Avionic Systems Design</i> (1994)
1025	<i>Malikie, et al. v. Nintendo, et al.</i> , No. 2:24-cv-01490-JLR, D.I. 50, LPR 132 Joint Claim Construction and Prehearing Statement (Amended), (W.D. Wash.) (Filed 09/24/2025)
1026	English translation of Japanese Laid-Open Patent Application No. 2000-148694A to Takeshi Nakano (filed November 6, 1998, published May 30, 2000) (“Nakano”)
1027	Japanese Laid-Open Patent Application No. 2000-148694A to Takeshi Nakano (filed November 6, 1998, published May 30, 2000)
1029	Sport Bass Fishin’ Instruction Manual, Radica (2000)

10. For my efforts in connection with the preparation of this declaration, I am being compensated at my usual and customary rate of \$750/hr. My compensation is in no way contingent on the results of these or any other proceedings (or any issue in these or any other proceedings) related to the ’731 patent or any

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other patent.

11. This declaration discloses my opinions formed to date and my bases and rationale for those opinions. I reserve the right to offer further opinions based on ongoing review of materials, including opinions and/or testimony of other expert witnesses.

II. PERSON OF ORDINARY SKILL IN THE ART

12. I understand that, under the patent laws in effect before the America Invents Act (“AIA”) of 2011, an assessment of claims of a patent filed before the AIA took effect should be undertaken from the perspective of a person of ordinary skill in the art (“POSITA”) as of the earliest claimed priority date (i.e., the “time the invention was made”). I have preliminarily for purposes of my declaration only assumed that date to be July 9, 2001, the earliest patent application to which the ’731 patent claims priority.²

13. I have also been advised that to determine the appropriate level of a person having ordinary skill in the art, the following factors may be considered:

² I express no opinion on whether the ’731 patent is entitled to such a priority date. This issue is not relevant here because all the prior art references relied upon predate that date.

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(1) the types of problems encountered by those working in the field and prior art solutions thereto; (2) the sophistication of the technology in question, and the rapidity with which innovations occur in the field; (3) the educational level of active workers in the field; and (4) the educational level of the inventor.

14. For purposes of assessing the level of skill necessary to understand the technology disclosed in the '731 patent, and based on my experience, it is my opinion that a POSITA at the time of the alleged invention of the '731 patent would have possessed a Bachelor's degree in software engineering, electrical engineering, or a similar degree, with two to three years of practical experience designing systems that use spatial sensors, including to detect position and orientation. A person could also have qualified as a POSITA with a combination of (1) more formal education and less technical experience, or (2) less formal education and more technical or professional experience.

15. Although my academic and professional background exceeds that of a POSITA as defined above, my analysis and opinions are based on the perspective of a POSITA as of the alleged priority date of the '731 patent.

16. The analysis and opinions in my declaration would not change if a somewhat different POSITA definition (e.g., with less or more academic or professional experience) were applied. For instance, in the related district court

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litigation, the Patent Owner's expert, Dr. Garner, opined that: "a person with ordinary skill in the field of the invention (POSITA), at the time [of] the invention of the '731 patent, would have been someone with a bachelor's degree in mechanical engineering or mechanical arts with one year of relevant experience or the equivalent." (EX1012, 8/6/2025 Garner Decl., ¶ 26.) None of my opinions here change if this slightly different POSITA definition is applied.

III. STATEMENT OF LEGAL PRINCIPLES

A. Claim Construction

17. I understand that a purpose of claim construction is to determine what a person of ordinary skill in the art would have understood the claim terms to mean. Claim terms are generally given their ordinary and customary meaning, which is the meaning that the term would have to a person of ordinary skill in the art in question as of the effective filing date.

18. I understand that the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification. I understand that the patent specification, under the legal principles, has been described as the single best guide to the meaning of a claim term, and is thus highly relevant to the interpretation of claim terms. And I understand for terms that do not

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have a customary meaning within the art, the specification usually supplies the best context of understanding the meaning of those terms.

19. I further understand that other claims of the patent in question, both asserted and unasserted, can be valuable sources of information as to the meaning of a claim term. Because the claim terms are normally used consistently throughout the patent, the usage of a term in one claim can often illuminate the meaning of the same term in other claims. Differences among claims can also be a useful guide in understanding the meaning of particular claim terms.

20. I understand that the prosecution history can further inform the meaning of the claim language by demonstrating how the inventors understood the invention and whether the inventors limited the invention in the course of prosecution, making the claim scope narrower than it otherwise would be. Extrinsic evidence, such as dictionaries, may also be consulted in construing the claim terms.

21. I understand that, in *Inter Partes* Review (“IPR”) proceedings, a claim of a patent shall be construed using the same claim construction standard that would be used to construe the claim in a civil action filed in a U.S. district court (which I understand is called the “*Phillips*” claim construction standard), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history

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pertaining to the patent.

22. I have been instructed by counsel to apply the “*Phillips*” claim construction standard for purposes of interpreting the claims in this proceeding, to the extent they require an explicit construction. The description of the legal principles set forth above thus provides my understanding of the “*Phillips*” standard as provided to me by counsel.

23. I understand that certain terms appearing in the challenged claims have been the subject of dispute in the district court litigation.

24. For purposes of my analysis here, I do not believe express claim constructions are necessary because the prior art renders the claim obvious under the claim constructions proposed by either party in the district court litigation. Additional details are provided below for the term “a direction substantially parallel or substantially perpendicular to the orientation” in claim 1.

B. Obviousness

25. I understand that a patent claim is obvious if, as of the effective filing date, it would have been obvious to a person having ordinary skill in the field of the technology (the “art”) to which the claimed subject matter belongs.

26. I understand that the following factors should be considered in analyzing obviousness: (1) the scope and content of the prior art; (2) the differences

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between the prior art and the claims; and (3) the level of ordinary skill in the pertinent art. I also understand that certain other facts known as “secondary considerations” such as commercial success, unexplained results, long felt but unsolved need, industry acclaim, simultaneous invention, copying by others, skepticism by experts in the field, and failure of others may be utilized as indicia of nonobviousness. I understand, however, that secondary considerations should be connected, or have a “nexus,” with the invention claimed in the patent at issue.

27. I understand that a reference qualifies as prior art for obviousness purposes when it is analogous to the claimed invention. The test for determining what art is analogous is: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor’s endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

28. I understand that a person of ordinary skill in the art is assumed to have knowledge of all prior art. I understand that one skilled in the art can combine various prior art references based on the teachings of those prior art references, the general knowledge present in the art, or common sense. I understand that a motivation to combine references may be implicit in the prior art, and there is no requirement that there be an actual or explicit teaching to combine two references.

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Thus, one may take into account the inferences and creative steps that a person of ordinary skill in the art would employ to combine the known elements in the prior art in the manner claimed by the patent at issue. I understand that one should avoid “hindsight bias” and *ex post* reasoning in performing an obviousness analysis. But this does not mean that a person of ordinary skill in the art, for purposes of the obviousness inquiry, does not have recourse to common sense.

29. I understand that when determining whether a patent claim is obvious in light of the prior art, neither the particular motivation for the patent nor the stated purpose of the patentee is controlling. The primary inquiry has to do with the objective reach of the claims, and that if those claims extend to something that is obvious, then the entire patent claim is invalid.

30. I understand one way that a patent can be found obvious is if there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent’s claims. I understand that a motivation to combine various prior art references to solve a particular problem may come from a variety of sources, including market demand or scientific literature. I understand that a need or problem known in the field at the time of the invention can also provide a reason to combine prior art references and render a patent claim invalid for obviousness. I understand that familiar items may have obvious uses beyond their

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primary purpose, and that a person of ordinary skill in the art will be able to fit the teachings of multiple prior art references together like the pieces of a puzzle. I understand that a person of ordinary skill is also a person of at least ordinary creativity. I understand when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this finite number of predictable solutions leads to the anticipated success, I understand that the invention is likely the product of ordinary skill and common sense, and not of any sort of innovation. I understand that the fact that a combination was obvious to try might also show that it was obvious, and hence invalid, under the patent laws. I understand that if a patent claims a combination of familiar elements according to known methods, the combination is likely to be obvious when it does not yield more than predictable results. Thus, if a person of ordinary skill in the art can implement a predictable variation, an invention is likely obvious. I understand that combining embodiments disclosed near each other in a prior art reference would not ordinarily require a leap of inventiveness.

31. I understand that obviousness may be shown by demonstrating that it would have been obvious to modify what is taught in a single piece of prior art to create the patented invention. Obviousness may also be shown by demonstrating

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that it would have been obvious to combine the teachings of more than one item of prior art. I understand that a claimed invention may be obvious if some teaching, suggestion, or motivation exists that would have led a person of ordinary skill in the art to combine the invalidating references. I also understand that this suggestion or motivation may come from the knowledge of a person having ordinary skill in the art, or from sources such as explicit statements in the prior art. I understand that when there is a design need or market pressure, and there are a finite number of predictable solutions, a person of ordinary skill may be motivated to apply common sense and his skill to combine the known options in order to solve the problem.

32. I understand the following are examples of approaches and rationales that may be considered in determining whether a piece of prior art could have been combined with other prior art or with other information within the knowledge of a person having ordinary skill in the art:

- (1) Some teaching, motivation, or suggestion in the prior art that would have led a person of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention;
- (2) Known work in one field of endeavor may prompt variations of it for use in the same field or a different field based on design incentives or other

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market forces if the variations would have been predictable to a person of ordinary skill in the art;

(3) Combining prior art elements according to known methods to yield predictable results;

(4) Applying a known technique to a known device, method, or product ready for improvement to yield predictable results;

(5) Applying a technique or approach that would have been “obvious to try” (choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success);

(6) Simple substitution of one known element for another to obtain predictable results; or

(7) Use of a known technique to improve similar products, devices, or methods in the same way.

33. I understand that, when determining whether a claimed combination is obvious, the correct analysis is not whether one of ordinary skill in the art, writing on a blank slate, would have chosen the particular combination of elements described in the claim. Instead, I understand the correct analysis considers whether one of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to selecting the combination claimed.

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34. I understand that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. The test for obviousness, in other words, is not whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole.

IV. THE '731 PATENT

A. Overview of the Specification

35. The '731 patent is 11 pages. (EX1001.) The '731 patent states that the “present invention relates to the field of controlling a handheld device.” ('731, 1:16-17.)

36. According to the '731 patent, “[h]andheld computing and communication devices are well known.” ('731, 1:24-25.) The patent explains that “[t]ypically, these handheld device have a processor connected to a memory, a screen and a user input device. The screen typically provides either a text or graphical interface through which options or applications are selected.” (*Id.*, 1:27-31.) A variety of directional input device preexisted the '731 patent, including “a touchpad, rollerball, directional keypad, or thumbwheel. These options allow the user to position a pointer or a cursor on the list application or option desired. These directional input devices allow a user to select options, launch applications, and

move pointers or cursors.” (*Id.*, 1:32-37.)

37. The patent explains that: “[t]he present invention provides a directional input device that provides a directional input signal when the orientation of the handheld device is manipulated. For example, if it desired to move the cursor to the right, the handheld would be tilted to the right. This completely removes the directional input device from the face of the device to allow for a larger screen, and does not require either an external mechanical mechanism subject to external wear and tear or an expensive moulding modification.” (’731, 5:50-58.)

38. The patent also discusses “a circuit closing means, such as a ball bearing or a mercury contact,” that is “movable,” such that in “response to inclination of the handheld device in the direction of the directional contact, the circuit closing means moves between a neutral position in which the primary contact and the directional contact form an open circuit, and an active position in which the primary contact and the directional contact form a closed circuit.” (’731, 4:8-16.)

B. Challenged Claims

39. This declaration covers claims 1, 2-3, 11, and 13-14 (the “challenged claims”) of the ’731 patent are addressed in this declaration. (EX1001.)

40. Independent claim 1 recites:

1. A handheld computing device, comprising:

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- [a] a display;
- [b] an internally located directional input device providing a directional input signal, the directional input signal corresponding to an axis of inclination of the handheld computing device and indicating an orientation;
- [c] a second directional input device providing a second directional input signal, the second directional input signal indicating an amount of displacement;
- [d] a processor coupled to the internally located directional input device and the second directional input device and operable to receive and process the directional input signal in conjunction with the second directional input signal; and
- [e] a memory subsystem, the memory storing an operating system executed by the processor to display on the display a graphical user interface for controlling the operation of the handheld computing device, wherein the graphical user interface provides a graphical element;
- [f] wherein the operating system comprises processor-executable instructions that cause the graphical element to move by the amount of displacement in a direction substantially parallel or substantially perpendicular to the orientation.

('731, 9:19-42 (Claim 1; bracketed notation (e.g., [a]) added).)

41. Claim 2 recites:

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2. The handheld computing device of claim 1, wherein the internally-located directional input device comprises:
- [a] a primary contact positionally fixed in the handheld computing device;
 - [b] at least one directional contact positionally fixed in the handheld computing device and operatively connected to the primary contact;
 - [c] circuit closing means, movable on, and in electrical contact with, the primary contact, the circuit closing means moving in response to inclination of the handheld computing device in the direction of any one of the at least one directional contact, between a neutral position in which the primary contact and the any one of the at least one directional contact form an open circuit, and an active position in which the primary contact and the any one of the at least one directional contact form a closed circuit; and
 - [d] a direction interpreter, operatively connected to the primary contact and the at least one directional contact, for generating the directional input signal.

(’731, 9:43-10:9 (Claim 2; bracketed notation (e.g., [a]) added).)

42. Claim 3 recites:

3. The handheld computing device of claim 2, wherein the

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directional input signal is uniquely associated with the direction
of the inclination.

(’731 patent, 10:10-12 (Claim 3).)

43. Claim 11 recites:

11. The handheld computing device of claim 1, wherein the processor is configured to detect movement patterns from the directional input signal and wherein the graphical element is further responsive to the detected movement patterns.

(’731 patent, 10:36-39 (Claim 11).)

44. Claim 13 recites:

13. The handheld computing device of claim 11, wherein the graphical element is configured to perform a selection function in response to the detected movement pattern.

(’731 patent, 10:43-45 (Claim 13).)

45. Claim 14 recites:

14. The handheld computing device of claim 13, wherein the detected movement pattern is a flick of the wrist..

(’731 patent, 10:46-47 (Claim 14).)

**V. APPLICATION OF THE PRIOR ART TO THE
CHALLENGED CLAIMS**

46. I have reviewed and analyzed the prior art references and materials

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listed in **Part I.B** above. In my opinion, the challenged claims of the '731 patent would have been obvious to a person of ordinary skill in the art based on the following prior art combinations.

Ground	Claims	Basis Under §103
Dance-Based Ground		
1	1	Dance
2	1	Dance in view of Kuo and Beuk
3	11, 13, 14	Ground 1 + Zwern
4	11, 13, 14	Ground 2 + Zwern
5	2-3	Ground 1 + Titus
6	2-3	Ground 2 + Titus
Dornbusch-Based Ground		
7	1-3, 11, 13-14	Dornbusch in view of Uragami
8	1-3, 11, 13-14	Ground 7 + Moritome + Nakano
9	2-3	Ground 7 + Titus
10	2-3	Ground 8 + Titus

A. Summary and Overview of Prior Art

1. Dance (EX1004)

47. U.S. Patent No. 6,937,272 to **Dance** is a Xerox patent, titled “Display Device for a Camera” (“Dance”) (EX1004). I am informed by counsel that Dance qualifies as prior art to the challenged claims because it was filed November

8, 2000, before the priority date of the '731 patent.

48. Much like the '731 patent, Dance describes, among other things, “a method for controlling [a] display device.” (Dance, 1:7-8.) Dance provides an “interface for reviewing stored images, which can provide an easier, more intuitive way of controlling the display of a region of an image.” (*Id.*, 1:64-67.) Dance discloses image display and control on a handheld digital camera, as shown, for instance, in Figure 1:

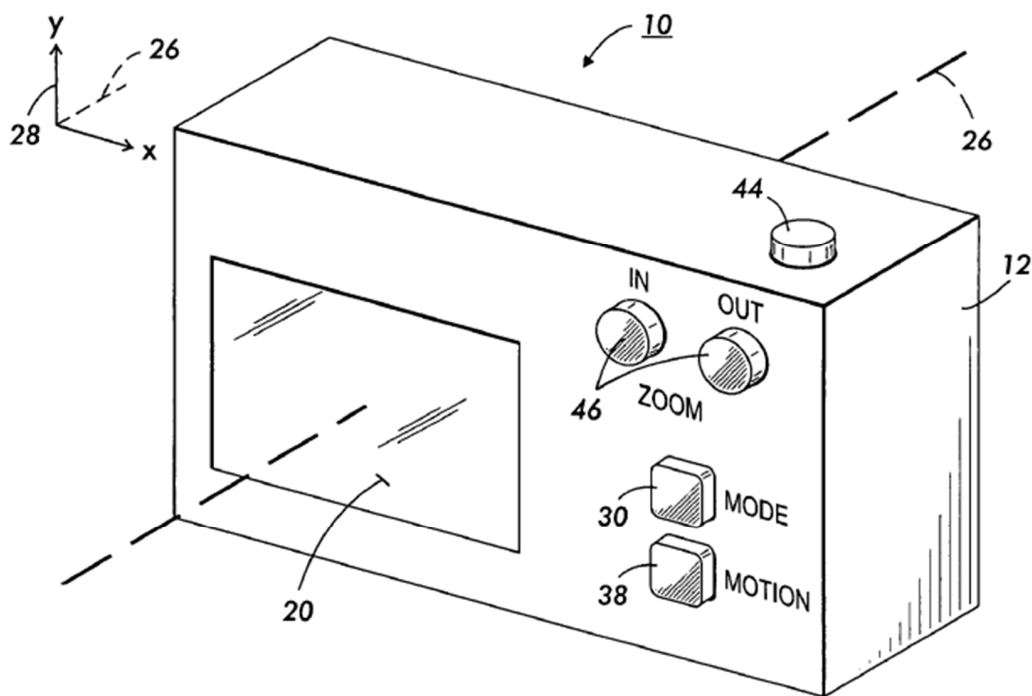


FIG. 1

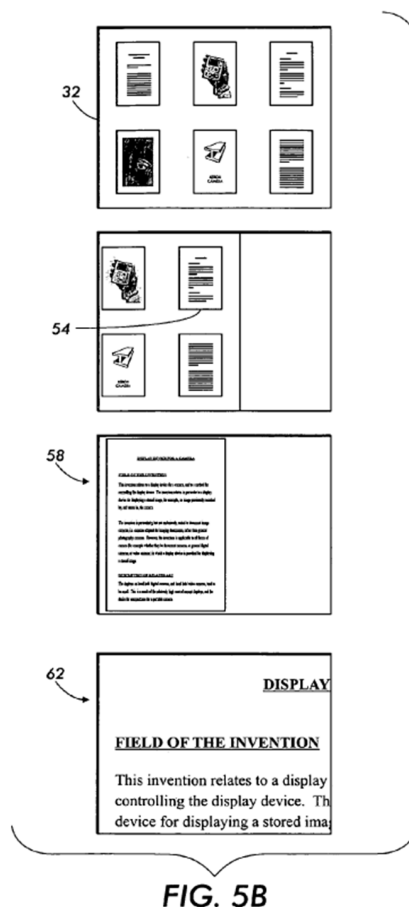
(*Id.*, Fig. 1.)

49. In Dance, the “selection and/or display of a stored image is controlled”

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using a motion sensor and “physical movement of the camera.” (*E.g.*, Dance, 2:4-5, Abstract, Figs. 6-7.) Dance describes, “when a stored image is a document image, in order to enable the document image to be reviewed in detail, a facility must be provided to enable zooming and scrolling of the document image in the small display. Additional manually operable controls are therefore required on the camera to enable the user to select an image to view, and then to zoom and scroll the display over the retrieved image.” (*Id.*, 1:23-29.)

50. Dance discloses using tilt of its device for control of the display. (Dance, 3:32-38, 4:58-65, 5:4-11.) For example, Dance discloses a single image view mode, where tilting the device in a direction (*e.g.*, left) causes the displayed image to move to the left. (*Id.*, 5:4-11.) Further, Dance discloses an image selection mode, where many images are shown on the display, and the user can navigate through the images via tilting the camera and select the image to view in the single-image view mode. (*Id.*, 4:52-5:19, Figs. 5A-5B.) The graphical user interface shown on the camera display device is shown, for instance, in Figure 5B of Dance:



(*Id.*, Fig. 5B, 2:14-16.)

51. Dance also discloses a zoom input via which a user can zoom in or out of an image displayed on the digital camera. (Dance, Fig. 1, 3:5-18, 3:42-48, 5:56-67.) Zooming into or out of an image causes the velocity of scrolling or navigating around the image. (*Id.*, 5:56-67.) The zoom input is used to determine a factor *k*, and “[t]he factor *k* is determined by a virtual velocity gain circuit **78** which receives a zoom input from a zoom control input device **46**[,]” as shown in Figure 6, reproduced below. (*Id.*, 5:65-67.)

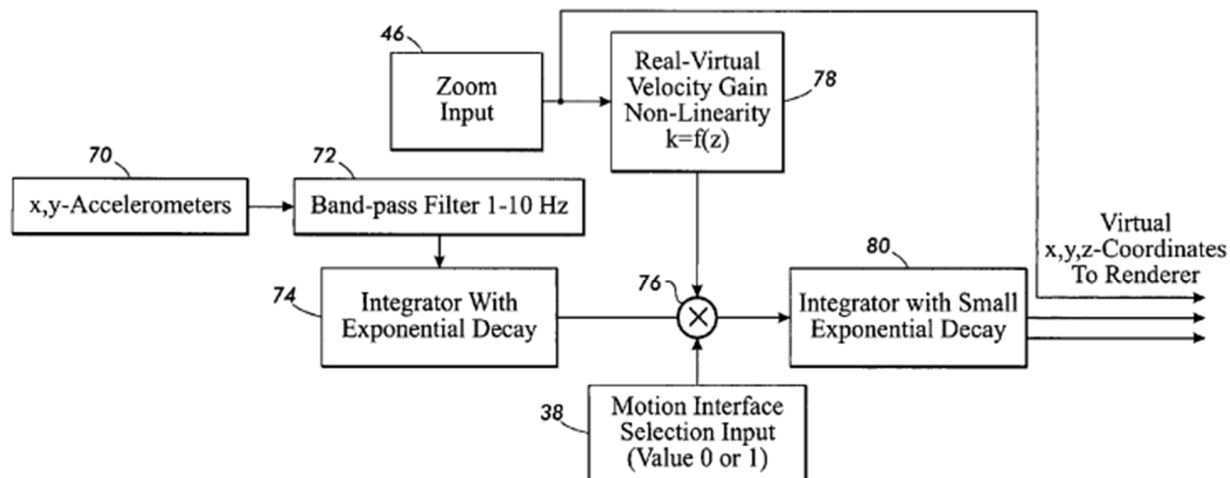


FIG. 6

(*Id.*, Fig. 6.)

52. I will provide more information about Dance in my analysis of the claim limitations below.

2. Kuo (EX1005)

53. U.S. Patent No. 6,400,471 to **Kuo** is titled “Flexible Architecture for Image Processing” (“Kuo”) (EX1005). I am informed by counsel that Kuo qualifies as prior art to the challenged claims because it was filed February 11, 1999, before the priority date of the ’731 patent.

54. Kuo teaches details of “processing image data in a digital image device such as a digital camera[,]” like the camera in Dance. (Kuo, Abstract.)

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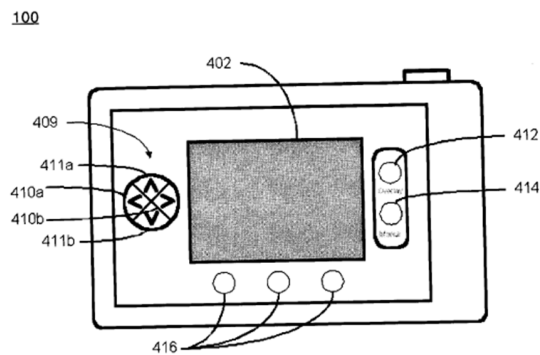


Figure 3A

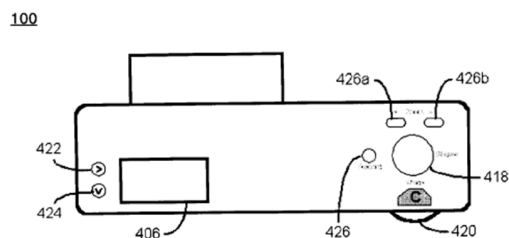


Figure 3B

(Kuo, Figs. 3A-3B.) Kuo explains that “[a] significant advantage to digital cameras is that users then have the capability to manipulate the image data in a number of ways.” (*Id.*, 1:17-20.) Kuo offers “an operating system that can be utilized with the image processing mode on any digital camera platform.” (*Id.*, 2:26-31.) Much like Dance, Kuo contemplates “the case where the digital camera has an orientation sensor[.]” (*Id.*, 9:33-35.) Further, like Dance, Kuo discloses providing a graphical user interface on its camera display screen using the operating system, as executed by the processor and memory in the digital camera. (*Id.*, 5:50-53, 7:53-65, 2:40-41, Figs. 2, 3A-3B, 4.)

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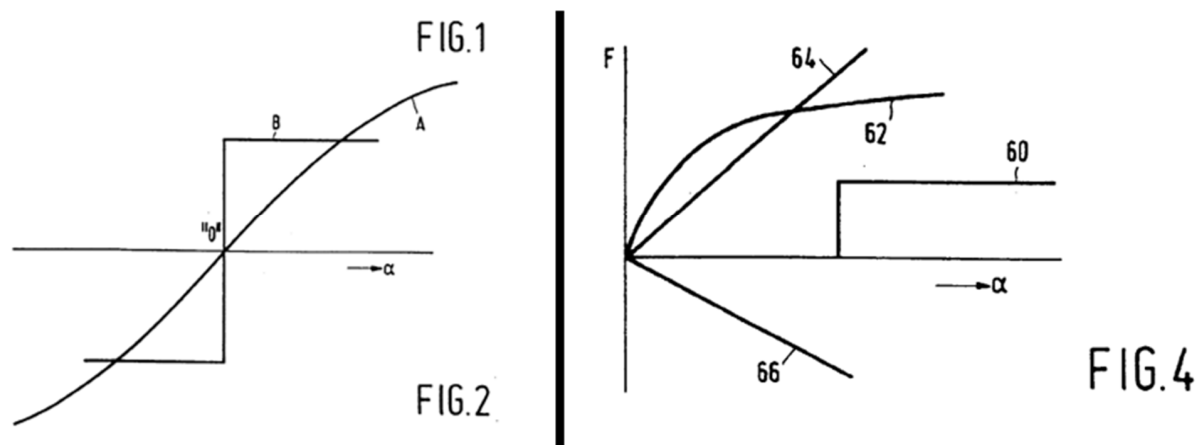
55. I will provide more information about Kuo in my analysis of the claim limitations below.

3. Beuk (EX1006)

56. U.S. Patent No. 5,910,797 to **Beuk** is a Phillips patent, titled “Portable Data Processing Apparatus Provided with a Screen and a Gravitation-Controlled Sensor for Screen Orientation” (“Beuk”) (EX1006). I am informed by counsel that Beuk qualifies as prior art to the challenged claims because it was both filed (February 13, 1996) and issued (June 8, 1999), before the priority date of the ’731 patent.

57. Beuk, like Dance, teaches a portable apparatus “wherein the orientation of the screen can be used to control various different types of motion depending on the actual spatial orientation.” (Beuk, 1:27-29.) Beuk provides for an “integrated screen means for displaying one or more graphical or other objects presented by said data processing means, said screen means having gravitation-controlled sensor means feeding said data processing means for measuring a spatial orientation of said screen means.” (Beuk, 1:8-13.) Beuk recognized that it was “known to sense the spatial orientation of a display apparatus, for example a television monitor, and control the orientation of the image in such a way that the image is always oriented vertically and with the right side up.” (*Id.*, 1:13-17.)

58. Beuk discloses different implementations of orientation or tilt-based controls in a device, including those shown in the following graphs:



(Beuk, Figs. 2, 4.) As shown above, Beuk discloses that tilt controls can have a “step response,” where “depending on whether the inclination is positive or negative, the signal may have a first or rather a second value.” (*Id.*, 3:18-22; *see also id.*, 4:1-14.)

59. I will provide more information about Beuk in my analysis of the claim limitations below.

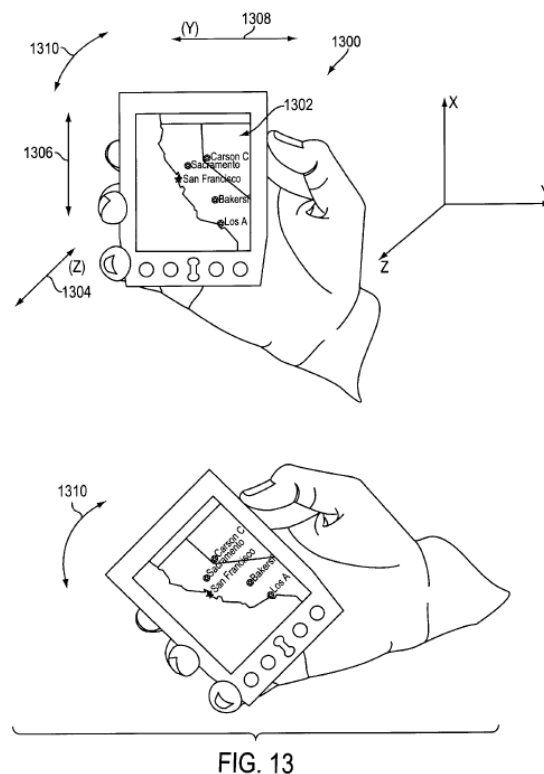
4. Zwern (EX1007)

60. International Patent Application No. WO 2000/17848 to Zwern is titled “Intuitive Control of Portable Data Displays” (“Zwern”) (EX1007). I am informed by counsel that Zwern qualifies as prior art to the challenged claims because it was filed September 22, 1999 and published March 30, 2000, before the priority date of the ’731 patent.

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61. Much like Dance, Zwern relates to “human/computer interfaces.” (Zwern, 1:4-6.) For example, Zwern “contemplates a variety of portable display devices operable to control a computer system through intuitive body gestures and natural movements.” (*Id.*, 29:1-3.) Zwern discusses the use of “intuitive body gestures and natural movements” on a Personal Digital Assistant (PDA), for instance. (*Id.*, 29:12-16.)

62. Zwern teaches “defin[ing] specific hand gestures that correspond in an intuitive manner with ‘special discrete commands,’” as shown in Figure 13:



(*Id.*, Fig. 13; *id.*, 29:17-19.) Zwern teaches that basic tilting or rotation gestures can

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be used for magnification, scrolling, and panning actions. (*Id.*, 29:19-26.) For example, Zwern teaches that a brisk or abrupt motion pattern—such as the flick of a wrist, shaking, or an abrupt downward motion—can correspond to a discrete command. (*Id.*, 29:25-26, Figs. 13-14, 33:1-3, 33:6-8.)

5. Dornbusch (EX1008)

63. U.S. Patent No. 5,232,223 to **Dornbusch** is titled “Electronic Game Controller” (“Dornbusch”) (EX1008). I am informed by counsel that Dornbusch qualifies as prior art to the challenged claims because it was filed March 24, 1992, before the priority date of the ’731 patent.

64. Dornbusch relates to an “electronic game controller for controlling the operation of a fishing game.” (Dornbusch, 1:11-13.) Dornbusch’s electronic game controller “responds to actual motion which mimics real motion typically occurring during the performance of a corresponding real event being simulated by the game play.” (*Id.*, 1:7-10.)

65. Dornbusch’s controller looks and is operated like a real-world fishing rod:

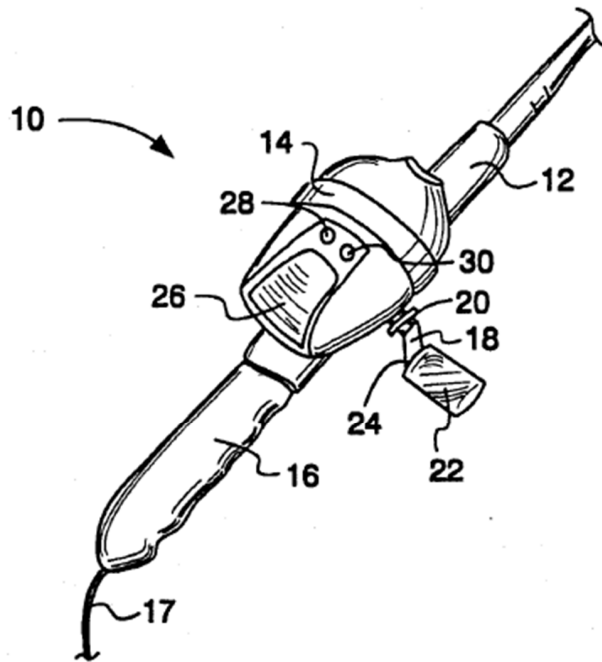


Fig. 2

(Dornbusch, Fig. 2; *id.*, 2:53-55 (“The game player operates the present electronic game controller in essentially the same fashion as if actually fishing.”), 2:66-67.)

The game includes a “rod **12** and an attached reel **14**.” (*Id.*, 4:38-39.)

66. The reel includes a circuit board **40** with mercury switches for sensing the orientation of the device. (Dornbusch, 4:48-5:15.) These are shown in Figure 3A, reproduced below:

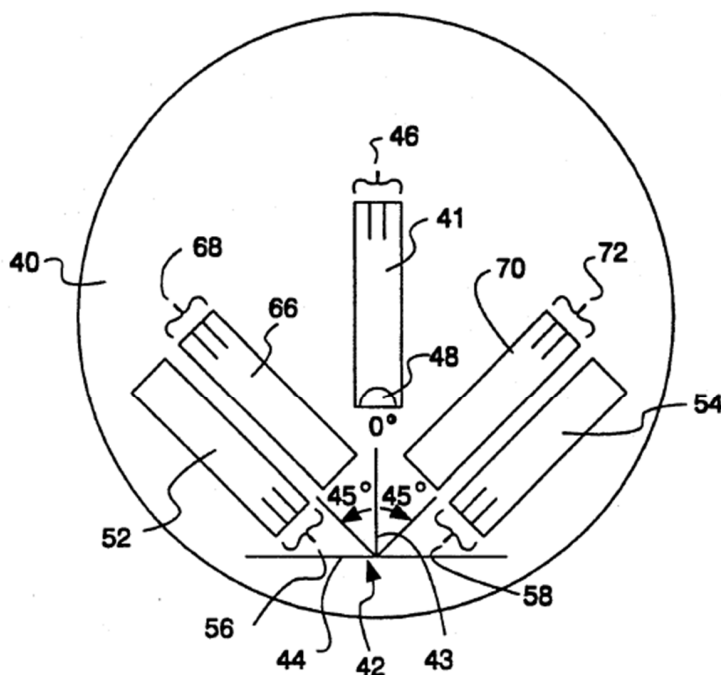


Fig. 3A

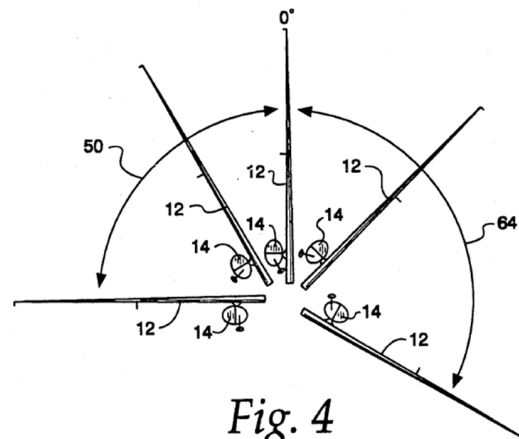


Fig. 4

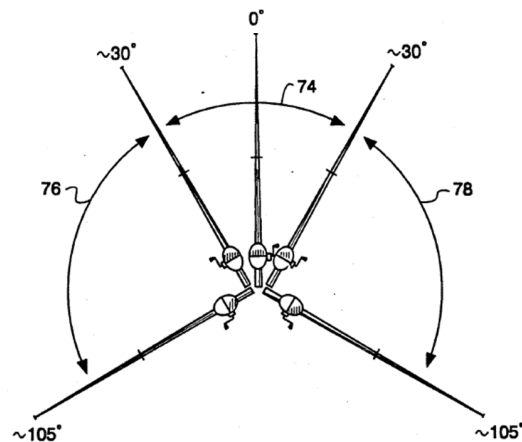


Fig. 5

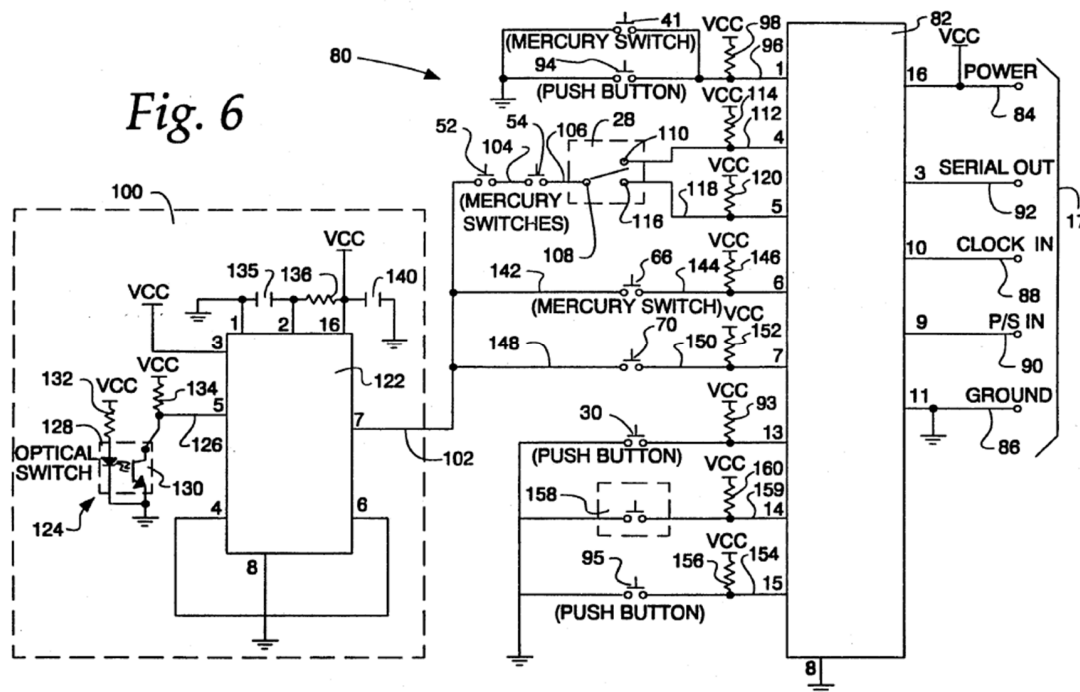
(Dornbusch, Figs. 4-5, 5:21-6:24.)

67. For example, Dornbusch discloses that the orientation of the rod to the right or the left (as shown in Figure 5, reproduced above) can control corresponding motion of a boat or a lure in the game. (Dornbusch, 9:40-68, 10:28-40.) Further, Dornbusch discloses that when the rod is in an upright position, the user can control movement of a cursor on a menu interface. (*Id.*, 8:10-24.)

68. Further, Dornbusch's controller allows a user to control gameplay by

physically turning the crank on the reel. (Dornbusch, 8:10-24, 9:21-39, 10:28-40, 8:48-65.)

69. Dornbusch discloses circuitry for its controller device in Figure 6, reproduced below:



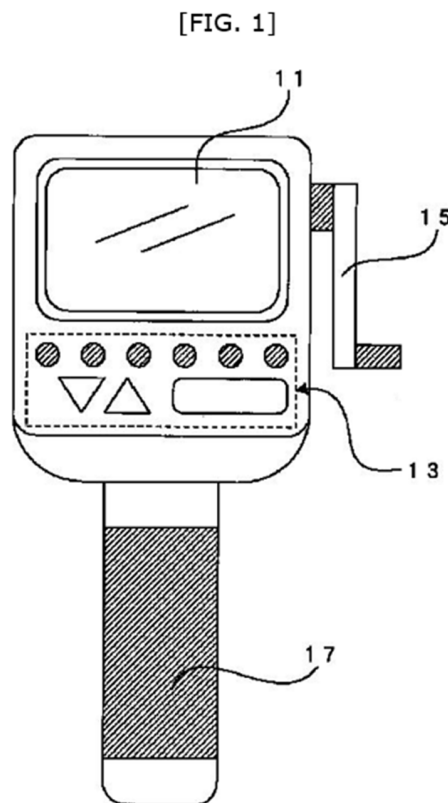
(Dornbusch, Fig. 6.) Signals from the crank and mercury switch circuitry are input to an interface circuit **82**, which provides a serial signal to a gaming device for controlling gameplay. (*Id.*, 6:42-62, 7:12-15.)

6. Uragami (EX1009)

70. Japanese Patent Publication No. H11-188182 to **Uragami** is titled “Fishing Simulation Game Device” (“Uragami”) (EX1009 (certified translation of

EX1015)). I am informed by counsel that Uragami qualifies as prior art to the challenged claims because it was filed December 25, 1997 and published July 13, 1999, before the priority date of the '731 patent.

71. Much like Dornbusch, Uragami discloses a fishing game that can be controlled via device motion, including based on motion sensing inputs and a crank:

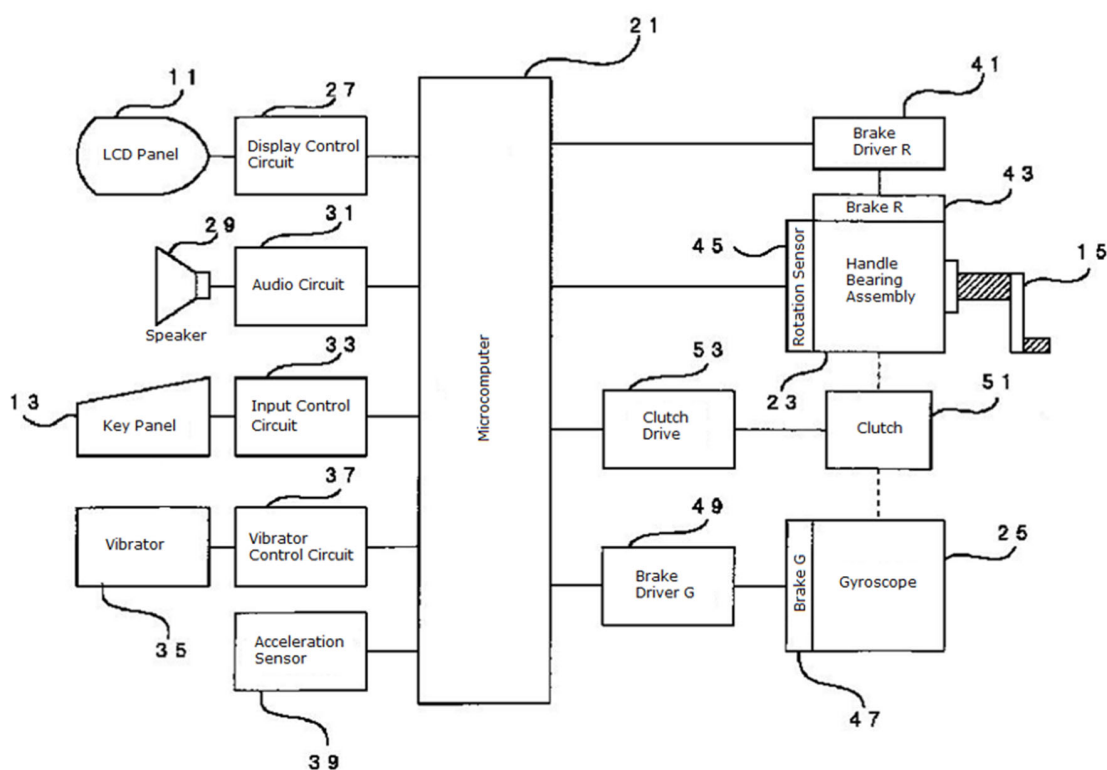


(Uragami, Fig. 1; *id.*, [0021] (“When the player rotates the reel handle 15, the gyroscope 25 rotates in tandem with the rotational force of the reel handle 15.”), [0003] (“The accelerometer detects the acceleration applied to the game device during the hooking motion and transmits this data to the microcomputer.”); *see also*

id., Fig. 2; *id.*, [0008], [0016].)

72. Uragami's device is a self-contained gaming device containing a display **11**, control circuitry including a microcomputer **21**, and the hardware and sensor circuitry for motion inputs:

[FIG. 2]



(Uragami, Fig. 2; *id.*, [0012]-[0015].) Uragami further discloses that the microcomputer **21** “controls the entire device, including a CPU, RAM, ROM, and timer[.]” (*Id.*, [0012].) Uragami further discloses that its device contains a “game program” that is “stored in a non-volatile memory inside the microcontroller 21.”

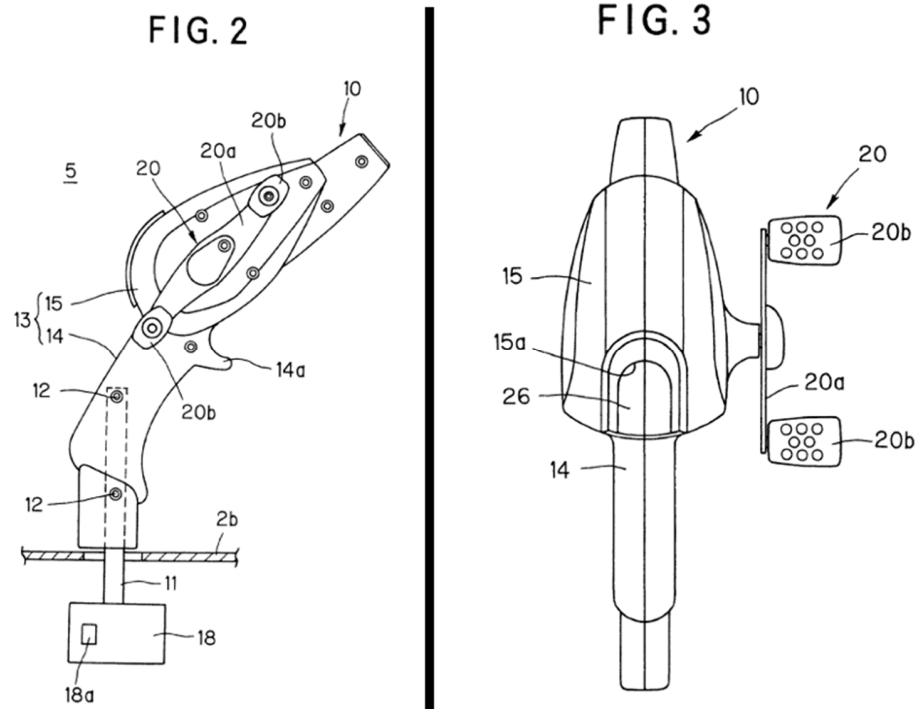
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(*Id.*, [0017].) Uragami discloses that “[w]hen the game device is turned ON, the microcontroller 21 starts the game program.” (*Id.*) The game program further provides the instructions for the microcontroller **21**, which “execut[es] a game program to perform game processing in response to” the various input signals and “to display progress in the game processing on the display panel[.]” (*Id.*, [0008]; *see also id.*, [0021]-[0023], [0026], Claim 1.)

7. Moritome (EX1010)

73. U.S. Patent No. 6,589,117 to **Moritome** is titled “Fishing Game System and Input Device Therefor” (“Moritome”) (EX1010). I am informed by counsel that Moritome qualifies as prior art to the challenged claims because it was filed December 7, 1998, before the priority date of the ’731 patent.

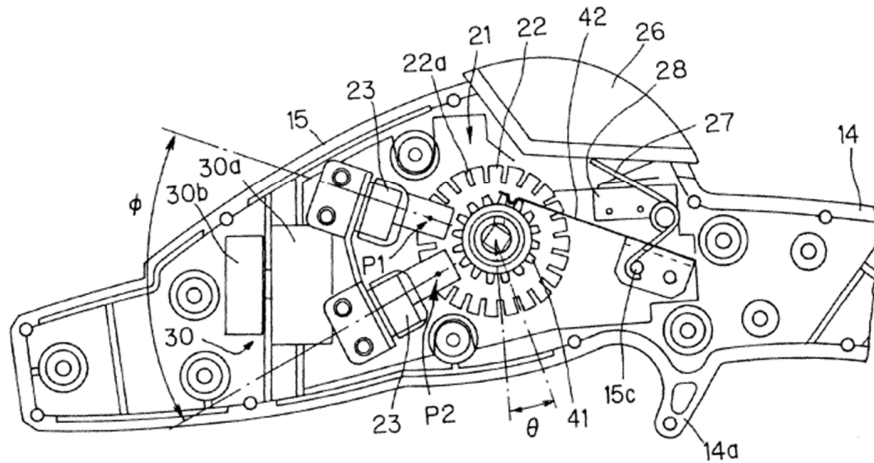
74. Moritome discloses a fishing game with a controller that resembles a real-world fishing rod, including a rotating handle **20**:



(Moritome, Figs. 2-3; *id.*, 1:11-13, 2:5-7 (“thus sufficiently reproducing a feeling of actual fishing”), 2:10-12 (“a feeling of operating a fishing reel can be reproduced”), 1:48-52.)

75. The rotation of the handle is measured by light-emitting devices and photosensors separated by a rotating “slit disc **22**,” which alternately blocks light and lets light through as it rotates. (Moritome, 7:19-52.)

FIG. 4



(Moritome, Fig. 4.)

76. The rotating handle **20** can be rotated in either of two directions. Moritome discloses that the direction of motion can be measured. Moritome discloses that “based on differences in phase between the output signals from the two photosensors **23** (specifically, based on a shift in timing when the signals switch between the ON and OFF levels), a rotational direction of the handle **20** can be determined.” (Moritome, 7:46-50.)

8. Titus (EX1011)

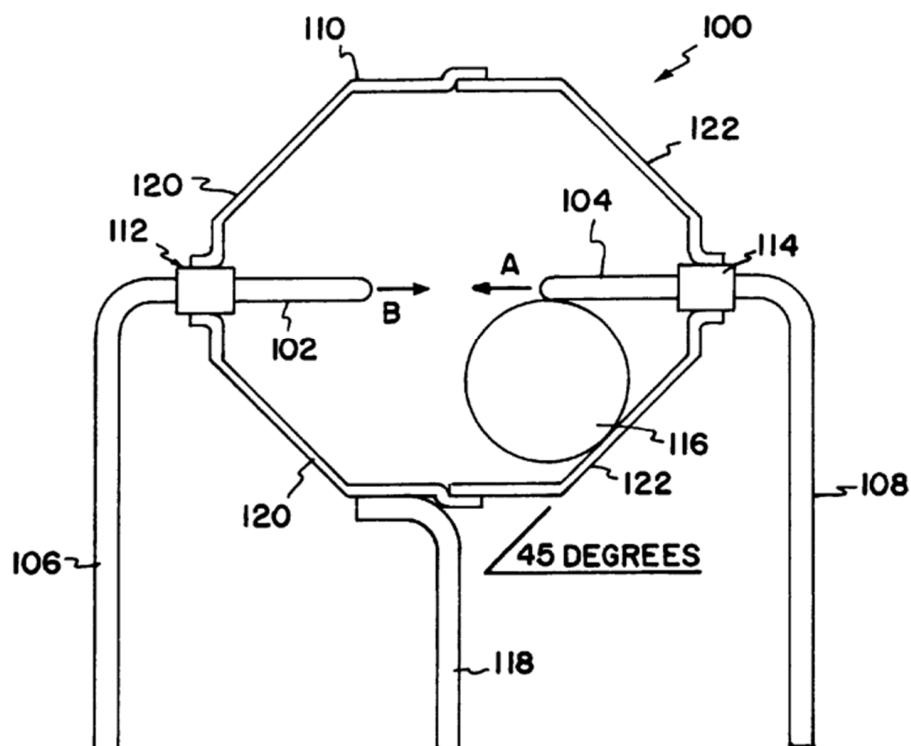
77. U.S. Patent No. 5,955,713 to **Titus** is titled “Tilt Switch Array for Electronic Orientation Detection” (“Titus”) (EX1011). I am informed by counsel that Titus qualifies as prior art to the challenged claims because it was filed October 3, 1997, before the priority date of the ’731 patent.

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78. Much like Dornbusch, Titus discloses “an apparatus for detecting the orientation of an object,” including for use in “portable electronic devices.” (Titus, 1:5-12, 1:38-42 (disclosing tilt switch that “should take up less volume within the device”).) Titus discloses various tilt switch array embodiments, which determine orientation of a device based on a movable conductive ball that can either close or open a circuit depending on the orientation of the device. (*Id.*, 2:66-3:3.)

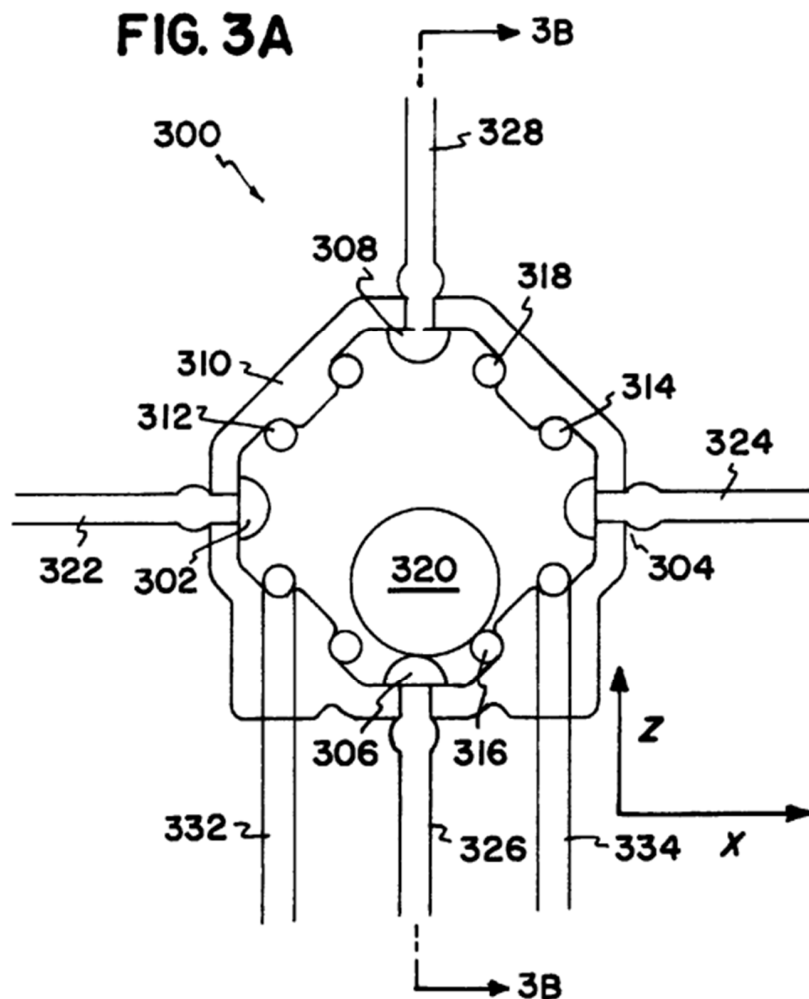
79. For example, Titus discloses a tilt switch array with “two centered electrodes **102** and **104** that are diametrically opposed and lying along a single axis of the tilt switch **100**[.]” which are inside of a “housing **110**” connected to a “housing electrode **118**[.]” with the housing being “electrically conducting[.]” (Titus, 3:20-37.) The housing also contains a “conducting ball **116**[.]” which is “free to move within the housing **110** under external forces, as may be imparted to the ball **116** by gravity or acceleration due to motion.” (*Id.*, 3:27-30.) Depending on the orientation of the tilt switch array, the ball **116** moves along the housing and completes a circuit between the housing **110** and one of the electrodes **102** or **104**. (*Id.*, 3:32-38, 3:50-61; *id.*, Fig. 1B.) For example, Figure 1B shows an example tilt switch array when the device is tilted such that a circuit is closed between the housing **110** and electrode **104**:

FIG. 1B



(*Id.*, Fig. 1B.)

80. Titus discloses other examples of tilt switch arrays, including as shown in Figure 3A:



(Titus, Fig. 3A.) The Figure 3A tilt switch array includes several electrodes **302**, **304**, **306**, and **308**, along with several metallic rings **312**, **314**, **316**, and **318**. (*Id.*, 4:51-60.) As the device rotates, the conductive ball **320** moves around the housing, completing different circuits as it proceeds. (*Id.*, 4:61-5:6.)

81. Titus further discloses that its tilt switch arrays can connect to an “external circuit” or “controller” that can use the signals from the various circuits in

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the switch array to determine the orientation of the device. (Titus, 4:55-60, 5:16-19, 6:2-5.)

9. Nakano (EX1026)

82. Japanese Laid-Open Patent Application Publication No. 2000-148694 to **Nakano** is titled “Portable Electronic Device for Entertainment System” (“Nakano”) (EX1026 (certified translation of EX1027)). I am informed by counsel that Nakano qualifies as prior art to the challenged claims because it was published May 30, 2000, before the priority date of the ’731 patent.

83. Nakano describes “a portable electronic device that can be connected to an information device such as a video game machine, has a function as an auxiliary storage device such as a memory card device, and can also be used independently.” (Nakano, [0001], [0010], [0018], etc.)

84. The “parent” video game device in Nakano includes “a control system 50 including a central processing unit (CPU) 51..., a graphic system 60 including an image processing device (GPU: Graphic Processing Unit) 62 ... and a memory card 10 or the portable electronic device 100 to be described later that stores game settings and the like[.]” (Nakano, [0031].) “The control system 50 includes the CPU 51, [random access memory], ... and a read-only memory (ROM) 54 in which programs such as an operating system” are stored. (Nakano, [0032].) “The CPU 51 controls

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the entire video game device 1 by executing the operating system stored in the ROM 54, and is, for example, a 32-bit RISC-CPU.” (Nakano, [0033].)

85. Nakano further describes a portable electronic device (or “child machine”) that can be used in conjunction with the parent video game device or independently. (Nakano, [0056].) Nakano teaches that to operate independently “the child machine is configured with a microcomputer and has control means 41 having a program memory 41a inside and a nonvolatile memory 46. The program memory 41a incorporates an operating system that controls the operation of this child machine.” (Nakano, [0141].) Nakano teaches that “the portable electronic device 100 is configured to include input means 43 such as button switches for operating the executed program and display means 44 using a liquid crystal display device (LCD) or the like, so as to be usable as a portable game device when a game application is operated.” (Nakano, [0077].) Nakano further teaches that a program downloaded from the parent machine to the child machine, “is executed by the microcomputer under control of the operating system[.]” (Nakano, [0142].) Nakano teaches that a video game program can be downloaded and operated on the child machine so that “a user (game player) can always carry around and train the characters or persons appearing in the [video game] program[.]” (Nakano, [0112].) In addition, Nakano teaches that other types of non-video game programs and

functions (such as a remote control program and a calculator program) can be used, downloaded, and/or operated on the child machine. (Nakano, [0114].)

**B. Grounds 1 and 2: Claim 1 is Obvious Over Dance (Ground 1);
Claim 1 is Obvious Over Dance in View Kuo and Beuk (Ground 2)**

1. Independent Claim 1

86. For reference, claim 1 recites:

1. A handheld computing device, comprising:
 - [a] a display;
 - [b] an internally located directional input device providing a directional input signal, the directional input signal corresponding to an axis of inclination of the handheld computing device and indicating an orientation;
 - [c] a second directional input device providing a second directional input signal, the second directional input signal indicating an amount of displacement;
 - [d] a processor coupled to the internally located directional input device and the second directional input device and operable to receive and process the directional input signal in conjunction with the second directional input signal; and
 - [e] a memory subsystem, the memory storing an operating system executed by the processor to display on the display a graphical user interface for controlling the operation of the handheld computing device, wherein

the graphical user interface provides a graphical element;

- [f] wherein the operating system comprises processor-executable instructions that cause the graphical element to move by the amount of displacement in a direction substantially parallel or substantially perpendicular to the orientation.

(’731, 9:19-42 (Claim 1; bracketed notation (e.g., [a]) added).)

**(a) “A handheld computing device, comprising:”
(Claim 1[p])**

87. It is my opinion that Dance discloses a “handheld computing device.”

88. Dance discloses a handheld digital camera, as shown in Figure 1:

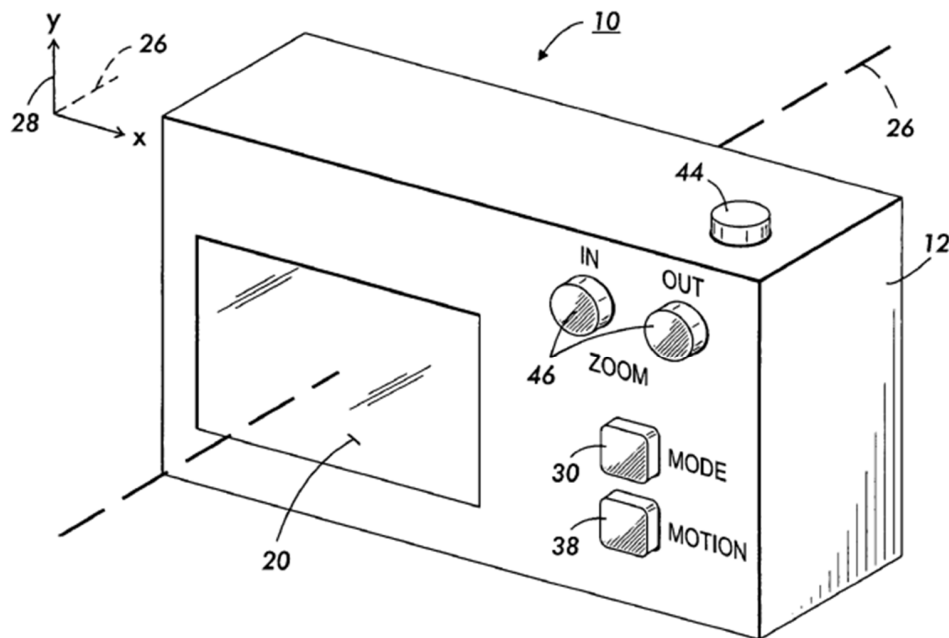


FIG. 1

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(Dance, Fig. 1; Dance, 1:6-7 (“This invention relates to a display device for a camera[.]”).)

89. Dance’s camera is “[a] **handheld**” device. Dance discloses that its camera is a “portable document imaging camera[.]” (*Id.*, 2:43-44 (emphasis added); *see also id.*, 1:19-22 (disclosing related art including “hand held digital cameras, and hand held video cameras”) (emphasis added).

90. Dance’s camera is a “**computing device.**” As explained further below, Dance discloses that “[t]he invention may be embodied as, or in, a camera, or a method of operation, or a program for controlling or implementing such a method when run on a processor.” (Dance, 2:17-19 (emphasis added).) A processor implementing Dance’s system constitutes “**a computing device.**” (*See, e.g.*, ’731, 1:24-29 (“Handheld computing and communication devices are well known.... Typically, these handheld device [sic] have a processor connected to a memory, a screen and a user input device.”).) Further, a POSITA would have understood Dance’s camera to be a digital camera, which a POSITA would have considered a “**computing device,**” since it includes a processor that executes computations and other instructions and a memory. For example, textbooks and other sources confirm that a POSITA would have considered a digital camera to be a computer. (Kuo, 1:26-27 (“The digital camera incorporates a central processing unit, memory, and many

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other features of a computer system.”); John Hedgecoe, *The Art of Digital Photography* (2006), EX1022, p.008 (“A digital camera is a computer, and the information recorded by the sensor needs to be digitized, processed, and stored[.]”); Mark Edward Soper, *Unleashing Microsoft Windows Vista Media Center* (2009), EX1023, p.029 (“Whenever you take a picture with a digital camera, the camera creates a file, just like a computer does (hence my favorite one-line explanation of what a digital camera is: ‘a computer that takes pictures’).”).) Accordingly, Dance teaches a **“handheld computing device.”**

(b) “a display” (Claim 1[a])

91. It is my opinion that Dance discloses claim 1[a].

92. Dance discloses **“a display.”** Dance’s camera “carries a display device **20** for displaying images ... mounted on the rear of the camera housing **12[.]”** (*Id.*, 2:66-3:4 (emphasis added).) Figure 1 of Dance is reproduced below with the **“display”** (element **20**) highlighted in pink.

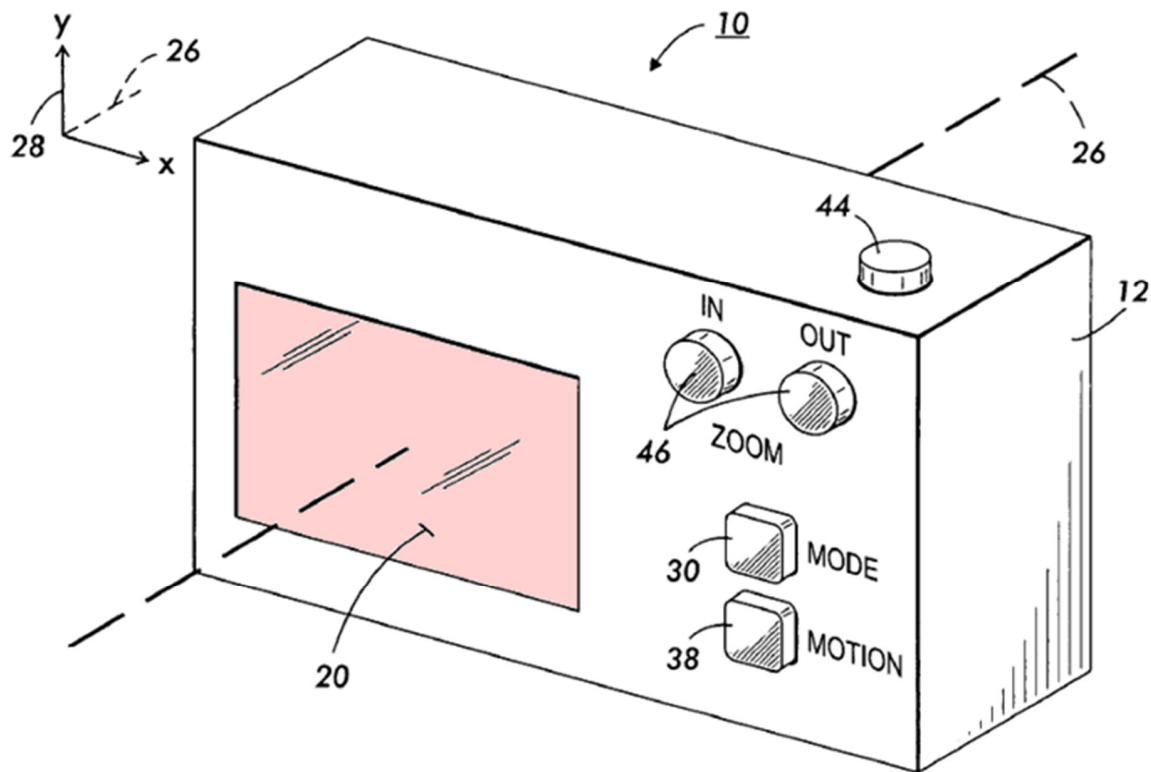


FIG. 1

(*Id.*, Fig. 1 (highlighting added), 2:66-3:4.)

- (c) “an internally located directional input device providing a directional input signal, the directional input signal corresponding to an axis of inclination of the handheld computing device and indicating an orientation” (Claim 1[b])

93. It is my opinion that Dance discloses claim 1[b].

94. Dance discloses “an internally located directional input device” in its motion sensing device 24. Dance’s motion sensing device 24, shown in blue below, is “internally located” because it is located inside the camera 10.

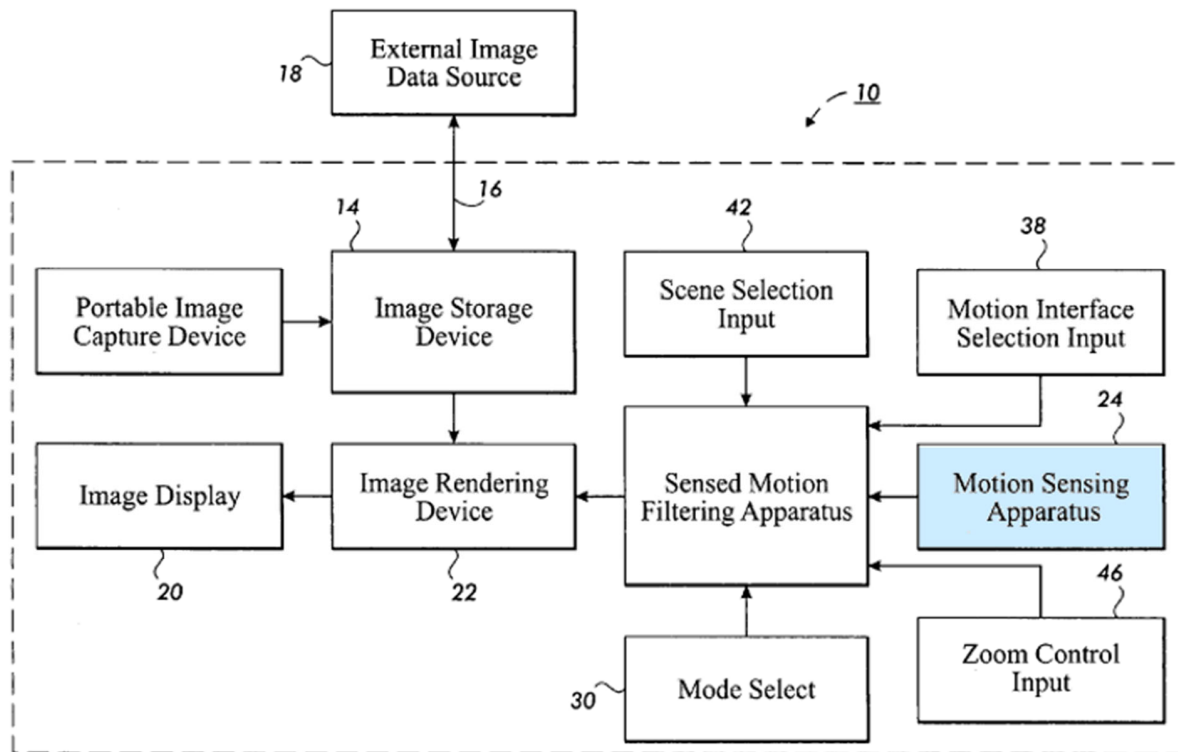


FIG. 2

(Dance, Fig. 2 (highlighting added); *see also id.*, Fig. 1.) Further, Dance’s motion sensing device **24** is a “**directional input device.**” Dance’s motion sensing device **24** can indicate the direction of tilt of the digital camera, and it indicates a scrolling direction to the camera. (*Id.*, Fig. 2, 3:32-39, 4:58-63, 5:9-11.) Motion sensing device **24** serves as an “**input device,**” as it is allowing a user to control the operation of the digital camera by tilting it. (*Id.*, Figs. 2, 4, 5B, 6, 3:32-39, 4:58-63, 5:9-11.) For example, Dance discloses that “[t]he output from the motion sensing device **24** is fed as a control input to the image rendering circuit **22**, to control the displayed

image based on the user's movement of the camera.” (*Id.*, 3:19-23.)

95. Dance explains that its motion sensing device 24 “provid[es] a **directional input signal, the directional input signal corresponding to an axis of inclination of the handheld computing device.**” For example, Dance discloses that the motion sensing apparatus 24 provides the “**directional input signal**” shown in Figure 2 below:

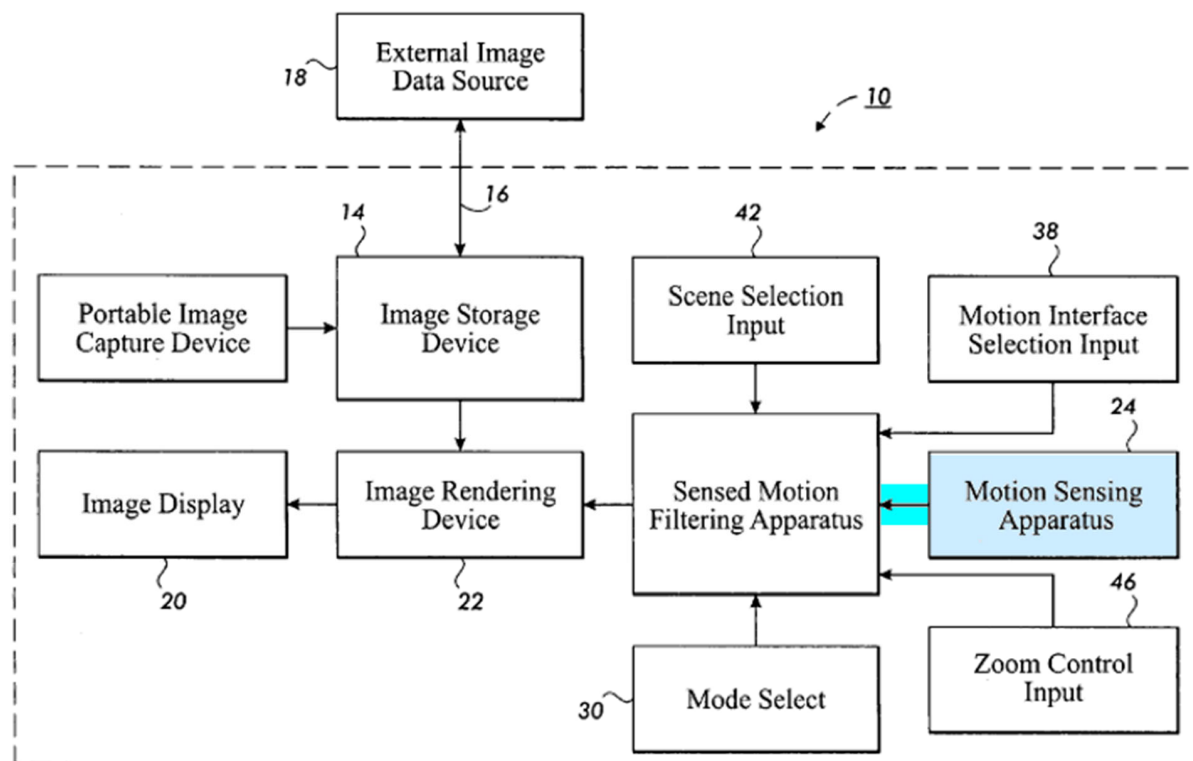
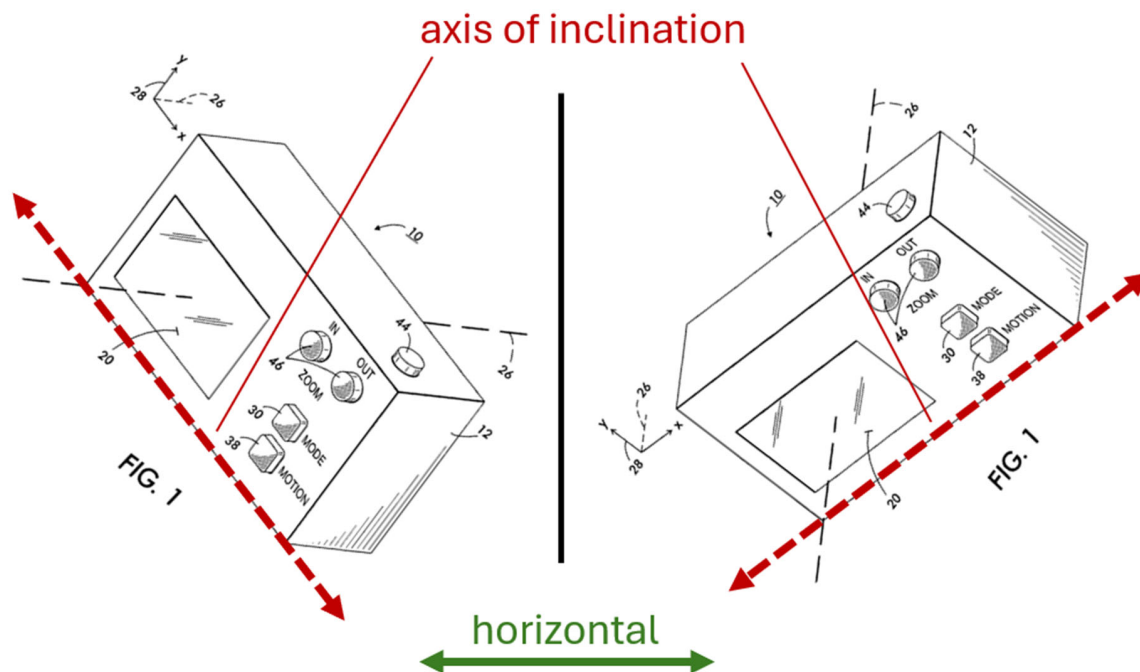


FIG. 2

(*Id.*, Fig. 2 (highlighting added), 3:19-23.) This signal “**correspond[s] to an axis of inclination of the handheld computing device.**” For example, Dance discloses that its digital camera measures whether the digital camera is tilted to the right or

left—which corresponds to “**an axis of inclination of the handheld computing device,**” i.e., the inclination of the handheld computing device with respect to horizontal, as shown in the below demonstrative:



(*Id.*, Fig. 1 (annotations added); *id.*, Fig. 2, 3:32-39, 4:58-63, 5:9-11.)

96. Dance discloses that the output signal of the motion sensing device 24 “**indicat[es] an orientation**”—i.e., the orientation of the digital camera. (Dance, 3:32-38 (“tilting the camera in a certain direction effects scrolling of the display in a corresponding direction of the display device 20”), 4:60-65 (“tilting the camera to the right”), 5:9-11 (“tilting to the left”).)

97. In the related district court litigation, I submitted a declaration

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providing my opinion that claim 1 of the '731 patent is indefinite as to its full scope, because of the claim language “an orientation.” (EX1013 (8/6/2025 Polish Decl.), ¶¶ 45-46.) I explained in that declaration that, in my view, there is a limited subset of the claim scope in which claim 1 is not indefinite. (*Id.*) Specifically, where the “orientation” refers to the orientation of the “axis of inclination of the handheld computing device.” (*Id.*) Patent Owner’s expert, Dr. Garner, likewise opined that “orientation” refers to “the orientation of the handheld device.” (EX1014 (9/5/2025 Garner Decl., p.001 n.1.)

98. In my opinion, Dance discloses a “**directional input signal**” that “**indicat[es] an orientation**” under the limited scope of the claim language in which it is definite in my opinion—i.e., where the “orientation” refers to the orientation of the “axis of inclination of the handheld computing device.” As discussed above, the output signal from Dance’s motion sensors indicates the orientation of the digital camera with respect to its axis of inclination. (Dance, 3:32-35, 3:27-31, 3:39-41, Fig. 1.) As Dance explains, “tilting the camera in a certain direction effects scrolling of the display in a corresponding direction of the display device **20**.” (Dance, 3:32-38; *id.*, 4:60-65 (“tilting the camera to the right”), 5:9-11 (“tilting to the left”).) Dance teaches “an internally located directional input device providing a directional input signal, the directional input signal corresponding to an axis of inclination of

the handheld computing device and indicating an orientation.”

(d) “a second directional input device providing a second directional input signal, the second directional input signal indicating an amount of displacement”
(Claim 1[c])

99. It is my opinion that claim 1[c] is disclosed by or obvious over Dance.
In the alternative, it is my opinion that claim 1[c] is also obvious over Dance in light of Beuk (EX1006, U.S. Patent No. 5,910,797).

Dance Alone Discloses Claim 1[c]

100. Dance discloses a “second directional input device”—i.e., the “zoom control input device 46,” shown highlighted in green in Dance’s Figure 1 below:

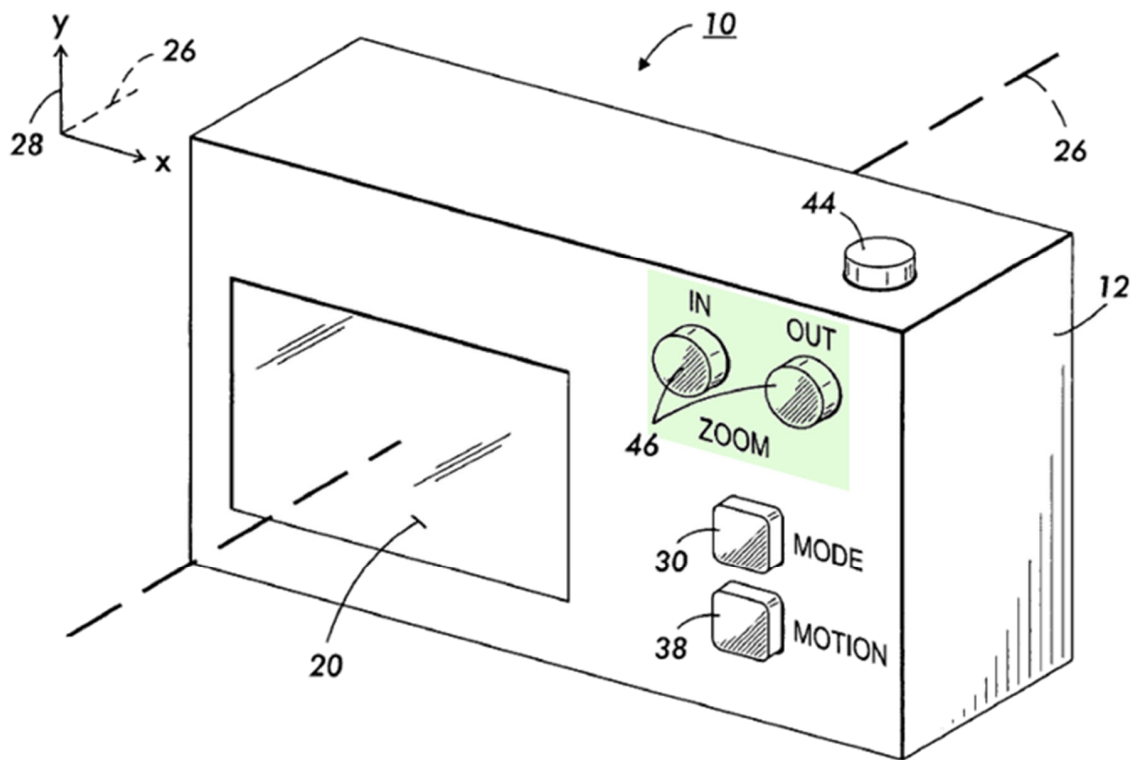


FIG. 1

(Dance, Fig. 1 (highlighting added), 4:43-51.)

101. Figure 2 of Dance shows the Zoom Control Input 46 block within the camera 10:

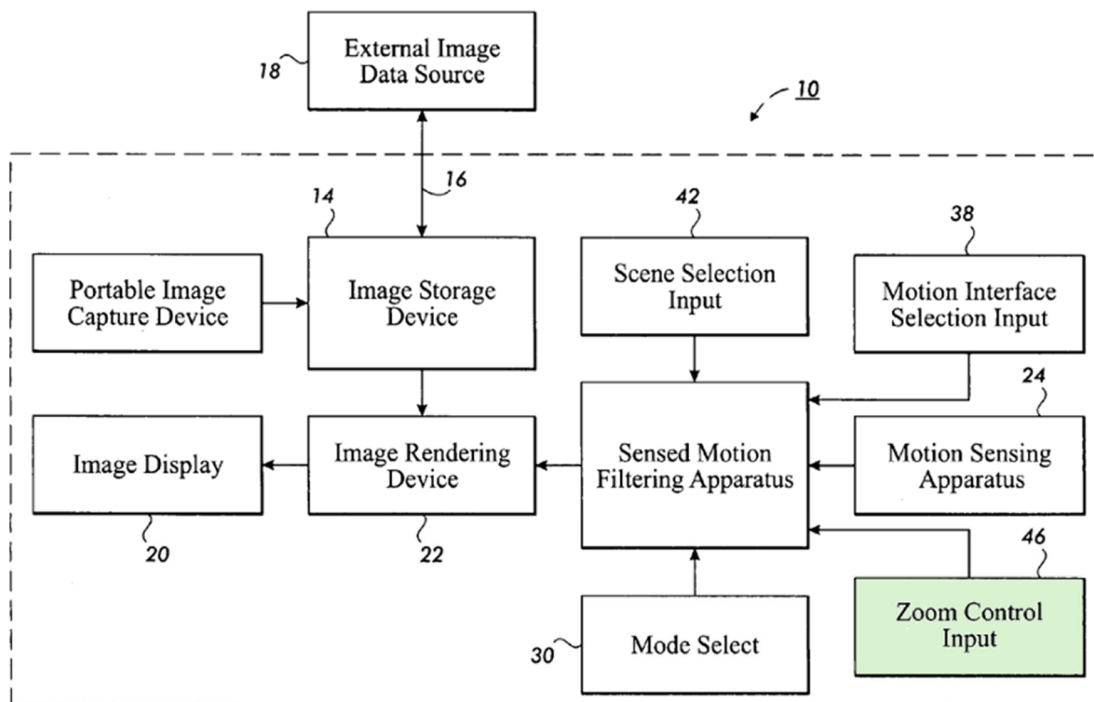


FIG. 2

(Dance, Fig. 2 (highlighting added).)

102. Dance discloses that the zoom control buttons are an “**input device**” allowing the user to provide “zoom control” either by manipulating “push buttons” as shown in Figure 1 or using a “variable analog device.” (Dance, 4:43-51, 5:4-9 (“the user zooms in[,]” including “by operating the camera’s zoom input buttons **46**”), 5:65-67 (describing a “zoom input from a zoom control input device **46**”).)

103. Dance further discloses that the zoom control buttons are a “**directional input device**,” because they allow a user to provide input in either of two directions (i.e., in or out) and they cause directional change on the display (i.e., zooming in or out of the displayed image). (Dance, Fig. 1 (showing “IN” and “OUT”

buttons), 5:4-9 (“the user zooms in to enlarge a portion of the image, while panning the image left, i.e. to zoom towards the top left of the document image” (emphasis added)), 4:43-51.)

104. Dance’s zoom control buttons are a “**second**” directional input device—i.e., they are separate from the motion sensors that constitute the “**first**” directional input device. For example, Dance’s Figure 2 shows the **Motion Sensing Apparatus 24** block (the first “**directional input device**” as discussed above for claim 1[b]) as separate from the **Zoom Control Input 46** block (the “**second directional input device**”).

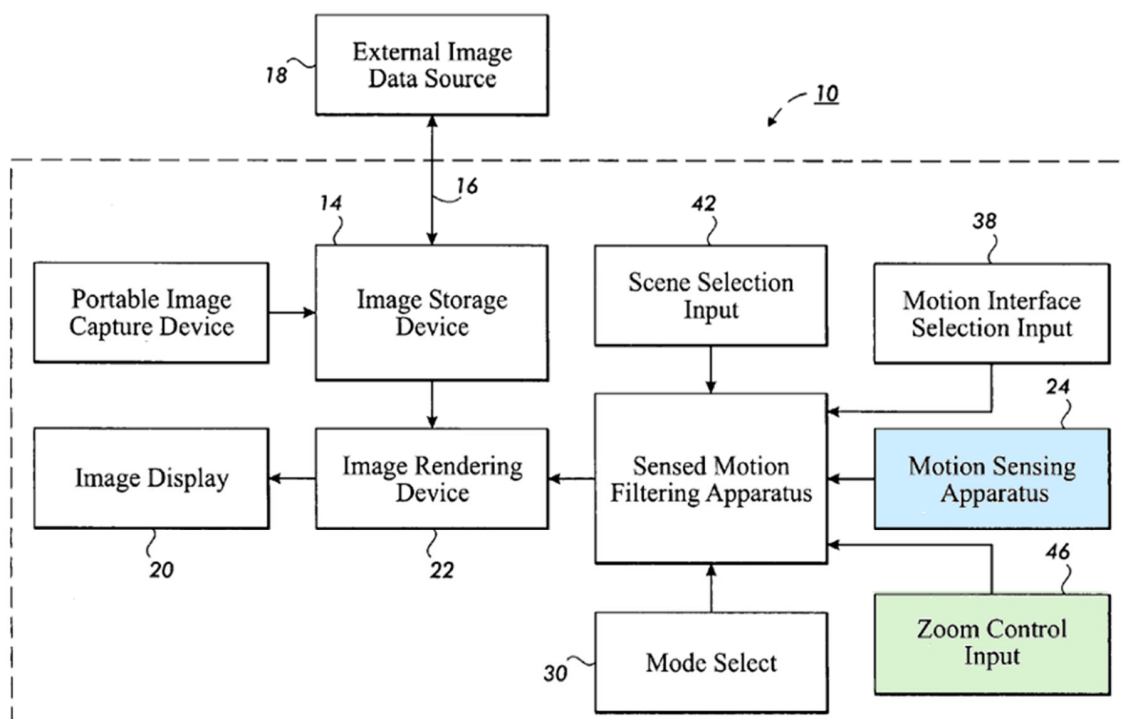


FIG. 2

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(Dance, Fig. 2 (highlighting added), 4:43-51, 4:21-27.) Dance thus discloses both an “internally located directional input device” and a “second directional input device.”

105. Considering Dance’s zoom control buttons to be the “**second directional input device**” is consistent with the ’731 patent’s disclosures. For example, dependent claim 15 of the ’731 patent (which depends from claim 1) recites “[t]he handheld computing device of claim 1, wherein the second directional input device is selected from the group consisting of **a button**; a roller; a touch surface; and a thumbwheel.” (’731 patent, 10:48-51 (emphasis added).) Furthermore, the ’731 patent discloses that “pressure sensors such as **buttons**” and “arrow keys” are examples of “**directional input device[s]**.” (’731 patent, 2:56-60 (emphasis added); *see also id.*, 8:40-43 (“directional input such as that provided by buttons”); 8:33-39 (disclosing “arrow keys” as an example “directional input means”).) Further, the ’731 patent discloses that “[d]irectional input devices produce signals which are further processed by the handheld device to represent a direction to an element of the handheld device user interface.” (*Id.*, 1:41-43.) Similarly, the zoom input control buttons on Dance’s camera represent a direction (i.e., in or out) to the camera user interface. (Dance, Fig. 1, 5:4-9, 4:43-51.)

106. Dance also discloses that the zoom input **46** can be implemented as

additional motion control functionality, where zoom input is provided through motion detected by “an accelerometer **82** mounted for sensing acceleration in the ‘z’ direction, i.e. parallel to the axis **26**[.]” (Dance, 6:19-29, 5:39-49, 4:43-51, 5:4-9, 6:7-15; *id.*, Fig. 7.) Thus, Dance’s accelerometer or other motion sensing circuitry for detecting “z”-axis motion of the digital camera is another disclosure in Dance that satisfies the “**second directional input device**”—separate and apart from the zoom input buttons.

107. Dance’s zoom control buttons provide a “**second directional input signal**” to the “Sensed Motion Filtering Apparatus” block shown in Figure 2:

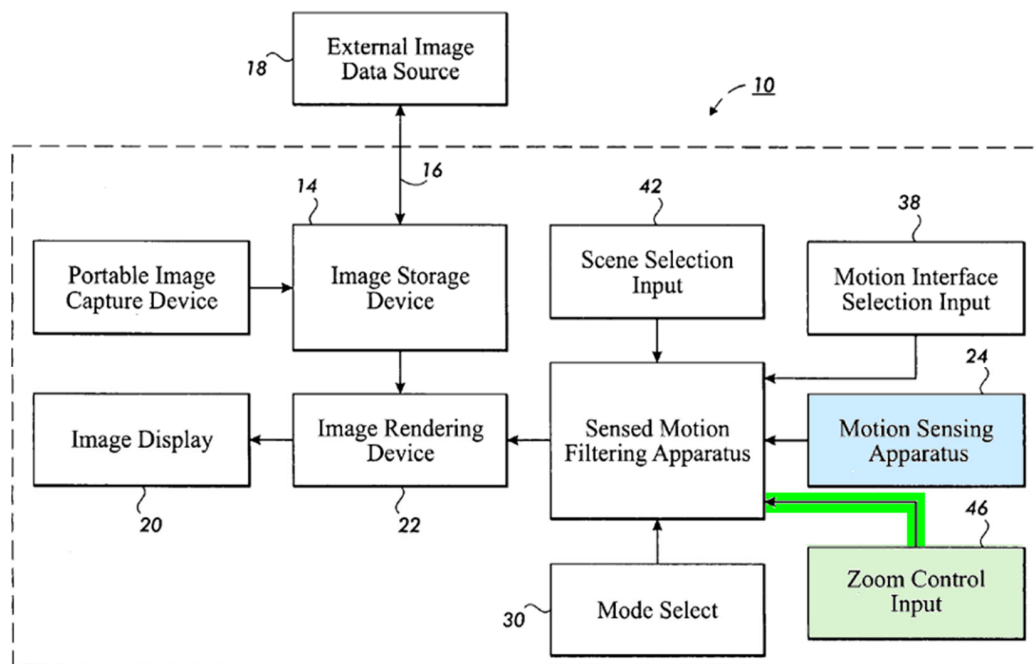


FIG. 2

(Dance, Fig. 2 (highlighting added), 4:43-51, 5:65-67.)

108. Dance’s “**second directional input signal**” “**indicat[es] an amount of displacement.**” Dance’s “**second directional input signal**” is used by the circuitry within the “Sensed Motion Filtering Apparatus” block to determine the velocity of motion for user control of image navigation. (Dance, Fig. 2, 5:56-67, 6:19-29.) Dance discloses that “the current zoom setting of the image rendering circuit **22** (i.e. the extent to which the currently displayed image is zoomed)” is used to determine a “factor k.” (*Id.*, 5:56-59.) Factor k is “a function of the current zoom setting” from the zoom input control, and it is provided to a multiplier **76** that multiplies the velocity from the motion sensors. (*Id.*) Dance discloses that “[t]he purpose of the factor k is to vary the panning speed depending on the current level of zoom.” (*Id.*, 5:60-61 (emphasis added).) Accordingly, the “**second directional input signal**” “**indicat[es] an amount of displacement**”—i.e., the panning speed, which is an amount of displacement over time.

109. Specifically, Dance discloses using the signal from the zoom control input **46** as an input to a velocity gain circuit **78**, shown below in Dance’s Figure 6:

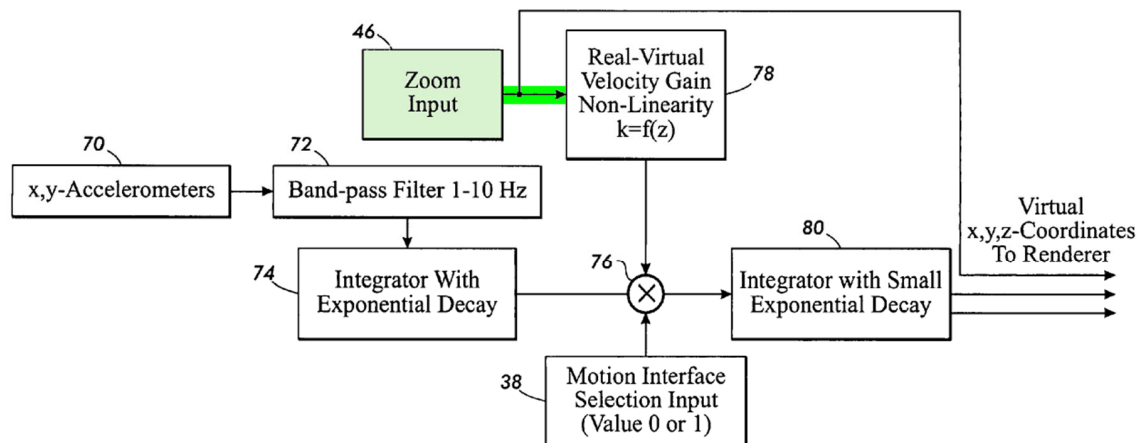


FIG. 6

(Dance, Fig. 6 (highlighting added), 5:65-67.) This circuit then determines a coefficient “k” as a function of the output of the zoom input. (*Id.*, 5:56-60.) The coefficient “k” is then multiplied by a velocity signal derived from the output of the accelerometer motion sensors **70** to determine the panning speed for the current level of zoom. (*Id.*, 5:56-65; *see also id.*, 5:39-55.) Since the scrolling velocity is determined by and varies with the coefficient “k,” which is derived from the current zoom level, the **“second directional input signal”** output by the zoom input **46** **“indicate[s] an amount of displacement.”** For example, if the signal from the motion sensing circuitry is constant (e.g., constant tilt) and zoom input **46** indicates a change in zoom level, then velocity changes with the signal from the zoom input **46**.

110. Dance’s Figure 6 relates to an embodiment where linear horizontal and

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vertical motion of the digital camera controls motion on the display. (Dance, Fig. 6, 5:34-6:18.) However, a POSITA would have understood that a similar structure would apply to the tilt control context, with a signal from the motion sensors (in this case, indicating tilt) being combined with zoom input information to set scrolling rate. (*Id.*, 5:4-11, 3:32-38, 5:52-67.) To the extent there is any argument that the use of variable scrolling velocity based on zoom level is not disclosed by Dance for tilt controls, it would have been obvious to combine Dance’s tilt controls with this feature. Dance discloses the motivation for why a POSITA would have been motivated to implement dynamic scrolling velocity based on zoom level in tilt controls—i.e., “the motion detection system becomes less sensitive to x-y acceleration when the image display is zoomed in, and hence more convenient for the user.” (*Id.*, 5:61-65 (emphasis added).) Further, Dance discloses linear horizontal and vertical motion along with tilt motion as similar types of input used for similar purposes—with tilt controls having the advantage that they can be used “in small space or if it is not practical to move the camera significantly.” (*Id.*, 3:32-38, 4:60-63 (“such movement could either be movement of the camera rightwards, or it may be tilting the camera to the right”), 5:9-11 (“The panning left is effected by appropriate movement of the camera **10**, for example movement leftwards or tilting to the left.”).) Accordingly, it would have been obvious to apply similar techniques

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(including dynamic scrolling velocity) to the similar types of motion control. Additionally, in my opinion, a POSITA would have had more than a reasonable expectation of success and could have implemented the proposed combination using conventional techniques without undue experimentation. As I discussed above, Dance treats tilt and linear (X-Y) motion as similar or parallel input types, so a POSITA would have had a reasonable expectation of success for both types of motion as to any feature (including dynamic scrolling velocity) disclosed for either type of motion. (*Id.*, 5:61-65.) Further, Dance discloses linear horizontal and vertical motion along with tilt motion as similar types of input used for similar purposes—with tilt controls having the advantage that they can be used “in small space or if it is not practical to move the camera significantly.” (*Id.*, 3:32-38, 4:60-63, 5:9-11.)

Dance in View of Beuk Also Renders Claim 1[c] Obvious

111. As noted above, Dance alone renders claim 1[c] obvious. But to the extent that there is any argument that Dance does not completely disclose a **“second directional input signal indicating an amount of displacement”** as claimed, it also would have been obvious to implement Dance’s system such that only coefficient “k” would be used to determine the scrolling velocity, as taught in **Beuk** (EX1006, U.S. Patent No. 5,910,797). (*Cf.* Dance, Fig. 6 (76).)

112. Beuk discloses a “portable apparatus having data processing means and integrated screen means for displaying one or more graphical or other objects” that can “measur[e] a spatial orientation of said screen means.” (Beuk, 1:7-14.) Like Dance, Beuk discloses scrolling based on the orientation of the device. (Beuk, 2:9-19 (“inclination of the apparatus” can lead to “vertical motion ... organized to represent scrolling”), 4:1-14 (“horizontal axis [of Fig. 4] gives the inclination angle α ” and “the vertical quantity may be the actual velocity” of a displayed object), Fig. 4, 5:7-9 (“An apparatus as claimed in claim 1, wherein said motion represents a scrolling effect on an associated text object.”).)

113. Beuk discloses that tilt scrolling could be implemented such that scrolling happens at a constant velocity in the tilt direction regardless of how much the device is tilted. (Beuk, 4:9-10, 4:12-14, Fig. 4.) For example, Beuk discloses

that Figure 4 shows different curves for how velocity of an object shown on the display (e.g., text to be scrolled) varies based on the orientation of the device. (*Id.*, 4:2-3, 4:12-14, Fig. 4.) One of the curves (highlighted below) indicates that once the orientation passes a certain threshold angle, the velocity of the object remains constant regardless of how much further the angle increases:

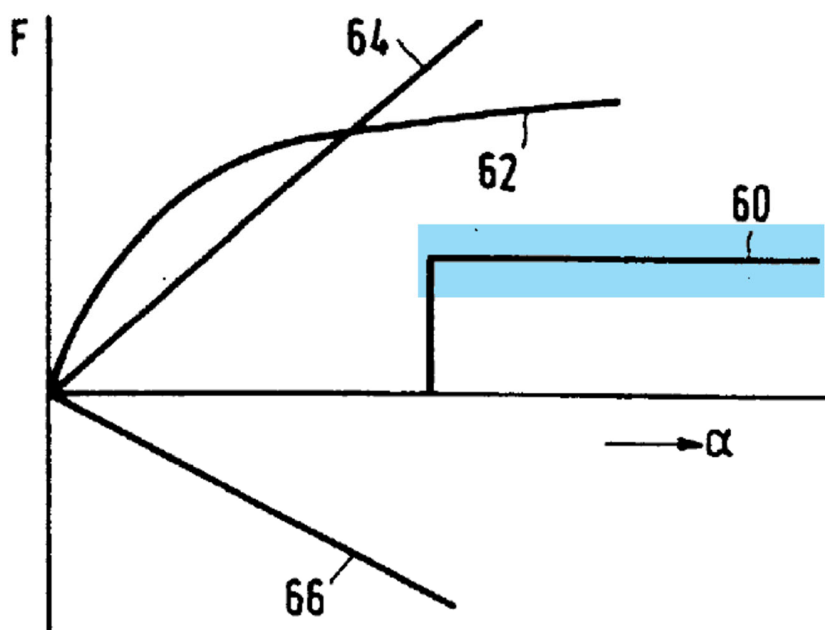
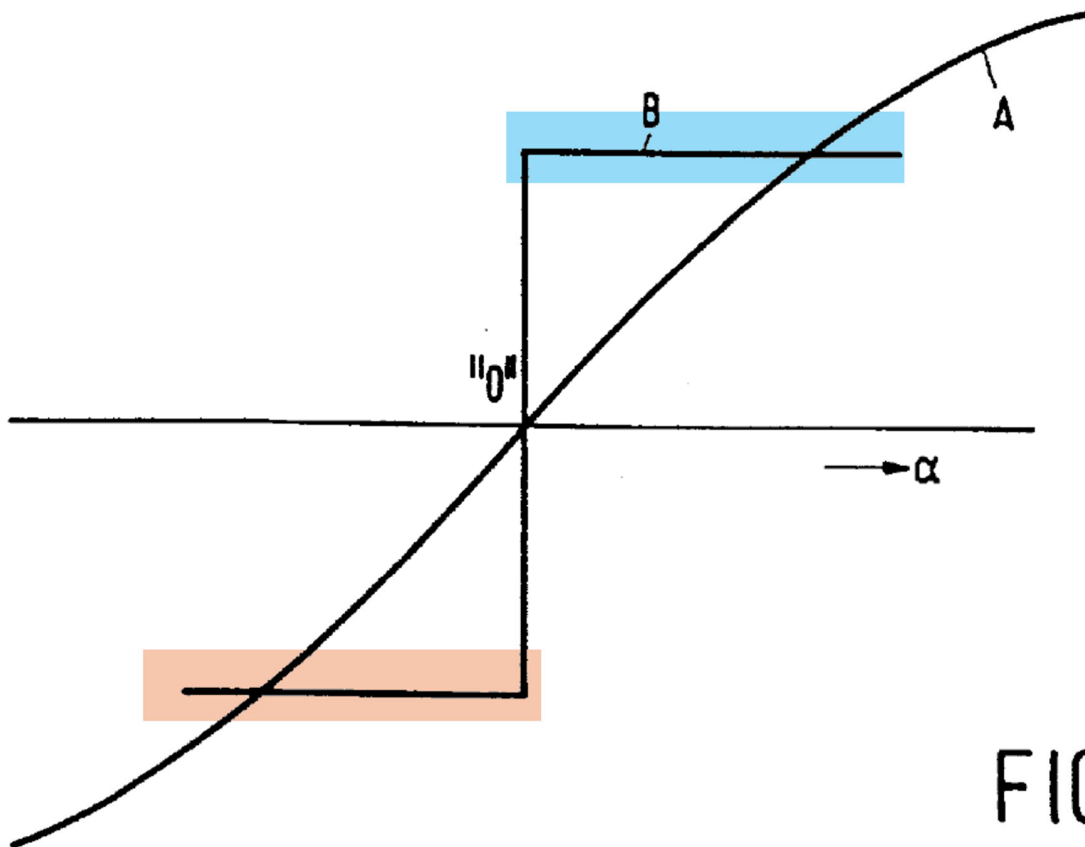


FIG.4

(*Id.*, Fig. 4 (highlighting added), 4:9-14.) Accordingly, Beuk discloses tilt scrolling where scrolling has a constant velocity, and velocity does not depend on magnitude of tilt. A single velocity applies regardless of tilt magnitude (assuming the tilt magnitude threshold is met).

114. Beuk also discloses implementing tilt-based scrolling by outputting one signal value when the inclination is negative (e.g., the device is tilted left) and

another signal value when the inclination is positive (e.g., the device is tilted right). (*Id.*, 3:19-22 (“depending on whether the inclination is positive or negative, the signal may have a first or rather a second value”), Fig. 2.) The resulting “step response” is shown in Beuk’s Figure 2, reproduced below, with the signal value output when the inclination is negative in red and the signal value output when the inclination is positive in blue. Again, signal value is independent of tilt magnitude. Only the direction of tilt is used to determine the output signal.



(*Id.*, Fig. 2 (highlighting added), 3:19-22.) It would have been obvious to implement

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Dance's tilt scrolling such that scroll velocity is independent of tilt magnitude. The combined system could be implemented in various straightforward ways. For example, Dance's tilt scrolling could be implemented like curve **60** in Figure 4 of Beuk. Once the tilt of the device exceeds a certain threshold in a particular direction, Dance's digital camera would cause scrolling on the display in that direction at a velocity that does not change if the tilt further increases. This constant velocity output by the motion sensing circuitry would then be multiplied by the coefficient "k" derived from the zoom setting **46**. Accordingly, the scroll velocity on Dance's system would vary only with changes in "k." Changes in tilt magnitude (above the threshold) would not impact the scroll velocity. A POSITA would have understood that the combined system could be implemented using signals similar to those shown in Beuk's Figure 2—with constant signal values indicating either left tilt or right tilt. Thus, in the combined system, there is **"a second directional input device [tilt sensor] providing a second directional input signal, the second directional input signal indicating an amount of displacement"** (the coefficient "k," which solely determines the scroll velocity).

115. A POSITA would have been **motivated to combine** Dance with Beuk. Dance and Beuk are analogous references in a similar field. For example, both references disclose the use of orientation or tilt of a device for the purpose of

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controlling a user interface. (Dance, 3:32-38, 4:58-65, 5:9-11; Beuk, 1:25-29, 2:42-3:12, 4:1-14, Figs. 2, 4.) Further, both references relate to handheld electronic devices. (Dance, 1:13-17, 1:19-20 (“hand held digital cameras”); Beuk, 2:50-53 (discussing “handheld calculators, handheld game-oriented devices, or so-called Personal Digital Assistants”).)

116. A POSITA would have been motivated to combine Dance with Beuk for implementation details of tilt scrolling in Dance’s system. For example, as discussed above, a POSITA would have sought implementation details for using tilt controls in the context of the example configuration shown in Dance’s Figure 6 in the context of linear (X-Y) motion controls. (Dance, 5:34-6:18, Fig. 6.) A POSITA would have looked to Beuk for those implementation details, since it discloses specifics for how tilt controls can work. (Beuk, 1:25-29 (“it is an object of the present invention to provide an apparatus according to the preamble wherein the orientation of the screen can be used to control various different types of motion depending on the actual spatial orientation”), 2:42-3:12, 4:1-14, Figs. 2, 4.)

117. A POSITA would have been motivated to combine Dance with Beuk to provide users with simple, straightforward tilt controls. A POSITA would have understood that either (1) tilt sensing where magnitude of tilt determines velocity of scrolling and (2) tilt sensing where velocity of scrolling is constant regardless of tilt

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would be two viable options for implementing tilt sensing, with design tradeoffs associated with each option. For tilt sensing where magnitude of tilt determines velocity of scrolling, a POSITA would have understood that it would have required more user attention and adjustment to navigate to a particular place in an image. In contrast, while tilt sensing with constant scrolling velocity would have provided less flexibility for a user, a POSITA would have understood that it would have required less sophisticated manipulation and prevented the user from accidentally scrolling too far or too fast based on substantial tilt. Dance indicates that the sensitivity of motion controls is a factor that should be considered in the context of its digital camera system—disclosing, for instance, the dynamic velocity functionality where “the motion detection system becomes less sensitive to x-y acceleration when the image display is zoomed in, and hence more convenient for the user.” (Dance, 5:61-65, Fig. 6.)

118. A POSITA would have had more than a reasonable expectation of success and could have implemented the proposed combination using conventional techniques without undue experimentation. For example, Dance discloses scroll velocity that varies with *both* motion sensing and zoom input, so it would have been straightforward to implement the simpler system of scroll velocity that *only* varies scroll velocity based on zoom input.

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119. Both Dance and Beuk are analogous art to the '731 patent because they are both related to portable devices capable of sensing motion and orientation of the device. ('731, 1:16-17.) For example, Dance discloses a portable camera with a “motion sensing device” that senses the camera’s movement as user input, including for scrolling on the display. (Dance, 2:43-44, 3:32-39, 4:58-63, 5:9-11). Similarly, Beuk discloses a “portable apparatus” that can “measur[e] a spatial orientation of said screen means.” (Beuk, 1:7-14.) Like Dance, the device disclosed in Beuk is capable of detecting movement of the device and scrolling. (Beuk, 2:9-19.) Furthermore, Dance and Beuk are reasonably pertinent to purported problems facing the inventor of the '731 patent, including providing a user-friendly handheld device that is capable of motion and orientation sensing. ('731, 3:54-57 (“There is therefore a need for a directional input device with a minimized size, to allow for a larger screen, while reducing the tooling costs associated with apertures on the moulding of the handheld device.”); Dance, 2:6-9 (“This can provide a much more straightforward interface for the user, without the difficulty of finding, and trying combinations of buttons to control the display. It is also less fatiguing to the users.”); Beuk, 1:17-21 (“The inventor has found that various spatial orientations of an apparatus according to the preamble may control associated object motions on the screen, and has envisaged various useful applications of a device that is enhanced in

such manner.”.)

120. Dance in view of Beuk thus renders obvious “**a second directional input device providing a second directional input signal, the second directional input signal indicating an amount of displacement.**”

(e) “**a processor coupled to the internally located directional input device and the second directional input device and operable to receive and process the directional input signal in conjunction with the second directional input signal; and**” (Claim 1[d])

121. It is my opinion that claim 1[d] is disclosed or rendered obvious by Dance. In the alternative, it is my opinion that claim 1[d] is also obvious over Dance in light of **Kuo** (EX1005, U.S. Patent No. 6,400,471).

Dance Alone Discloses Claim 1[d]

122. Dance discloses a “**processor.**” Dance discloses that its digital camera may be embodied as “a camera, or a method of operation, or a program for controlling or implementing such a method when run on a processor.” (Dance, 2:17-19 (emphasis added).)

123. Dance further discloses a “**processor**”—i.e., the combination of functionality in image rendering device **22** and sensed motion filtering apparatus. (Dance, 3:5-18, 3:52-64, 6:7-15, Figs. 2, 6.) Dance’s image rendering device **22** and sensed motion filtering apparatus is shown in Figure 2, reproduced below:

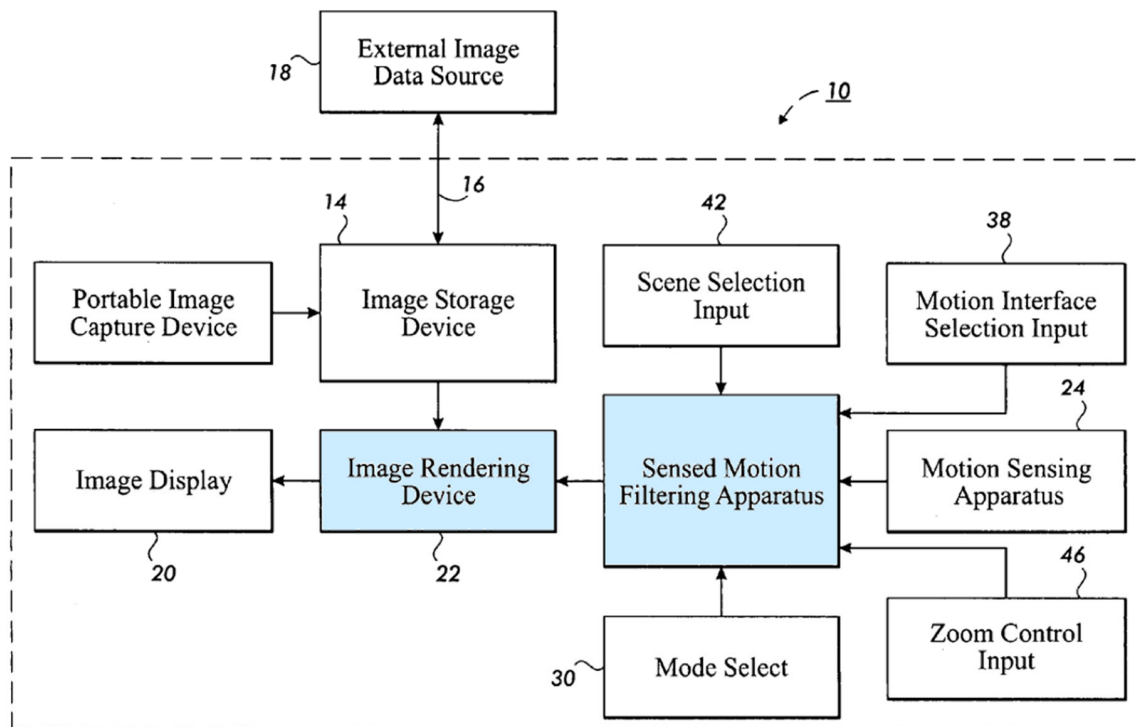


FIG. 2

(*Id.*, Fig. 2 (highlighting added).)

124. Dance discloses that image rendering device 22 performs functions that would be performed by a “**processor**,” including “receiv[ing] image data from the storage medium 14,” “compos[ing] an image for display,” receiving various inputs, and controlling scrolling and zooming on the display. (Dance, 3:5-23, 3:52-64, 4:15-42, 6:7-15, 6:19-29, Figs. 2, 6.) A POSITA would have understood that the operations Dance discloses for image rendering device 22 would be performed by a “**processor**.” For example, Dance discloses that “control[.]” of its digital camera is performed by a program “run on a processor,” which indicates that image rendering

device **22** (which performs control operations on the digital camera) constitutes a “**processor.**” (Dance, 2:17-19, 1:13-20.)

125. Dance discloses that the sensed motion filtering apparatus performs functions that would be performed by a “**processor.**” Dance’s Figure 6 (reproduced below) provides more details on the filtering circuitry between the input devices and image rendering device **22**, including virtual velocity gain circuit **78**, multiplier **76**, bandpass filter **72**, and integrators **74** and **80**. (Dance, Fig. 6, 5:39-6:15.)

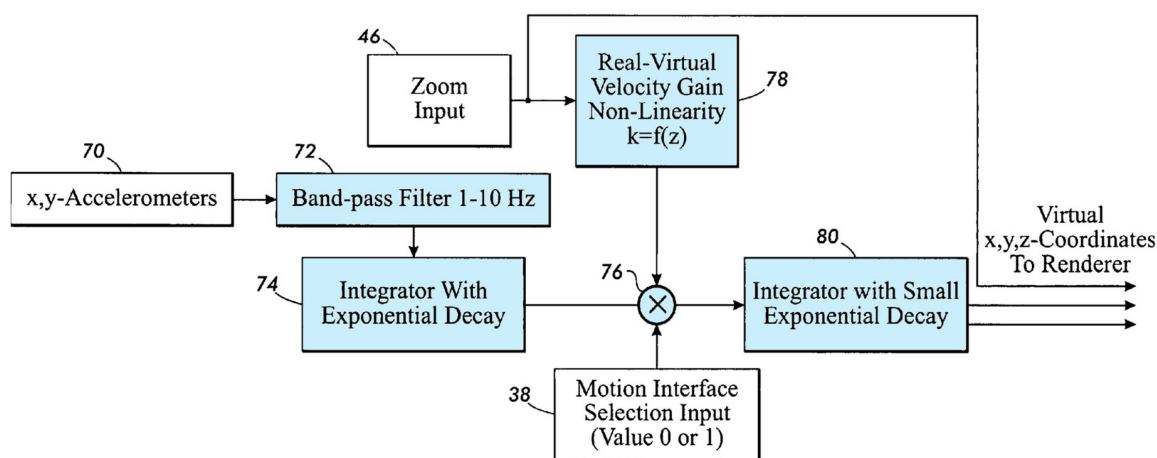


FIG. 6

(*Id.*, Fig. 6 (highlighting added).) A POSITA would have understood that this functionality would be performed by the “**processor.**” For example, a POSITA would have understood that mathematical operations like that performed by the virtual velocity gain circuit **78** or the multiplier **76** would be performed by a processor. (See, e.g., Dance, 2:17-19, 1:13-20.) Further, it would have been in the

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knowledge of a POSITA that filter and integrator operations could be performed on a “**processor.**” (See, e.g., Steven W. Smith, *The Scientist and Engineer’s Guide to Digital Signal Processing* (1997), EX1021, p.010 (“These problems can be attacked with either analog or digital filters.... Digital filters, in comparison, are vastly superior in the level of performance that can be achieved.”), p.017 (including bandpass filters in the “four basic frequency responses”); John R. Newport, *Avionic Systems Design* (1994), EX1024, p.041 (“The software on the data processor might involve three application tasks: one for I/O, a second for the integration, and an idle task which is a spin loop.”).)

126. Dance discloses that image rendering device **22** and sensed motion filtering apparatus is “**coupled to the internally located directional input device and the second directional input device.**” Dance discloses that image rendering device **22** receives inputs from the motion sensing device **24** (“**internally located directional input device**”) and the zoom control input **46** (“**second directional input device**”). (Dance, 3:19-23 (“The output from the motion sensing device **24** is fed as a control input to the image rendering circuit **22**, to control the displayed image based on the user’s movement of the camera.”), 6:27-29 (“The output from the input circuit **46a** can be fed to the virtual velocity gain circuit **78** and to the image rendering circuit **22.**”), 6:10-15 (“the output from the zoom control input

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device **46** are fed as x, y and z coordinates to the image rendering circuit **22**”).
The signals from the directional input devices in Dance are processed “**in conjunction**” with each other. They are processed together and are both used to determine how to change the digital camera display. (*Id.*, 5:56-6:18; *id.*, Fig. 6.)

127. Claim 1[d] is obvious in view of Dance. As I discussed above, Dance discloses a digital camera including a “processor” and memory. (Dance, 2:17-19, 2:50-58.) It would have been obvious to a POSITA to use the “**processor**” for control of the digital camera, including for receiving and processing signals (“**directional input signal**” and “**second directional input signal**”) from the motion sensing (“**internally located directional input device**”) and zoom input (“**second directional input device**”) modules. A POSITA would have found it obvious to implement Dance’s digital camera as a standard digital camera design, with a processor executing operating system instructions stored on a memory, including for receiving and processing input and displaying images (including a graphical user interface) on the display. (Kuo (EX1005), 1:26-27 (“The digital camera incorporates a central processing unit, memory, and many other features of a computer system.”).) A POSITA would have been motivated to implement Dance’s digital camera with all hardware and software necessary to implement its functionality as a standalone device—which a POSITA would have understood to

include a processor, memory, and an operating system for providing a graphical user interface on the display. For example, Dance's Figure 1 shows an entirely self-contained device, with no external hardware or software required to make the device operate:

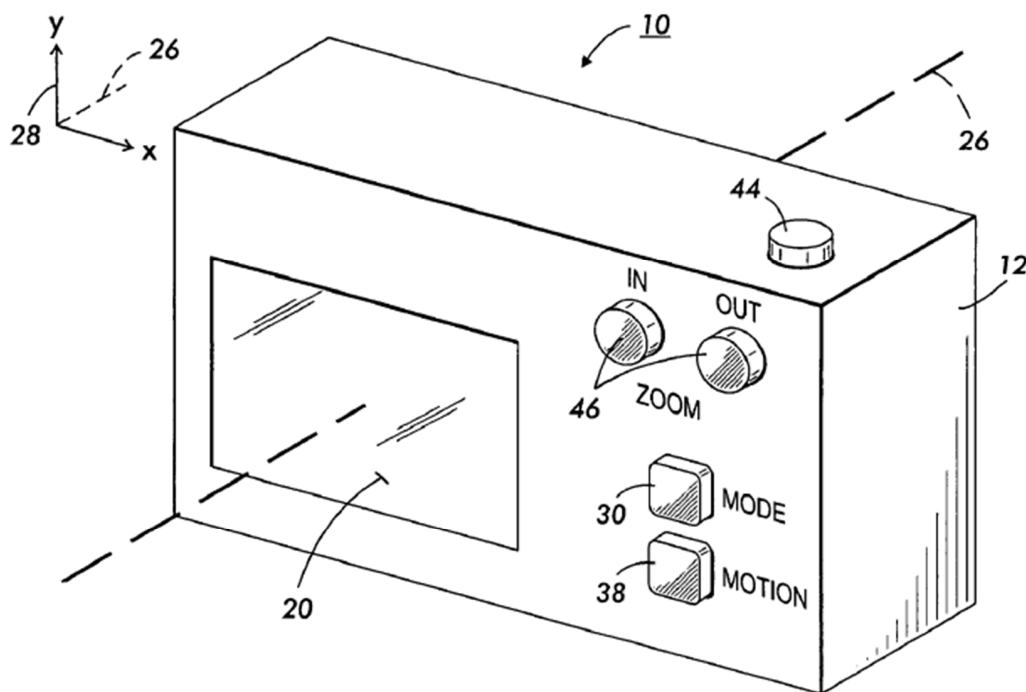


FIG. 1

(Dance, Fig. 1; *see also* Kuo (EX1005), 1:26-27.)

Dance In View of Kuo Also Renders Claim 1[d] Obvious

128. As noted above, Dance alone renders claim 1[d] obvious. But to the extent that there is any argument that Dance does not completely disclose a “processor coupled to the internally located directional input device and the

second directional input device and operable to receive and process the directional input signal in conjunction with the second directional input signal,” this limitation would have been obvious over Dance in view of **Kuo** (EX1005, U.S. Patent No. 6,400,471).

129. Kuo discloses hardware and software architecture for a digital camera. (Kuo, 2:18-24, 2:32-47, Abstract, Figs. 3A-3B.) Kuo discloses that its digital camera design includes a central processing unit (CPU) **344**, which may include “a conventional processor device for controlling the operation” of the camera. (Kuo, Fig. 2, 5:35-54.) The CPU **344** is coupled to various input devices on the camera, including buttons **404** for the user to control a graphical user interface (GUI), via input/output interface **348**. (*Id.*, 5:50-53, 5:42-47, 5:59-63.) Kuo’s CPU **344** “is capable of concurrently running multiple software routines to control the various processes of digital camera **100** within a multi-threaded environment.” (*Id.*, 5:42-47.)

130. Kuo also discloses that its digital camera includes a “memory unit coupled to the bus,” which “has stored therein an operating system for managing the image processing subsystem[.]” (Kuo, 2:34-41.) Kuo discloses that the CPU runs the operating system, which is capable of providing a “menu-driven graphical user interface (GUI) and software image processing.” (*Id.*, 5:50-53, 7:53-65, Figs. 3A-

3B, 4.)

131. It would have been obvious to a POSITA to implement Dance's digital camera by including a CPU ("**processor**") as Kuo discloses for its digital camera design. It would have been obvious to "**couple[]**" the CPU "**to the internally located directional input device and the second directional input device**" and for the CPU to be "**operable to receive and process the directional input signal in conjunction with the second directional input signal,**" just as Kuo discloses that its CPU is coupled to and receives signals from the input devices in its digital camera design (e.g., input buttons). (Kuo, Fig. 2, 5:35-54, 5:50-53, 5:42-47, 5:59-63.)

132. Further, as I discuss further below in connection with claim 1[e], it would have been obvious to a POSITA to implement Dance's camera with a "**memory subsystem**" as Kuo discloses for its digital camera design. It would have further been obvious for the memory in Dance's camera to "**stor[e] an operating system executed by the processor to display on the display a graphical user interface for controlling the operation of the handheld computing device,**" as Kuo discloses. (Kuo, 2:34-41, 5:50-53, 7:53-65, Figs. 3A-3B, 4.)

133. A POSITA would have been **motivated to combine** Dance with Kuo, because they are analogous references in the same field. Both Dance and Kuo relate

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to digital cameras. (Dance, 2:17-19 (“The invention may be embodied as, or in, a camera, or a method of operation, or a program for controlling or implementing such a method when run on a processor.”), 1:11-17 (disclosing its invention relates to “general digital cameras”), 1:19-20 (discussing “hand held digital cameras” as related art); Kuo, 1:5-7 (“The present invention relates to the field of digital cameras[.]”).)

134. Both Dance and Kuo disclose digital cameras with similar features and systems. For example, both Dance and Kuo disclose graphical user interfaces to control their digital cameras and select items. (Dance, 2:1-5 (describing an “interface for viewing stored images”), 3:5-18, 3:52-4:14 (describing scene selection interface), 4:52-5:3 (describing the user “select[ing] the currently centered image thumbnail **34** for display”); Kuo, 5:50-53 (describing “menu-driven graphical user interface (GUI) and software image processing”), 7:53-65 (describing menu system for “provid[ing] information for controlling access to camera control menus and camera control menu items”), 6:61-63).)

135. Further, both Dance and Kuo disclose the use of digital cameras for reviewing previously captured photos. (Dance, 2:1-5 (describing “an interface for viewing stored images”), 3:5-18, 4:66-5:11; Kuo, 6:61-63 (“In review mode, digital camera **100** supports the actions of reviewing camera contents, editing and sorting

images, and printing and transferring images.”), 6:38-42.)

136. Further, the designs of the cameras disclosed by Dance and Kuo have similar structures as shown in the diagrams below, including a display, zoom buttons, capture button, and other input buttons. Dance is on the left; Kuo is on the right:

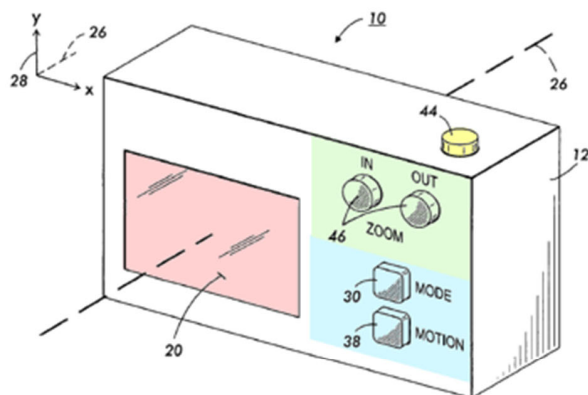


FIG. 1

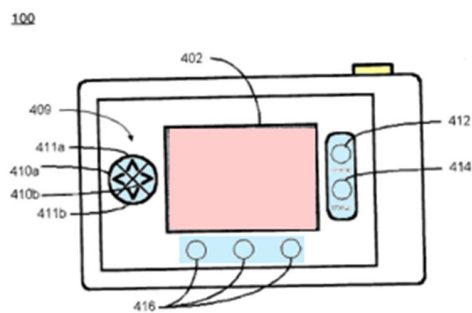


Figure 3A

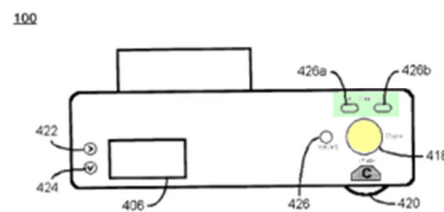


Figure 3B

(Dance, Fig. 1 (highlighting added), 3:24-31, 4:36-42; Kuo, Figs. 3A-3B (highlighting added), 6:43-7:11.)

137. A POSITA would also have been motivated to combine Dance with Kuo, because a POSITA would have been motivated to look to Kuo for implementation details of Dance’s digital camera design. Dance provides high-level

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hardware details for its digital camera design—for example, the inclusion of a “processor” and a “storage medium 14” that could be a “semiconductor memory.” (Dance, 2:17-19, 2:50-55, Fig. 2.) A POSITA would have looked to Kuo for more detail on how these elements function to operate a digital camera. (*See id.*, 2:55-58 (“Suitable constructions for the above conventional sections are well known to the skilled man, and so need not be described here in detail.”).) Kuo makes clear that “a central processing unit, memory, and many other features of a computer system” are features of any digital camera. (Kuo, 1:26-27.)

138. A POSITA would have been particularly motivated to look to Kuo for implementation details because it discloses a flexible operating system “that can be utilized with the image processing mode used by any digital camera platform.” (Kuo, 2:18-20.) Kuo discloses that prior art digital cameras used model-specific operating systems that could not be used on other digital camera designs. (*Id.*, 1:40-51.) Kuo discloses that its operating system “can be utilized with the image processing mode used by any digital camera platform[,]” which it discloses can lead to greater efficiency and lower costs. (*Id.*, 1:60-2:24.)

139. A POSITA would have been motivated to implement Dance’s digital camera system using a processor executing an operating system stored in memory. As I discussed above, a POSITA would have understood that various processes it

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discloses for its image rendering circuit **22** and sensed motion filtering apparatus would be performed by a processor. (Dance, 3:5-23, 3:52-64, 4:15-42, 6:7-15, 6:19-29, Figs. 2, 6.) For example, a POSITA would have understood that mathematical operations like that performed by the virtual velocity gain circuit **78** or the multiplier **76** and provision of a graphical user interface would be performed by a processor. (*See, e.g., id.*, 4:21-42, 4:58-5:20, 5:56-6:6; *see also id.*, 2:17-19, 1:13-20, 3:5-18.)

140. In my opinion, a POSITA would have had more than a reasonable expectation of success and could have implemented the proposed combination using conventional techniques without undue experimentation. For example, Kuo references an existing digital camera operating system as an example of the software it discloses. (Kuo, 5:53-54 (“An example of such software is the Digita Operating Environment by FlashPoint Technology of San Jose, Calif.”).)

141. Kuo, like Dance, is analogous art to the '731 patent because it relates to user control of a handheld device, including one with an integrated display. (Kuo, 2:18-24, 2:32-47, Abstract, 5:35-54, Figs. 3A-3B; '731, 1:16-20, 1:65-2:10, 3:54-61.) Further, Kuo is reasonably pertinent to purported problems facing the inventor of the '731 patent, including providing a user-friendly handheld device with a display. (Kuo, 4:30-34 (“any digital image device which processes, displays and/or

prints digital images, icons and/or other items, could incorporate the features described hereinbelow[.]”); ’731, 3:54-61.)

142. Dance in view of Kuo renders obvious a **“processor coupled to the internally located directional input device and the second directional input device and operable to receive and process the directional input signal in conjunction with the second directional input signal.”**

(f) **“a memory subsystem, the memory storing an operating system executed by the processor to display on the display a graphical user interface for controlling the operation of the handheld computing device, wherein the graphical user interface provides a graphical element” (Claim 1[e])**

143. It is my opinion that Dance renders obvious claim 1[e]. In the alternative, it is my opinion that claim 1[e] is also obvious over Dance in light of Kuo.

Dance Alone Discloses Claim 1[e]

144. Dance discloses a **“memory subsystem.”** Dance discloses that its digital camera can have a **“storage medium 14,”** which may be a **“semiconductor memory, or an optical disc, or a magnetic disc, or a magnetic tape.”** (Dance, 2:50-55.) Dance discloses that the camera can store and retrieve images from the storage medium **14** to show on the camera’s display. (*Id.*, 2:66-3:1 (“The camera housing **12** carries a display device **20** for displaying images, to enable the user to

view images prior to storage, and to view images after storage.”), 3:7-9 (“The image rendering circuit **22** receives image data from the storage medium **14**, and composes an image for display.”), 5:1-3.) Dance also discloses that its camera has an interface to communicate with external devices, such that images can be “downloaded from the external device **18** into the camera **10**[,]” including over a “wireless LAN connection.” (*Id.*, 2:59-65.)

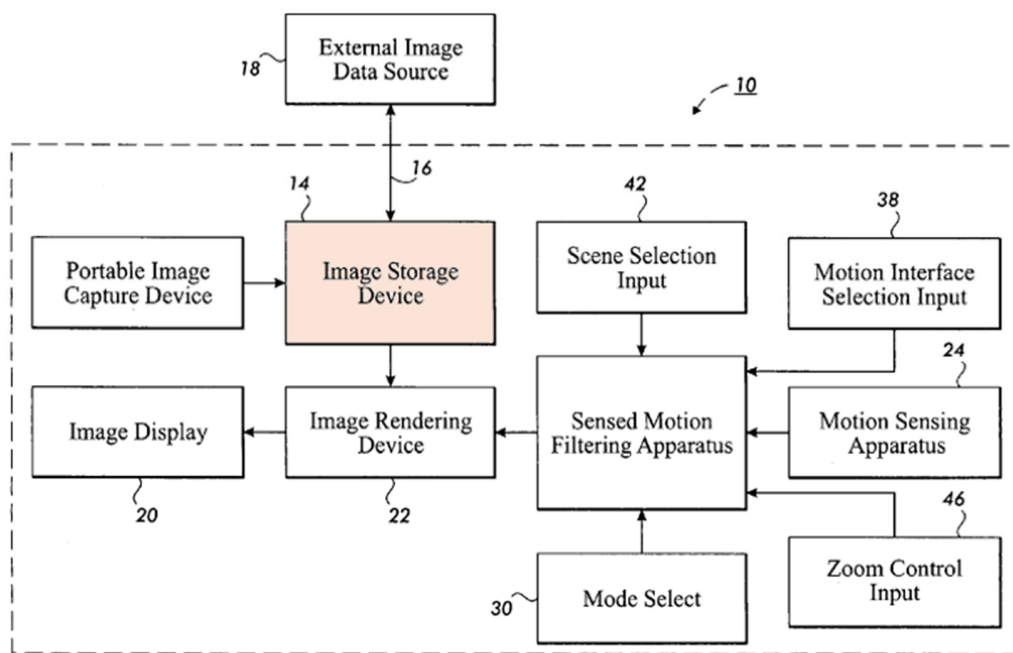


FIG. 2

(*Id.*, Fig. 2 (highlighting added).)

145. Dance further renders obvious a “**memory storing an operating system executed by the processor.**” Dance discloses that its camera performs various steps—for example, in displaying images and providing a graphical user

interface for selecting images for display. (Dance, Figs. 5A-B, 4:52-5:33 (“The stored image corresponding to the selected thumbnail view is retrieved, and displayed by the display device **20** (indicated at **58**).”).) For example, below is an annotated example of Figure 5A:

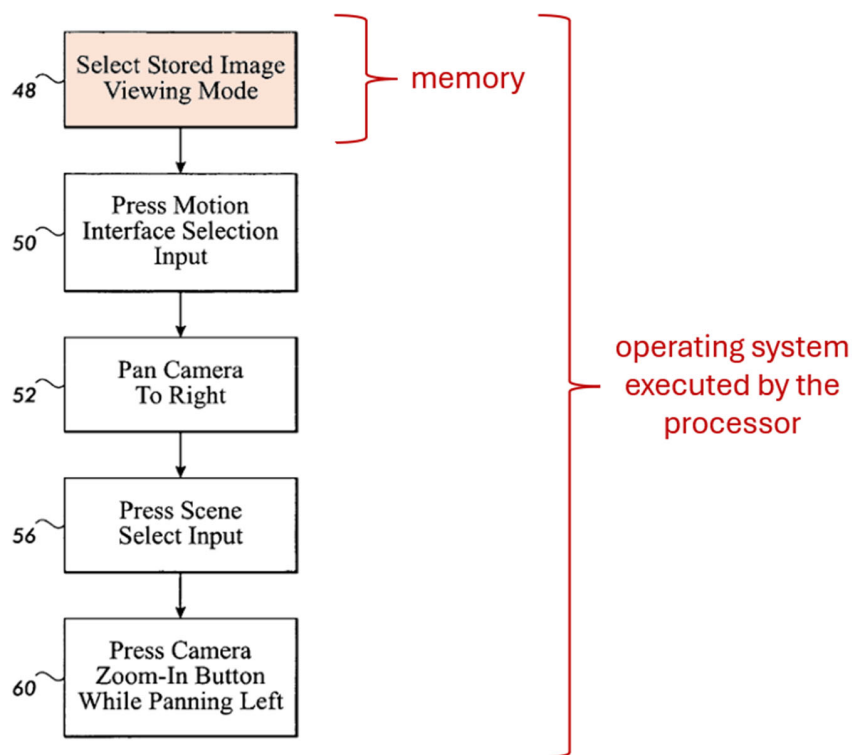


FIG. 5A displayed on the display

(Dance, Fig. 5A (highlighting and annotations added).) It would have been obvious to a POSITA based on Dance in light of the knowledge of a POSITA to implement these steps via an “**operating system executed by the processor**” stored in the digital camera’s memory. A POSITA would have found it obvious to implement

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Dance's digital camera as a standard digital camera design, with a processor executing operating system instructions stored on a memory, including for receiving and processing input and displaying images (including a graphical user interface) on the display. (Kuo (EX1005), 1:26-27 ("The digital camera incorporates a central processing unit, memory, and many other features of a computer system.").) A POSITA would have been motivated to implement the system of Dance via a locally stored **"operating system executed by the processor,"** including **"to display on the display a graphical user interface"** and to facilitate a self-contained handheld digital camera that can be operated without a connection to other devices. Indeed, Dance discloses that "hand held digital cameras" are related art to its system (Dance, 1:19-20), and Figure 1 (reproduced below) shows Dance's system as a standalone device:

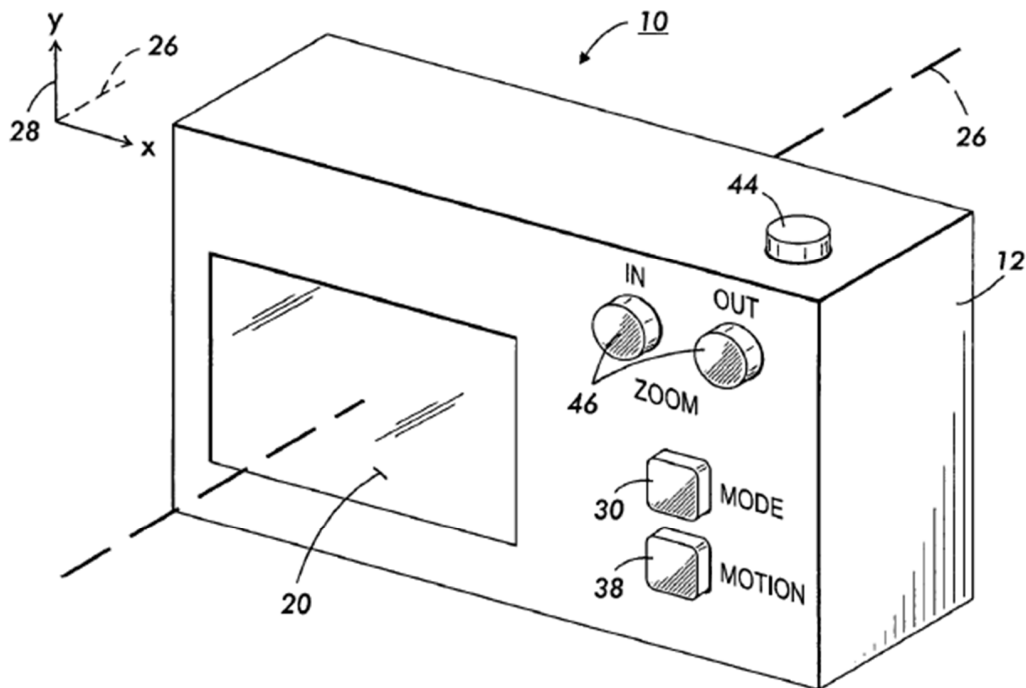


FIG. 1

(*Id.*, Fig. 1.)

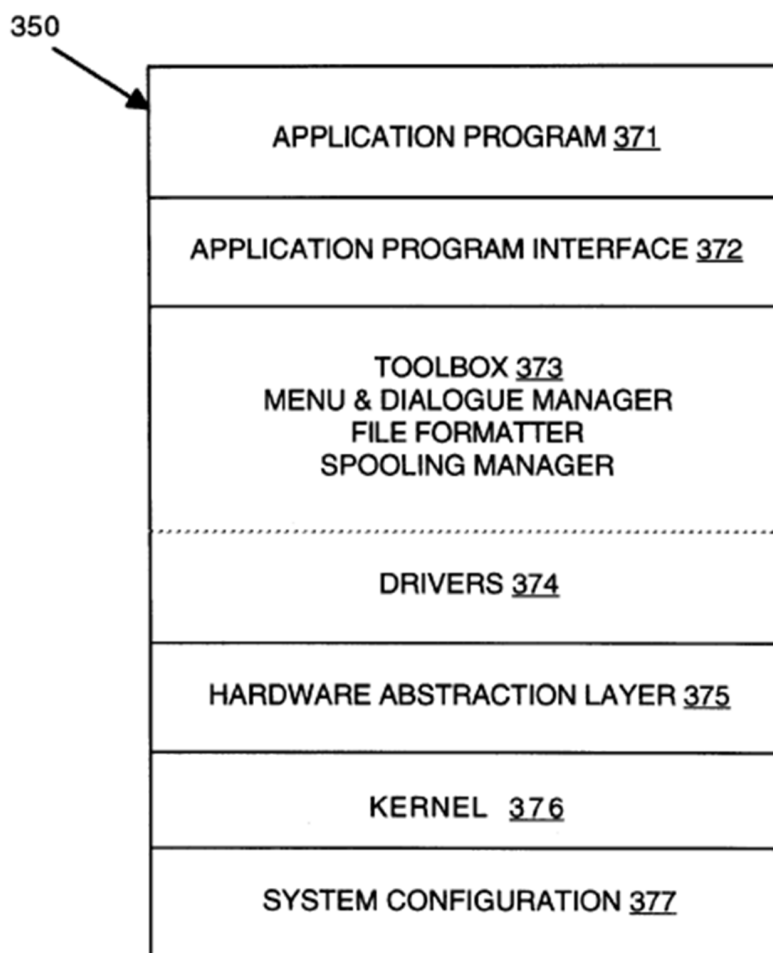
Dance in View of Kuo Also Renders Claim 1[e] Obvious

146. As noted above, Dance alone renders claim 1[e] obvious. But to the extent that there is any argument that Dance does not completely disclose claim 1[e], then it would have been obvious based on Dance in view of **Kuo** (EX1005, U.S. Patent No. 6,400,471). I provide my analysis for the combination of Dance and Kuo in my discussion of claim 1[d] above.

147. Dance in view of Kuo renders claim 1[e] obvious. Kuo teaches a **“memory storing an operating system executed by the processor.”** As discussed

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above, Kuo discloses that its digital camera includes a “memory unit coupled to the bus,” which “has stored therein an operating system for managing the image processing subsystem[.]” (Kuo, 2:34-41 (emphasis added).) Kuo discloses that the CPU runs the operating system, which is capable of providing a “menu-driven graphical user interface (GUI) and software image processing.” (*Id.*, 5:50-53, 7:53-65, Figs. 3A-3B, 4, 5.) For example, Figure 4 of Kuo teaches:



(*Id.*, Fig. 4.) Kuo has an operating system stored on a memory and executed by a

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processor. Kuo's Abstract explains: "[t]he memory unit has stored therein an operating system for managing the image processing subsystem, and the memory unit also has a data structure for managing the image data for the image processing subsystem during image processing." (*Id.*, Abstract (emphasis added).) Kuo also teaches that a CPU "may include a conventional processor device for controlling the operation of digital camera **100**." (*Id.*, 5:42-43 (emphasis added).)

148. It would have been obvious to a POSITA to implement Dance's camera with a "**memory subsystem**" as Kuo discloses for its digital camera design. For example, as explained above, both Dance and Kuo disclose digital cameras with similar features and systems. (*E.g.*, Dance, 2:1-5 (describing an "interface for viewing stored images"), 3:5-18, 3:52-4:14 (describing scene selection interface), 4:52-5:3 (describing the user "select[ing] the currently centered image thumbnail **34** for display"); Kuo, 5:50-53 (describing "menu-driven graphical user interface (GUI) and software image processing"), 7:53-65 (describing menu system for "provid[ing] information for controlling access to camera control menus and camera control menu items"), 6:61-63).) Both Dance and Kuo disclose the use of digital cameras for reviewing previously captured photos. (Dance, 2:1-5 (describing "an interface for viewing stored images"), 3:5-18, 4:66-5:11; Kuo, 6:61-63 ("In review mode, digital camera **100** supports the actions of reviewing camera contents, editing and sorting

images, and printing and transferring images.”), 6:38-42.) The cameras disclosed by Dance and Kuo also have similar structures. (*E.g.*, Dance, Fig. 1, 3:24-31, 4:36-42; Kuo, Figs. 3A-3B, 6:43-7:11.) A POSITA would also have been motivated to combine Dance with Kuo, because a POSITA would have been motivated to look to Kuo for implementation details of Dance’s digital camera design. Dance and Kuo are analogous art to the ’731 patent for the reasons provided above.

149. It would have further been obvious for the memory in Dance’s camera to **“stor[e] an operating system executed by the processor to display on the display a graphical user interface for controlling the operation of the handheld computing device,”** as Kuo discloses. (Kuo, 2:40-41, 5:50-53, 7:53-65, Figs. 3A-3B, 4.) My additional analysis is below.

Dance Renders the Remainder of Claim 1[e] Obvious

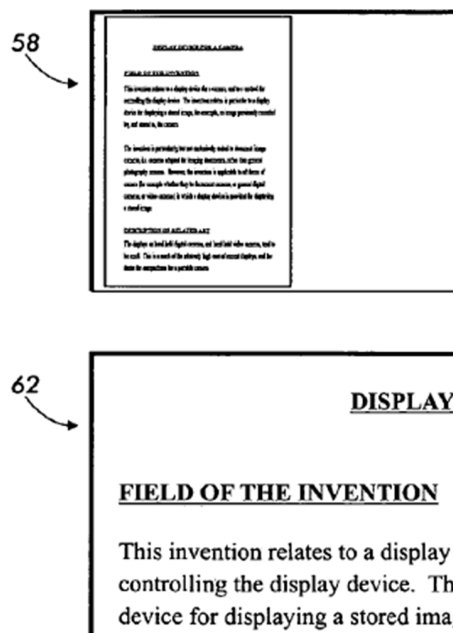
150. Dance discloses **“display[ing] on the display a graphical user interface for controlling the operation of the handheld computing device.”**

151. As explained above, Dance teaches a “display,” a “handheld computing device,” “controlling the operation of the handheld computing device,” and “display[ing] on the display a graphical user interface.” Dance discloses that its digital camera “provide[s] an interface for viewing stored images[.]” (Dance, 2:1-5 (emphasis added).) Dance renders claim 1[e] obvious in several ways.

“Single Image View” Mapping

152. Dance’s interface includes an interface for displaying, zooming, and navigating through an individual stored image. (*E.g.*, Dance, Figs. 1, 5A-B.)

153. Dance discloses that once an image has been selected for viewing, the digital camera display shows that individual image and allows the user to zoom and scroll throughout the image. (Dance, 3:5-38, 4:66-5:11, 5:56-6:15, Figs. 5A-B.) Dance’s Figure 5B, reproduced in part below, shows Dance’s interface for viewing a particular image:



(Dance, Fig. 5B (excerpt), 5:1-11.) Dance’s user interface for viewing a single image is “**display[ed] on the display.**” (*Id.*, 5:1-3 (“The stored image ... is ... displayed by the display device 20[.]”).) The single image view is a “**graphical user**

interface”—e.g., it shows information graphically, it is controlled by a user, and it provides a user an “interface” for controlling the view of an image (e.g., using motion inputs). Considering Dance’s single image view a “**graphical user interface**” is consistent with the ’731 patent’s disclosures, since Dance’s single image view allows the user to move around and zoom in on a graphical element (the viewed image) for purposes of selecting what part of the image to view. (’731, 1:29-31 (“graphical interface through which options or applications are selected”), 1:41-46 (disclosing “user interface” that “involv[es] the displacement of a cursor on a screen”), 4:1-5, 4:49-52, 5:5-13.) Further, the single image view is “**for controlling the operation of the handheld computing device,**” since it enables the user to control what part of the displayed image is shown on the digital camera display.

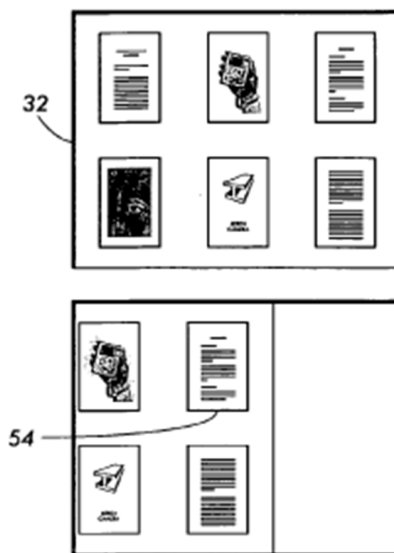
154. Dance’s single image view is a “**graphical user interface** [that] **provides a graphical element.**” Dance’s single image view provides the “**graphical element**” of the image currently being viewed. (Dance, 4:66-5:3, 3:16-17 (displaying “a stored image”).)

“Image Selection Scene” Mapping

155. Another example of a “**graphical user interface**” that Dance discloses is the display shown in the “scene selection mode.” (Dance, 3:55-58, 4:54-57, Figs. 3, 4, 5B.) In this mode, Dance discloses a “selection scene **32**,” which is an array of

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“icons/thumbnail views **34**” through which a user can navigate to determine the image to view on the display. (*Id.*, 3:65-4:14, 4:36-42, 4:52-5:25, 3:5-18.) As shown in Figure 5B of Dance, reproduced below, the image selection interface (including the example selection scene **32** shown below (upper image) and the additional selection scene resulting from scrolling to the right (lower image)) is a “**graphical user interface**”—e.g., it is an interface displayed graphically that a user can control.

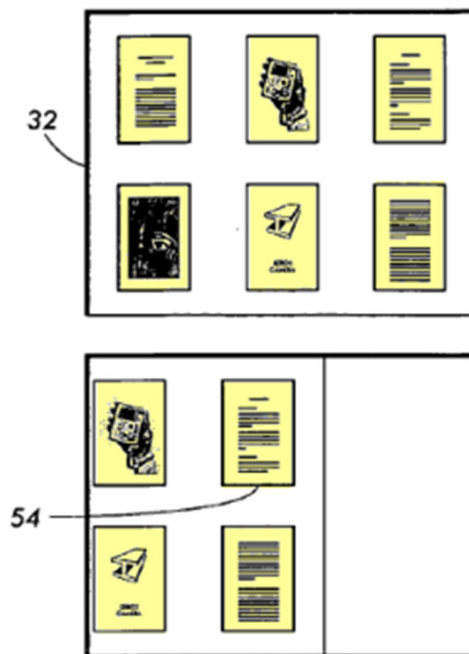


(*Id.*, Fig. 5B (excerpt); *see also* ’731, 1:29-31 (“graphical interface through which options or applications are selected”), 1:41-46 (disclosing “user interface” that “involv[es] the displacement of a cursor on a screen”), 4:1-5, 4:49-52, 5:5-13.) Further, Dance discloses that its image selection interface is “**for controlling the operation of the handheld computing device.**” The image selection interface

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allows a user to change what is displayed on the digital camera's display, either by moving left or right along the images shown in the selection interface or selecting a specific image to show in more detail. (Dance, 4:58-5:11, 3:5-18 (discussing “controlling the display of stored images”).)

156. Dance's image selection interface is also a “**graphical user interface** [that] **provides a graphical element.**” Dance's image selection interface provides multiple graphical elements—i.e., the different images shown on the selection screen (highlighted below). Each of these images constitutes a “**graphical element**”:



(Dance, Fig. 5B (excerpt; highlighting added).)

157. It is thus my opinion that Dance discloses or renders obvious a

“memory subsystem, the memory storing an operating system executed by the processor to display on the display a graphical user interface for controlling the operation of the handheld computing device, wherein the graphical user interface provides a graphical element[.]” Alternatively, Dance in view of Kuo renders obvious claim 1[e].

Dance in View of Beuk Also Renders Claim 1[e] Obvious

158. Claim 1[e] is also rendered obvious over Dance in view of Beuk.

159. As explained above, Beuk teaches implementation details for tilt-based control of a device. Beuk also teaches the use of device tilt for purposes of controlling “one or more graphical or other objects presented” on a display, including a dot, a “fixed-shape icon,” or a ball. (Beuk, 3:32-40, 3:45-48, 2:3-8, Abstract, 1:7-13.) It would have been obvious to a POSITA to implement tilt controls for a graphical cursor object in Dance’s digital camera.

160. As I explained above, a POSITA would have been **motivated to combine** Dance with Beuk. Dance and Beuk are analogous references in a similar field. For example, both references disclose the use of orientation or tilt of a device for the purpose of controlling a user interface. (Dance, 3:32-39, 4:58-65, 5:9-11; Beuk, 1:25-29, 2:42-3:12, 4:1-14, Figs. 2, 4.) Further, both references relate to handheld electronic devices. (Dance, 1:13-17, 1:19-20 (“hand held digital

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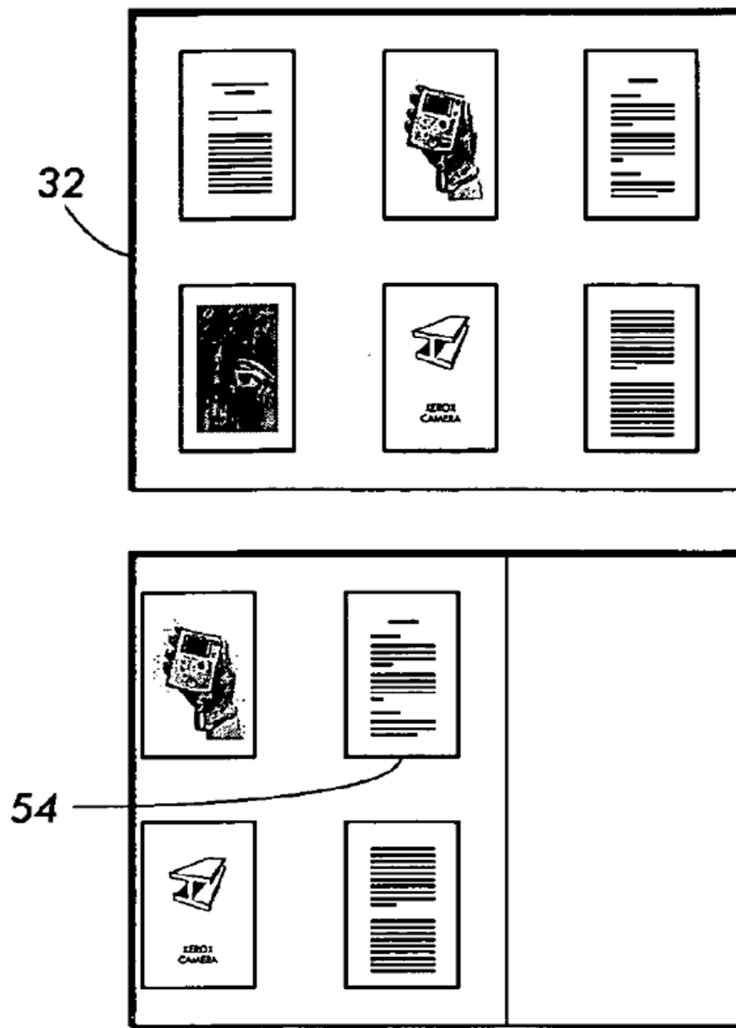
cameras”); Beuk, 2:50-53 (discussing “handheld calculators, handheld game-oriented devices, or so-called Personal Digital Assistants”).)

161. A POSITA would have considered a graphical cursor element obvious to incorporate into Dance’s digital camera, since Dance discloses that it is “particularly, but not exclusively, suited to document imaging cameras[.]” (Dance, 1:11-17, 2:43-49 (“a portable document imaging camera”), 5:4-19, 1:23-30; *id.*, Fig. 5B.) A POSITA would have considered a movable graphical cursor element to be a useful feature for a camera that can be used to view documents, since a cursor would allow the user to select certain parts of a given document or otherwise interact with a document. For example, a user could highlight certain language in a document or select certain images or subparts of a document for more detailed review. Accordingly, a POSITA would have understood that the addition of a movable graphical cursor object to Dance’s camera would have improved its document imaging capabilities.

162. A POSITA would have been motivated to implement a graphical cursor object on Dance’s digital camera controlled by device tilt. A POSITA would have recognized that a graphical cursor object would have improved the graphical user interface of Dance’s digital camera. For example, Dance discloses that in its image selection mode, pressing a button on the camera “selects the icon or thumbnail view

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34 currently in the center of the display, so that the corresponding stored image or video clip is then displayed.” (Dance, 4:40-42.) A POSITA would have understood that a user may have difficulty determining what image is closest to the center of the display, causing ambiguity about which image would be selected when the user pressed the button. For example, Dance’s Figure 5B shows that its image selection mode does not provide any indication for what image is closest to the center and therefore to be selected by the camera button.



(Dance, Fig. 5B (excerpt).) Accordingly, a POSITA would have been motivated to provide an on-screen indicator in the form of a moving cursor like Beuk discloses that indicates what image is to be selected. A POSITA would have recognized that incorporating such a cursor element would have made it easier for a user to navigate using Dance's graphical user interface.

163. Further, a POSITA would have been motivated to incorporate a cursor

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into Dance's graphical user interface to enable additional ways for the user to navigate and zoom throughout the single image view mode. For example, a user could navigate the cursor to a particular part of the image being viewed. If the user then adjusted the zoom input to zoom further into the photo, a POSITA could design the graphical user interface such that it would zoom toward the particular part of the image in which the cursor is located. This would have enabled a user to zoom in on particular parts of an image more easily.

164. A POSITA would have had more than a reasonable expectation of success and could have implemented the proposed combination using conventional techniques without undue experimentation. For example, controlling a cursor on a computer based on user inputs was widely available on handheld devices and computers in the prior art, as the '731 patent specification discloses. ('731, 1:24-37 (discussing "well known" handheld computing and communication devices that "allow the user to position a pointer or a cursor on the list application or option desired"), 2:32-42, 3:27-30.)

165. Dance and Beuk are analogous art to the '731 patent for the same reasons as described above.

166. Thus, it would have been obvious over Dance in light of Beuk to incorporate a movable cursor element into Dance's graphical user interface.

The combined system would have had a **“memory subsystem, the memory storing an operating system executed by the processor to display on the display a graphical user interface for controlling the operation of the handheld computing device, wherein the graphical user interface provides a graphical element”** (e.g., a cursor element).

- (g) **“wherein the operating system comprises processor-executable instructions that cause the graphical element to move by the amount of displacement in a direction substantially parallel or substantially perpendicular to the orientation.”** (Claim 1[f])

167. It is my opinion that Dance renders obvious claim 1[f]. In the alternative, it is my opinion that claim 1[f] is also obvious over Dance in light of Kuo. I provide my analysis for the obviousness of combination of Dance and Kuo above. Additional details are below.

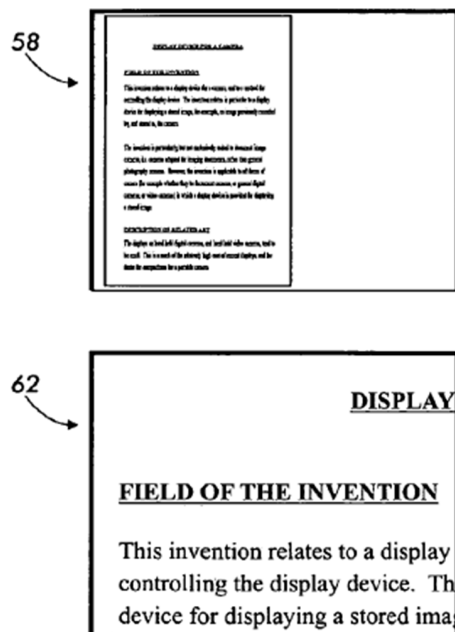
Dance Renders Obvious Claim 1[f]

168. As I discussed above in connection with claim 1[e], Dance renders obvious that its digital camera would have an **“operating system compris[ing] processor-executable instructions.”** (*E.g.*, Dance, Figs. 1, 2, 5A-B, 4:52-5:33.) Dance’s **“operating system comprises processor-executable instructions that cause the graphical element to move.”** (*Id.*) As explained above, Dance discloses that once an image has been selected for viewing, the digital camera display shows

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that individual image and allows the user to zoom and scroll throughout the image.

(*Id.*, 3:5-38, 4:66-5:11, 5:56-6:15, Figs. 5A-B.) Dance’s Figure 5B, partially reproduced below, shows Dance’s interface for viewing a particular image:



(Dance, Fig. 5B (excerpt), 5:1-11 (“The stored image ... is ... displayed by the display device 20[.]”); *see also* ’731, 1:29-31 (“graphical interface through which options or applications are selected”), 1:41-46 (disclosing “user interface” that “involv[es] the displacement of a cursor on a screen”), 4:1-5, 4:49-52, 5:5-13.) The image selection interface allows a user to change what is displayed on the digital camera’s display, either by moving left or right along the images shown in the selection interface or selecting a specific image to show in more detail. (Dance, 4:58-5:11, 3:5-18 (discussing “controlling the display of stored images”).)

Dance thus renders obvious an **“operating system compris[ing] processor-executable instructions that cause the graphical element to move.”**

Dance in View of Kuo Also Renders Claim 1[f] Obvious

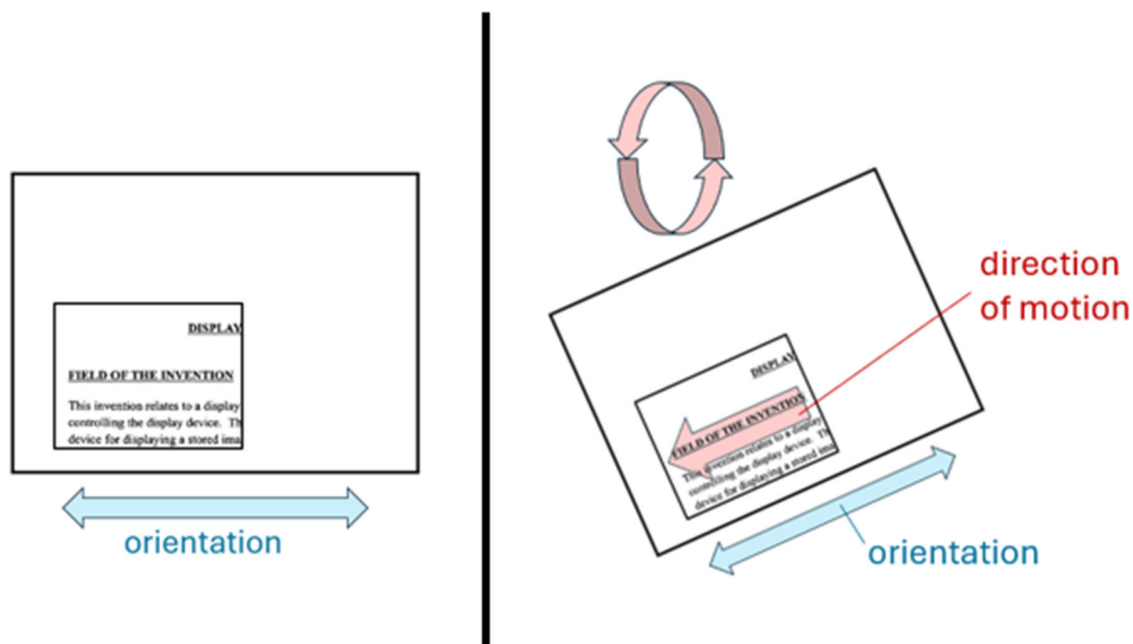
169. As explained above, Kuo teaches an operating system with a memory and processor, and that the **“operating system comprises processor-executable instructions.”** Kuo explains that “CPU 344 runs an operating system capable of providing a menu-drive graphical user interface (GUI) and software image processing.” (Kuo, 5:50-53.) Kuo’s Abstract also explains: “[t]he memory unit has stored therein an operating system for managing the image processing subsystem, and the memory unit also has a data structure for managing the image data for the image processing subsystem during image processing.” (Kuo, Abstract.) Kuo also teaches that a CPU “may include a conventional processor device for controlling the operation of digital camera 100.” (Kuo, 5:42-43.) As explained above, Dance in view of Kuo renders obvious **“caus[ing] the graphical element to move.”**

Dance Renders the Remainder of Claim 1[f] Obvious

170. Dance further discloses **“caus[ing] the graphical element to move by the amount of displacement in a direction ... to the orientation.”** Similar to what I described above for claim 1[e], Dance renders claim 1[f] obvious in several ways.

“Single Image View” Mapping

171. Dance discloses that in the single image view mode, when the digital camera is tilted in a direction—e.g., right or left—then the image shown on the display is moved in that direction—i.e., right or left, respectively. For example, Dance discloses that when the digital camera is tilted to the left, it causes the image to pan to the left. (Dance, 5:9-11.) Dance discloses that the velocity of this panning motion is “determined by a virtual velocity gain circuit **78**,” which, as I discussed above, depends on the zoom input **46** (i.e., the “**amount of displacement**” indicated by the “**second directional input signal**”). (*Id.*, 5:56-67.) As the below diagram indicates, the panning motion left is “**in a direction [] parallel ... to the orientation**” of the digital camera. Leftward tilt yields leftward motion, which is parallel with the orientation of the device as the screen rotates with the device:

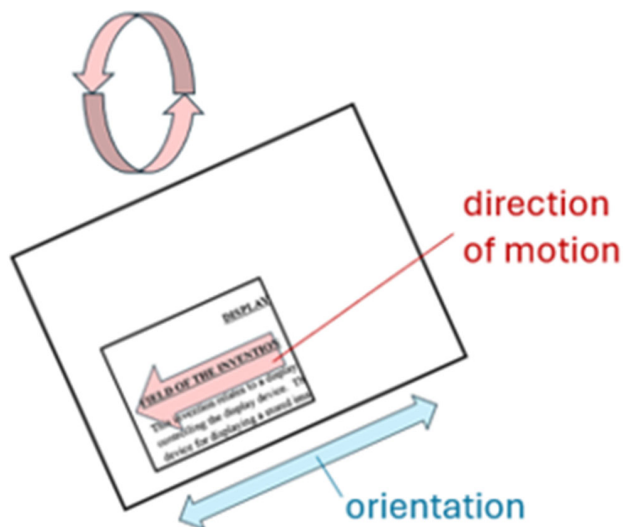


(Dance, Fig. 5B (excerpts; annotations added).) Dance discloses that tilting the display in other directions causes corresponding movement, similar to the leftward tilt shown above. (*Id.*, 3:32-38; *see also id.*, 4:60-63.)

172. In the related district court litigation, I submitted a declaration providing my opinion that claim 1 of the '731 patent is indefinite as to its full scope, including because of the claim language “substantially parallel or substantially perpendicular to the orientation.” (EX1013 (8/6/25 Polish Decl.), ¶¶ 25, 32, 37; EX1025.) I also explained in that declaration that, in my view, there is a limited subset of the claim scope in which claim 1 is not indefinite. (*Id.*) In my opinion, Dance satisfies claim 1[f] under the subset of the claim scope as to which it is my opinion that the claim is definite—i.e., where the direction of movement of a

graphical element is *parallel or perpendicular* to the orientation. As I discussed above, Dance describes various graphical elements that move “parallel to the orientation” of the digital camera.

173. For example, as shown below, Dance is “**caus[ing] the graphical element to move by the amount of displacement in a direction [] parallel ... to the orientation**”:

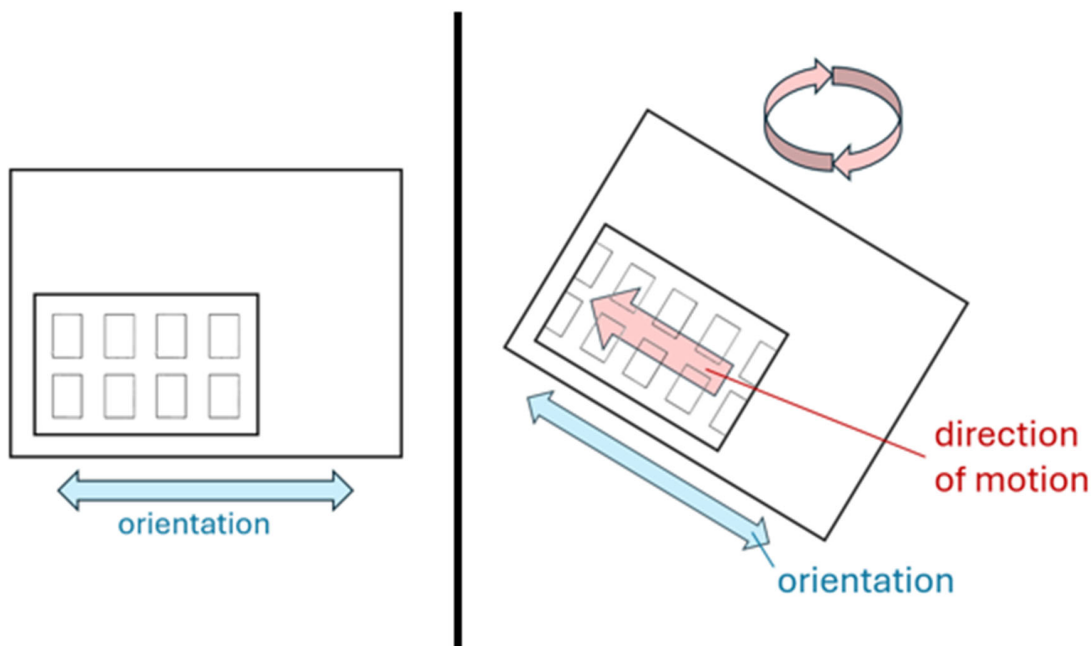


(Dance, Fig. 5B (excerpt; annotations added).) Dance thus renders obvious an “**operating system compris[ing] processor-executable instructions that cause the graphical element to move by the amount of displacement in a direction [] parallel ... to the orientation.**”

“Image Selection Scene” Mapping

174. Another example of Dance rendering claim 1[f] obvious is the image

selection mode taught by Dance. Dance's image selection mode can “**cause the graphical element to move by the amount of displacement in a direction [] parallel or ... perpendicular to the orientation.**” In the image selection mode, Dance discloses that “tilting the camera to the right ... causes the image to move leftwards in the display device **20**, bringing the rightmost thumbnail view **34** to the top center of the display (indicated at **54**).” (Dance, 4:60-65.) Accordingly, similar to the single image view mode discussed above, Dance's image selection mode “**cause[s] the graphical element to move ... in a direction [] parallel or [] perpendicular to the orientation.**”



175. Dance does not disclose using the zoom input **46** to adjust the velocity of scrolling (i.e., the “**amount of displacement**”) in the image selection mode.

However, it would have been obvious to a POSITA to use Dance's zoom input **46** to adjust velocity of scrolling in the image selection mode based on Dance's disclosures related to the single image view mode. As I discussed above, Dance discloses in connection with its single image view mode that the velocity of scrolling is determined by the zoom input **46**, where more zoom indicates a slower velocity to enable finer-grained scrolling when zoomed in. (Dance, 5:56-67.) It would have been obvious to use the zoom input **46** setting for the same purpose in image selection mode, such that user could zoom in to the image selection scene and finer-grained scrolling velocity would result.

176. A POSITA would have been motivated to implement zoom and zoom-based scrolling velocity in Dance's image selection mode to allow a user to vary the level of detail in which the images can be viewed in image selection mode. For example, different users may have different preferences for the level of detail in image selection mode. Some users may be navigating through a variety of similar but slightly different photos, such that careful detail is needed to determine which photo is to be selected. Other users may be navigating through highly diverse photos, such that little detail is necessary to distinguish between different photos. Such a detail preference may also vary for a single user between different use cases—i.e., as the user navigates between different parts of his or her photo

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collection. Dance itself discloses that the image selection mode may present photos in a “one-dimensional (e.g. horizontal) array of the icons or thumbnail views or, as illustrated in FIG. 3, the selection scene 32 may be a two-dimensional array.” (Dance, 3:65-4:3.) Thus, Dance acknowledges that image selection mode can be provided at differing levels of detail (i.e., with larger thumbnails in a one-dimensional array or smaller thumbnails in a two-dimensional array). It would have been obvious to allow the user to vary between these different levels of detail—for example, zooming in to a one-dimensional array of photos or zooming out to a two dimensional array.

177. A POSITA would have also been motivated to implement zoom and zoom-based scrolling velocity in Dance’s image selection mode to allow a user to vary the speed with which the images can be navigated. Similar to my discussion above regarding level of detail, different users or a single user over time may have different needs for how quickly they may want to navigate through their collection of photos. Implementing zoom and zoom-based scrolling velocity would allow the user to vary how quickly such navigation occurs. (See Dance, 3:65-4:14, 4:21-35, 4:58-65; *see also id.*, 5:4-11.)

178. In my opinion, a POSITA would have had more than a reasonable expectation of success and could have implemented the proposed modification of

Dance using conventional techniques without undue experimentation. For example, Dance discloses zoom and zoom-based scrolling velocity in the context of the single image mode, so implementing the proposed modification would be as simple as implementing the same functionality in the context of the image selection mode.

179. Dance thus renders obvious **“wherein the operating system comprises processor-executable instructions that cause the graphical element to move by the amount of displacement in a direction [parallel (or perpendicular)] to the orientation.”**

Dance in View of Beuk Also Renders Claim 1[f] Obvious

180. As discussed above, it would have further been obvious to incorporate a graphical cursor element into Dance’s graphical user interface in light of Beuk. Beuk discloses moving a graphical cursor element using tilt controls. (Beuk, 3:32-48.) It would have further been obvious for a POSITA to be able to move the graphical cursor element using Dance’s tilt controls. Thus, in the combined system, **“the operating system comprises processor-executable instructions that cause the graphical element [e.g., the graphical cursor element] to move by the amount of displacement in a direction [] parallel or [] perpendicular to the orientation.”**

**C. Grounds 3 and 4: Claims 11, 13, and 14 Are Obvious Over Dance
in View of Zwern (Ground 3); Claims 11, 13, and 14 Are Obvious
Over Ground 2 Art in View of Zwern (Ground 4)**

2. Dependent Claim 11

181. For reference, claim 11 recites:

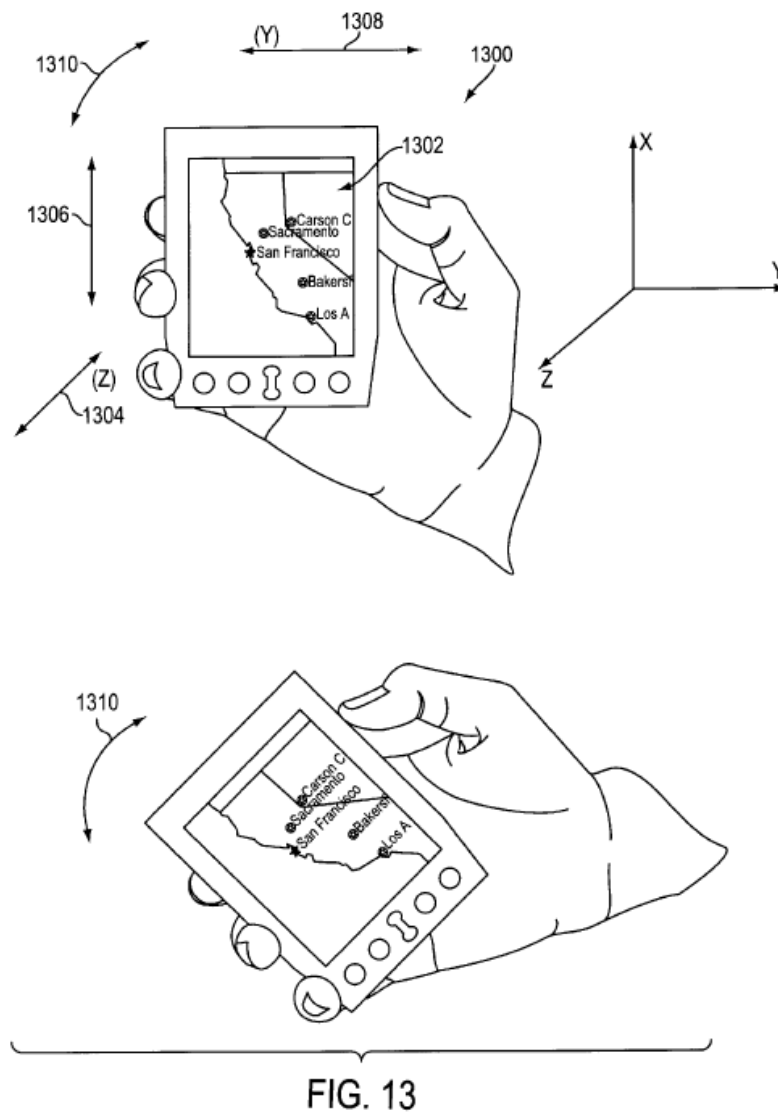
11. The handheld computing device of claim 1, wherein the processor is configured to detect movement patterns from the directional input signal and wherein the graphical element is further responsive to the detected movement patterns.

182. It is my opinion that claim 11 is obvious over Dance in view of Zwern (Ground 3) and/or Dance in view of Kuo and Beuk (as discussed for claim 1) in further view of Zwern (Ground 4).

183. As discussed above for claim 1[d], Dance discloses a **“processor.”** Although not expressly disclosed in Dance, Zwern teaches **“detect[ing] movement patterns from the directional input signal and wherein the graphical element is further responsive to the detected movement patterns.”** In particular, Zwern teaches “defin[ing] specific hand gestures that correspond in an intuitive manner with ‘special discrete commands.’” (Zwern, 29:17-19.) Like Dance, Zwern teaches that basic tilting or rotation gestures can be used for magnification, scrolling, and panning actions. (*Id.*, 29:19-26.) In addition, Zwern teaches that a brisk or abrupt motion pattern—such as the flick of a wrist, shaking, or an abrupt downward

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motion—can correspond to a discrete command. (*Id.*, 29:25-26, Figs. 13-14, 33:1-3, 33:6-8.) The flick of the wrist is shown in Figure 13 below:



(Zwern, Fig. 13, 29:25-26 (“The last two-tailed motion arrow 1310 illustrates brisk

or abrupt [hand]³ shaking motion[.]”).)

184. Applying Zwern’s teaching (of defining specific hand gestures to special discrete commands) to Dance, it would have been obvious to use a specific movement pattern (such as a flick of the wrist) for a discrete command. For example, in Dance’s image selection mode, a manually operable button is used to select an image corresponding to the thumbnail in the center of the display. (Dance, 4:36-42.) Following Zwern’s teaching, however, the manually operable button could be replaced by a specific movement pattern. For example, after positioning a thumbnail in the center of the screen, the thumbnail can be used to select a corresponding image by performing a specific motion pattern (such as a flick of the wrist).⁴ In this way,

³ A POSITA would understand that the use of the word “head” in Zwern, 29:25-26 is merely a typographical error and that “head” should have been “hand.” Indeed, throughout Zwern, 29:12-31:5 and Figures 13-16, Zwern is repeatedly and consistently discussing hand movements used to control the PDA display. And the figure being referenced (Fig. 13) is clearly illustrating a hand motion.

⁴ While Zwern teaches using a shaking motion to “cause erasure or screen clearing,” Zwern is clear that specific hand gestures can be used for any discrete command in

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the graphical element (the thumbnail) is responsive to the detected movement patterns (the flick of the wrist) in that it performs a selection function (selecting the image corresponding to the thumbnail for display).

185. A POSITA would have been **motivated to combine** Dance with Zwern. Dance and Zwern are analogous references in a similar field. For example, both references disclose the use of intuitive actions such as changing the orientation or tilt of a device for the purpose of controlling magnification or scrolling functions for a user interface. (Dance, 3:32-39, 4:58-65, 5:9-11; Zwern, 29:12-31:5.) Further, both references relate to handheld electronic devices. (Dance, 1:13-17, 1:19-20 (“hand held digital cameras”); Zwern, 29:12-16 (discussing “a Personal Digital Assistant”).)

186. A POSITA would have been motivated to combine Dance with Zwern to add the special discrete commands in Zwern to the system described in Dance in

an intuitive manner. (Zwern, 29:17-26.) Moreover, Zwern explicitly recognizes that the same hand gesture can be assigned opposite meanings by the designer. (*Id.*, 30:13-15.) Accordingly, the fact that Zwern references using a shaking motion for “erasure or screen clearing” is not limiting, and another designer following Zwern’s own teachings could assign an opposite function.

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order to reduce dependency on buttons. Dance itself encourages the use of intuitive hand gesture commands (such as those taught by Zwern) rather than buttons because hand gestures commands “can provide a much more straightforward interface for the user, without the difficulty of finding, and trying combination of buttons to control the display.” (Dance, 2:6-8.) Allowing a user to simply flick their wrist once a thumbnail is centered in the screen would be an intuitive option for selecting the corresponding image that avoids the user having to remember which button controls selection.

187. A POSITA would have had more than a reasonable expectation of success and could have implemented the proposed combination using conventional techniques without undue experimentation. For example, Dance discloses a system with sensors capable of detecting a series of motion (such as a flick of wrist, shaking, or an abrupt downward motion) and Zwern teaches a method for detecting and assigning intuitive meanings to specific series of motions.

188. Zwern, like Dance, is analogous art to the '731 patent because both relate to controlling handheld devices, including through motion sensing inputs. (Zwern, 29:12-31:5; '731, 1:16-20, 3:54-61.) Zwern is also pertinent to purported problems faced by the inventor of the '731 patent, including providing a user-friendly handheld device capable of motion sensing. (Zwern, 8:4-5 (“in order to

create a novel and intuitive display interface for visually impaired users”), 8:12
 (“freeing the user’s hands for other tasks”); ’731, 3:54-61.)

189. Dance in view of Zwern (Ground 3) and/or Dance in view of Kuo and Beuk (as discussed for claim 1) in further view of Zwern (Ground 4) thus renders obvious **“the processor is configured to detect movement patterns from the directional input signal and wherein the graphical element is further responsive to the detected movement patterns.”**

3. Dependent Claim 13

190. For reference, claim 13 recites:

13. The handheld computing device of claim 11, wherein the graphical element is configured to perform a selection function in response to the detected movement pattern.

191. As discussed for claim 11, Dance in view of Zwern (Ground 3) and/or Dance in view of Kuo and Beuk (as discussed for claim 1) in further view of Zwern (Ground 4) renders obvious using Zwern’s hand gestures for discrete commands in Dance’s image selection mode, where once a thumbnail is positioned in the center of the screen, the thumbnail can be used to select a corresponding image by performing a specific motion pattern (such as a flick of the wrist). In this way, **“the graphical element [the thumbnail] is configured to perform a selection function [selecting the image corresponding to the thumbnail for display] in response to the**

detected movement pattern [the flick of a wrist.]”

4. Dependent Claim 14

192. For reference, claim 14 recites:

14. The handheld computing device of claim 13, wherein the detected movement pattern is a flick of the wrist.

193. As discussed for claim 11, Dance in view of Zwern (Ground 3) and/or Dance in view of Kuo and Beuk (as discussed for claim 1) in further view of Zwern (Ground 4) renders obvious using Zwern’s hand gestures for discrete commands in Dance’s image selection mode, where once a thumbnail is positioned in the center of the screen, the thumbnail can be used to select a corresponding image “**wherein the detected movement pattern is a flick of the wrist.**”

D. Grounds 5 and 6: Claims 2 and 3 are Obvious Over Dance in View of Titus (Ground 5), and Obvious Over Ground 2 Art in View of Titus (Ground 6)

1. Dependent Claim 2

194. For reference, claim 2 recites:

2. The handheld computing device of claim 1, wherein the internally-located directional input device comprises:

[a] a primary contact positionally fixed in the handheld computing device;

[b] at least one directional contact positionally fixed in the handheld

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computing device and operatively connected to the primary contact;

[c] circuit closing means, movable on, and in electrical contact with, the primary contact, the circuit closing means moving in response to inclination of the handheld computing device in the direction of any one of the at least one directional contact, between a neutral position in which the primary contact and the any one of the at least one directional contact form an open circuit, and an active position in which the primary contact and the any one of the at least one directional contact form a closed circuit; and

[d] a direction interpreter, operatively connected to the primary contact and the at least one directional contact, for generating the directional input signal.

(’731, 9:43-10:9 (Claim 2; bracketed notation (e.g., [a]) added).)

195. As explained above, it is my opinion that claim 1 of the ’731 patent is obvious over Dance. Further, it is my opinion that claim 1 of the ’731 patent is obvious over Dance in view of Kuo and Beuk. Claims 2 and 3 would further have been obvious over (1) Dance or (2) Dance, Kuo, and Beuk in view of Titus (EX1011, U.S. Patent No. 5,955,713.)

(a) “The handheld computing device of claim 1, wherein the internally-located directional input device comprises” (Claim 2[p])

196. It is my opinion that Dance discloses claim 2[p] for the same reasons I provided in my opinions regarding claims 1[p] and 1[b].

(b) “a primary contact positionally fixed in the handheld computing device” (Claim 2[a])

197. It is my opinion that claim 2[a] would have been obvious over Dance in light of **Titus** (EX1011, U.S. Patent No. 5,955,713).

198. As discussed above, Dance discloses an “internally-located directional input device”—i.e., motion sensing device **24**, which can detect orientation of a digital camera.

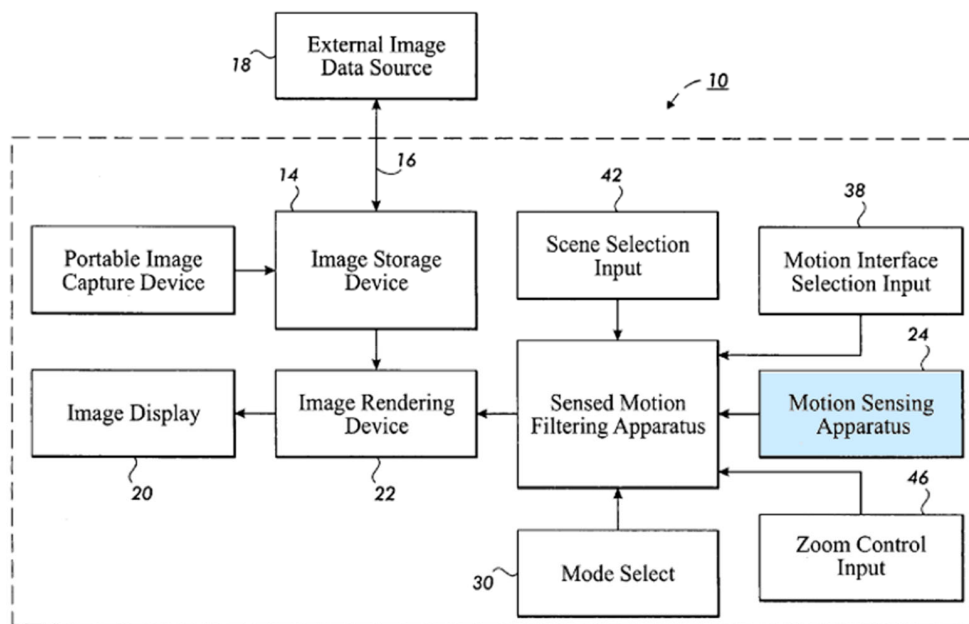


FIG. 2

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(Dance, Fig. 2 (highlighting added); *see also id.*, Fig. 1.) It would have been obvious to implement Dance’s motion sensing orientation sensor as a tilt switch array per the disclosures of **Titus**, because Dance does not disclose implementation details for such an orientation sensor, and Titus, entitled “Tilt Switch Array for Electronic Orientation Detection,” teaches the details for an orientation sensor. (EX1011.) For example, Dance discloses generally that the motion sensing device **24** “could include a gyroscope, or use integrated rotational accelerometers, to estimate the gravity direction,” but it does not provide details for the operation or structure of such devices. (Dance, 6:30-35.)

199. A POSITA would have been **motivated to combine** Dance with Titus. Dance and Titus are analogous references in a similar field. For example, both references disclose tracking orientation or tilt of a device. (Dance, 3:32-39, 4:58-65, 5:9-11; Titus, 1:5-7 (“This invention relates in general to an apparatus for detecting the orientation of an object, and particularly to a tilt switch for detecting a particular orientation.”), 1:37-42.) Further, both references relate to handheld electronic devices. (Dance, 1:13-17, 1:19-20 (“hand held digital cameras”); Titus, 1:8-11 (“Tilt switches and jitter switches are used in portable electronic devices, such as radio transceivers and paging units, to detect whether the unit is in a non-vertical orientation, and to detect movement of the device.”).)

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200. A POSITA would have been motivated to look to Titus for implementation details on Dance's tilt sensing functionality. Dance discloses that tilt sensing could be implemented using various components. (Dance, 6:30-40.) Titus discloses several embodiments of tilt sensing devices. (*See, e.g.*, Titus, 3:13-67, 4:51-60; *id.*, Figs. 1B, 3A.) Accordingly, a POSITA would have looked to Titus for discussion of how to implement tilt sensing in the Dance digital camera device.

201. A POSITA would have been further motivated to combine Dance with Titus for a compact implementation of a tilt sensor. Titus explains that a limitation of the prior art its invention seeks to overcome is that prior art tilt switches "take up significant real-estate in the device[.]" (Titus, 1:32-35, 1:45-52.) Titus discloses that its invention seeks to overcome that limitation by "tak[ing] up less volume within the device." (*Id.*, 1:38-42, 1:45-52.) A POSITA would be motivated to minimize the size of components in the Dance digital camera design. For example, Dance discusses the "desire for compactness for a portable camera." (Dance, 1:19-22; *see also id.*, 2:43-44 (describing "a portable document imaging camera" (emphasis added)); *id.*, Figs. 1-2.) Accordingly, a POSITA would have looked to Titus's tilt switches for implementing Dance's tilt sensing functionality with a compact form factor.

202. A POSITA would have had more than a reasonable expectation of

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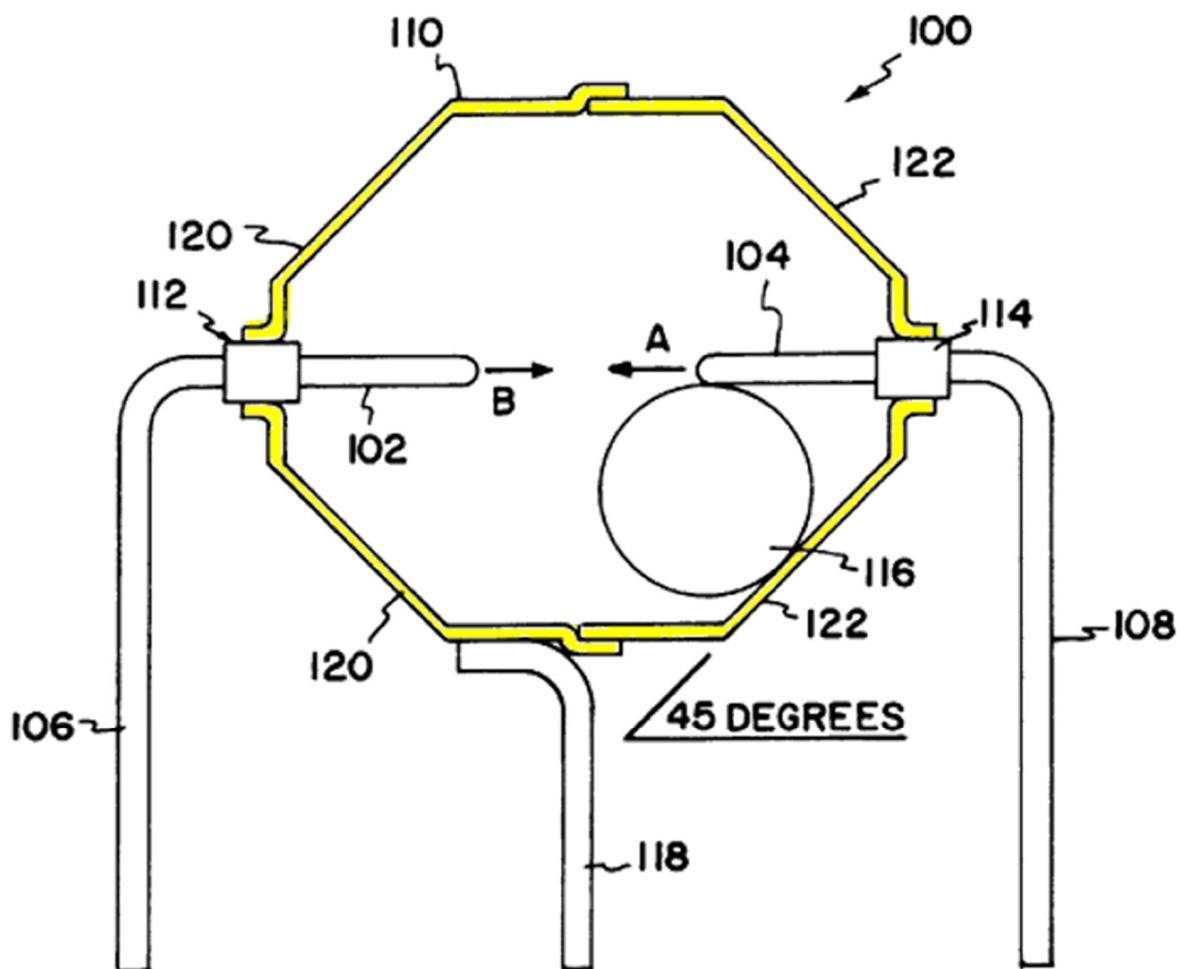
success and could have implemented the proposed combination using conventional techniques without undue experimentation. For example, Titus discloses that its tilt switch arrays are designed to be a single unit, which avoids precise calibration of multiple sensors. (Titus, 1:36-42, 1:45-52.) Accordingly, a POSITA would have recognized Titus's tilt switch arrays as a unit that could be easily integrated without undue experimentation into the Dance digital camera design.

203. Titus, like Dance, is analogous art to the '731 patent, including since both relate to control of a handheld electronic device, including using motion inputs. (Titus, 1:5-7, 1:13-17, 1:19-20, 1:37-42; '731, 1:16-17, 3:54-61.) Titus is also reasonably pertinent to the purported problems faced by the inventor of the '731 patent, including providing a user-friendly handheld device, capable of sensing motion and orientation of the device. (Titus, 1:32-36 ("However, the use of several individual tilt switches may take up significant real-estate in the device, and the individual switches must typically be mounted in precise orientation relative to each other in order for the combination of tilt switches to be effective."); '731, 3:54-61.)

204. Titus discloses a tilt switch array with a "**primary contact positionally fixed in [a] handheld computing device.**" For example, Titus discloses the tilt switch array **100** in Figure 1B. (Titus, 3:13-67.) Tilt switch array **100** includes frustrated conical portion **120** and second frustrated conical section **122**, **highlighted**

below:

FIG. 1B

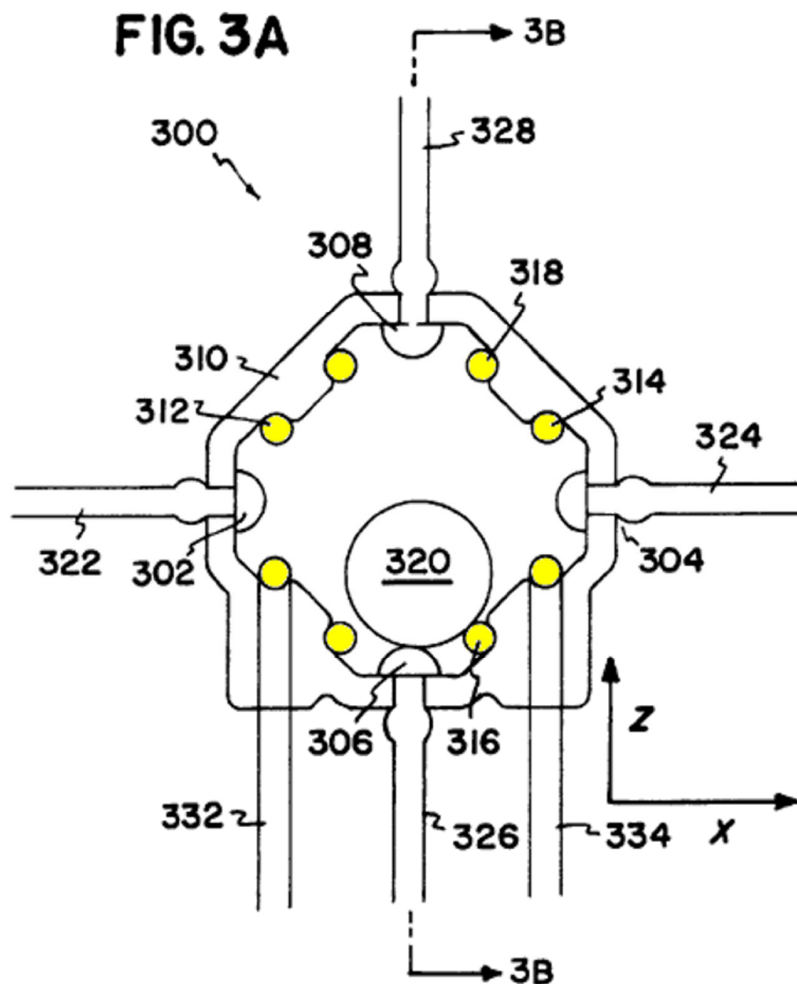


(*Id.*, Fig. 1B (highlighting added).) These elements **120** and **122** constitute the “**primary contact.**” Titus discloses that elements **120** and **122** are electrical “**contact[s]**”—i.e., they conduct electricity through the ball **116**. (*Id.*, 3:50-57, 3:12-38 (“The housing **110** is electrically conducting[.]”).) Further, Titus discloses that

elements **120** and **122** are “**positionally fixed.**” Titus discloses that elements **120** and **122** are part of the “housing **110**” of the device, which Titus describes as being “shaped so that those portions of the housing **110** surrounding the electrodes **102** and **104** form an angle, in this case 45°, relative to the axis lying between the electrodes **102** and **104.**” (*Id.*, 3:39-45.) Further, elements **120** and **122** cannot come into contact with electrodes **102** or **104** unless the movable ball element **116** connects these positionally fixed elements. (*Id.*, 3:65-67.)

205. Titus further discloses that its tilt switch designs are situated “**in [a] handheld computing device.**” For example, Titus discloses that “[t]he present invention has application in small electronic devices,” including “radio transceivers, pagers, devices for locating buried electrical utilities and also electronic animal collars[.]” (Titus, 3:5-11.) Furthermore, in the combination of Dance and Titus, it would have been obvious (as discussed above) to implement Titus’s tilt switch array “**in**” Dance’s digital camera—as part of its motion sensing device **24**, for instance. (Dance, Fig. 2, 3:32-39, 4:58-63, 5:9-11.)

206. Titus further discloses more complicated tilt switch arrays using a similar design, including multiple “**primary contact[s]**” in the embodiment shown below:



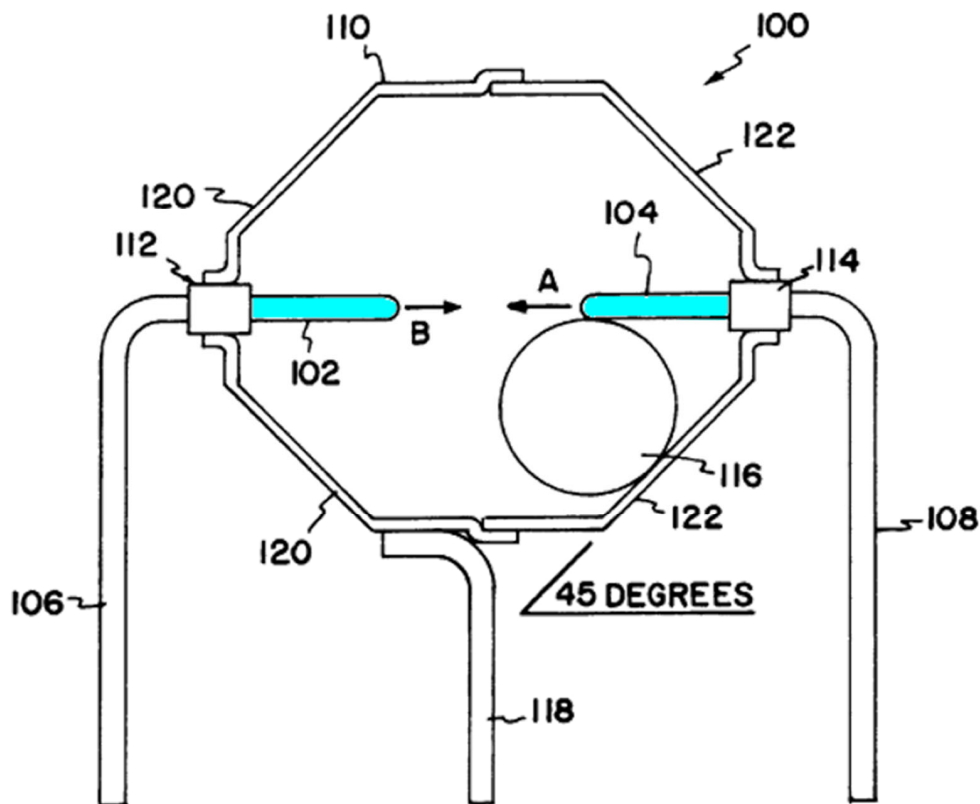
(Titus, Fig. 3A (highlighting added), 4:45-5:6.)

- (c) **“at least one directional contact positionally fixed in the handheld computing device and operatively connected to the primary contact;” (Claim 2[b])**

207. It is my opinion that claim 2[b] would have been obvious over Dance in light of Titus. As I discussed above, it would have been obvious to implement Titus’s tilt switch array in Dance’s digital camera system. Titus’s tilt switch array includes **“at least one directional contact.”** Titus’s tilt switch array includes

electrodes **102** and **104**, highlighted below, each of which constitutes a “**directional contact.**” (Titus, 3:50-59, Fig. 1B.) For example, the electrode contacted by conductive ball **116** depends on the “**direction[]**” in which the device is oriented. (*Id.*, 3:50-61 (“The first electrode **102** is defined to point in the direction labeled ‘B.’” (emphasis added)).)

FIG. 1B



(*Id.*, Fig. 1B (highlighting added).)

208. Electrodes **102** and **104** are “**positionally fixed.**” Titus discloses that electrodes **102** and **104** are in a fixed position relative to the housing elements and

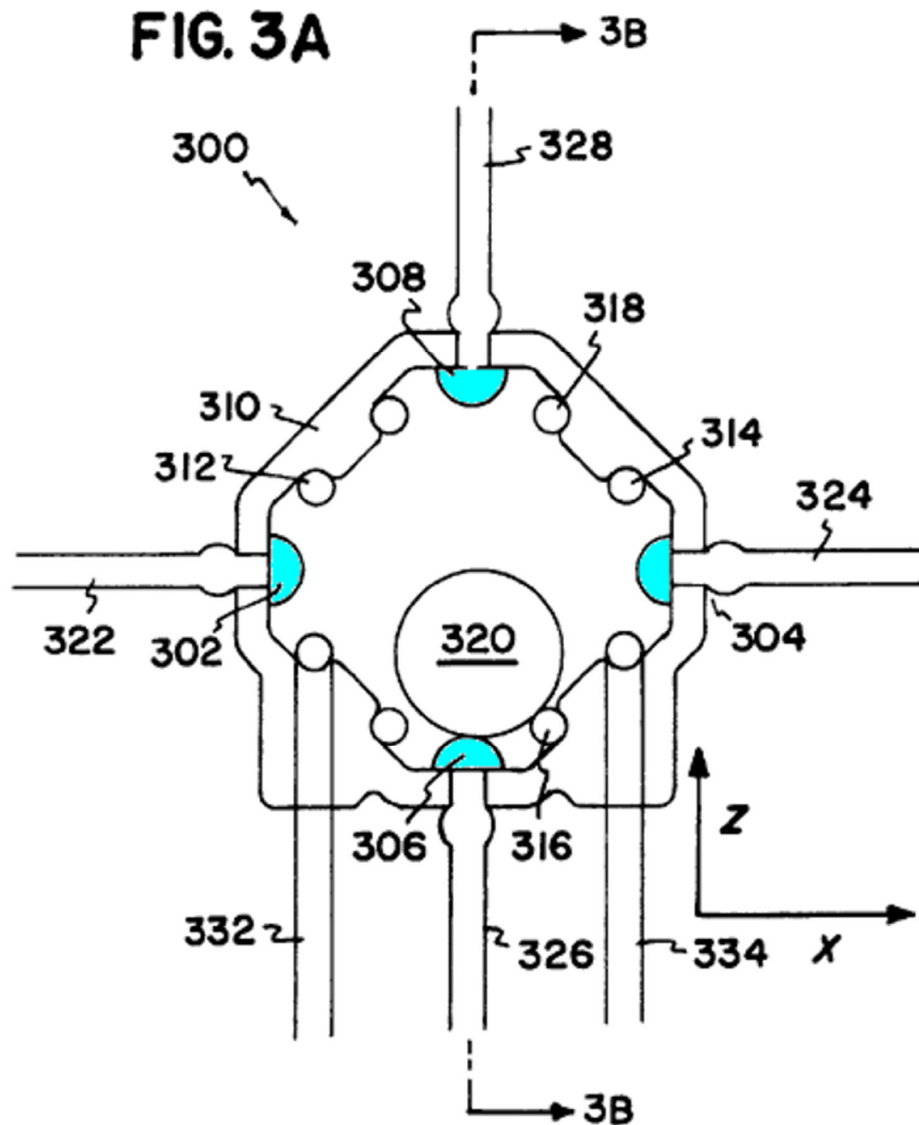
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other electrodes around them. (Titus, 3:32-42.) Further, elements **120** and **122** cannot come into contact with electrodes **102** or **104** unless the movable ball element **116** connects these positionally fixed elements. (*Id.*, 3:65-67.)

209. Electrodes **102** and **104** are “**in [a] handheld computing device.**” For example, Titus discloses that “[t]he present invention has application in small electronic devices,” including “radio transceivers, pagers, devices for locating buried electrical utilities and also electronic animal collars[.]” (Titus, 3:5-11.) Furthermore, in the combination of Dance and Titus, it would have been obvious (as discussed above) to implement Titus’s tilt switch array “**in**” Dance’s digital camera—as part of its motion sensing device **24**, for instance. (Dance, Fig. 2, 3:32-39, 4:58-63, 5:9-11.)

210. Further, electrodes **102** and **104** are “**operatively connected to the primary contact.**” Electrodes **102** and **104** are “**connected**” to the “**primary contact**” (housing elements **120** and **122**) when the device is in certain orientations such that the ball **116** connects them. (Titus, 3:50-61.)

211. Titus further discloses more complicated tilt switch arrays using a similar design, including multiple “**directional contact[s]**” in the embodiment shown below:



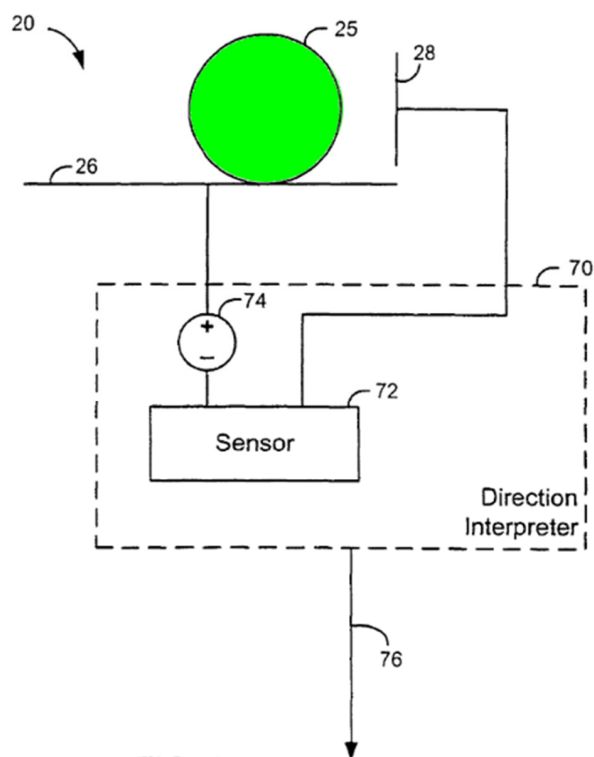
(Titus, Fig. 3A (highlighting added), 4:45-5:6.)

212. Dance in view of Titus thus renders obvious a “**primary contact positionally fixed in the handheld computing device; at least one directional contact positionally fixed in the handheld computing device and operatively connected to the primary contact.**”

- (d) **“circuit closing means, movable on, and in electrical contact with, the primary contact, the circuit closing means moving in response to inclination of the handheld computing device in the direction of any one of the at least one directional contact, between a neutral position in which the primary contact and the any one of the at least one directional contact form an open circuit, and an active position in which the primary contact and the any one of the at least one directional contact form a closed circuit; and” (Claim 2[c])**

213. It is my opinion that claim 2[c] would have been obvious over Dance in light of Titus. I understand that the limitation **“circuit closing means”** appears to be a means-plus-function term. It is my opinion that Dance and Titus render obvious the **“circuit closing means”** limitation regardless of whether it is construed as a means-plus-function term. If construed as a means-plus-function term, it is my opinion that the function of the claimed **“circuit closing means”** is to move in response to inclination of the handheld computing device between a neutral position in which the primary contact and a directional contact form an open circuit, and an active position in which the primary contact and a directional contact form a closed circuit. It is my opinion that the corresponding structure is either a “ball bearing or a mercury contact.” (’731, 4:8-10, 6:12-14, Figs. 1-5.) The ’731 patent shows the following “circuit closing means”:

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(’731, Fig. 1 (highlighting added).)

214. As I discussed above, it would have been obvious to implement Titus’s tilt switch array in Dance’s digital camera system.

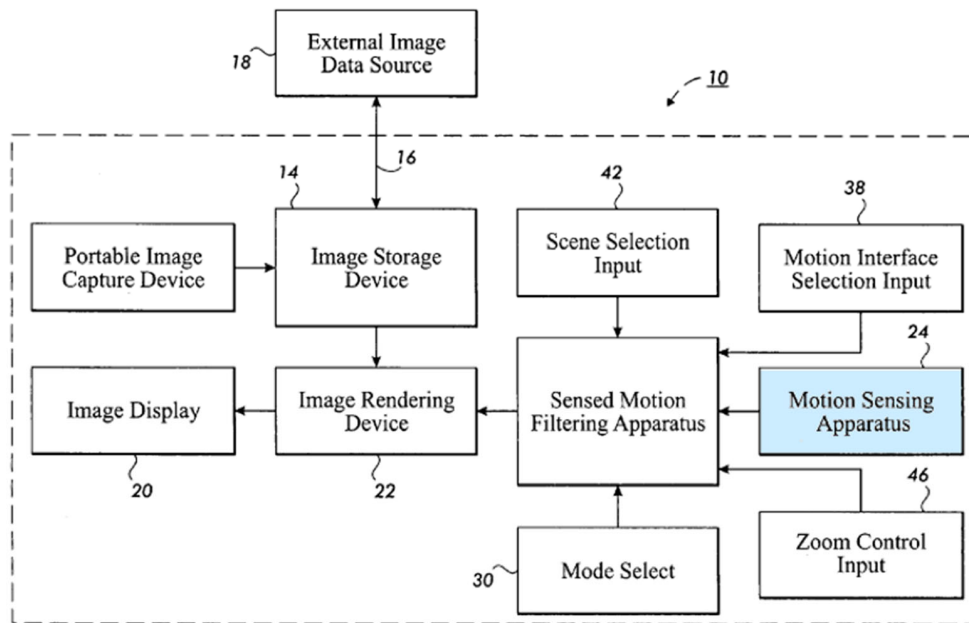
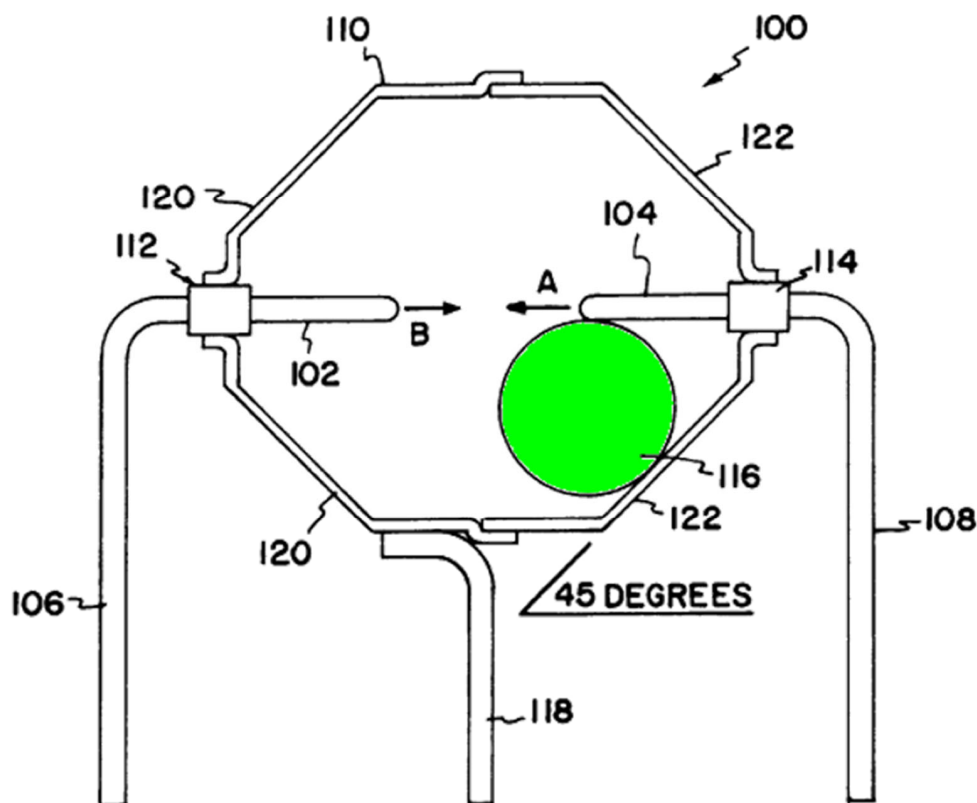


FIG. 2

(Dance, Fig. 2 (highlighting added); *see also id.*, Fig. 1.)

215. Titus discloses “circuit closing means”—e.g., ball 116, highlighted below:

FIG. 1B



(Titus, Fig. 1B (highlighting added).)

216. Ball 116 is a “**circuit closing means.**” This is shown in Figure 1B above. **Ball 116** is shown in a position where it closes a circuit between electrode 104 and housing element 122. Titus discloses that “there is an electrically conductive path from the housing electrode 118 to, for example, the second lead 108 through the housing 110, the ball 116, and the second electrode 104, when the ball 116 simultaneously contacts the inner surface of the housing 110 and the electrode

104, as illustrated.” (Titus, 3:32-38 (emphasis added), Fig. 1B; *see also id.*, 3:54-57 (“the first tilt switch between the first lead **106** and the housing lead **118** is closed when the ball **116** simultaneously contacts the first portion **120** of the housing **110** and the first electrode **102**” (emphasis added)).) Ball **116** is similar to the “circuit closing means” disclosed in the ’731 patent specification. (’731, 4:8-10 (“[a] circuit closing means, such as a ball bearing”), 6:12-14, Figs. 1-5.) For example, the ’731 patent shows the following “circuit closing means **25**” in Figure 1:

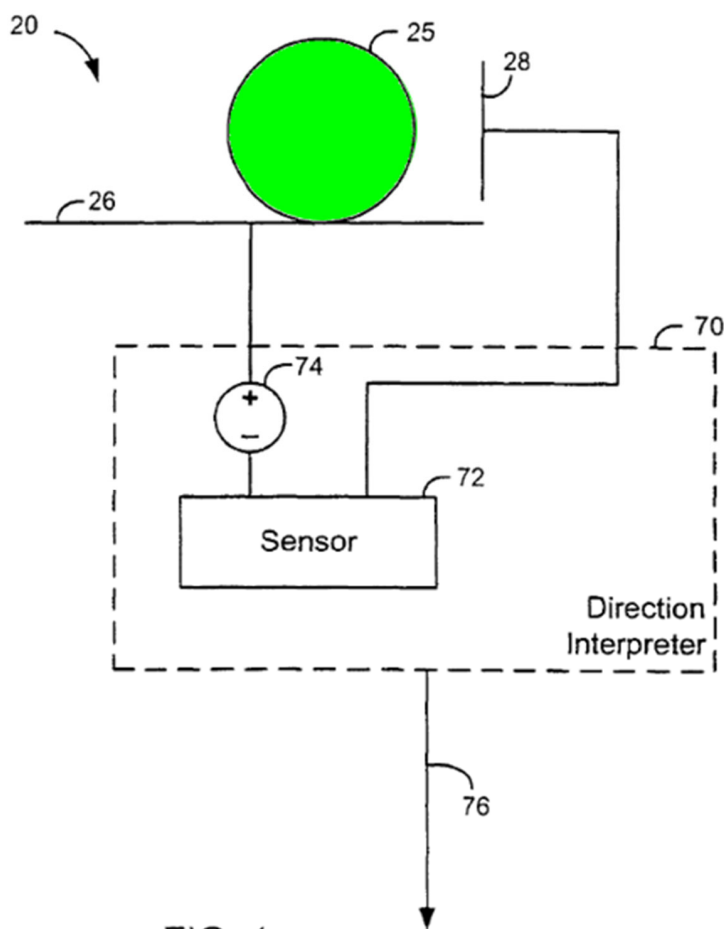
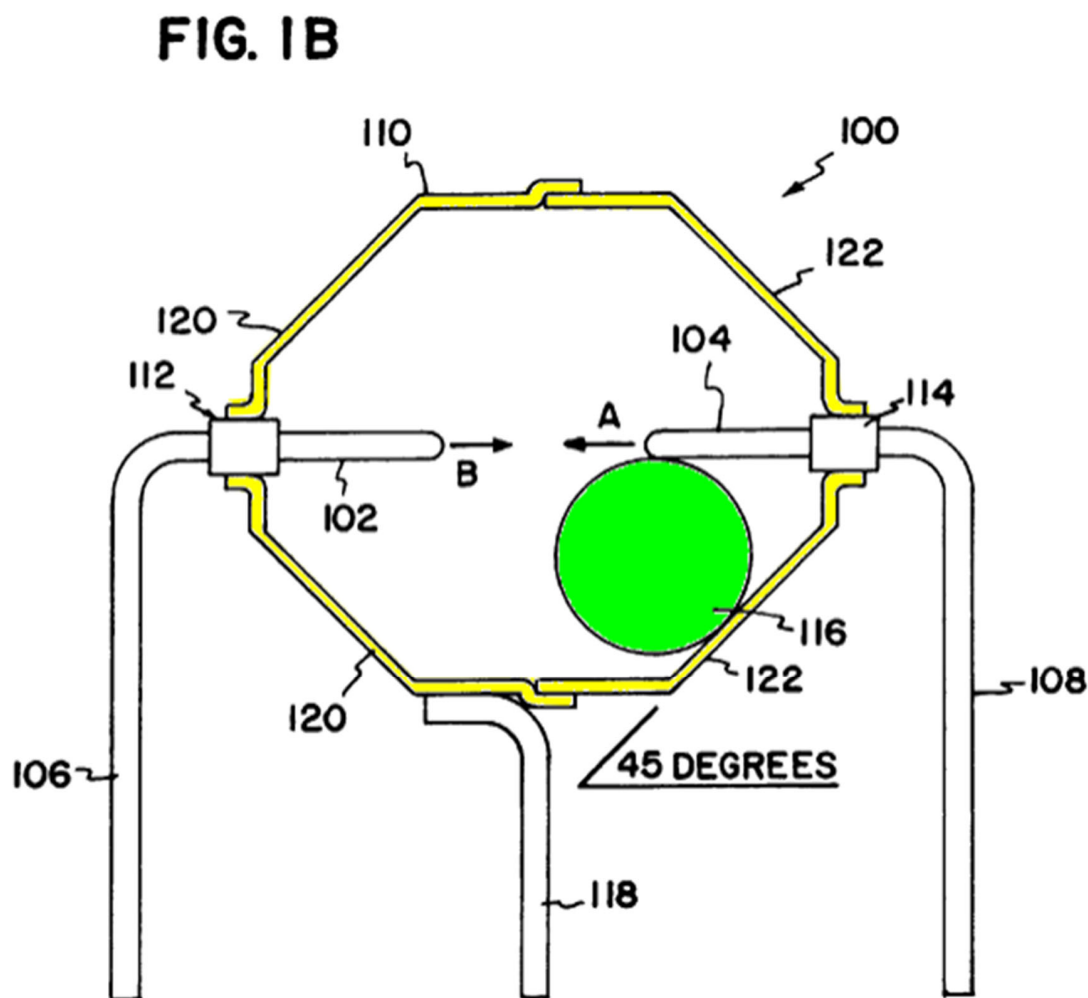


FIG. 1

(’731, Fig. 1 (highlighting added).)

217. Titus’s ball **116** is “**movable on, and in electrical contact with, the primary contact.**” As shown in Figure 1B, ball **116** rolls along the housing components **120** and **122** (the “**primary contact**”):



(Titus, Fig. 1B (highlighting added).) Titus also discloses that when “neither the first electrode **102** nor the second electrode **104** is pointing within $\pm 45^\circ$ of an upward

direction, there is no stable position for the ball **116** to contact either electrode **102** or **104**.” (*Id.*, 3:62-67.) In other words, ball **116** rolls into the lower portion of the housing shown in Figure 1B. Accordingly, Titus’s ball **116** is “**movable on**” the housing. Furthermore, Titus’s ball **116** is “**in electrical contact with**” the housing—i.e., ball **116** can create an “electrically conductive path” with the housing. (*Id.*, 3:32-37, 3:50-61.)

218. Titus’s ball **116** “**mov[es] in response to inclination of the handheld computing device in the direction of any one of the at least one directional contact.**” For example, Figure 1B shows ball **116** after it has “**mov[ed] in response to inclination of the handheld computing device in the direction of**” electrode **104**. (Titus, 3:32-38.) Further, Titus discloses that depending on the tilt of the device, ball **116** can move toward and complete a circuit with either electrode **102** or electrode **104**. (*Id.*, 3:50-59.)

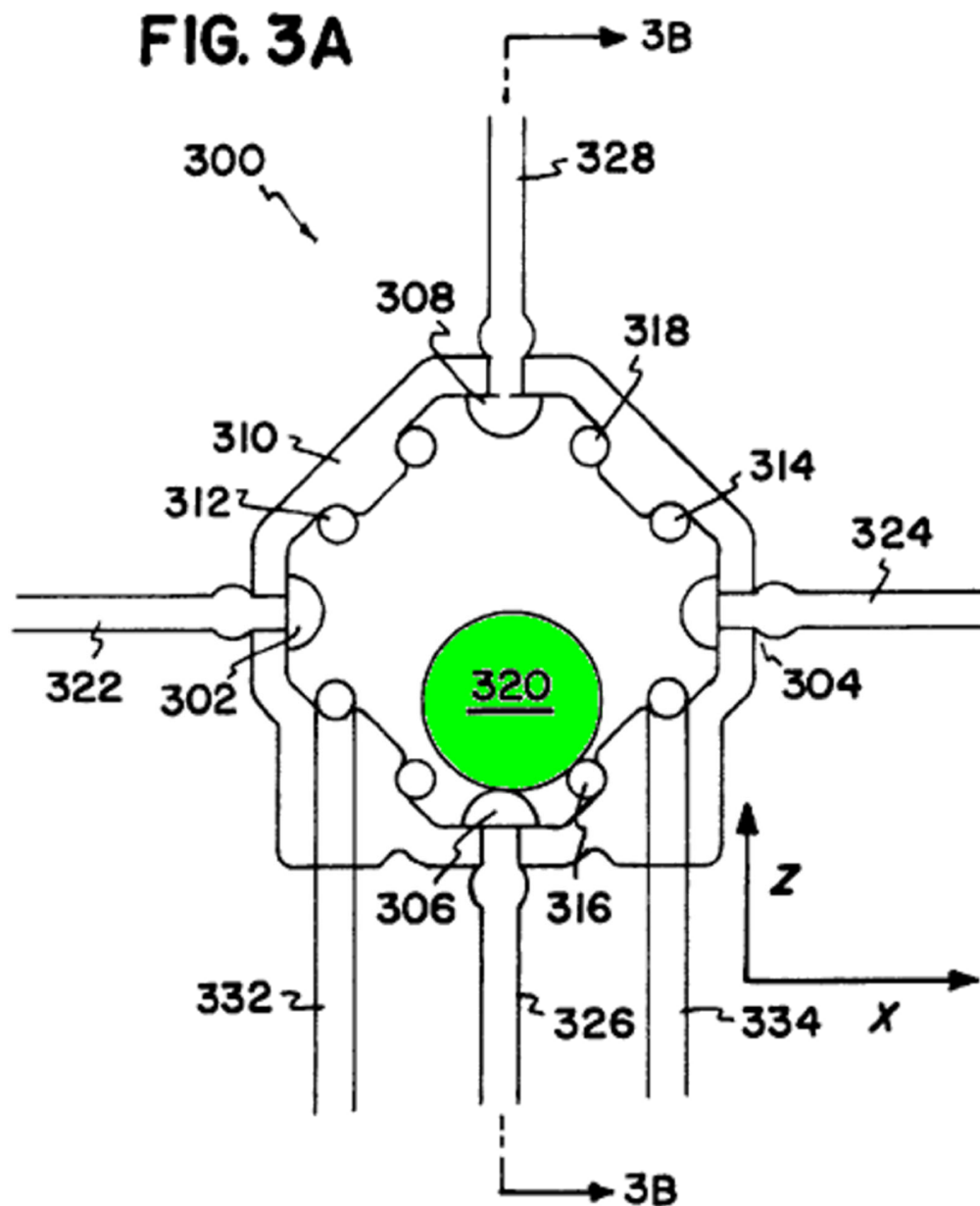
219. Titus further discloses that its ball **116** moves “**between a neutral position in which the primary contact and the any one of the at least one directional contact form an open circuit, and an active position in which the primary contact and the any one of the at least one directional contact form a closed circuit.**” Titus discloses that ball **116** can be in a “**neutral position,**” such that “there is no stable position for the ball **116** to contact either electrode **102** or

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104” and “neither the first or second tilt switches are closed[.]” (Titus, 3:62-67.)

Further, Titus discloses that ball **116** can be in an “**active position**,” such that it forms a closed circuit between the housing and either of electrodes **102** or **104**. (*Id.*, 3:50-59, 3:32-38.)

220. Titus further discloses more complicated tilt switch arrays using a similar design, including the “**circuit closing means**” in the embodiment shown below:



(Titus, Fig. 3A (highlighting added), 4:45-5:6.)

- (e) **“a direction interpreter, operatively connected to the primary contact and the at least one directional contact, for generating the directional input signal.”**
(Claim 2[d])

221. It is my opinion that claim 2[d] would have been obvious over Dance in light of Titus.

222. As I discussed above, it would have been obvious to implement Titus’s tilt switch array in Dance’s digital camera system. Titus discloses that its tilt switch array can include a **“direction interpreter.”** For example, Titus discloses that its tilt switch array can be connected to an “external circuit,” which “permits the user to determine which particular tilt switch ... is closed by the ball[.]” (Titus, 4:57-60.) This “external circuit” is **“operatively connected to the primary contact and the at least one directional contact.”** For example, Titus discloses that in the Figure 3A embodiment, “[e]ach ring **312, 314, 316, and 318** has an associated lead **332, 334, 336, and 338** extending through the housing **310** for connection to the external circuit.” (*Id.*, 4:55-57.) It would have been obvious to a POSITA to use the **“direction interpreter”** disclosed by Titus in the context of the Dance system to **“generat[e] the directional input signal.”** For example, Titus discloses that the “external circuit” can be used to “determine which particular tilt switch ... is closed by the ball[.]”—which indicates the tilt direction. (Titus, 4:57-60; *see also* 5:16-19 (“external circuit for determining the orientation of the tilt switch array **400**”).)

Titus's embodiments also disclose using a "controller" for determining the orientation of a tilt switch array. (*Id.*, 6:2-5.)

2. Dependent Claim 3

223. For reference, claim 3 recites:

3. The handheld computing device of claim 2, wherein the directional input signal is uniquely associated with the direction of the inclination.

224. It is my opinion that claim 3 would have been obvious over Dance in light of Titus.

225. As discussed above, Titus's Figure 1B embodiment leads to one output signal when the device is tilted in one direction (e.g., a signal along lead **106** when it is tilted to the left and the ball completes a circuit between the housing **110** and the electrode **102**). (Titus, 3:54-61; *id.*, Fig. 1B.) Titus's Figure 1B circuit provides a different output signal when the device is tilted in the opposite direction (e.g., a signal along lead **108** when it is tilted to the right and the ball completes a circuit between the housing **110** and the electrode **104**). (*Id.*, 3:45-53; *id.*, Fig. 1B.) Further, Titus discloses that an external circuit or controller can be used to determine the particular tilt based on the information from the tilt switch array. (Titus, 4:57-60, 6:2-5, 5:16-19.) Accordingly, **"the directional input signal is uniquely associated with the direction of the inclination."**

226. Similarly, Titus's Figure 3A embodiment leads to different output signals depending on the contacts between which the circuit is completed based on the position of the ball. (Titus, 4:51-60; *id.*, Fig. 3A.) The external circuit then "permits the user to determine which particular tilt switch, i.e. electrode/ring combination in the tilt switch array, is closed by the ball **320**." (*Id.*, 4:57-60.) Thus, Titus indicates that the external circuit provides a "**directional input signal**" that is "**uniquely associated with the direction of the inclination.**"

227. As I explained above, it would have been obvious to implement Dance's device using a tilt switch array like Titus discloses. Accordingly, it would have been obvious over Dance in view of Titus that "**the directional input signal is uniquely associated with the direction of the inclination.**"

E. Grounds 7 and 8: Claims 1-3, 11, and 13-14 are Obvious Over Dornbusch in view of Uragami (Ground 7); Claim 1-3, 11, and 13-14 are Obvious Over Dornbusch in View of Uragami, Nakano, and Moritome (Ground 8)

1. Independent Claim 1

228. For reference, claim 1 recites:

1. A handheld computing device, comprising:
 - [a] a display;
 - [b] an internally located directional input device providing a directional input signal, the directional input signal corresponding to an axis of

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inclination of the handheld computing device and indicating an orientation;

- [c] a second directional input device providing a second directional input signal, the second directional input signal indicating an amount of displacement;
- [d] a processor coupled to the internally located directional input device and the second directional input device and operable to receive and process the directional input signal in conjunction with the second directional input signal; and
- [e] a memory subsystem, the memory storing an operating system executed by the processor to display on the display a graphical user interface for controlling the operation of the handheld computing device, wherein the graphical user interface provides a graphical element;
- [f] wherein the operating system comprises processor-executable instructions that cause the graphical element to move by the amount of displacement in a direction substantially parallel or substantially perpendicular to the orientation.

(’731, 9:19-42 (Claim 1; bracketed notation (e.g., [a]) added).)

(a) “A handheld computing device, comprising:” (Claim 1[p]) and “a display” (Claim 1[a])

229. Handheld fishing rod controllers were known before the ’731 patent.

Both **Dornbusch** and **Uragami** are fishing controller patent disclosures. (EX1008;

EX1009/EX1015.) As explained below, for this obviousness combination, I will address claim 1[p] and 1[a] together. To the extent that the preamble is limiting, it is my opinion that claim 1[p], as well as claim 1[a], are obvious over Dornbusch in light of Uragami. A POSITA would have been motivated to implement Dornbusch's fishing rod controller as a single handheld device to increase the realism of Dornbusch's fishing rod system. A self-contained fishing game would also better mimic real-world fishing. More details are provided below.

230. Starting with Dornbusch first, Dornbusch discloses that its handheld fishing rod controller can be used as the hand held game controller 3 which is connected via wire to game device 2 and video monitor 5 with “display screen 6.” (Dornbusch, Fig. 1, 3:66-4:23.) Using the fishing rod controller (controller 3 in the above diagram), the player controls the game, which is displayed on display screen 6. (*Id.*, 4:1-7.) Dornbusch thus discloses that its fishing rod controller is used as part of a system that includes a “**display**.” Dornbusch's Abstract teaches a handheld electronic fishing rod game controller:

An electronic game controller enables a game player to play a fishing game and to control an electronic game device. The electronic game controller resembles an actual rod and reel. The reel includes an electronic circuit for sensing pushbutton switches which are depressed by the game player during game play and for sensing position sensing

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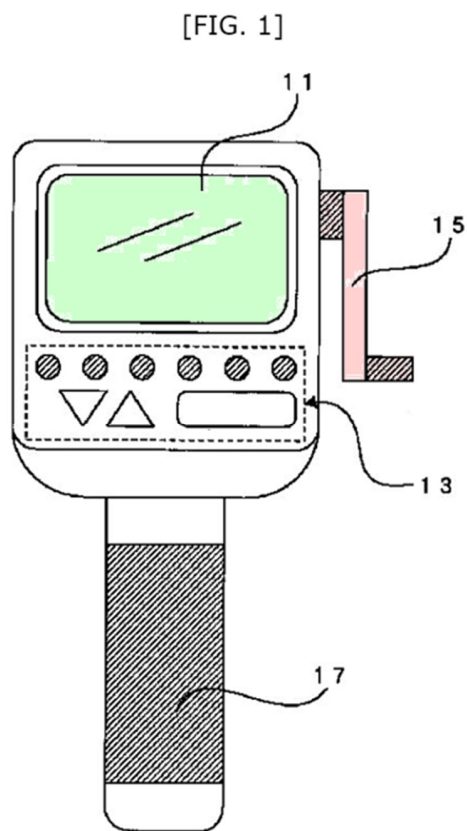
switches which are activated by the position in which the game controller is held. The reel also includes a crank which controls the switching of an optical switch. These features provide an electronic game controller which responds to actual fishing movements typically made during an actual fishing episode such as casting the line and reeling in the line in various directions to avoid natural obstacles.

(Dornbusch, Abstract.) While Dornbusch discloses using the fishing rod controller as part of a system including a “**display**,” Dornbusch does not explicitly depict that the “**display**” is on the fishing rod controller. It would have been obvious in light of Uragami (EX1009 (certified translation of EX1015, JPH11-188182) to implement Dornbusch’s fishing rod controller as a self-contained video game system including a “**display**” and any circuitry necessary to control and render a video game as part of the handheld fishing rod controller. In the combined system, it would have been obvious to a POSITA to combine the elements shown in Dornbusch’s Figure 1 (e.g., display screen 6, game device 2, and controller 3) into a single handheld computing device. It would have been obvious in light of Uragami to implement Dornbusch as a standalone device containing a display, processor, and controller (e.g., motion sensors, crank, etc.) that is portable and can be held in a user’s hands. Accordingly, a “**handheld computing device**” with a “**display**” would have been obvious over Dornbusch in light of Uragami.

231. Much like Dornbusch, Uragami is a patent application that discloses a

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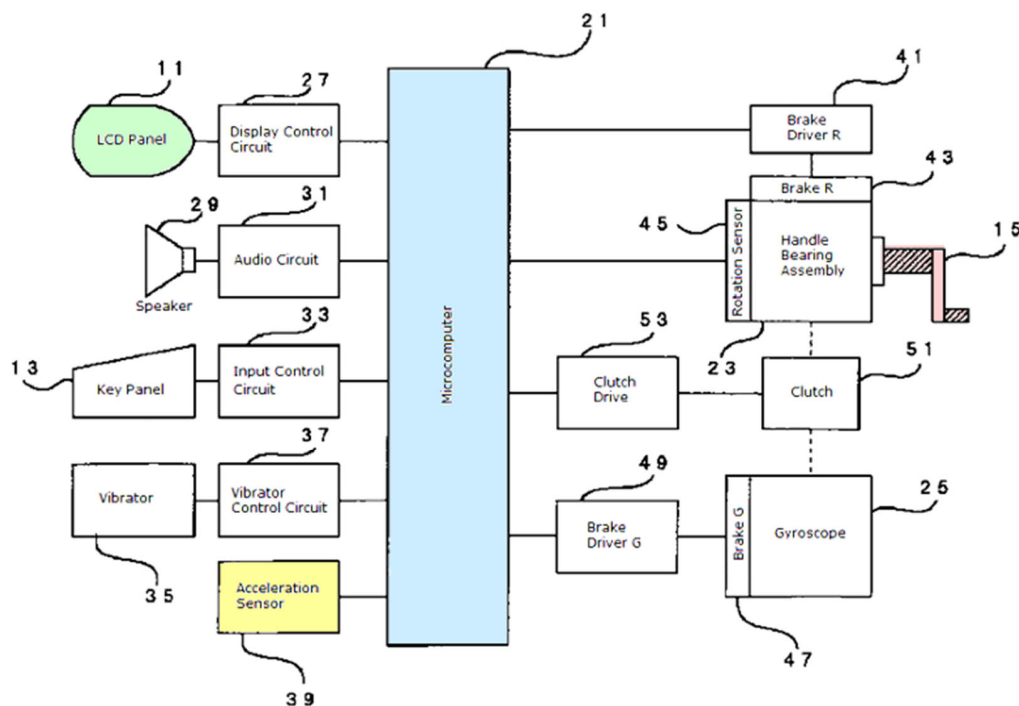
“fishing simulation game device equipped with a key panel 13, a display panel 11, a reel handle 15, [and] an acceleration sensor 39 responsive to movement by the device itself, a vibrator 35 for vibrating the device, and a microcomputer 21, all integrally housed inside a device housing[.]” (Uragami, Abstract.) Uragami’s game device is shown in Figure 1, reproduced below, including LCD panel 11 and reel handle 15:



(Uragami, Fig. 1 (highlighting added), [0002] (“The main unit incorporates a microcontroller that controls the entire device, [and] an accelerometer that detects acceleration applied to the game main unit and reports it to the microcontroller[.]”).)

The “internal configuration of the game device” is shown in Figure 2, reproduced below, including microcomputer 21, LCD panel 11, acceleration sensor 39, and reel handle 15:

[FIG. 2]



(Uragami, Fig. 2 (highlighting added), [0013]-[0014].) Uragami is a “**handheld computing device, comprising: a display.**” Dornbusch in view of Uragami thus renders obvious claim 1[p] and claim 1[a].

232. A POSITA would have been motivated to implement (e.g., combine) Dornbusch using Uragami, as both are analogous fishing controller patent disclosures. As explained above, a POSITA would have been motivated to

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implement Dornbusch's fishing rod controller as a self-contained system to increase the realism of Dornbusch's fishing rod controller system. A POSITA would have been motivated based on Dornbusch to create a system that best captures the experience of fishing in the real world. A POSITA would have understood that implementing Dornbusch's fishing rod controller and gaming device as a self-contained fishing game would have increased its realism and similarity to real-world fishing.

233. For example, a POSITA would have recognized that a fishing rod is a portable instrument that can be taken anywhere—not a device that has to be used while stationary, likely in some indoor location where there is a television display. Accordingly, a POSITA would have been motivated to implement Dornbusch's system as a self-contained device, because it would have better simulated the experience of a standalone fishing rod.

234. Furthermore, a POSITA would have recognized that requiring the fishing rod controller to be hooked up via a wired connection to a gaming device would have limited the range of motion for the device—potentially making the motions fail to authentically reflect the motions used in real-world fishing.

235. Dornbusch makes clear that realism and authenticity to the experience of real-world fishing is important to its system. For example, in discussing the “Field

of the Invention,” Dornbusch discloses that “[t]he controller resembles an actual rod and reel and permits the game player to interact with the controller and the game as if the game player were actually fishing.” (Dornbusch, 1:13-16 (emphasis added); *see also id.*, 1:7-10 (“[t]he electronic game controller responds to actual motion which mimics real motion typically occurring during the performance of a corresponding real event being simulated by the game play”).) Similarly, when discussing electronic games that “mimic real life events,” Dornbusch discloses that such games’ “interaction in real time is intended to give the game player the same feeling as he would experience if he were participating in the real-life event.” (*Id.*, 1:28-30; *see also id.*, 1:40-42 (discussing game controllers that “attempt to give the game player a more realistic experience”).) Indeed, one of the main limitations Dornbusch highlights in prior art fishing video games is the lack of realism:

As can be seen, the realism of the fishing game is substantially diminished by use of pushbuttons on a box controller. **What is needed is a game controller which more accurately recreates the experience of fishing with a hook, line and sinker.**

(*Id.*, 2:26-30 (emphasis added); *see also id.*, 1:64-2:25.) Furthermore, throughout its disclosure, Dornbusch repeatedly discusses its fishing rod controller and gaming device with reference to aspects of fishing in the real world—suggesting that the real-world fishing experience should be the metric for how a POSITA should

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approach designing a fishing video game. (*Id.*, 2:53-65 (“The game player operates the present electronic game controller in essentially the same fashion as if actually fishing.”), 4:25-32 (“The game controller **10** is designed to look like an actual rod and reel and to function like a rod and reel under realistic fishing conditions.”), 5:25-30 (“just as in a real casting motion”), 11:24-30 (describing the invention as offering “the game player a realistic fishing experience not present in the prior art game controller”).) Dornbusch’s disclosures would have strongly motivated a POSITA to make further improvement to Dornbusch’s system to create more realism in its fishing game experience.

236. Further, Uragami refers to its device as a “fishing simulation game device” and repeatedly emphasizes the importance of providing a “realistic” fishing experience. (Uragami, [0007] (emphasis added), [0006] (connecting a “more realistic sensation” to a “likely increase [in] the popularity of the game device”), Title (“Fishing Simulation Game Device”), Abstract, [0007]-[0008], [0016], [0027], [0001] (“The present invention relates to a fishing simulation game device, and more specifically to a technique for providing players with a more realistic feel.”), [0006], [0021], [0026]-[0028].) A POSITA would have been motivated by these disclosures to implement Dornbusch’s controller as a standalone device like Uragami discloses.

237. A POSITA would have been motivated to implement Dornbusch’s

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fishing rod controller as a self-contained handheld computing device to simplify Dornbusch's system. A POSITA would have considered it advantageous to streamline a multi-part video gaming system into a singular, self-contained system. For example, a self-contained system is easier to transport than a multipart system. A self-contained system can also be played in locations where a system requiring a separate display and gaming device are not feasible—for example, in contexts like airports where a user may have a lot of free time on his or her hands.

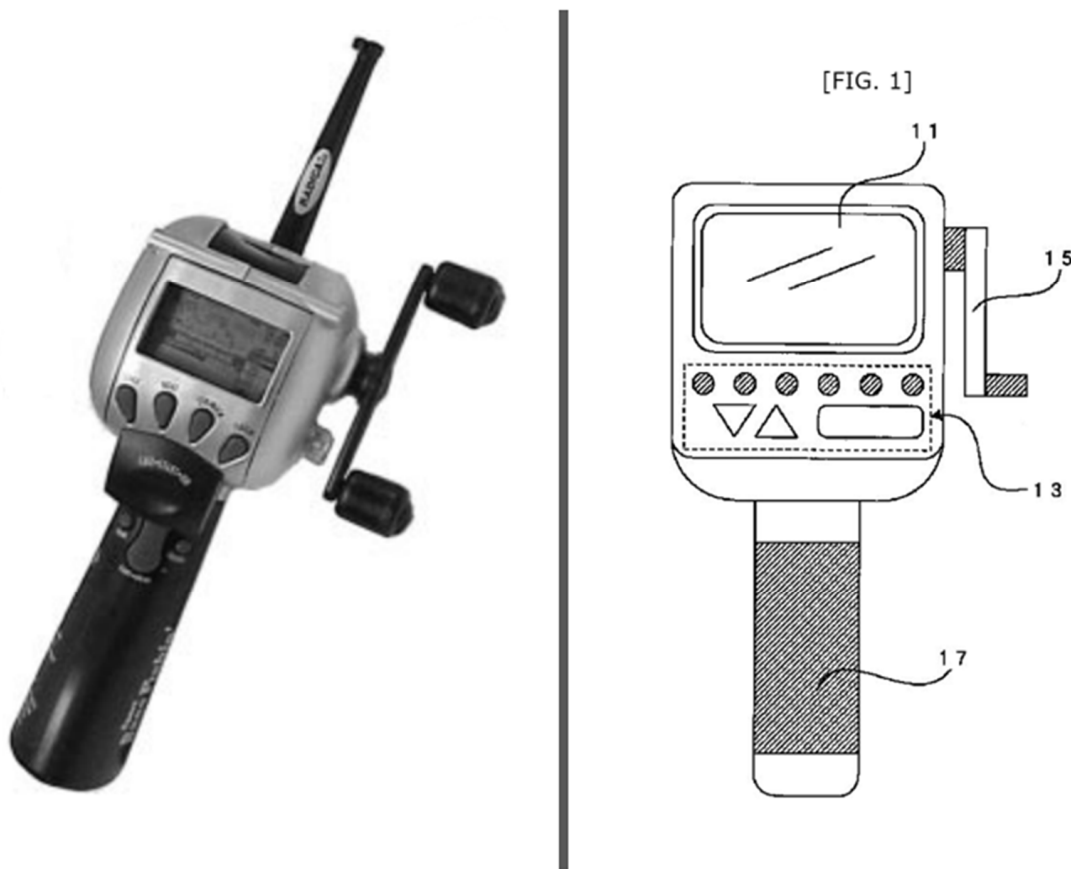
238. In my opinion, a POSITA would have had more than a reasonable expectation of success and could have implemented the proposed combination using conventional techniques without undue experimentation. As I discussed above, the '731 patent admits that “[h]andheld computing and communication devices are well known,” and such devices “[t]ypically ... have a processor connected to a memory, a screen and a user input device.” ('731, 1:24-31 (emphasis added).) It is my opinion that the proposed combination would have involved nothing more than the routine implementation of prior art devices according to known techniques.

239. There is ample prior art indicating that a POSITA would have had a reasonable expectation of success in implementing a game like Dornbusch discloses (e.g., with controllable boat and lure graphics) on a self-contained device like Uragami's.

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240. For example, the prior art **Rudell** patent (EX1016, U.S. Patent No. 6,200,219)⁵ discloses improving on a self-contained fishing gaming device similar to Uragami—i.e., the Radica BASS FISHIN’ game—by allowing for more dynamic graphics on a self-contained device. (Rudell, 1:45-50 (describing graphical limitations of Radica system), Figs. 1-3, 1:56-62, 2:49-3:21 (describing dynamic graphics responding to motion controls that can be displayed on the improved self-contained system).) Further, similar to Dornbusch, Rudell discloses that its system “senses the movement of the [toy] vehicle” and “varies the graphic image to simulate the motion of the vehicle.” (*Id.*, 2:32-37; *see also id.*, 4:9-13.) An image of the Radica BASS FISHIN’ game referenced by Rudell is shown alongside Figure 1 of Uragami below:

⁵ I understand that Rudell is also prior art to the ’731 patent, filed on November 9, 1998.



(EX1029, Sport Bass Fishin' Instruction Manual, p.001; EX1016; EX1009, Uragami, Fig. 1; EX1015.) The claimed “handheld computing device” with a self-contained display was known before the '731 patent, including as shown in Dornbusch in view of Uragami.

241. Both Dornbusch and Uragami are analogous art to the '731 patent as they both relate to control of a handheld device, including using motion sensing inputs. (Dornbusch, 1:13-16; *see also id.*, 1:7-10; Uragami, Fig. 1; *id.*, [0021]; '731, 1:16-20.) Dornbusch and Uragami are reasonably pertinent to the same purported

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problems faced by the inventor of the '731 patent, including providing more realistic motion sensing and control. (Dornbusch, 2:26-30, 2:53-65; Uragami, [0006]; '731, 3:40-43 (discussing the drawbacks of prior art devices that attempt to sense and control multidirectional movements and orientation).)

(b) “an internally located directional input device providing a directional input signal, the directional input signal corresponding to an axis of inclination of the handheld computing device and indicating an orientation” (Claim 1[b])

242. It is my opinion that Dornbusch discloses claim 1[b].

243. Dornbusch discloses **“an internally located directional input device.”** Dornbusch discloses that its fishing rod controller contains a circuit board—e.g., circuit board **40**—on which “position sensing switches, such as mercury switches, are mounted[.]” (Dornbusch, 3:10-13.) The mercury switches are placed such that “the game controller can sense the position of the fishing rod as the rod is moved in various directions by the game player.” (*Id.*, 3:16-20 (emphasis added).) Figure 5 of Dornbusch shows various directions of the fishing rod controller that can be sensed by the mercury switches:

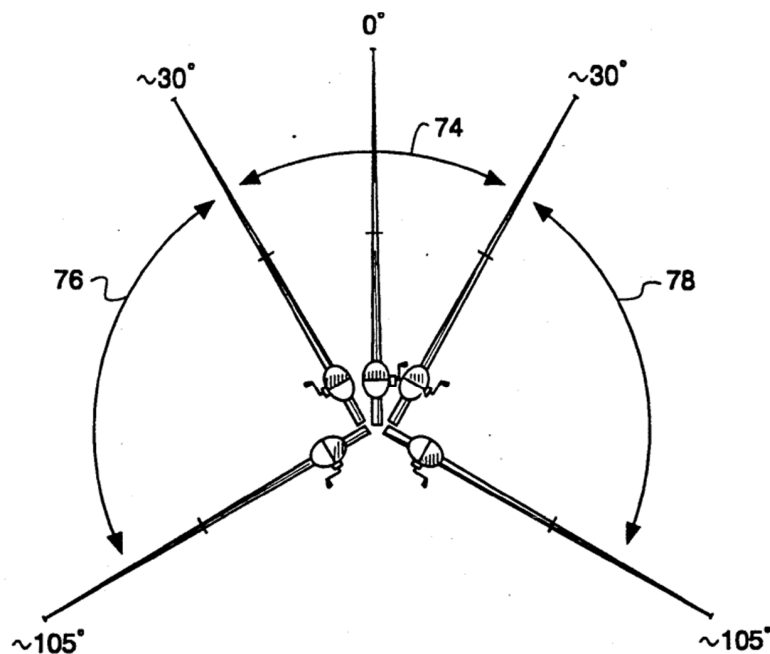


Fig. 5

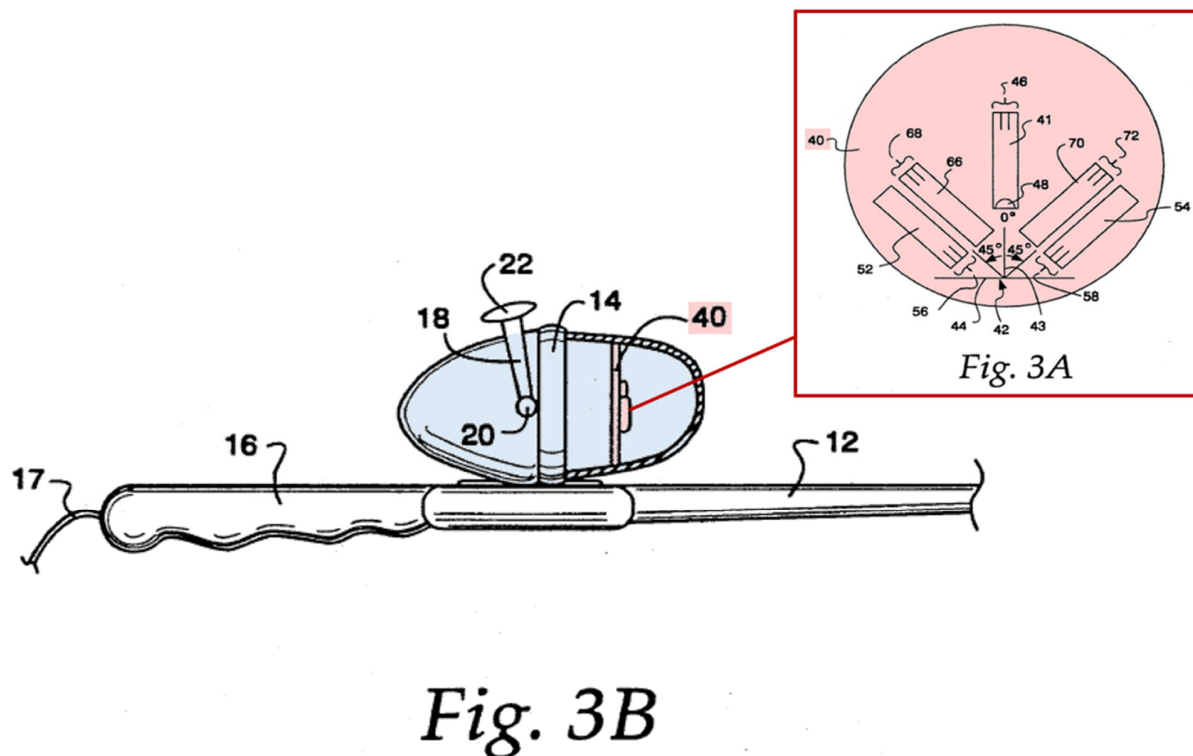
(*Id.*, Fig. 5.) Dornbusch also discloses that the mercury switches can determine whether “the rod is in the upright position[.]” (*Id.*, 8:10-24; *see also id.*, Fig. 4.)

244. Further, Dornbusch discloses that the orientation measured by the control circuit containing mercury switches can be used as an input to control the direction of a virtual boat or fishing line. (Dornbusch, 9:22-24 (“To move the boat, the game player cranks the handle and adjusts the position of the rod and reel to determine direction.”); Abstract (“These features provide an electronic game controller which responds to actual fishing movements typically made during an actual fishing episode such as casting the line and reeling in the line in various directions to avoid natural obstacles.”); 3:16-20 (“The mercury switches are placed

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on the circuit board in specific locations so that the game controller can sense the position of the fishing rod as the rod is moved in various directions by the game player.”.) Thus, the mercury switches disclosed by Dornbusch (along with its associated circuitry) are a “**directional input device**,” since they allow a user to provide directional input (a direction indicated by the orientation of the device).

245. Dornbusch discloses that the mercury switches are “**internally located**.” Dornbusch discloses that the mercury switches are “disposed inside the reel 14.” (Dornbusch, 4:60-62 (emphasis added).) Dornbusch explains that “the circuit board 40 is disc-shaped so that the board 40 can be mounted inside the reel 14.” (*Id.*, 4:62-65.) The “internally located” disc-shaped circuit board is shown in Figure 3A below, and the annotated version of Figure 3B below shows the reel 14 inside which that circuit board is mounted:

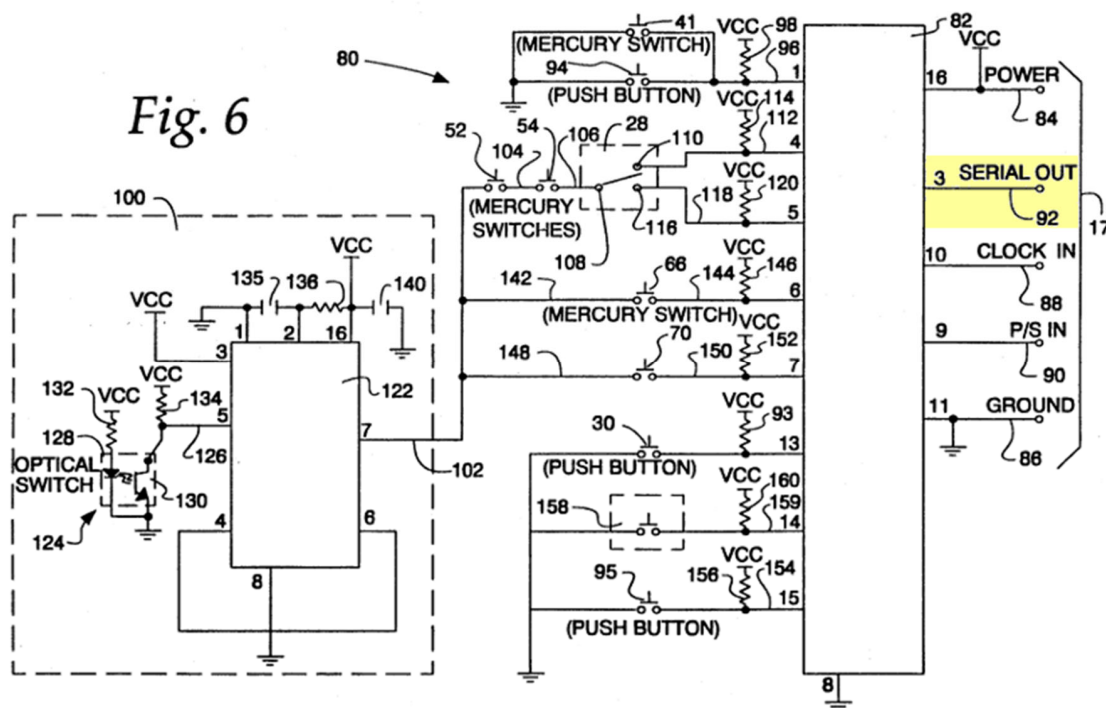


(Dornbusch, Figs. 3A, 3B (annotations added).) Since Dornbusch discloses that its mercury switches are contained inside the fishing rod controller, Dornbusch’s mercury sensors constitute an “**internally located**” directional input device.

246. Dornbusch’s mercury switches are consistent with “**internally located directional input device[s]**” disclosed by the ’731 patent. For example, the ’731 patent discloses a directional input device “embedded in a handheld device” and comprised of a “mercury switch that is used to provide a directional input.” (’731, 5:59-6:21; *see also id.*, 4:8-10 (“[a] circuit closing means, such as a ball bearing or a mercury contact[.]” (emphasis added)), 10:32-33 (“the circuit closing means is a mercury contact”).)

247. Dornbusch's mercury switches "**provid[e] a directional input signal.**"

Dornbusch discloses that "[t]he mercury switches are coupled to electronic circuitry which recognizes the opening and closing of the mercury switches and generates signals for controlling the operation of the game being played." (Dornbusch, 6:28-32.) For example, Dornbusch discloses that the mercury switches on the circuit board connect to an "interface integrated circuit (IC) **82**," which "recognizes the states of the switches in the electronic game controller **10** and converts those states to the serial output signal on the conductor **92** for the game device." (*Id.*, 7:12-15, 6:42-48, 7:5-6; *see also* 7:8-11 ("The signal carried is a serial stream of information whose content is determined based on the state of the switches in the game controller **10**.")) This signal is "recognizable by the game device" that "controls the play of the game." (*Id.*, 7:6-8, 9:36-39; *see also id.*, 3:20-32.) The signal output by Dornbusch's circuitry (e.g., interface integrated circuit (IC) **82** shown below in Dornbusch's Figure 6) is a "**directional input signal**" since it is a signal that carries directional input information through the system's mercury switches:



(Dornbusch, Fig. 6 (highlighting added).)

248. Dornbusch discloses that the signal output by Dornbusch's interface circuitry is a directional input signal that **“correspond[s] to an axis of inclination of the handheld computing device.”** Dornbusch discloses that the signals from its mercury switches, which are reflected in the interface circuitry output signal, correspond to the axis of inclination of the fishing rod controller. For example, Dornbusch discloses that the circuit board **40** containing mercury switches “is disposed inside the reel **14** so that the surface of the board is substantially perpendicular to the longitudinal axis or centerline of the rod **12**.” (Dornbusch, 4:60-62; *see also id.*, 8:10-24 (discussing detection of orientation in an “upright

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position”).) Accordingly, “the position sensing switches indicate the position of the reel **14** with respect to horizontal.” (*Id.*, 4:65-5:2; *see also id.*, 4:60-62.) As a result, the output signal from Dornbusch’s interface circuitry—which “recognizes the states of the switches in the electronic game controller **10** and converts those states to the serial output signal on the conductor **92** for the game device”—corresponds to an axis of inclination of the fishing rod controller—i.e., the inclination of the fishing rod controller with respect to horizontal. (*Id.*, 7:12-15, 6:28-32.)

249. The correspondence between Dornbusch’s directional input signal and **“an axis of inclination of the handheld computing device”** is shown in the “reference coordinate system” in Figure 3A of Dornbusch, which is reproduced below:

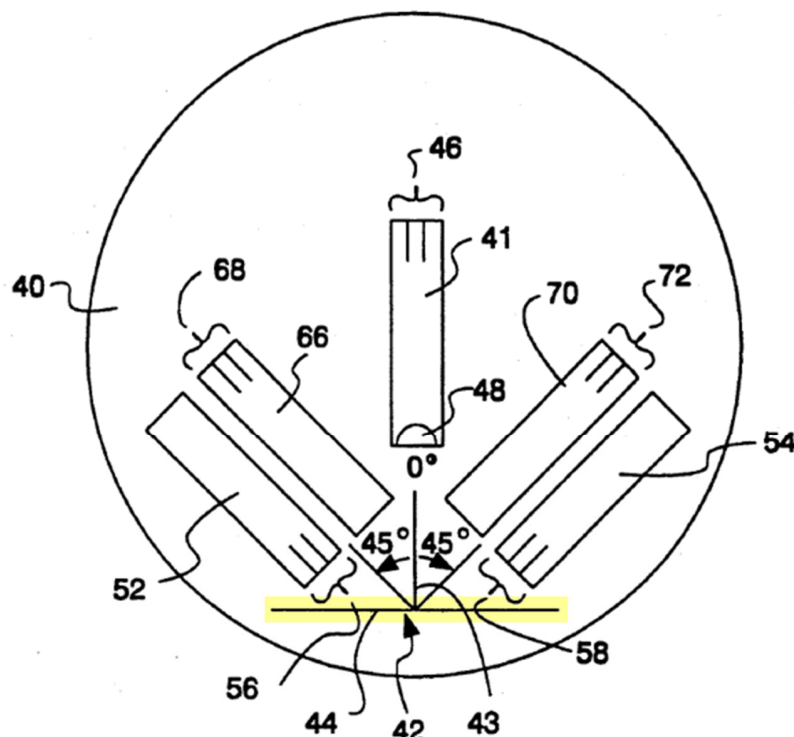


Fig. 3A

(Dornbusch, Fig. 3A (highlighting added), 5:5-11.) Line 44 is a “horizontal reference line ... corresponding to the position of rod 12 and reel 14 when held in a horizontal position.” (*Id.*, 5:5-11.) Dornbusch’s mercury switches are arranged in reference to this horizontal line as shown in Figure 3A. (*Id.*) As a result, when the position of Dornbusch’s fishing rod controller deviates from horizontal, that deviation from horizontal (“**an axis of inclination of the handheld computing device**”) is measured by the mercury switches and output in the interface circuitry output signal.

250. For example, Figure 5 of Dornbusch shows the fishing rod controller in different orientations:

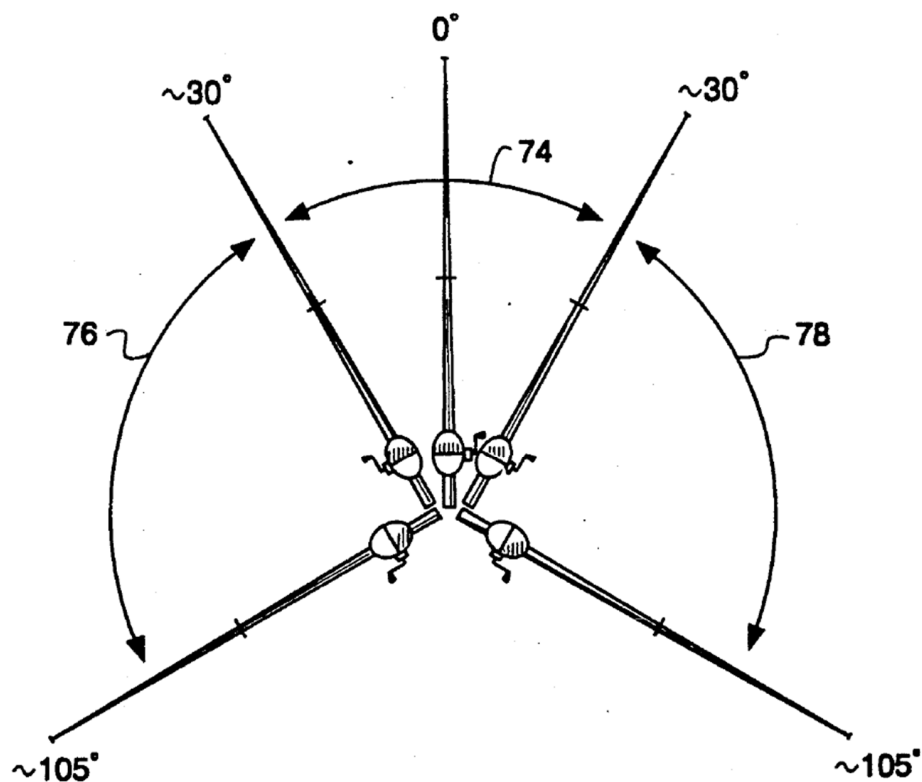


Fig. 5

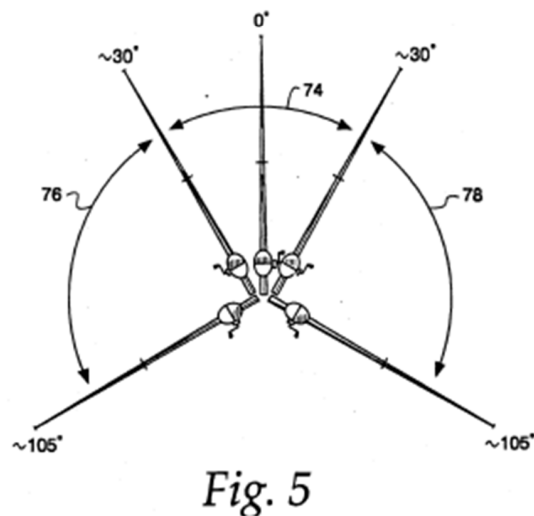
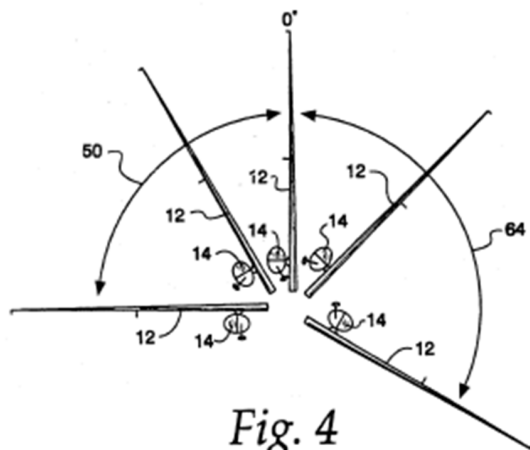
(Dornbusch, Fig. 5.) The specification accompanying Dornbusch's Figure 5 discloses different mercury switches opening and closing depending on the orientation of the fishing rod controller axis of inclination with respect to the horizontal plane (e.g., depending on gravity). (*Id.*, 6:4-34; *see also id.*, Fig. 4, 5:21-33 ("When the rod 12 and reel 14 are positioned within the first zone 50, the first mercury switch 41 is closed, indicating that a cast motion is beginning."); 5:34-54

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(“The second and third mercury switches **52** and **54** are closed when the rod and reel are positioned in a second zone **64** (denoted by a lined arrow) or second casting position corresponding to the forward motion during a cast as illustrated in FIG. 4.”); 5:55-6:3 (“The mercury switches **66** and **70** are positioned on the circuit board **40** so that the pair of contacts **68** and **72** are located towards the top of the board which is opposite the position of the contacts for the second and third mercury switches **52** and **54**.”).) The opening and closing of mercury switches is reflected in the interface circuitry output signal, as discussed above. (*Id.*, 6:25-34 (“The mercury switches are coupled to electronic circuitry which recognizes the opening and closing of the mercury switches and generates signals for controlling the operation of the game being played.”), 7:5-15, 6:42-48.) Accordingly, the interface circuitry output signal **“correspond[s] to an axis of inclination of the handheld device.”**

251. Further, Dornbusch discloses that the output signal from its interface circuitry **“indicat[es] an orientation.”** As I discussed above, the output signal from Dornbusch’s interface circuitry indicates the orientation of the fishing rod controller based on the output of the mercury switches on Dornbusch’s circuit board **40**. (Dornbusch, 7:5-15, 6:25-34, 6:42-48.) Dornbusch discloses that the signals from the mercury switches—and therefore the output signal from the interface circuitry—change based on the orientation of the fishing rod controller, as shown in Figures 4

and 5:



(Dornbusch, Figs. 4, 5, 5:21-6:24.) Each of the different zones shown in Figures 4 and 5 (**50**, **64**, **74**, **76**, and **78**) corresponds to configurations of mercury switches that are activated. (*Id.*, 5:21-6:25.)

252. As noted above, I explained in a related litigation that, in my view, there is a limited subset of the claim scope in which claim 1 is not indefinite. (EX1013.) In my opinion, Dornbusch discloses a “**directional input signal**” that “**indicat[es]**

an orientation” under the limited scope of the claim language in which it is definite—i.e., where the “orientation” refers to the orientation of the “axis of inclination of the handheld computing device.” As discussed above, the output signal from Dornbusch’s interface circuitry indicates the orientation of the fishing rod controller—i.e., the orientation of the fishing rod controller’s axis **44** with respect to the horizontal plane. (*See, e.g.*, Dornbusch, 7:5-15, 6:25-34, 6:42-48, 8:10-24.)

(c) **“a second directional input device providing a second directional input signal, the second directional input signal indicating an amount of displacement”
(Claim 1[c])**

253. It is my opinion that Dornbusch discloses claim 1[c].

254. Dornbusch discloses **“a second directional input device providing a second directional input signal.”** Dornbusch discloses that its fishing rod controller includes a crank input that the user can rotate to control gameplay. (Dornbusch, 8:10-9:68 (“To move the boat, the game player cranks the handle and adjusts the position of the rod and reel to determine direction.”), 10:27-40 (“To work the lure to the left, the rod and reel are tilted to the left to close the fourth mercury switch **66** and at the same time turning the crank **18**.”), 7:48-58 (“To select one of the options by moving up the menu, the crank **18** is turned while the rod is held in an upright position.”), 4:4-47 (“A crank **18** is attached to the reel **14** and rotates

about a pin 20.”), 3:24-35 (“[T]he crank is used to move the lure once the lure has been cast from the reel.”), 2:47-52 (“Once the lure lands in the water, the fisherman moves the lure to attract fish. This motion is caused by either reeling in the lure through the cranking of a handle attached to the reel, by moving the rod from side to side thereby causing the lure to travel from side to side, or both.”).) The crank input is highlighted below in Figure 2 of Dornbusch:

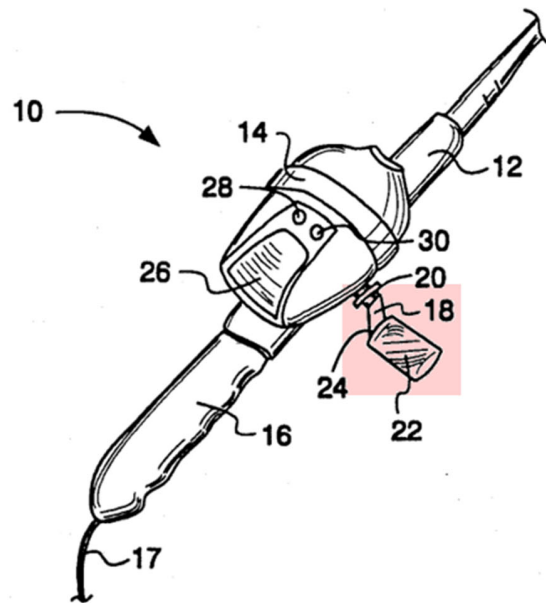


Fig. 2

(Dornbusch, Fig. 2 (highlighting added).)

255. Dornbusch’s crank input is a “**second directional input device.**” For example, the crank input is an “**input device,**” since it allows a user to provide inputs

into the game system, and it is “**directional**” in that it measures the user’s manipulation of the device in a particular direction and is used by Dornbusch’s game device to move a graphical element in a direction. (*See, e.g., id.*, 8:10-9:68, 10:27-40, 2:47-52.)

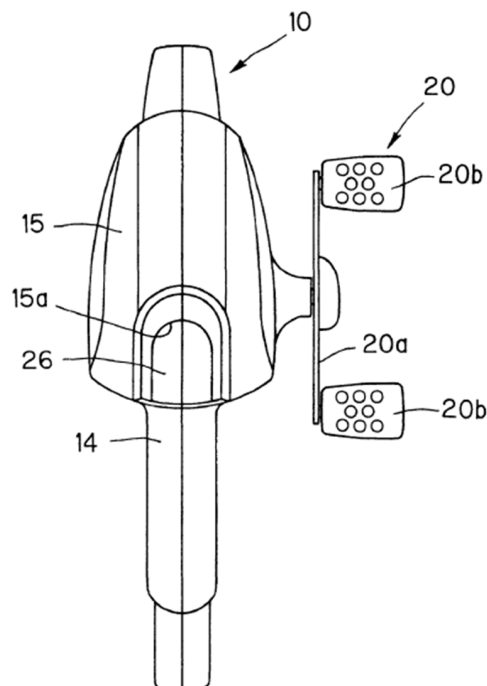
256. Considering the crank input as a “**directional input device**” is consistent with the ’731 patent’s disclosure of similar devices, such as thumbwheels, as examples of “**directional input device[s]**.” For example, claim 15 of the ’731 patent, which depends from claim 1, recites: “The handheld computing device of claim 1, wherein the second directional input device is selected from the group consisting of a button; a roller; a touch surface; and a thumbwheel.” (’731 patent, 10:48-51 (emphasis added); *see also id.*, 1:29-33 (disclosing directional input devices including a “rollerball ... or thumbwheel”); 1:43-46 (“[I]n operations involving the displacement of a cursor on a screen, a handheld device user presses, rolls, touches, or exerts pressure on some directional sensor.”), 2:21-37 (“a thumbwheel is provided on handheld devices for directional input”), 3:12-15).)

Claim 1[c] is Obvious Over Dornbusch in View of Moritome

257. As explained above, Dornbusch discloses a “**second directional input device**.” This limitation is also rendered obvious based on Dornbusch in view of Moritome (EX1010, U.S. Patent No. 6,589,117). Moritome discloses a fishing

game controller with a rotatable handle **20** that can be rotated in either of two directions.

FIG. 3



(Moritome, Fig. 3.) Moritome discloses that the rotation of the handle is measured via two light-emitting devices, which are either blocked or allowed to illuminate photosensors through a slit disc **22** that rotates with the handle. (*Id.*, 7:19-37; *id.*, Fig. 4.) Moritome discloses that “based on differences in phase between the output signals from the two photosensors **23** (specifically, based on a shift in timing when the signals switch between the ON and OFF levels), a rotational direction of the handle **20** can be determined.” (*Id.*, 7:45-50.)

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258. It would have been obvious in light of Moritome for a POSITA to implement Dornbusch's crank to be rotatable in either direction. The combined system would have a crank that could be rotated in either direction and would provide a signal indicating the direction of rotation. Dornbusch's game could then use the directional signals for controlling gameplay—e.g., causing an object to move in one direction when the crank is rotated one way, and causing the object to move in the opposite direction when the crank is rotated the other way.

259. A POSITA would have been **motivated to implement** (e.g., combine) Dornbusch (and Uragami) using **Moritome**, as they are analogous fishing controller patent disclosures. Dornbusch, Uragami, and Moritome disclose fishing game controllers designed to resemble a real-world experience and to simulate a real-world fishing experience, including a crank. Furthermore, Dornbusch (and Uragami) and Moritome measure the rotation of the crank in an analogous way—i.e., via the use of light-emitting devices and photosensors through spaced holes on a rotatable disk.

260. A POSITA would have been motivated to combine Dornbusch/Uragami and Moritome to provide a more realistic fishing experience. A POSITA would have recognized that fishing rods have cranks that can be rotated in either of two directions, allowing for the line to be let out or drawn in.

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Accordingly, a POSITA would have recognized that a fishing game controller with a crank that could be rotated in either of two directions would better simulate real-world fishing.

261. As I explained above, Dornbusch makes clear that realism and authenticity to the experience of real-world fishing is important to its system. For example, in discussing the “Field of the Invention,” Dornbusch discloses that “[t]he controller resembles an actual rod and reel and permits the game player to interact with the controller and the game as if the game player were actually fishing.” (Dornbusch, 1:13-16 (emphasis added); *see also id.*, 1:7-10 (“[t]he electronic game controller responds to actual motion which mimics real motion typically occurring during the performance of a corresponding real event being simulated by the game play”).) Similarly, when discussing electronic games that “mimic real life events,” Dornbusch discloses that such games’ “interaction in real time is intended to give the game player the same feeling as he would experience if he were participating in the real-life event.” (*Id.*, 1:28-30; *see also id.*, 1:40-42 (discussing game controllers that “attempt to give the game player a more realistic experience”).) Indeed, one of the main limitations Dornbusch highlights in prior art fishing video games is the lack of realism:

As can be seen, the realism of the fishing game is substantially

diminished by use of pushbuttons on a box controller. **What is needed is a game controller which more accurately recreates the experience of fishing with a hook, line and sinker.**

(*Id.*, 2:26-30 (emphasis added); *see also id.*, 1:64-2:25.) Furthermore, throughout its disclosure, Dornbusch repeatedly discusses its fishing rod controller and gaming device with reference to aspects of fishing in the real world—suggesting that the real-world fishing experience should be the metric for how a POSITA should approach designing a fishing video game. (*Id.*, 2:53-65 (“The game player operates the present electronic game controller in essentially the same fashion as if actually fishing.”), 4:25-32 (“The game controller 10 is designed to look like an actual rod and reel and to function like a rod and reel under realistic fishing conditions.”), 5:25-30 (“just as in a real casting motion”), 11:24-30 (describing the invention as offering “the game player a realistic fishing experience not present in the prior art game controller”).) Dornbusch’s disclosures would have strongly motivated a POSITA to make further improvement to Dornbusch’s system to create more realism in its fishing game experience.

262. Further, Moritome explains that in fishing games, “how a feeling of operating a fishing rod and a reel is reproduced is an essential factor which attracts player’s interest.” (Moritome, 1:11-13; *see also id.*, 2:5-7 (“thus sufficiently reproducing a feeling of actual fishing”), 2:10-12 (“a feeling of operating a fishing

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reel can be reproduced”).) Moritome further indicates that “an object of the present invention” is “to provide a game system and an input device therefor, which are capable of sufficiently reproducing a feeling of actual fishing with a simple mechanism for inputting operational information.” (*Id.*, 1:48-52.) A POSITA would have been motivated by these disclosures to implement Dornbusch’s crank to allow for rotation in either direction, since it better simulates a real-world fishing experience.

263. Additionally, a POSITA would have been motivated to implement a bidirectional crank in Dornbusch’s controller to simplify Dornbusch’s system. Dornbusch discloses a control button **28** that reverses the direction of in-game motion caused by the crank when depressed. (Dornbusch, 7:53-58, 7:63-8:9, 8:15-24; *id.*, Figs. 2, 6.) A POSITA would have understood that it would be simpler and more intuitive for a user to simply reverse the direction of crank rotation to cause reversed in-game motion. Accordingly, a POSITA would have been motivated to implement a bidirectional crank to replace the control button system and simplify the operation of the Dornbusch controller.

264. In my opinion, a POSITA would have had more than a reasonable expectation of success and could have implemented the proposed combination using conventional techniques without undue experimentation. Dornbusch itself discloses

the use of optical sensors passed through spaced holes in a rotatable disk to determine rotation. (Dornbusch, 8:48-65.) Accordingly, implementing the combination would have simply involved adjusting the optical sensor arrangement per Moritome's disclosures. (Moritome, 7:19-37; *id.*, Fig. 4.)

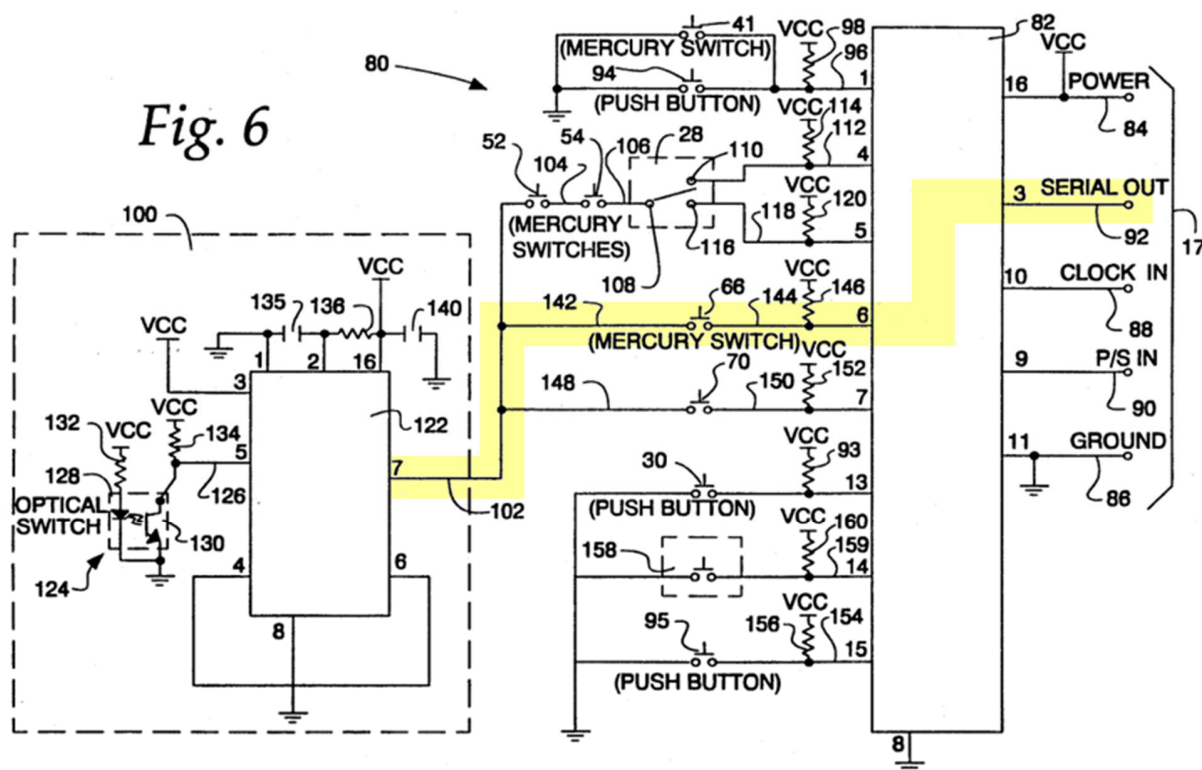
265. Moritome, like Dornbusch and Uragami, is an analogous art to the '731 patent because it relates to motion sensing inputs to an electronic device. (Moritome, Figs. 2-3; *id.*, 1:11-13, 7:19-52, 2:5-7; '731, 1:16-20, 3:54-61.)

266. Accordingly, a **“second directional input device”** is obvious over Dornbusch/Uragami in view of Moritome.

Claim 1[c] is Disclosed by Dornbusch

267. Continuing on with my analysis for Dornbusch, the crank input provides a **“second directional input signal.”** The crank input provides a signal to Dornbusch's interface circuitry, which is then converted into a signal usable by the game device. This converted signal constitutes the **“second directional input signal.”** Specifically, Dornbusch's crank input operates by rotating an “opaque disk” that “includes a number of holes spaced around the periphery of the disk,” causing an optical switch to close whenever the disk rotates to allow the light of the optical switch to go through one of the holes. (Dornbusch, 8:48-65.) Whenever the switch is closed, “a pulse is generated at pin 7 on the conductor **102.**” (*Id.*, 8:60-62.)

Pulses from the crank input are output to Dornbusch’s interface circuitry (for example, via pins **4**, **5**, **6**, or **7**), which then “converts this signal into one recognizable by the game device received over the serial out conductor **92** at pin **3**.” (*Id.*, 9:35-39, 18:19-24, 9:50-54, 9:64-67.) I have shown an example signal path from the crank input to the output of the interface circuitry in Dornbusch’s Figure 6 below:



(*Id.*, Fig. 6 (highlighting added).)

268. The output signal provided by Dornbusch's interface circuitry includes a **“second directional input signal indicating an amount of displacement.”** The

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rotation of the crank is measured by a photosensor system, where light is passed through spaced holes on a rotatable disk, and “[e]ach time one of the holes passes between the optical source **128** and the optical sensor **130**, the optical switch **124** is closed” and “a pulse is generated at pin 7[.]” (Dornbusch, 8:57-62.) Further, Dornbusch discloses that a high state for pins **6** or **7** of the interface circuitry causes a graphical element like a boat or a lure to “move to the left” or “move to the right.” (Dornbusch, 9:40-68 (describing boat control), 10:28-38 (indicating that lure control “utilizes the same technique as directing the travel of the boat”).) Thus, the signal indicating crank displacement indicates an “**amount of displacement**” of a graphical element in the game. Further, Dornbusch discloses that when the crank is rotated on a menu screen, “[e]ach time a pulse is generated by the pulse circuit **100** in response to the crank, the cursor moves up one selection in the menu.” (Dornbusch, 8:10-24 (emphasis added).) This moving up of “one selection” is an “**amount of displacement**” (i.e., rather than moving two selections up, etc.).

269. Dornbusch’s interface circuitry provides both a “**directional input signal**” and a “**second directional input signal.**” Dornbusch’s interface circuitry provides a serial output signal, serving as a “parallel to serial data converter which provides for the sensing of eight inputs”—i.e., the eight input pins shown in Figure 6 (pins **1, 4, 5, 6, 7, 13, 14, and 15**). (Dornbusch, 6:46-48.) In other words,

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Dornbusch's interface circuitry takes the signals at its parallel input pins and serializes them across a signal provided over time at pin 3. (*Id.*, 6:63-7:15.) A POSITA would have understood that the serial input signal at a given snapshot in time can be separated into multiple signals, each of which represents the state of an individual one of the eight input pins.

270. At any given time, signal output by the interface circuitry could be separated into a “**directional input signal ... indicating an orientation**” and a “**second directional input signal indicating an amount of displacement.**” For example, Dornbusch discloses that when the fishing rod controller is (1) tilted to the left such that mercury switch 66 is closed and (2) the crank is being rotated, pulses from the crank circuitry can reach input pin 6 of the interface circuitry, causing pin 6 to be in a high state. (Dornbusch, 9:40-54.) Once converted into the serial output signal via the interface circuitry, the signal at pin 6 over time (e.g., rate of pulses) is a “**second directional input signal indicating an amount of displacement.**” Meanwhile, Dornbusch's interface circuitry receives a signal representing the orientation of the device across multiple separate pins—pins 1, 4, 5, 6, and 7, for instance. This overall signal—representing the state of all mercury switches in Dornbusch's device collectively—is provided to the game device in the serial output signal. This overall signal representing the state of all mercury switches is the

“directional input signal ... indicating an orientation.” Similarly, the information at all pins *other* than pin 6 (i.e., the set of states at pins 1, 4, 5, and 7) could be considered to be the **“directional input signal ... indicating an orientation.”** While the high state at pin 6 indicates an orientation of the device to the left, so too do the low states at pins 1, 4, 5, and 7. Accordingly, it is my opinion that Dornbusch’s interface circuitry provides both a **“directional input signal”** and a **“second directional input signal,”** as claim 1 of the ’731 patent requires.

- (d) **“a processor coupled to the internally located directional input device and the second directional input device and operable to receive and process the directional input signal in conjunction with the second directional input signal; and” (Claim 1[d])**

271. It is my opinion that claim 1[d] is disclosed by or obvious over Dornbusch. In the alternative, claim 1[d] would also have been obvious in light of Uragami (EX1009, JPH11-188182).

Dornbusch Renders Obvious Claim 1[d]

272. Dornbusch discloses that its fishing rod controller is coupled to a game device. For example, Dornbusch’s Figure 1 depicts the controller 3 coupled to game device 2 through a wired connection. (Dornbusch, Fig. 1, 3:66-4:11.) Dornbusch discloses a preferred embodiment in which its controller is used with the Nintendo Entertainment System (“NES”) running the fishing game entitled “The Black Bass.”

(*Id.*, 6:39-42.)

273. Dornbusch discloses that such a game device includes “a microprocessor” (“**a processor**”). (Dornbusch, 1:19-23 (“microprocessor”).) Further, as shown in Figure 1, Dornbusch discloses that the device (including the processor) is “**coupled to the internally located directional input device and the second directional input device,**” (which are contained in the controller **3** as discussed above for claims 1[b] and 1[c]), by a wired connection. (*Id.*, Fig. 1, 3:66-4:1.)

274. Dornbusch additionally discloses that the game device (including the processor) is “**operable to receive and process the directional input signal in conjunction with the second directional input signal.**” Dornbusch discloses that the output signal from its interface circuitry (which contains both the first “**directional input signal**” and the “**second directional input signal**” as discussed above for claims 1[b] and 1[c]) is “**receive[d]**” by the game device. Dornbusch discloses that the interface circuitry is coupled to the game device through conductor **92** and “[t]he conductor **92** carries a control signal to the game device which controls the play of the game.” (Dornbusch, 7:5-11; *see also id.*, 9:36-39 (“[T]he interface IC **82** converts this signal into one recognizable by the game device received over the serial out conductor **92** at pin **3**.”), 6:50-53 (“The interface IC **82** senses eight

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inputs on the left hand side of the IC as illustrated and is coupled to the game device on the right hand side through the five conductors of the cable **17**.”), 7:12-15.)

275. Further, Dornbusch discloses that the game device “**process**[es]” the directional input signals. Dornbusch discloses that the output signal from the interface circuitry (including the directional input signals) is “recognizable by the game device.” (Dornbusch, 9:36-39, 9:52-54, 9:66-68.) This indicates that the game device processes the signal, since a POSITA would have understood that a computer system like the game device recognizes a signal through processing. Further, Dornbusch discloses that the signals control or effect gameplay. Since games are executed via the processor in the game device, this means that the processor in the game device has processed the input signals and used them in executing a game. (*Id.*, 7:5-11 (“The conductor **92** carries a control signal to the game device which controls the play of the game.”), 9:30-32 (“The IC **82**, in response, generates a signal on pin **3** which causes the game device to move the boat forward.”), 4:1-4 (“The electronic game controller **3** controls the operation of the game device **2**[.]”), 9:52-54, 9:66-68, 10:12-14.)

276. Further, Dornbusch discloses that the output signal of its interface circuitry is a serial output signal. (Dornbusch, 6:46-48, 7:1-5, 7:8-15.) As Dornbusch indicates, this requires converting the parallel input signals received by

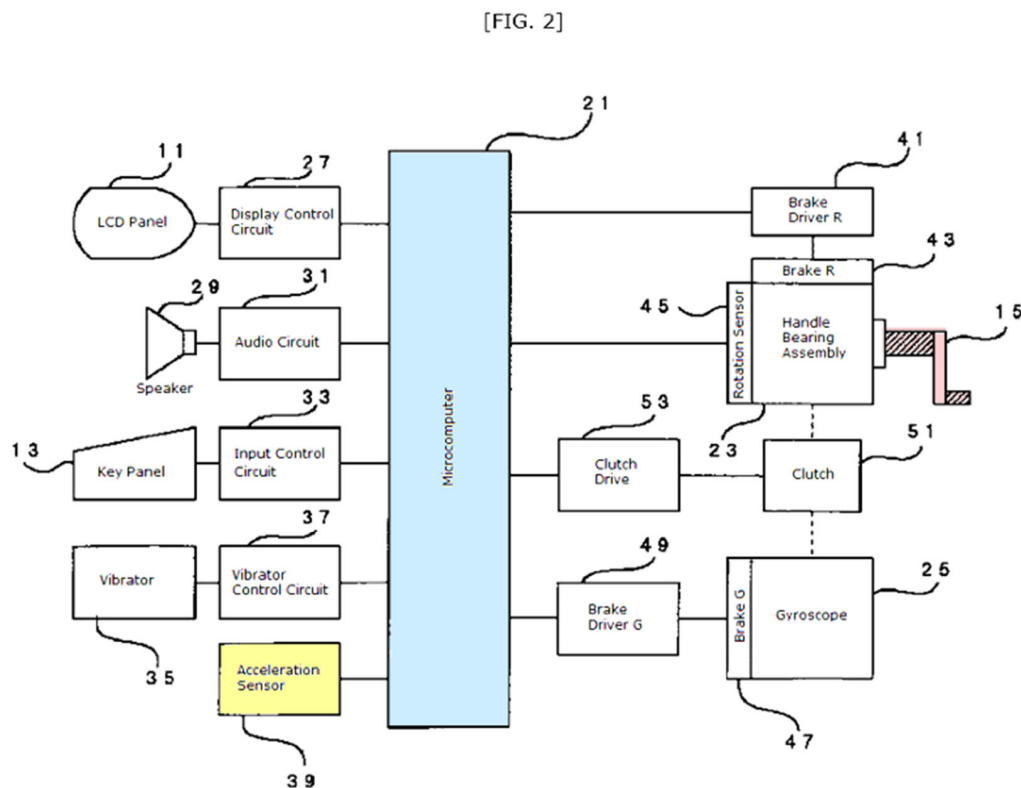
the interface circuitry (at pins **1, 4, 5, 6, 7, 13, 14, and 15**) into a series of signals that represents those parallel input states over time. (*Id.*, 7:1-5 (discussing the interface circuitry’s use of signals to “strobe the IC **82** ... to develop a serial output signal ... as is understood by those skilled in the art”).) Accordingly, Dornbusch’s game device must “**process**” the incoming output signal from the interface circuitry (i.e., determine high and low state timing, etc.) to get it into a form usable by the game device microprocessor.

277. Dornbusch discloses that the first “**directional input signal**” and the “**second directional input signal**” are “**receive[d] and process[ed] ... in conjunction with**” each other. As discussed above for limitation 1[c], Dornbusch discloses that both directional input signals are sent in the same serial output signal, so the receipt and processing of these signals discussed above happen simultaneously or as part of the same processing workflow.

Dornbusch in View of Uragami Renders Obvious Claim 1[d]

278. As discussed above for claim 1[a], it also would have been obvious to implement Dornbusch’s device as a self-contained handheld device in which the display and game device are situated on the handheld device itself, in light of **Uragami**. In the resulting combined system, Dornbusch’s “**processor**” would have been situated in the handheld device, rather than in a separate gaming device.

279. Dornbusch in view of Uragami renders claim 1[d] obvious. Both are fishing rod controllers, where there is a “**processor coupled to the internally located directional input device[.]**” Uragami teaches a “processor coupled to the internally located directional input device.” For example, Uragami discloses a **microcomputer 21** as part of its internal hardware design, as shown in Figure 2, reproduced below:



(Uragami, Fig. 2 (highlighting added), [0012]-[0014].) Uragami’s microcomputer **21** contains a “CPU” (“**processor**”). (*Id.*, [0012].) Uragami further discloses that its **microcomputer 21** receives and processes signals from both its **acceleration**

sensor 39, which tracks the motion of the device, and the circuitry associated with the reel handle 15. (*Id.*, [0013]-[0014].) Accordingly, it would have been obvious in light of Uragami to implement Dornbusch such that “**a processor coupled to the internally located directional input device and the second directional input device and operable to receive and process the directional input signal in conjunction with the second directional input signal[.]**”

280. My analysis for the Dornbusch-Uragami combination is above in my discussion of claim 1[a]. Under the combination, using the hand held fishing rod controller, the player controls the game, which is displayed on the display screen. (Dornbusch, 4:1-7.) The processor is receiving and processing the signals to ensure realistic gameplay.

Dornbusch in View of Uragami and Moritome Renders Obvious Claim 1[d]

281. As discussed above, it would also have been obvious to implement Dornbusch’s crank input (the “**second directional input device**”) as a bidirectional crank per Moritome’s disclosures. In the resulting combined system, the “**processor**” would be “**coupled**” to the bidirectional crank input (the “**second directional input device**”) and receive signals (the “**second directional input signal**”) from the bidirectional crank input.

- (e) **“a memory subsystem, the memory storing an operating system executed by the processor to display on the display a graphical user interface for controlling the operation of the handheld computing device, wherein the graphical user interface provides a graphical element” (Claim 1[e])**

282. It is my opinion that claim 1[e] is disclosed by or obvious over Dornbusch. In the alternative, claim 1[e] would also have been obvious in light of Uragami (EX1009, JPH11-188182) and Nakano (EX1026, JP2000-148694A).

283. Claim 1[e] has essentially two parts: (i) **“a memory subsystem, the memory storing an operating system executed by the processor”** and (ii) **“to display on the display a graphical user interface for controlling the operation of the handheld computing device, wherein the graphical user interface provides a graphical element.”** I address each of these parts in turn below.

Dornbusch Renders Obvious Claim 1[e]

284. Starting first with claim 1[e][ii] defined above, Dornbusch discloses an operating system that **“display[s] on the display a graphical user interface for controlling the operation of the handheld computing device, wherein the graphical user interface provides a graphical element.”**

285. As explained above, Dornbusch teaches:

An electronic game controller enables a game player to play a fishing

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game and to control an electronic game device. The electronic game controller resembles an actual rod and reel. The reel includes an electronic circuit for sensing pushbutton switches which are depressed by the game player during game play and for sensing position sensing switches which are activated by the position in which the game controller is held. The reel also includes a crank which controls the switching of an optical switch. These features provide an electronic game controller which responds to actual fishing movements typically made during an actual fishing episode such as casting the line and reeling in the line in various directions to avoid natural obstacles.

(Dornbusch, Abstract (emphasis added).)

286. Dornbusch discloses that its game system generates a graphical display for a fishing game that allows a user to control various graphical elements, including a boat and a lure. For example, Dornbusch discloses that once the “rectangular box containing a game program” is “inserted” into the game device, “game play is started by operating control buttons on the game controller **3**.” (Dornbusch, 4:8-11.) Dornbusch’s disclosed game provides a “**graphical user interface**” in the form of a graphical display that shows a fishing boat or a lure that can be controlled by the user. (*Id.*, 9:21-68 (describing moving the boat graphical element on the display), 2:34-52 (describing moving the lure graphical element), 3:24-35, 4:25-37, 6:18-25, 10:28-52.) The fishing boat and lure constitute “**graphical element[s]**” provided by the “**graphical user interface**.” (*Id.*) This is consistent with the ’731 patent’s

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disclosure that a “graphical interface” can be something “through which options or applications are selected.” (’731, 1:29-31.) Dornbusch’s fishing game displays allow a user to select the option of moving a graphical element in various directions, and ultimately to select various “options” for the location of graphical elements (e.g., a boat or a lure). (*Id.*, 9:21-68, 2:34-52, 3:24-35, 4:25-37, 6:18-25, 10:28-52.)

287. Dornbusch also discloses displaying a “menu containing various options to be selected before game play can begin, such as select lure, move boat, cast, and end the game.” (Dornbusch, 7:22-26.) Considering Dornbusch’s “menu” to be a **“graphical user interface”** is consistent with the ’731 patent’s disclosure that a “graphical interface” is something “through which options or applications are selected.” (’731 patent, 1:29-31.) In Dornbusch’s menu example, the “cursor” that moves up and down the menu constitutes the **“graphical element.”** (Dornbusch, 8:10-24 (disclosing “mov[ing] the cursor up the menu” and “mov[ing] the cursor down the menu”).)

288. Returning back to claim 1[e][i] defined above (i.e., a **“memory subsystem, the memory storing an operating system executed by the processor”**), Dornbusch discloses: “[t]o play a game, a rectangular box containing a game program is inserted into the game device 2.” (Dornbusch, 4:7-9.) A POSITA would have understood the rectangular box to refer to a “read-only memory”

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(“ROM”) cartridge inserted into Dornbusch’s video game system. In such a system, a ROM disk or cartridge is inserted into a video game console containing game software. A POSITA would have understood that the ROM cartridge serves as the “memory subsystem” of Dornbusch’s game device, “storing an operating system” (i.e., the game software) “executed by the processor” (i.e., the microprocessor in the game device disclosed by Dornbusch).

289. The fact that the concept of a ROM cartridge would have been well understood by a POSITA is supported by textbooks and dictionaries published well in advance of the alleged 2001 priority date of the ’731 patent. For example, the 1994 *Microsoft Press Computer Dictionary* (2d ed.) (“Microsoft Computer Dictionary”), EX1017) provides the following definition for “ROM cartridge”:

ROM cartridge A plug-in module that contains one or more printer fonts, programs, **games**, or other information stored in ROM (read-only memory). The ROM is in the form of one or more computer chips mounted on a printed circuit board. **The board is enclosed in a plastic case with a connector exposed at one end so that it can easily plug into a** printer, computer, **game system**, or other device. For example, **a cartridge that plugs into a Nintendo or similar game system is a ROM cartridge.** *See also* ROM, ROM card.

(Microsoft Computer Dictionary, p.007 (emphasis added); *see also id.* (defining “ROM” as “Semiconductor-based memory that contains instructions or data that can

be read but not modified.”).) The Microsoft Press Computer dictionary makes clear that several years before the alleged 2001 priority date of the ’731 patent, a POSITA would have understood that a cartridge that plugs into a game system like Dornbusch discloses is a memory device that stores game software instructions. (*Id.*)

290. The Microsoft Press Computer dictionary even indicates that “a cartridge that plugs into a Nintendo or similar game system is a ROM cartridge.” (Microsoft Computer Dictionary, p.007.) Dornbusch explicitly contemplates implementing its system on a Nintendo Entertainment System (“NES”) game system, including while running the “fishing game entitled ‘The Black Bass’ by HOT-B U.S.A. Inc.” (Dornbusch, 6:39-42.) A POSITA would have understood that the “Black Bass” fishing game is a ROM cartridge, which serves as a **“memory subsystem, the memory storing an operating system executed by the processor.”** Dornbusch thus teaches and renders obvious a **“memory subsystem, the memory storing an operating system executed by the processor to display on the display a graphical user interface for controlling the operation of the handheld computing device, wherein the graphical user interface provides a graphical element[.]”**

Dornbusch in View of Uragami and Nakano Renders Obvious Claim 1[e]

291. As explained above, Dornbusch discloses an operating system that

“display[s] on the display a graphical user interface for controlling the operation of the handheld computing device, wherein the graphical user interface provides a graphical element.” Uragami, another fishing controller reference, provides detail about the **“memory subsystem, the memory storing an operating system executed by the processor to display on the display.”** As explained above, both Uragami and Dornbusch are fishing controllers. A POSITA would have been motivated to implement Dornbusch’s fishing rod controller with Uragami to simplify Dornbusch’s system. Within the microcomputer **21** (containing Uragami’s **“processor”**), Uragami teaches that various components are contained, including **“a CPU, RAM, ROM, and timer[.]”** (Uragami, [0012].) Uragami further discloses that its device contains a **“game program”** that is **“stored in a non-volatile memory inside the microcontroller 21.”** (*Id.*, [0017].) Uragami discloses that **“[w]hen the game device is turned ON, the microcontroller 21 starts the game program.”** (*Id.*) The game program further provides the instructions for the microcontroller **21**, which **“execut[es] a game program to perform game processing in response to”** the various input signals and **“to display progress in the game processing on the display panel[.]”** (*Id.*, [0008]; *see also id.*, [0021]-[0023], [0026], Claim 1.) In turn, Uragami discloses that the microcontroller **21** **“controls”** and provides **“instructions”** for the entire gaming device. (*Id.*, [0002] (the

microcontroller “controls the entire device,” including based on “instructions from the microcontroller”), [0012]-[0014].) Accordingly, it would have been obvious in light of Uragami’s disclosures to implement Dornbusch’s system such that the handheld device contains a self-contained memory unit that serves as a **“memory subsystem, the memory storing an operating system executed by the processor”** (i.e., in line with Uragami’s disclosure of a game program executed by the microcomputer stored in non-volatile memory).

292. To the extent necessary, Dornbusch in view of Uragami in further view of Nakano renders obvious this limitation. Nakano describes a portable electronic device/child device that includes “a program memory 41a inside and a nonvolatile memory 46. The program memory 41a incorporates an operating system that controls the operation of this child machine.” (Nakano, [0141].) Nakano thus teaches **“a memory subsystem, the memory storing an operating system”** (program memory 41a incorporates an operating system), where the operating system is **“executed by [a] processor”** (microcomputer executes programs under control of the operating system). (*Id.*, [0141]-[0142].) In Nakano, the “operating system [] controls the operation of this child machine” to **“display on the display”** (display means 44) **“a graphical user interface”** (for example, Figures 22-24 show a user interface for the calculator program) **“for controlling the operation of the**

handheld computing device,” (the calculator interface is used to control calculations performed by the child machine) **“wherein the graphical user interface provides a graphical element”** (cursor **307** is a graphical element). (*Id.*, [0141], [0143].)

293. A POSITA would understand or consider it obvious that when Nakano’s operating system is used to execute a remote control program or video game program (*see, e.g.*, Nakano, [0112]-[0114]), it could similarly use a graphical user interface and graphical element appropriate for the remote control program or video game. In view of Nakano, it would have been obvious to a POSITA to include an operating system in the handheld device taught by Dornbusch and Uragami to execute a fishing video game as well as other non-video game programs.

294. Nakano further renders obvious that the operating system can be used to execute software stored in a removable medium (e.g., ROM cartridge, disc, memory card) or downloaded into memory on the device. For example, for the parent video game device, Nakano teaches that an operating system can be used to play games from a removable medium. (Nakano, [0007]-[0008], [0020]-[0021], [0032]-[0034].) For the child device, Nakano teaches that the operating system can be used to execute software (video game or non-video game) downloaded on the device. (*Id.*, [0141]-[0142].) Following Nakano’s teaching, a POSITA would have

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readily understood that an operating system (whether on the main system in Dornbusch or in a portable device in Uragami) can be used to execute game software stored locally or on a removable medium.

295. Dornbusch, Uragami, and Nakano are analogous references. For example, all three references relate to control of a handheld electronic device, including for video game applications. (Dornbusch, 1:13-16; *see also id.*, 1:7-10; Uragami, Fig. 1; *id.*, [0021]; Nakano, [0141]-[0142].)

296. A POSITA would have been motivated to make this combination because the operating system in Nakano allows the device to operate multiple programs—including video games and other non-video game programs—that a user may desire. (Nakano, [0114].) A POSITA would have understood that an operating system would allow a user to use multiple different programs on the handheld device. For example, a user could play multiple fishing games, and the device could incorporate other non-video game software as well. For example, Nakano’s child device includes calculator functionality. (Nakano, [0141]-[0142].)

297. A POSITA would have also been motivated to make the Dornbusch, Uragami, and Nakano combination because a POSITA would have understood that an operating system would be a flexible control means for an electronic device. A POSITA would have understood that an operating system would give users and

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developers significant flexibility in using and creating functionality for the device.

298. Whether the game software is stored locally or on a removable medium is merely a design choice. A POSITA would have had more than a reasonable expectation of success in either case and could have implemented the proposed combination using conventional techniques. For example, Nakano teaches an operating system capable of executing programs that use a graphical user interface, with a graphical element, to control operation of the device. (Nakano, [0112]-[0114].) Further, a POSITA would have considered the combination between Uragami and Nakano straightforward, including because both references discuss software that controls a self-contained electronic device. (Nakano, [0141]-[0142]; Uragami, [0012], [0017].)

299. Nakano is analogous art to the '731 patent because it is directed at a portable electronic device with a display and a memory subsystem. (Nakano, Abstract, [0141]-[0143]; '731, 1:16-20, 3:54-61.)

300. It is thus my opinion that it would have been obvious in light of Uragami (alone or in further view of Nakano) to implement Dornbusch's system as a standalone handheld device including a display, processor, memory, and operating system.

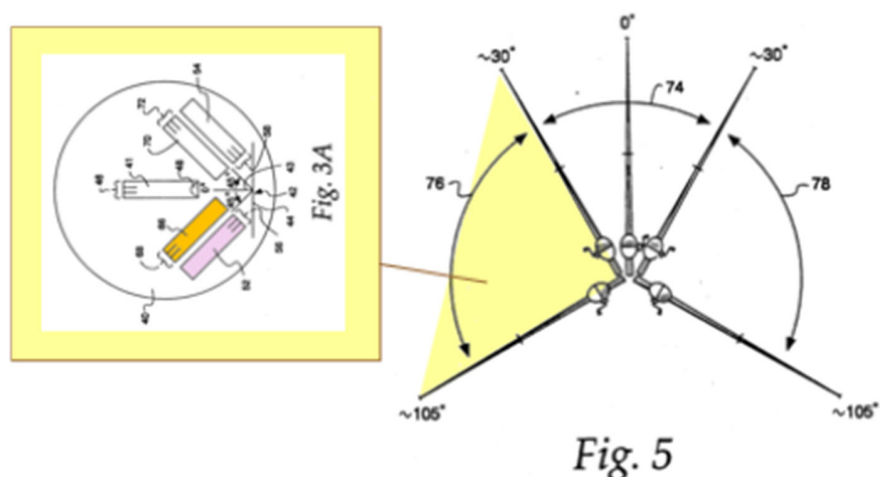
- (f) **“wherein the operating system comprises processor-executable instructions that cause the graphical element to move by the amount of displacement in a direction substantially parallel or substantially perpendicular to the orientation.” (Claim 1[f])**

301. It is my opinion that claim 1[f] is disclosed by or obvious over Dornbusch. In the alternative, claim 1[f] would also have been obvious in light of Uragami (EX1009, JPH11-188182) and Nakano (EX1026, JP2000-148694A).

Dornbusch Renders Obvious Claim 1[f]

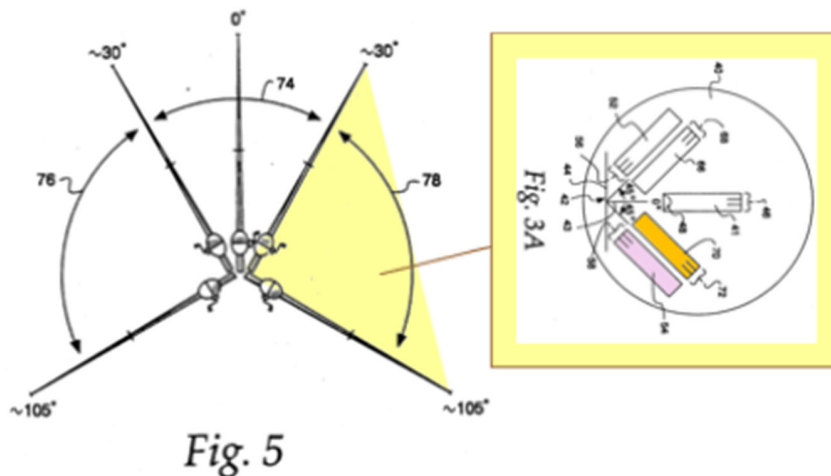
302. Dornbusch discloses that **“the operating system comprises processor-executable instructions.”** As I discussed above, Dornbusch discloses and renders obvious an **“operating system comprise[d of] processor-executable instructions.”** (Dornbusch, 4:7-9; *see also* Microsoft Computer Dictionary, p.007.)

303. Dornbusch discloses that its game system **“causes the graphical element to move by the amount of displacement in a direction [] parallel or [] perpendicular to the orientation.”** For example, Dornbusch discloses that when its sensors indicate that it is tilted to the left and the crank is rotating, it causes a graphical element (a boat or a lure) to move left. (Dornbusch, 9:50-54.) The below demonstrative diagram incorporating Dornbusch’s Figures 3A and 5 shows the set of orientations to the left that cause leftward motion of the graphical element:



(Dornbusch, Figs. 3A, 5 (highlighting added), 6:6-20.) This set of orientations causing leftward motion of the graphical includes the orientation 90 degrees to the left of upright (i.e., the angle shown as 0° in Figure 5). At that 90 degrees left orientation, the movement of the graphical element (boat or lure) to the left is movement **“by the amount of displacement”** (i.e., the amount of displacement indicated by a pulse from the crank circuitry) **“in a direction [] parallel or [] perpendicular to the orientation** (i.e., left—a direction **“parallel”** to the **“orientation”**).

304. As a further example, Dornbusch discloses that when its sensors indicate that it is tilted to the right and the crank is rotating, it causes a graphical element (a boat or a lure) to move right. (Dornbusch, 9:64-68.) The below demonstrative diagram incorporating Dornbusch’s Figures 3A and 5 shows the set of orientations to the right that cause rightward motion of the graphical element:



(Dornbusch, Figs. 3A, 5 (highlighting added), 6:20-25.) This set of orientations causing rightward motion of the graphical includes the orientation 90 degrees to the right of upright (i.e., the angle shown as 0° in Figure 5). At that 90 degrees right orientation, the movement of the graphical element (boat or lure) to the right is movement **“by the amount of displacement”** (i.e., the amount of displacement indicated by a pulse from the crank circuitry) **“in a direction [] parallel or [] perpendicular to the orientation** (i.e., right—a direction **“parallel”** to the **“orientation”**).

305. As another example, Dornbusch discloses that on its “menu” screen, a user can “move the cursor up the menu” by turning the crank **18** “while the rod is in the upright position, which closes the second and third mercury switches **52** and **54**.” (Dornbusch, 8:10-12 (emphasis added); *see also id.*, 8:19-24.) Dornbusch’s disclosures indicate that the set of “upright” orientations includes the case where the

fishing rod controller is pointed straight up. When the fishing rod controller is oriented straight up, the movement of the cursor (a “**graphical element**”) up the menu is movement “**by the amount of displacement**” (i.e., one selection, as indicated by the “**second directional input signal**” derived from the crank output) “**in a direction [] parallel or [] perpendicular to the orientation**” (i.e., up—a direction “**parallel**” to the “**orientation**”).

306. In my opinion, Dornbusch satisfies claim 1[f] under the subset of the claim scope as to which it is my opinion that the claim is definite—i.e., where the direction of movement of a graphical element is *parallel or perpendicular* to the orientation. As I discussed above, Dornbusch describes various graphical elements that move “parallel to the orientation” of the fishing rod controller.

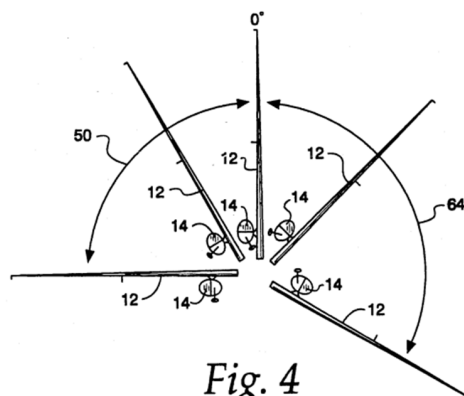


Fig. 4

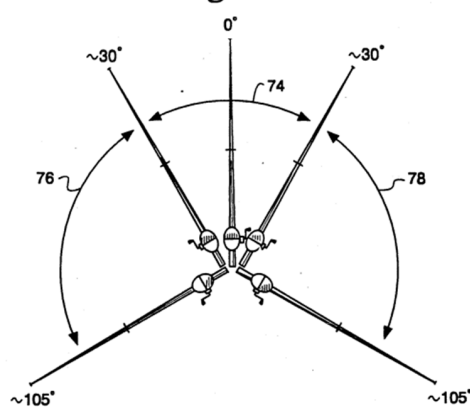


Fig. 5

(Dornbusch, Figs. 4, 5; *id.*, 5:21-6:24.)

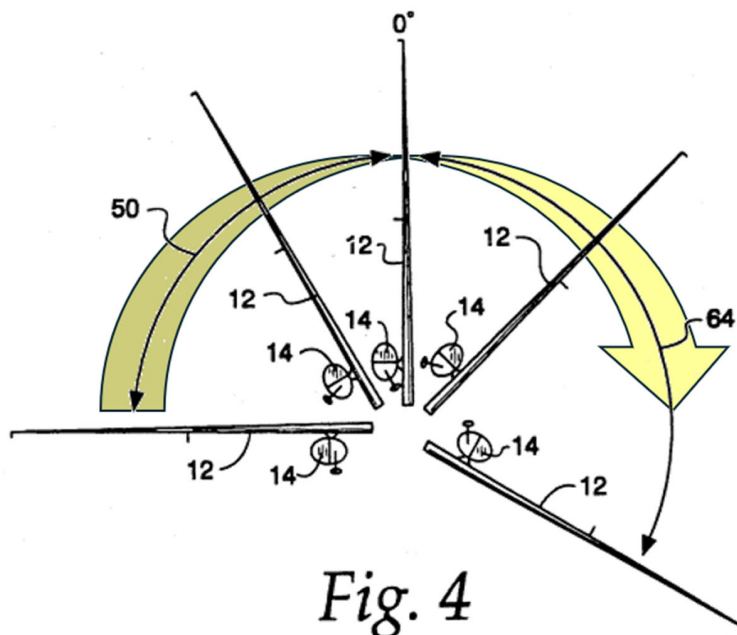
307. As noted above, in the related district court litigation, I submitted a declaration providing my opinion that claim 1 of the '731 patent is indefinite as to its full scope, including because of the claim language “substantially parallel or substantially perpendicular to the orientation.” (EX1013 (8/6/25 Polish Decl.), ¶¶ 25, 32, 37; EX1025.) I also explained in that declaration that, in my view, there is a limited subset of the claim scope in which claim 1 is not indefinite. (*Id.*) In my opinion, Dornbusch satisfies claim 1[f] under the subset of the claim scope as to

which it is my opinion that the claim is definite—i.e., where the direction of movement of a graphical element is *parallel or perpendicular* to the orientation. As I discussed above, Dornbusch describes various graphical elements that move “parallel to the orientation” of fishing controller device.

Dornbusch in View of Uragami and Dornbusch in View of Uragami and Nakano Renders Obvious Claim 1[f]

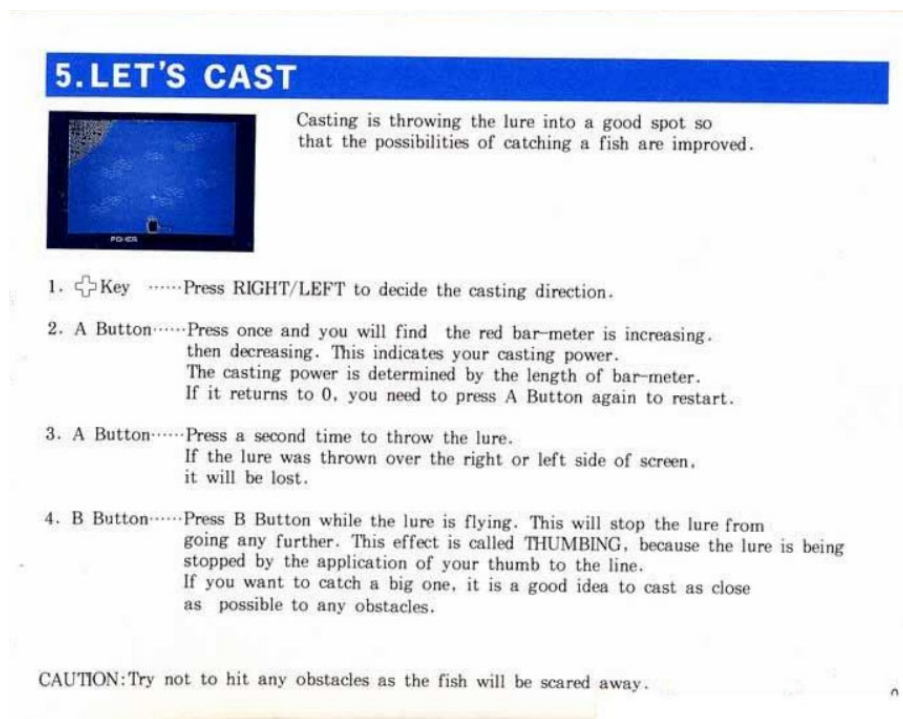
308. As explained above, it also would have been obvious to implement an “**operating system comprise[d of] processor-executable instructions**” in light of Uragami and Dornbusch together. (Uragami, [0017], [0008], [0012].) Further, as explained above, it would have been obvious to implement an “**operating system comprise[d of] processor-executable instructions**” in light of Dornbusch, Uragami, and Nakano.

309. Additionally, it would have been understood and/or obvious from Dornbusch in view of Uragami that the series of movements used to simulate casting would be used with an on-screen casting strength indicator to select casting power. Dornbusch teaches that the game controller can be used to control “casting” by detecting a specific set of movements—such as flicking the user’s wrist so the rod changes from a tilted backward position to a tilted forward position as shown in the annotated Figure 4 below. (Dornbusch, 2:42-44, 5:21-33, 10:1-27, Fig. 4.)



(Dornbusch, Fig. 4 (annotation added).) Dornbusch does not discuss an on-screen casting strength indicator that is used to select casting power. However, Dornbusch states that the game controller is intended to replace the controller typically used for “The Black Bass” game, (*id.*, 4:12-17), which did include an on-screen casting strength indicator (“red bar-meter” that “indicates your casting power”):

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(EX1018, The Black Bass Instruction Manual, p.011.) It would have been obvious to implement this casting strength indicator to move along the bottom or the side of the screen, which would be “by the amount of displacement in a direction [] parallel or [] perpendicular to the orientation” in the combination of Dornbusch and Uragami where the display is contained on the controller device.

2. Dependent Claim 2

310. For reference, claim 2 recites:

2. The handheld computing device of claim 1, wherein the internally-located directional input device comprises:

[a] a primary contact positionally fixed in the handheld computing device;

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- [b] at least one directional contact positionally fixed in the handheld computing device and operatively connected to the primary contact;
- [c] circuit closing means, movable on, and in electrical contact with, the primary contact, the circuit closing means moving in response to inclination of the handheld computing device in the direction of any one of the at least one directional contact, between a neutral position in which the primary contact and the any one of the at least one directional contact form an open circuit, and an active position in which the primary contact and the any one of the at least one directional contact form a closed circuit; and
- [d] a direction interpreter, operatively connected to the primary contact and the at least one directional contact, for generating the directional input signal.

(’731, 9:4-10:9 (Claim 2; bracketed notation (e.g., [a]) added).)

- (a) **“The handheld computing device of claim 1, wherein the internally-located directional input device comprises” (Claim 2[p])**

311. As I discussed above, Dornbusch discloses a handheld computing device comprising an internally-located directional input device—i.e., the mercury switches contained on circuit board **40** shown in Figure 3A:

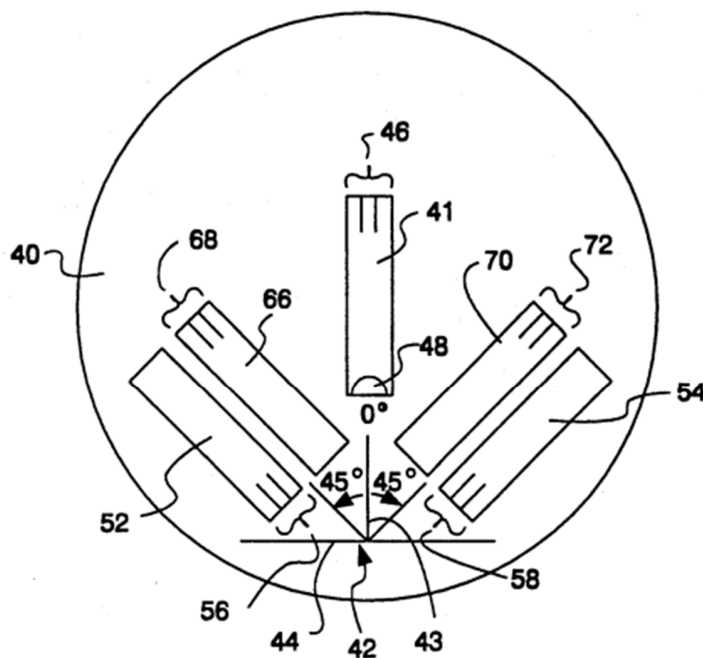


Fig. 3A

(Dornbusch, Fig. 3A.)

(b) “a primary contact positionally fixed in the handheld computing device” (Claim 2[a])

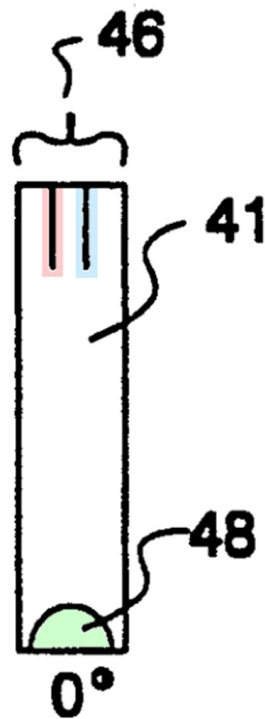
312. Dornbusch discloses that its mercury switches comprise “a **primary contact positionally fixed in the handheld computing device.**”

313. Each mercury switch in the Dornbusch circuit board 40 contains a pair of fixed electrical contacts and a movable drop of mercury that connects the two electrical contacts only when the device is in certain orientations. (Dornbusch, 5:3-15 (“The first mercury switch 41 includes a pair of contacts 46. The contacts 46 are closed when a drop of mercury 48 within switch 41 makes contact with both of the

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contacts **46.**”), 10:7-11 (“In the zone **50**, the first mercury switch **42** is closed. The first mercury switch **41** has one contact connected to ground and the other contact connected to the conductor **96**. Closing the first mercury switch **41** takes pin **1** of the interface IC to ground through the conductor **96.**”), 5:34-37 (“The third mercury switch **54** also includes a pair of contacts **58** located towards the bottom of the circuit board **40**. Each of the second and third mercury switches includes a small drop of mercury as previously described (not shown).”), 3:8-23 (“The mercury switches are placed on the circuit board in specific locations so that the game controller can sense the position of the fishing rod as the rod is moved in various directions by the game player.”), 4:55-5:2.) When the device is not in such orientations, the electrical contacts are not connected. (*Id.*, 5:3-15, 10:7-11, Fig. 3A.)

314. For example, Figure 3A of Dornbusch shows a mercury switch **41** with two electrical contacts **46** and drop of mercury **48**. (*Id.*, 5:3-15 (“The first mercury switch **41** includes a pair of contacts **46**. The contacts **46** are closed when a drop of mercury **48** within switch **41** makes contact with both of the contacts **46.**”).) The mercury switch **41** shown in Figure 3A is oriented such that the drop of mercury **48** does *not* connect the electrical contacts (shown in red and blue below):



(Dornbusch, Fig. 3A (excerpt; highlighting added); *see also id.*, 5:34-37, 10:7-11.)

315. Figure 3A of Dornbusch shows several mercury switches arranged in different directions, shown below in yellow highlighting:

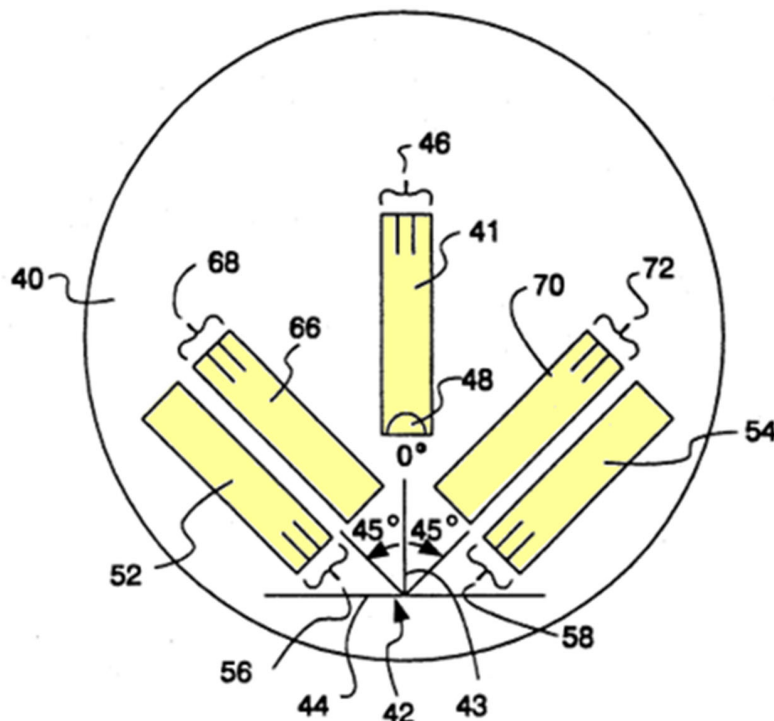


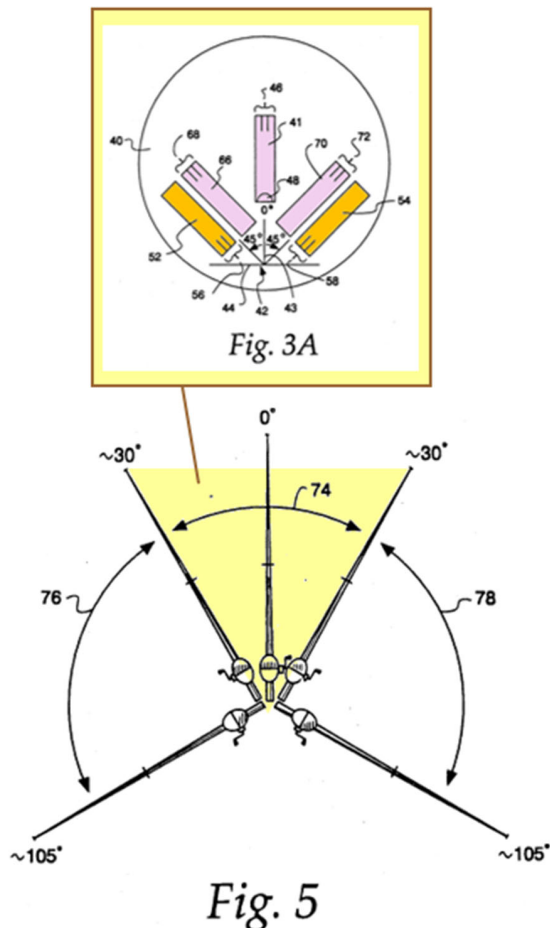
Fig. 3A

(Dornbusch, Fig. 3A (highlighting added).) Each of these mercury switches has its own contacts, its own drop of mercury (not shown in Fig. 3A for switches **52**, **54**, **66**, and **72**), and its own orientation which determines when it is open or closed depending on the orientation of Dornbusch's handheld computing device. (*Id.*, 5:3-15, 5:21-6:34, Figs. 4-5.)

316. Dornbusch discloses that as the handheld computing device changes orientation, the mercury drops in the various mercury switches move within the mercury switches, connecting or disconnecting the circuit between the two contacts

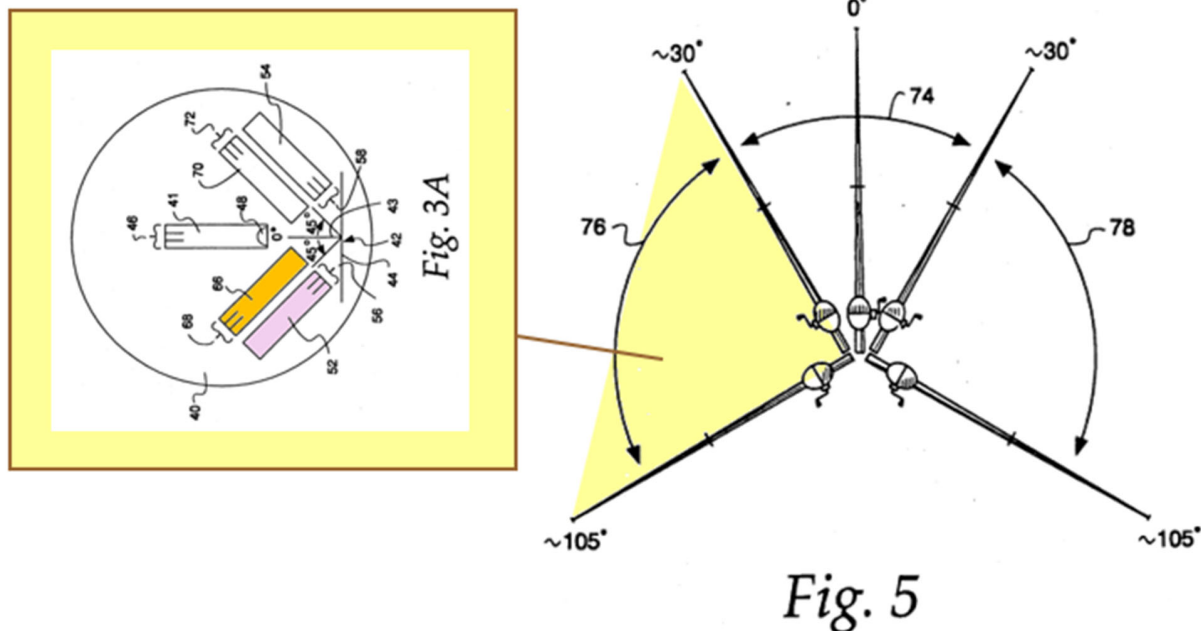
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as they move. For example, Figure 5 shows that for a certain set of orientations (zone 74), “mercury switches 52 and 54 are closed since the small drop of mercury contained therein will be located at the bottom of the glass tubes comprising each of the mercury switches 52 and 54.” (Dornbusch, 6:6-13.) Below I have placed Figure 5 alongside Figure 3A, highlighting the closed switches in orange and the open switches in purple:



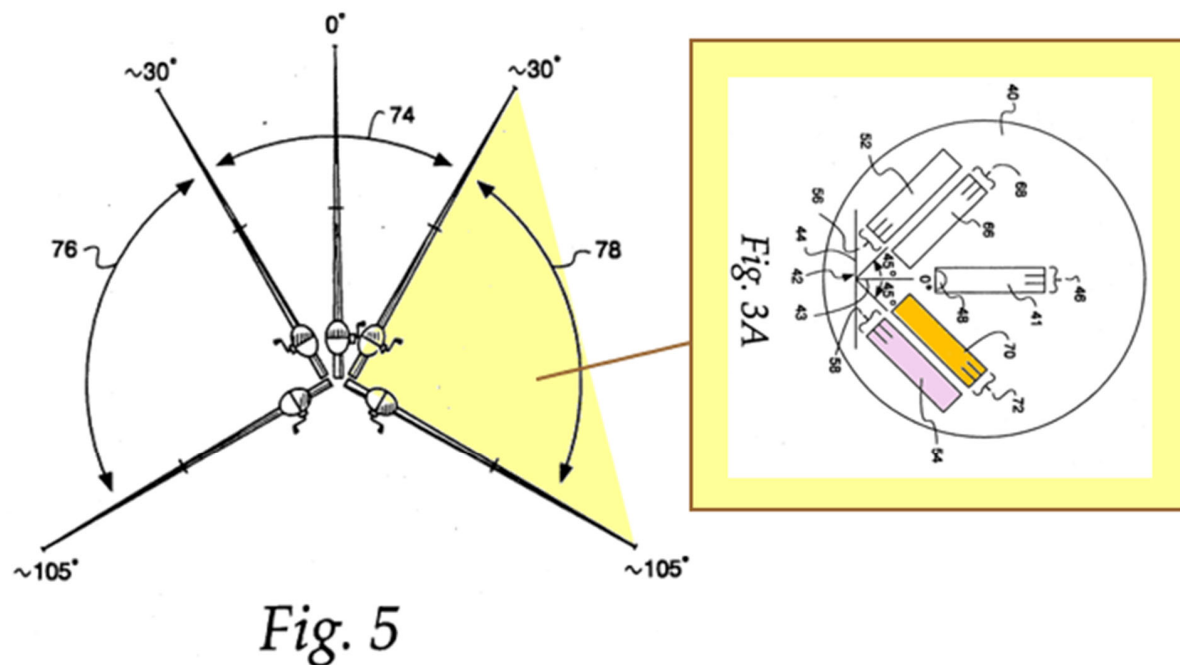
(Dornbusch, Figs. 3A, 5 (highlighting added), 6:6-13.)

317. Dornbusch further discloses that other zones in Figure 5 correspond to various sets of mercury switches being closed. Dornbusch discloses that zone 76 in Figure 5 represents a set of orientations where mercury switch 52 is open and mercury switch 66 is closed. (Dornbusch, 6:13-20 (“A fourth zone 76 (denoted by the lined arrow) illustrates the area where the fourth mercury switch 66 will be closed and the second mercury switch 52 will be open, which extends from approximately 30 degrees to 105 degrees to the left of the 0 degree line.”).) As shown below, that zone represents the set of orientations where the mercury drop in switch 66 falls to the end of the switch with the contacts in that switch, thereby connecting those contacts, and where the mercury drop in switch 52 falls to the other end of that switch where the contacts are *not* located (and so the contacts form an open circuit).



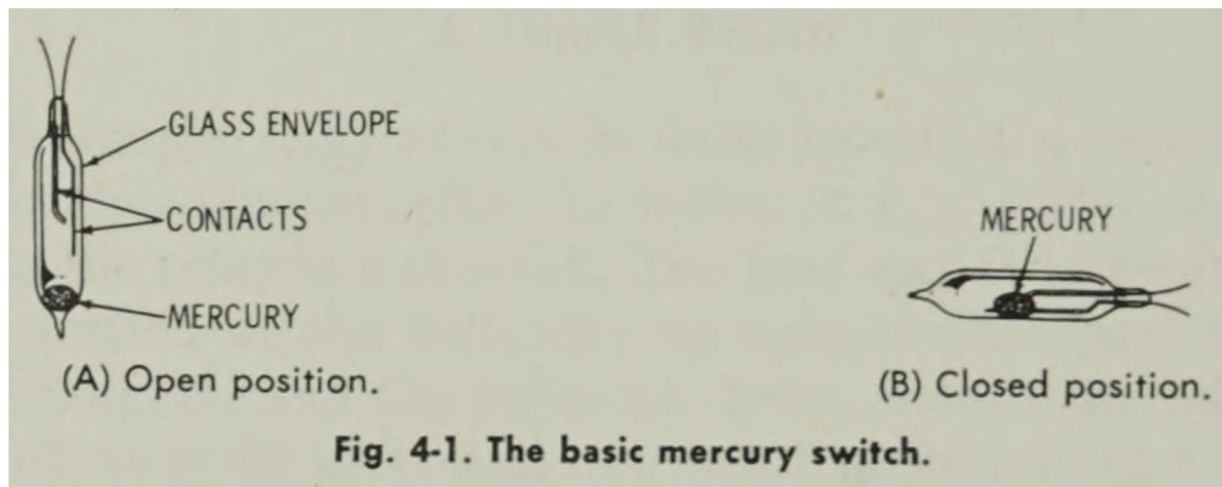
(Dornbusch, Figs. 3A, 5 (highlighting added), 6:6-20.)

318. Dornbusch further discloses that zone **78** in Figure 5 represents a set of orientations where mercury switch **54** is open and mercury switch **72** is closed. (Dornbusch, 6:20-25 (“In the fifth zone **78**, the fifth mercury switch **70** will be closed and the third mercury switch **54** will be open.”).) As shown below, that zone represents the set of orientations where the mercury drop in switch **72** falls to the end of the switch with the contacts in that switch, thereby connecting those contacts, and where the mercury drop in switch **54** falls to the other end of that switch where the contacts are *not* located (and so the contacts form an open circuit).



(Dornbusch, Figs. 3A, 5 (highlighting added), 6:20-25.)

319. A POSITA would have understood that when mercury switch **41** shown in Figure 3A of Dornbusch changes orientation, the mercury drop **48** would move, causing the electrical contacts **46** to electrically connect in certain orientations. For example, a 1970 textbook shows a typical mercury switch that a POSITA would have been familiar with in 2001:



(Shields, *Novel Experiments with Electricity* (1970) (EX1019), p.007.) The textbook states: “In the ‘off’ position, mercury is positioned so that it is not in contact with the contacts. When the switch lever is placed in the ON position, the internal switch is tilted so the mercury makes contact with the contacts.” (*Id.*, p.006.) It is my opinion that this textbook from 1970 (published more than 30 years before the purported priority date of the ’731 patent) reflects the knowledge of a POSITA. For example, the textbook states:

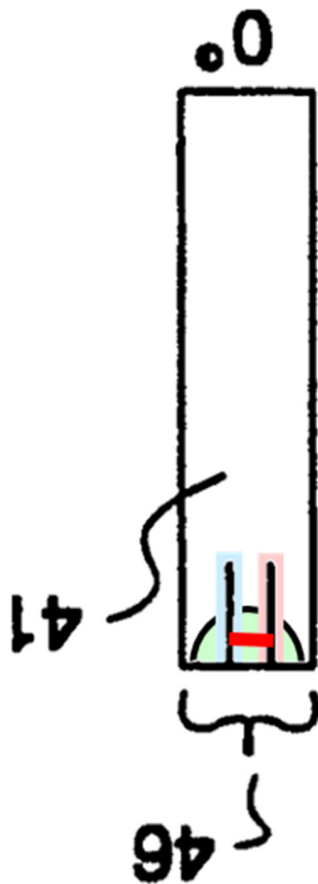
The book is intended to introduce the myriad of the fascinating properties of electricity and magnetism. In the pages that follow, you will find first a brief introduction to the fundamentals of electricity and magnetism.

(*Id.*, Preface, p.003.)

320. The below image shows how a POSITA would have understood mercury switch 41 to operate in an orientation where the contacts 46 are connected

and the switch is “activated”—as indicated by the red line in the below diagram.

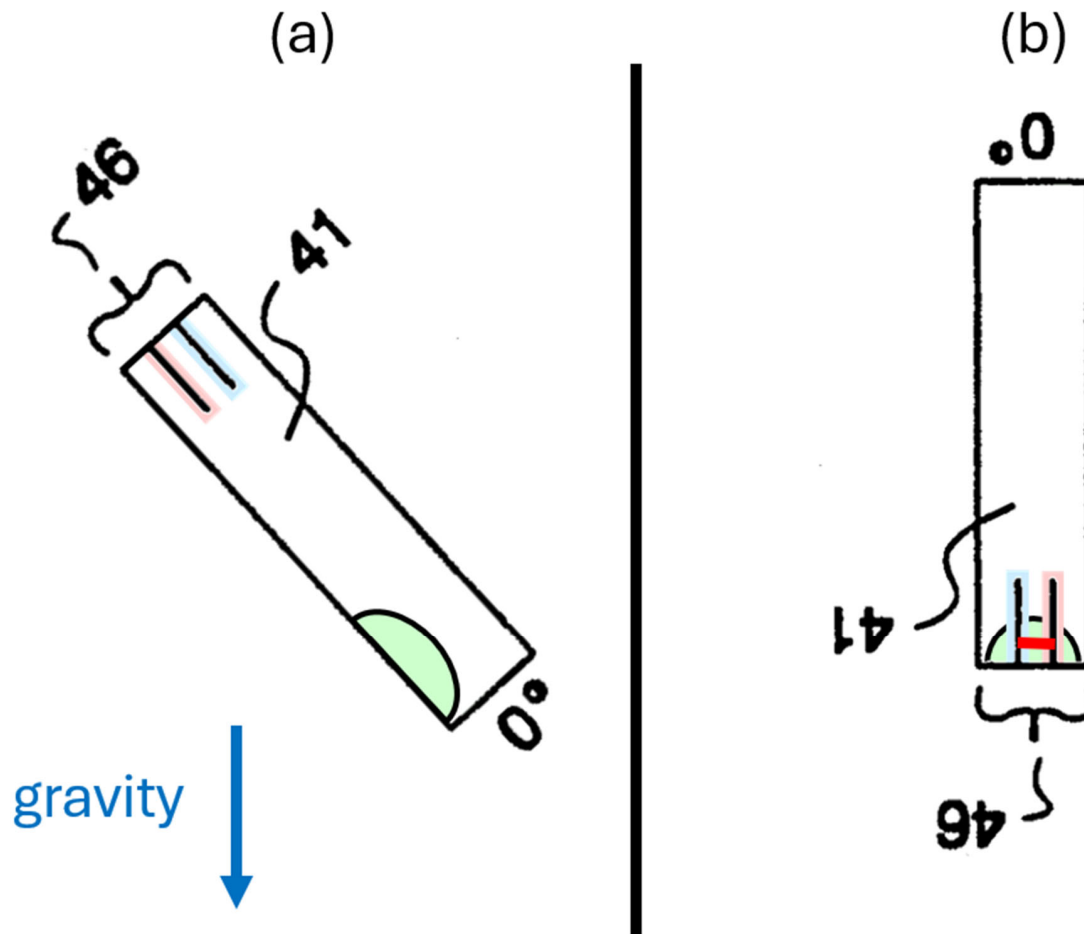
(Dornbusch, 3:54-59.)



(Dornbusch, Fig. 3A (excerpt; highlighting added; modified).)

321. Below I have provided a further diagram to show how a POSITA would have understood the operation of Dornbusch’s mercury switches. In certain orientations (e.g., orientation (a) shown below), gravity pulls the drop of mercury toward the contacts and closes the circuitry, whereas in other orientations (e.g., orientation (b) shown below), gravity pulls the drop of mercury away from the

contacts and opens the circuit:



(Dornbusch, Fig. 3A (excerpt; highlighting and annotations added; modified).)

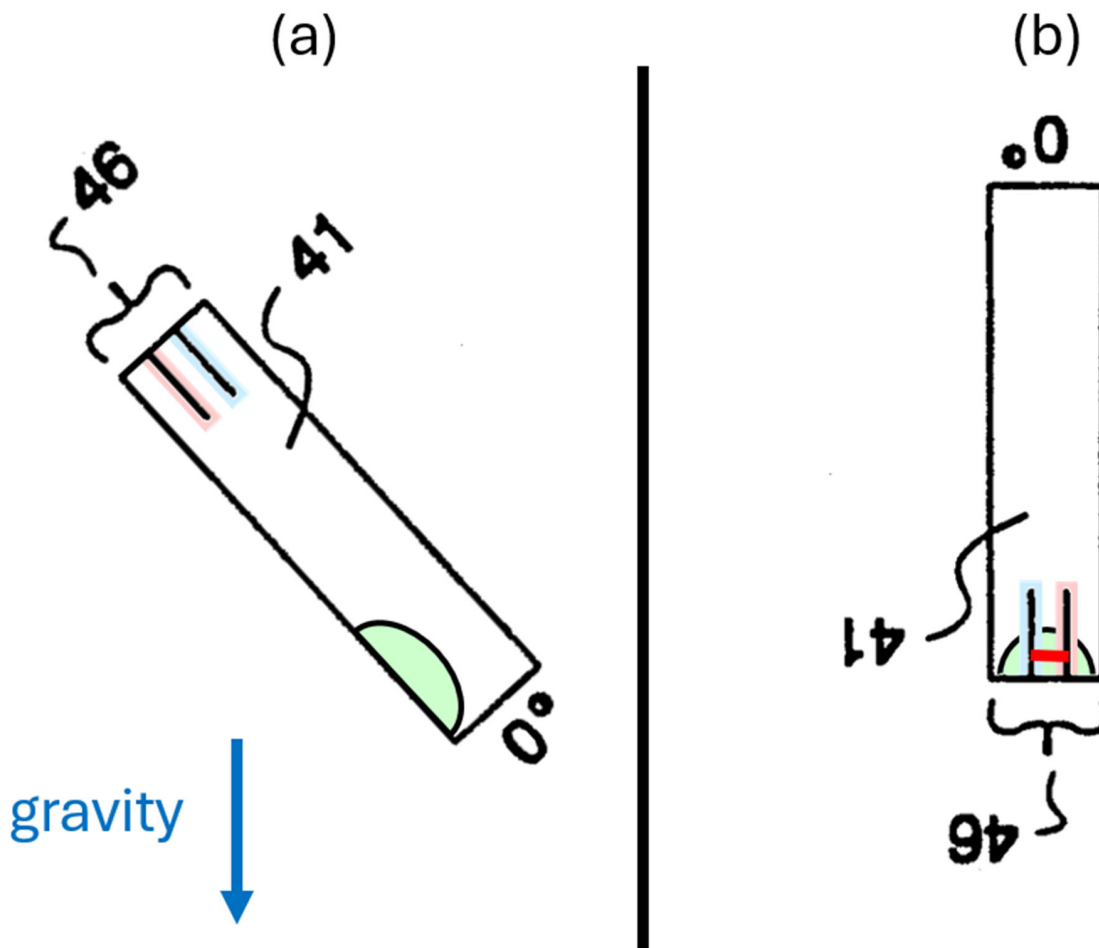
322. Either of the contacts (the red- and blue-highlighted elements in the above diagrams) in any of Dornbusch’s mercury switches is “**a primary contact positionally fixed in the handheld computing device.**” As shown above, each of the contacts 46 (the red- and blue-highlighted elements) in Dornbusch’s mercury switch 41 (or any of its other disclosed mercury switches) is “**positionally fixed in**

the handheld computing device”—i.e., as Dornbusch’s handheld computing device changes position or orientation, the contacts do not change position relative to each other or other positionally fixed elements within the device.

- (c) **“at least one directional contact positionally fixed in the handheld computing device and operatively connected to the primary contact;” (Claim 2[b])**

323. Dornbusch discloses that its mercury switches comprise **“at least one directional contact positionally fixed in the handheld computing device and operatively connected to the primary contact.”**

324. As I discussed above, Dornbusch discloses that each of its mercury switches contains two positionally fixed contacts and a movable drop of mercury. (See, e.g., Dornbusch, 5:3-15, 10:7-11, 5:34-37, 3:8-23, 4:55-5:2.) The contacts are not connected (i.e., an open electrical circuit) at orientations in which the drop of mercury is not connecting them. When the orientation changes such that the drop of mercury closes the circuit between the contacts, then the contacts (highlighted in red and blue below) are connected by the drop of mercury (highlighted in green below), as shown in the below diagram:



(Dornbusch, Fig. 3A (excerpt; highlighting and annotations added; modified).)

325. As I discussed above, either contact (e.g., red- or blue-highlighted above) in any of Dornbusch’s mercury switches constitutes “a **primary contact positionally fixed in the handheld computing device.**” Similarly, either contact constitutes a “**directional contact positionally fixed in the handheld computing device,**” depending on which contact is considered the “**primary contact.**” For example, if the red-highlighted contact above is the “**primary contact,**” then the

blue-highlighted contact is the “**directional contact**”—and vice versa. As I discussed above, either of these contacts is “**positionally fixed in the handheld computing device**,” because as Dornbusch’s handheld computing device changes position or orientation, the contacts do not change position relative to each other or other positionally fixed elements within the device.

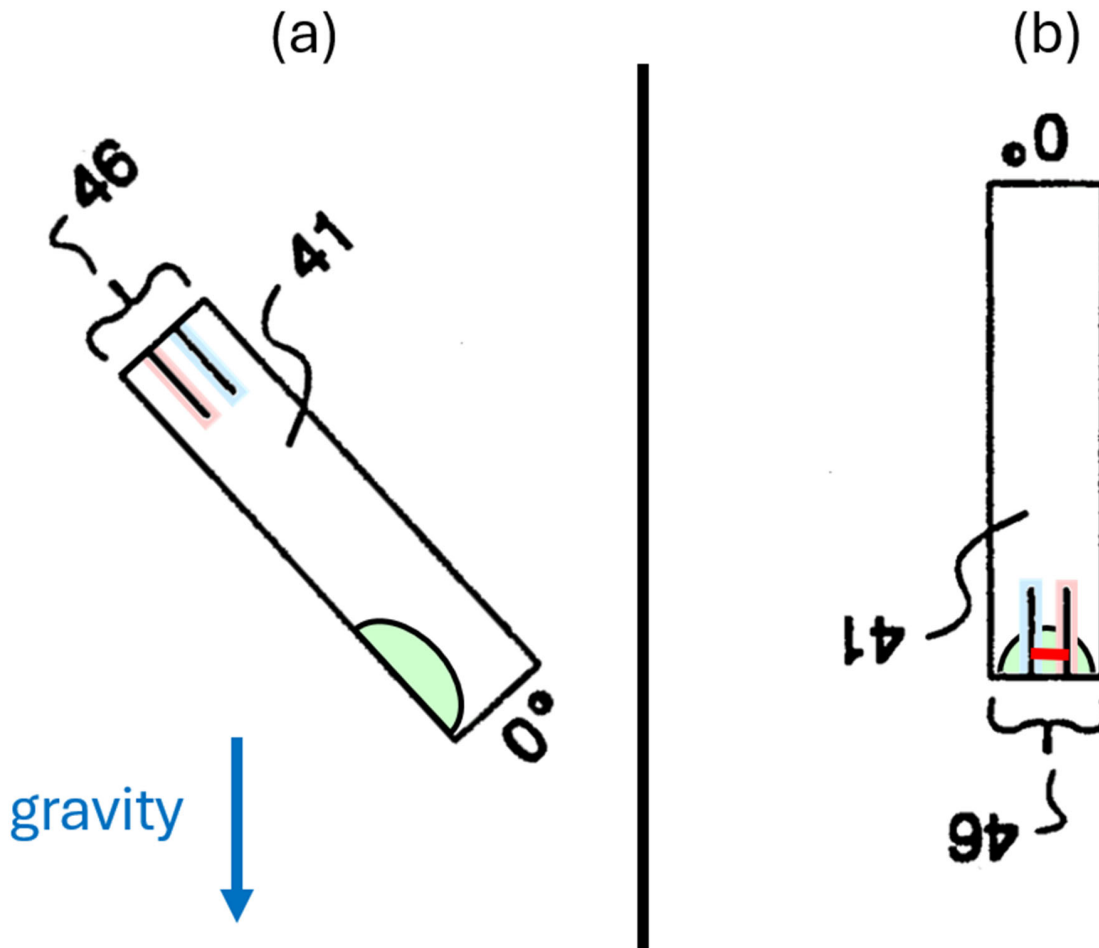
326. Regardless of whether the red- or blue-highlighted contact is the “**directional contact**,” it is “**operatively connected to the primary contact**,” because the two contacts are both fixedly connected to the handheld computing device, so they are “**operatively connected**” through the handheld computing device. (Dornbusch, 5:3-15, 10:7-11, Fig. 3A; *see also* Shields, *Novel Experiments with Electricity* (1970) (EX1019), pp.006-07.) Further, as discussed above, Dornbusch’s two contacts are connected by the drop of mercury in certain orientations, so Dornbusch discloses that they are “**operatively connected**” by the drop of mercury. (*Id.*)

- (d) **“circuit closing means, movable on, and in electrical contact with, the primary contact, the circuit closing means moving in response to inclination of the handheld computing device in the direction of any one of the at least one directional contact, between a neutral position in which the primary contact and the any one of the at least one directional contact form an open circuit, and an active position in which the primary contact and the any one of the at least one directional contact form a closed circuit; and” (Claim 2[c])**

327. Dornbusch discloses that its mercury switches comprise **“circuit closing means, movable on, and in electrical contact with, the primary contact, the circuit closing means moving in response to inclination of the handheld computing device in the direction of any one of the at least one directional contact, between a neutral position in which the primary contact and the any one of the at least one directional contact form an open circuit, and an active position in which the primary contact and the any one of the at least one directional contact form a closed circuit[.]”**

328. As I discussed above, Dornbusch discloses that each of its mercury switches contains two positionally fixed contacts and a movable drop of mercury. (*See, e.g.*, Dornbusch, 5:3-15, 10:7-11, 5:34-37, 3:8-23, 4:55-5:2.) The contacts are not connected (i.e., an open electrical circuit) at orientations in which the drop of mercury is not connecting them. When the orientation changes such that the drop of

mercury closes the circuit between the contacts, then the contacts (highlighted in red and blue below) are connected by the drop of mercury (highlighted in green below), as shown in the below diagram:



(Dornbusch, Fig. 3A (excerpt; highlighting and annotations added; modified).)

329. The drop of mercury in any of Dornbusch's mercury switches is a **“circuit closing means, movable on, and in electrical contact with, the primary contact.”** The drop of mercury is a **“circuit closing means,”** because it closes the

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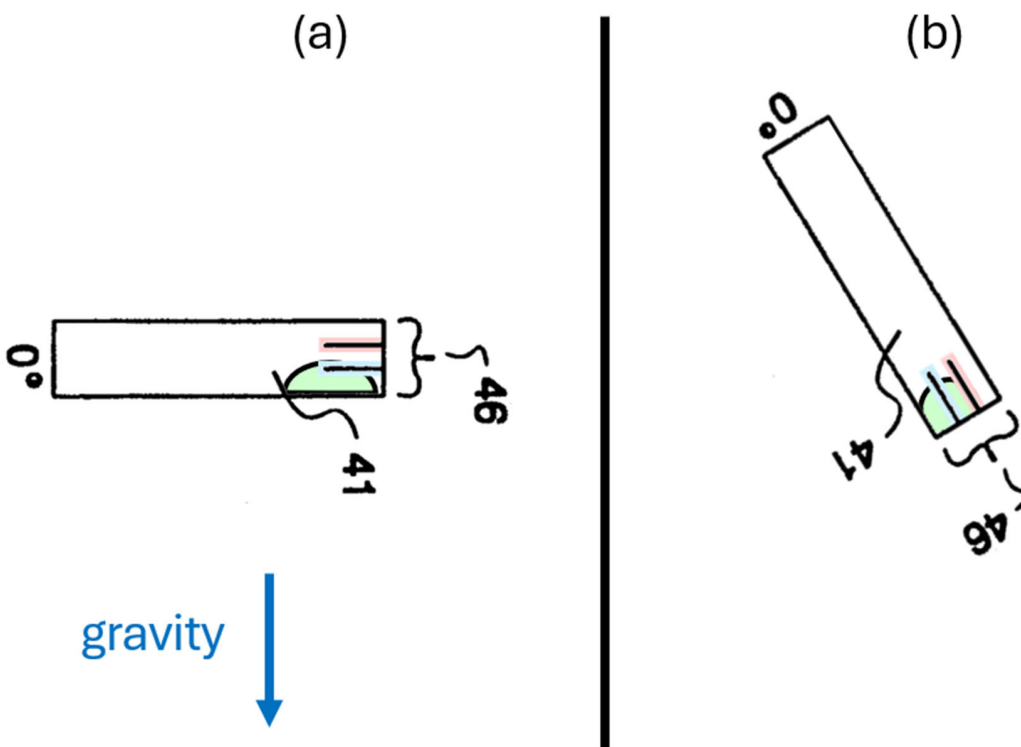
circuit between the contacts of the mercury switch (e.g., contacts **46** in mercury switch **41**). (Dornbusch, 5:13-15 (“The contacts **46** are closed when a drop of mercury **48** within switch **41** makes contact with both of the contacts **46**.”), 6:6-13 (“[T]he second and third mercury switches **52** and **54** are closed since the small drop of mercury contained therein will be located at the bottom of the glass tubes comprising each of the mercury switches **52** and **54**.”).)

330. Dornbusch’s use of a drop of mercury as a “**circuit closing means**” is consistent with the ’731 patent’s disclosures. For example, the ’731 patent discloses an embodiment in which “circuit closing means **25** is a small quantity of mercury that forms a mercury contact.” (’731, 6:17-21; *see also id.*, 4:8-10 (“[a] circuit closing means, such as a ball bearing or a mercury contact.” (emphasis added)), 10:32-33 (“the circuit closing means is a mercury contact”).)

331. I understand that the limitation “**circuit closing means**” appears to be a means-plus-function term. It is my opinion that Dornbusch satisfies the “**circuit closing means**” limitation regardless of whether it is construed as a means-plus-function term. If construed as a means-plus-function term, it is my opinion that the function of the claimed “**circuit closing means**” is to move in response to inclination of the handheld computing device between a neutral position in which the primary contact and a directional contact form an open circuit, and an active position in which

the primary contact and a directional contact form a closed circuit. It is my opinion that the corresponding structure is either a “ball bearing or a mercury contact.” (’731, 4:8-10, 6:12-14, Figs. 1-5.)

332. The drop of mercury is “**movable on**” the “**primary contact**”—i.e., either of the contacts in any of Dornbusch’s mercury switches. The mercury drop in any of Dornbusch’s mercury switches can move along either of the contacts as the switch changes orientation. For example, the below diagrams show two different snapshots in time in which the mercury drop has moved along the blue-highlighted contact **46** within mercury switch **41**.

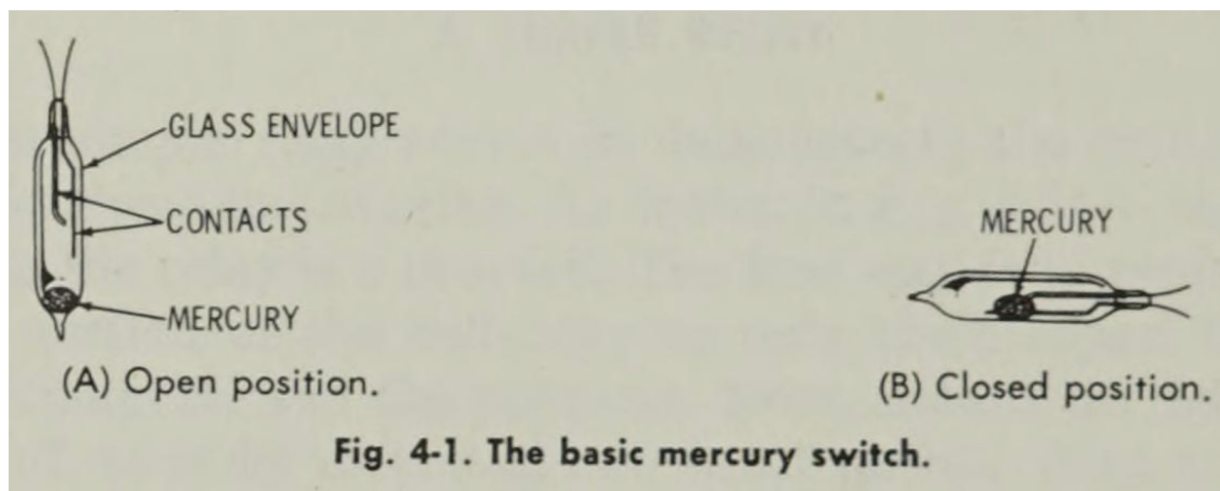


(Dornbusch, Fig. 3A (excerpt; highlighting added; modified).) A POSITA would

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have understood that the drop of mercury could also move along the red-highlighted contact **46** within mercury switch **41**, similar to what the diagrams show above for the blue contact.

333. Such motion of the drop of mercury on the contacts of the mercury switch would have been well-established in the knowledge of a POSITA. For example, the 1970 Shields textbook I discussed above (Shields, *Novel Experiments with Electricity* (1970) (EX1019)) shows (in Fig. 4-1(B)) a mercury drop at one particular point in the mercury switch (toward the middle of the switch) where it is touching the contacts. But there are other locations within the mercury switch where the drop of mercury could be located such that it is in contact with one or both contacts. For example, the drop of mercury could move anywhere on the right side of the tube in Figure 4-1(b) below.



(Shields, *Novel Experiments with Electricity* (1970) (EX1019), p.007.)

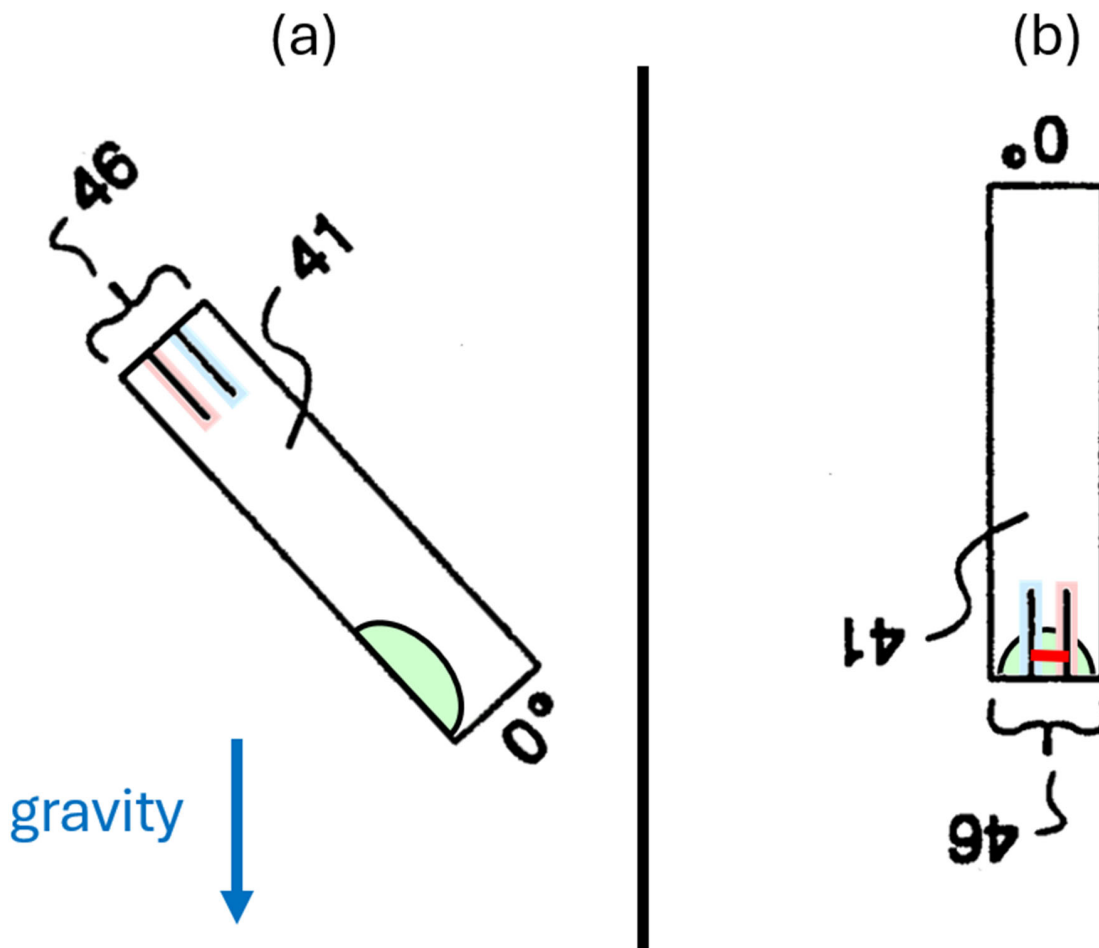
Accordingly, it was well-established in the knowledge of a POSITA that the drop of mercury in a mercury switch is “**movable on**” the electrical contacts of the switch.

334. Dornbusch discloses that the mercury drop in any of its mercury switches is in “**electrical contact with, the primary contact.**” As I discussed above, the mercury drop forms a closed circuit between the two contacts in the mercury switch. (Dornbusch, 5:13-15 (“The contacts **46** are closed when a drop of mercury **48** within switch **41** makes contact with both of the contacts **46**.”), 6:6-13 (“[T]he second and third mercury switches **52** and **54** are closed since the small drop of mercury contained therein will be located at the bottom of the glass tubes comprising each of the mercury switches **52** and **54**.”).) This indicates that the mercury drop is in electrical contact with the primary contact (whether the **red** or **blue** contact in Dornbusch’s mercury switch **41**, for example).

335. Further, the drop of mercury in any of Dornbusch’s mercury switches operates such that it “**mov[es] in response to inclination of the handheld computing device in the direction of any one of the at least one directional contact, between a neutral position in which the primary contact and the any one of the at least one directional contact form an open circuit, and an active position in which the primary contact and the any one of the at least one directional contact form a closed circuit[.]**”

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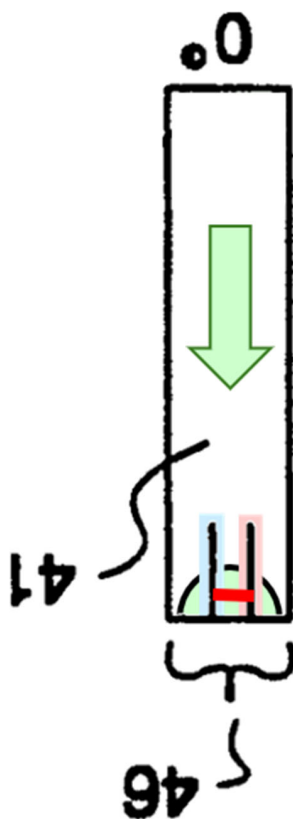
336. As I discussed above, the drop of mercury in Dornbusch's mercury switches **"mov[es] in response to inclination of the handheld computing device."** (Dornbusch, 3:8-23 ("The mercury switches are placed on the circuit board in specific locations so that the game controller can sense the position of the fishing rod as the rod is moved in various directions by the game player."), 5:3-15, 10:7-11, 5:34-37, 4:55-5:2.) For example, this is shown in the diagram below. As the orientation of the mercury switch **41** changes (which depends on the inclination of the handheld computing device), the drop of mercury in the mercury switch moves in response to the inclination—i.e., gravity pulls the drop of mercury to different locations within the mercury switch:



(Dornbusch, Fig. 3A (excerpt; highlighting and annotations added; modified).)

337. Dornbusch further discloses that the drop of mercury in any of its mercury switches moves in response to inclination of the handheld computing device **“in the direction of any one of the at least one directional contact.”** For example, Dornbusch discloses that in certain orientations, the drop of mercury in a given mercury switch moves toward the end of the mercury switch with the electrical contacts, thereby closing a circuit between the two contacts. Figure 3A shows the

result of the movement of the drop of mercury “**in the direction of any one of the at least one directional contact**” (represented by the **green** arrow in the below diagram)—with the drop of mercury touching the directional contact of the mercury switch.



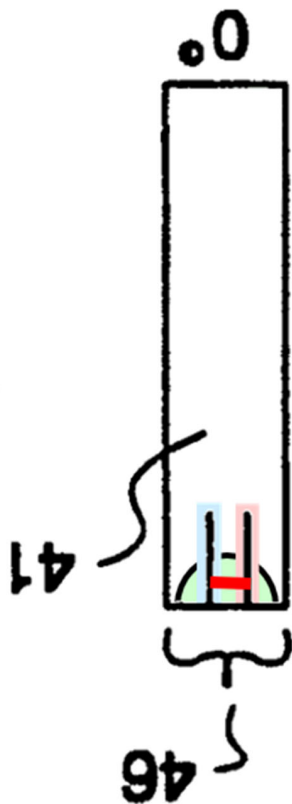
(Dornbusch, Fig. 3A (excerpt; highlighting added; modified).)

338. The above diagram also shows an example (item (a)) of a “**neutral position in which the primary contact and the any one of the at least one directional contact form an open circuit.**” The primary and directional contacts

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in the Dornbusch mercury switch (e.g., the red and blue contacts 46 in the above diagram) form an “**open circuit**”—i.e., they are electrically disconnected from one another. Dornbusch discloses that there are orientations where the drop of mercury in a given mercury switch is positioned such that it is not connected to the mercury switch contacts, and the contacts form an open circuit. (*See, e.g.*, Dornbusch, 6:13-32, 10:20-22, Figs. 3A, 4, 5.)

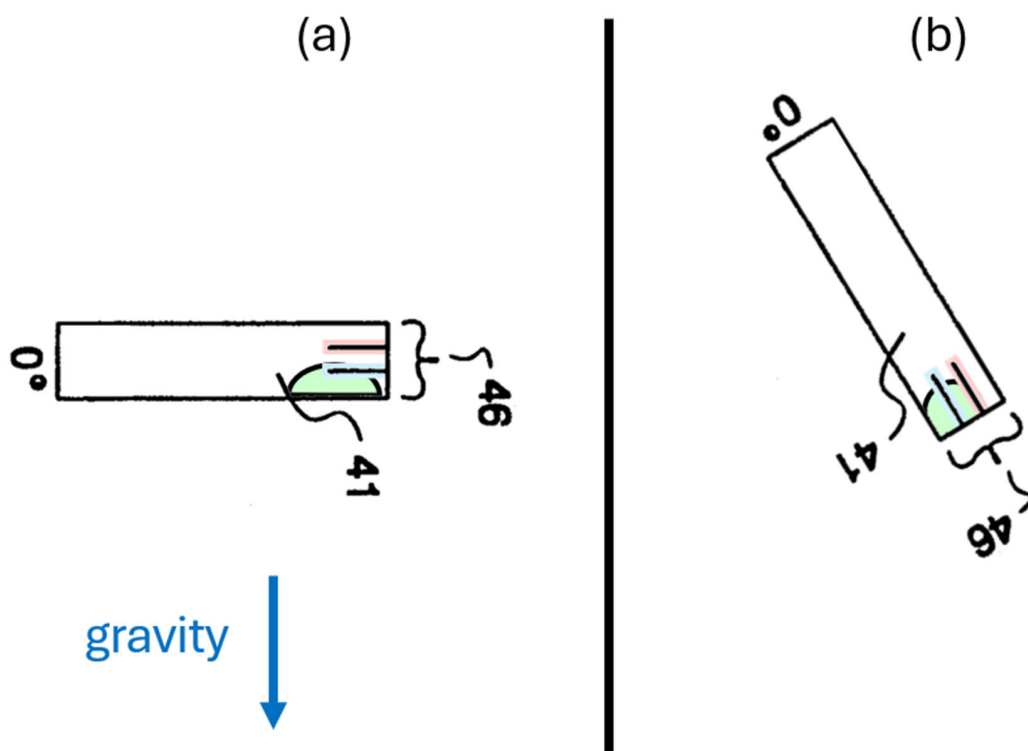
339. Additionally, Dornbusch discloses an “**active position in which the primary contact and the any one of the at least one directional contact form a closed circuit.**” As I discussed above, Dornbusch discloses that the drop of mercury can be in a position in the mercury switch in which it electrically connects the contacts of the switch. One example of such an “**active position**” is shown in Figure 3A, where the mercury drop is located at the very bottom of mercury switch 41 and it closes the circuit between the contacts 46 of that switch:



(Dornbusch, Fig. 3A (excerpt; highlighting added; modified).)

340. To the extent there is any argument that the claim language requires that the “**circuit closing means**” must be in electrical contact with the “**primary contact**” for the claimed “**moving in response to inclination of the handheld computing device in the direction of any one of the at least one directional contact,**” the “**neutral position,**” and the “**active position,**” Dornbusch satisfies the claim limitations viewed according to this understanding. As I discussed above, a POSITA would have understood that the drop of mercury in any of Dornbusch’s mercury switches could be in a variety of positions in the mercury switch while being

in contact with the “**primary contact.**” For example, two such positions (where the blue contact in switch 41 is treated as the “**primary contact**”) are shown in the diagram below—one of which (item (a)) is a “**neutral position**” where the contacts form an open circuit and the other of which (item (b)) is an “**active position**” where the contacts form a closed circuit.

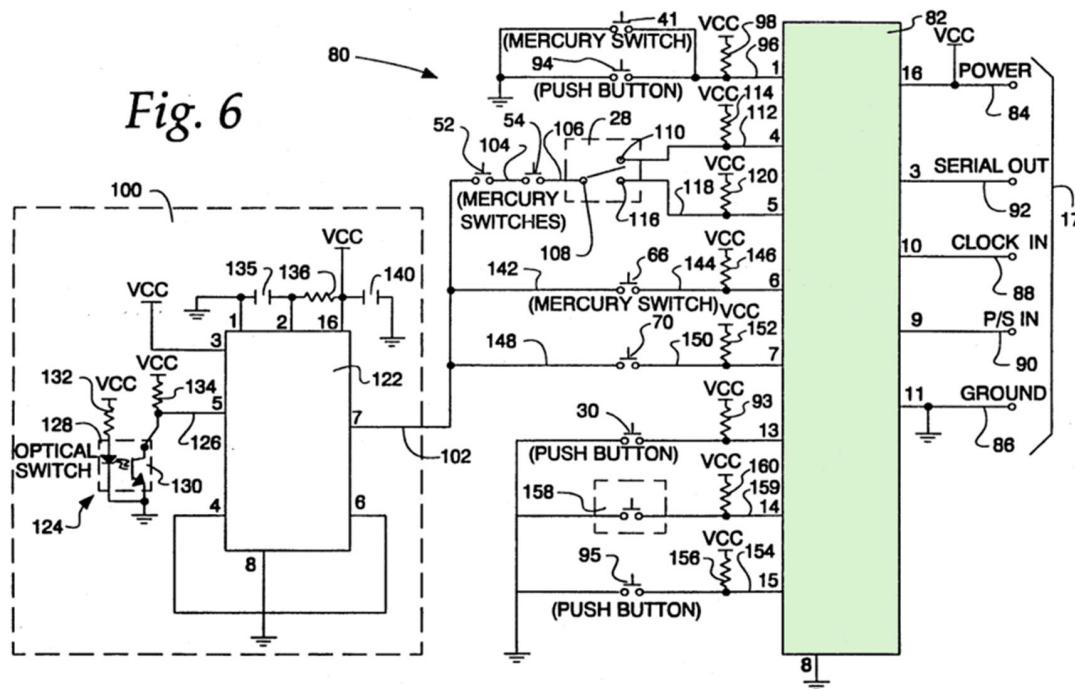


(Dornbusch, Fig. 3A (excerpt; highlighting added; modified).) Between item (a) and item (b), the drop of mercury has “**mov[ed] in response to inclination of the handheld computing device in the direction of any of the at least one directional contact**”—all while being in electrical contact with the “**primary contact.**”

- (e) **“a direction interpreter, operatively connected to the primary contact and the at least one directional contact, for generating the directional input signal.” (Claim 2[d])**

341. Dornbusch discloses **“a direction interpreter, operatively connected to the primary contact and the at least one directional contact, for generating the directional input signal.”**

342. Dornbusch discloses interface circuitry, which is connected to the outputs of the mercury switches in the fishing rod controller and constitute a **“direction interpreter.”** Dornbusch discloses that “interface IC **82** recognizes the states of the switches in the electronic game controller **10** and converts those states to the serial output signal on the conductor **92** for the game device.” (Dornbusch, 7:12-15; *see also id.*, 6:42-53 (describing integrated circuit **82** as “for interfacing between the game device and a plurality of switches including the mercury switches previously described”), 7:1-11, 9:36-39, 9:52-54, 9:66-68, 10:12-14, 6:25-32.) Interface circuitry **82** is highlighted in Dornbusch’s Figure 6 below:



(*Id.*, Fig. 6 (highlighting added).) Specifically, Dornbusch discloses that the interface circuitry takes the signals from the mercury switches and converts them (i.e., it acts as a “**direction interpreter**”) into a signal usable by the game device. (*Id.*, 7:12-15, 6:42-53, 7:1-11, 9:36-39, 9:52-54, 9:66-68, 10:12-14, 6:25-32.)

343. Dornbusch’s interface circuitry is “**operatively connected to the primary contact and the at least one directional contact.**” As Figure 6 above shows, interface circuitry **82** is connected to one end of mercury switches **41**, **54**, **66**, and **70**. (Dornbusch, 7:58-8:1, 8:15-18, 10:7-9, 9:43-52, 9:57-66.) When switch **54** is closed, interface circuitry is also connected to mercury switch **52**. (*Id.*, 7:58-8:1, 8:15-18.) Thus, when the mercury switches on a given path are closed, Dornbusch’s

interface circuitry **82** is “**operatively connected to the primary contact and the at least one directional contact**” of those mercury switches.

344. Dornbusch’s interface circuitry also “**generat[es] the directional input signal.**” Dornbusch outputs a serial output signal on pin **3** to a game device via conductor **92**, which includes signals indicating the states of the mercury switches and serving as a “**directional input signal**” for controlling gameplay. (Dornbusch, 6:42-54 (“The interface IC **82** is a parallel to serial data converter which provides for the sensing of eight inputs.”), 7:1-7 (“The conductor **92** carries a control signal to the game device which controls the play of the game.”), 7:12-15, 9:30-32, 9:36-39, 9:52-54, 9:66-68, 10:12-14; *see also id.*, 4:1-4.)

3. Dependent Claim 3

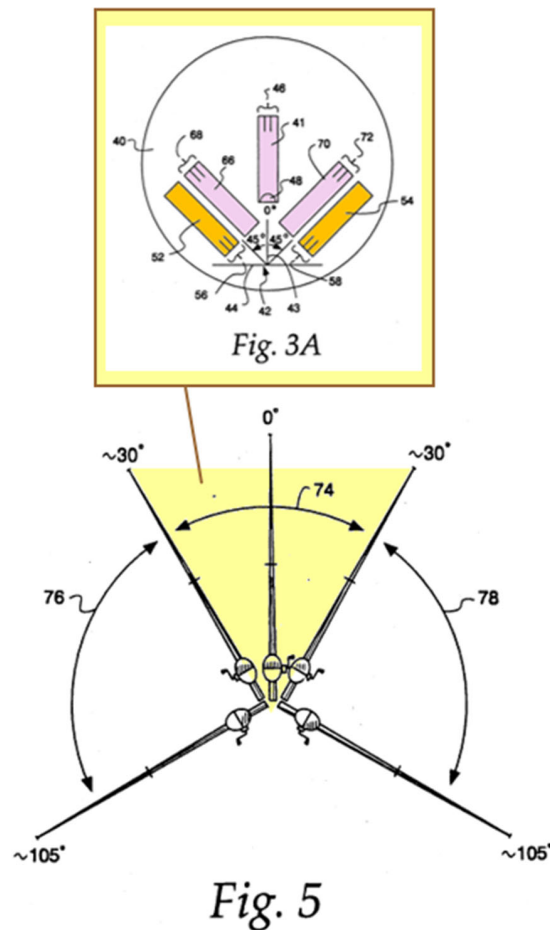
345. For reference, claim 3 recites:

3. The handheld computing device of claim **2**, wherein the directional input signal is uniquely associated with the direction of the inclination.

346. Dornbusch discloses claim 3. For example, Dornbusch discloses that its “**directional input signal**” (i.e., the information in the output signal from the interface circuitry reflecting the state of the mercury switches) is “**uniquely associated with the direction of the inclination.**” The below demonstrative diagrams show unique mercury switch states corresponding to different inclination

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directions, which would be reflected in different “**directional input signal[s]** ...
uniquely associated” with the different inclination directions:



(Dornbusch, Figs. 3A, 5 (highlighting added), 6:6-13.)

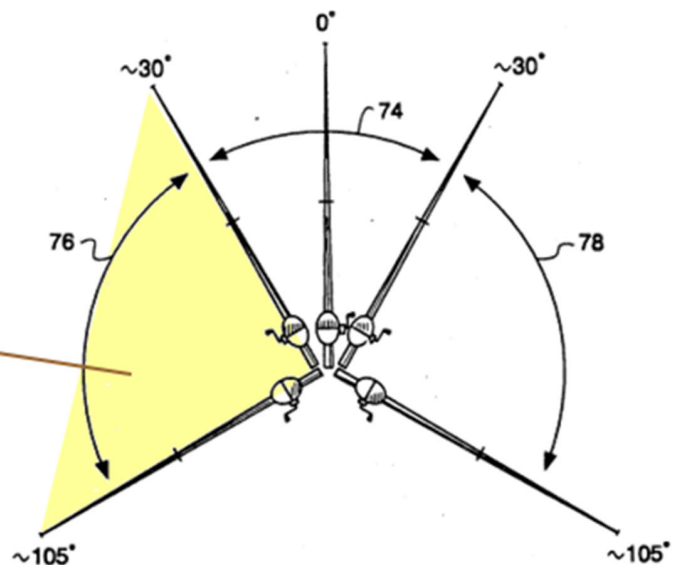
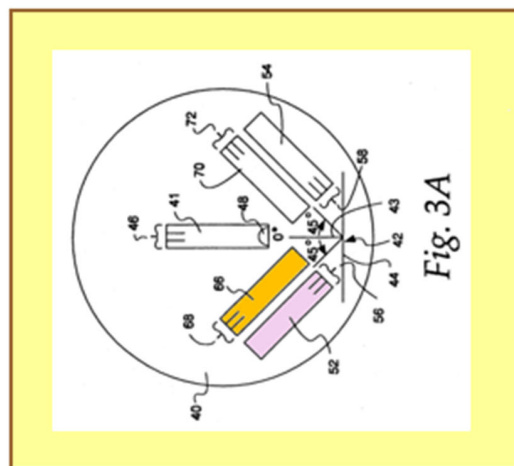


Fig. 5

(Dornbusch, Figs. 3A, 5 (highlighting added), 6:6-20.)

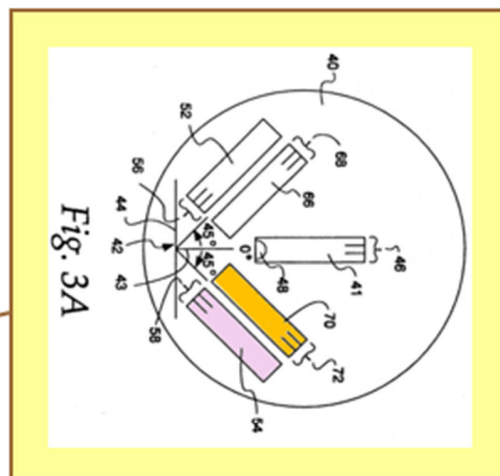
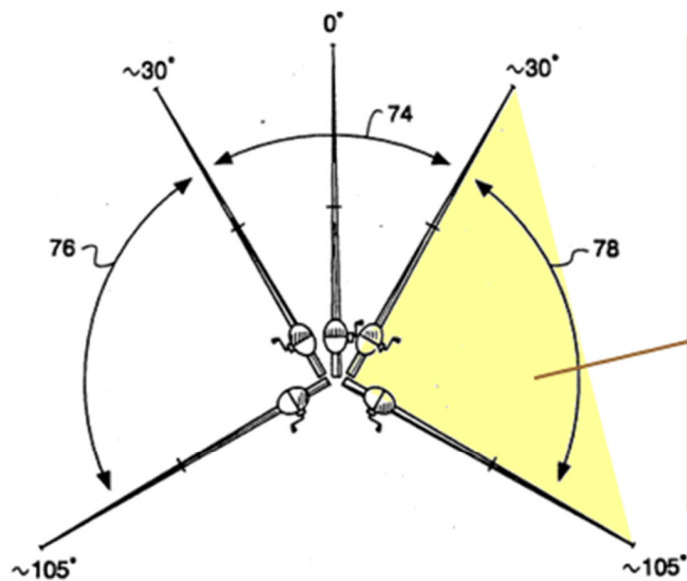


Fig. 5

(Dornbusch, Figs. 3A, 5 (highlighting added), 6:20-25.)

4. Dependent Claim 11

347. For reference, claim 11 recites:

11. The handheld computing device of claim 1, wherein the processor is configured to detect movement patterns from the directional input signal and wherein the graphical element is further responsive to the detected movement patterns.

348. As discussed above for claim 1[d], Dornbusch discloses a “**processor**”—i.e., the microprocessor in the gaming device. Dornbusch further discloses that its system is “**configured to detect movement patterns from the directional input signal.**” The mercury switches in the circuit board are placed such that “the game controller can sense the position of the fishing rod as the rod is moved in various directions by the game player.” (Dornbusch, 3:16-20 (emphasis added).) This detection of multiple directions over time constitutes detection of “**movement patterns.**” Examples of such “**movement patterns**” (discussed in more detail below), include a casting motion, side to side movements to control the lure to entice fish, and rotating the rod and reel to the left and right to control the boat and select where to fish, all of which involve various motions by the user over time. As a fishing simulation gaming device, Dornbusch discloses detecting these “**movement patterns**” (e.g., “casting the line and reeling in the line in various directions,”

“invitingly presenting the lure to a waiting fish by causing the lure to move from side to side,” and moving “the rod and reel” to the left and the right to select the direction of movement) in order to control the game. (*See, e.g., id.*, Abstract, 3:20-23 (“The control circuitry responds to the signals generated by the position switches and converts the signals to other signals recognizable by the game machine.”), 4:17-20, 4:29-37, 6:25-34, 9:40-54 (providing example of using movements to control movement of boat), 10:1-40 (providing example of using movements to control casting and lure movement).) Furthermore, as discussed above, Dornbusch discloses various graphical elements that are “**responsive to the detected movement patterns.**” Dornbusch discloses that a boat and a lure are each graphical elements that responds to the orientation of the device through the “**directional input signal.**” (*Id.*) As a user makes multiple movements in a row (a “**movement pattern[]**”), these graphical elements respond to those patterns. (*Id.*)

5. Dependent Claim 13

349. For reference, claim 13 recites:

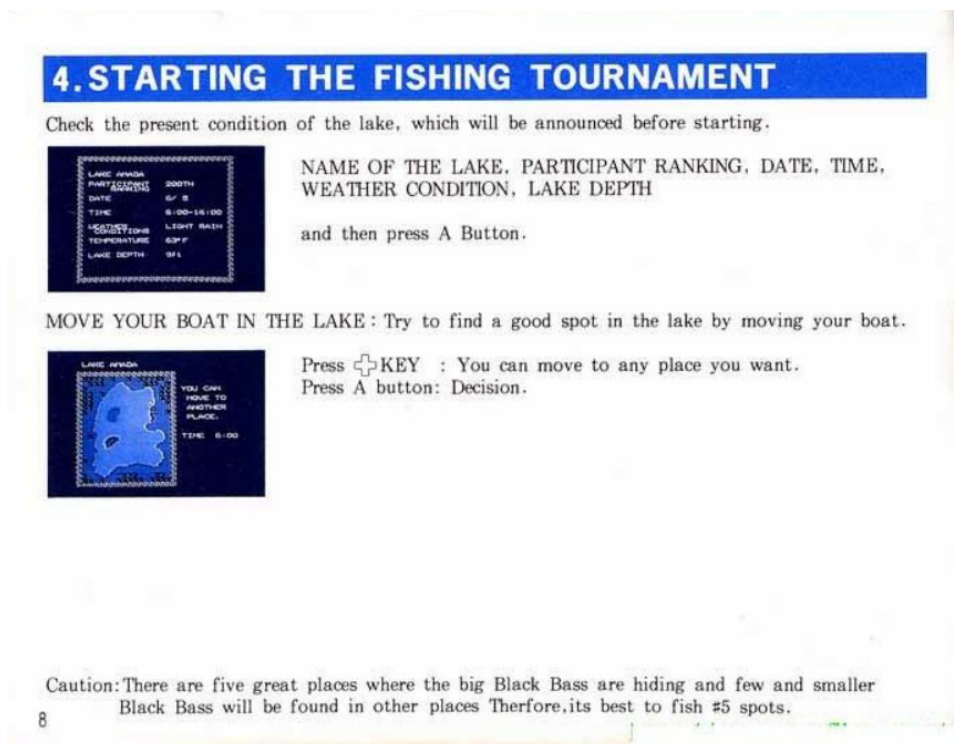
13. The handheld computing device of claim 11, wherein the graphical element is configured to perform a selection function in response to the detected movement pattern.

350. For the same reasons I provided in claim 11, the “**graphical element**”

“respon[ds] to the detected movement pattern.” In response to the detected movement pattern, the graphical element is further **“configured to perform a selection function.”** As discussed above for claim 1[f], Dornbusch discloses multiple ways in which the graphical element (e.g., boat, lure) performs a selection function (e.g., the boat selects a where to fish, the position of the lure selects a direction of movement of lure, etc.) in response to the detected movement pattern.

351. First, Dornbusch discloses that the boat selects where to fish in response to detecting a tilting movement pattern of the game controller. (Dornbusch, 9:21-68 (while in boat mode the player “adjusts the position of the rod and reel to determine direction” of the movement of the boat in order to select where to fish).) This understanding of Dornbusch is confirmed by Dornbusch’s disclosure that the game controller can be used with “The Black Bass” game by HOT-B U.S.A. Inc. (*Id.*, 4:12-17.) In “The Black Bass,” the boat is used to select “a good spot in the lake” where the player wants to fish:

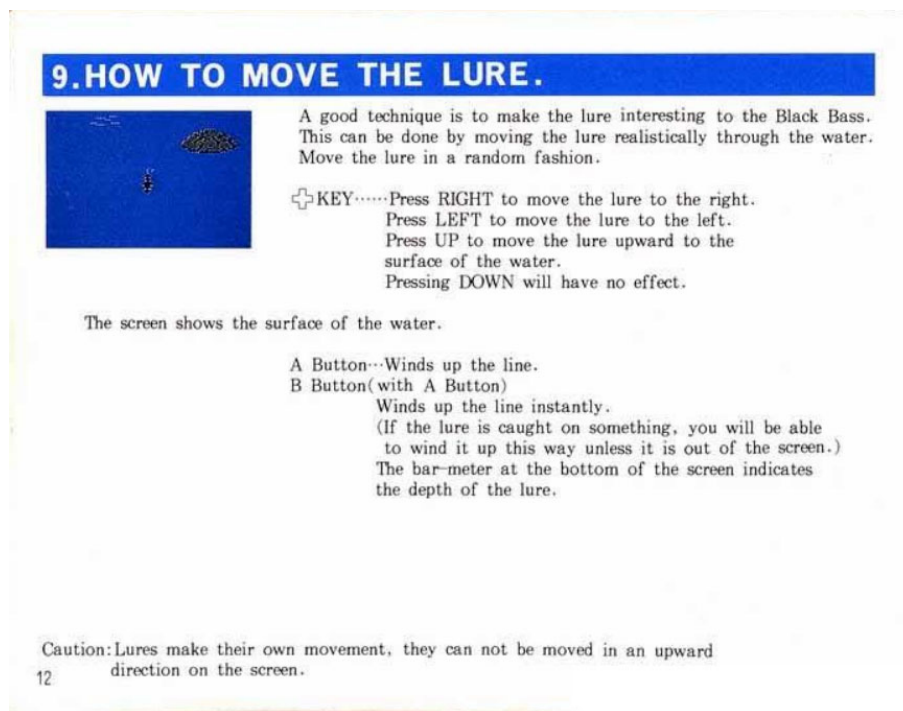
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(EX1018, The Black Bass Instruction Manual, p.010.) Accordingly, when Dornbusch's controller is used to play "The Black Bass" the graphical element (the boat) is used to perform a selection function (where to fish) in response to the detected movement pattern.

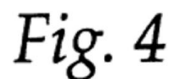
352. Second, Dornbusch teaches controlling the direction of travel of the lure through the water in response to detecting a tilting movement pattern of the game controller. (Dornbusch, 10:27-40.) For "The Black Bass," the on-screen lure changes its orientation on the screen as part of selecting its direction of travel:

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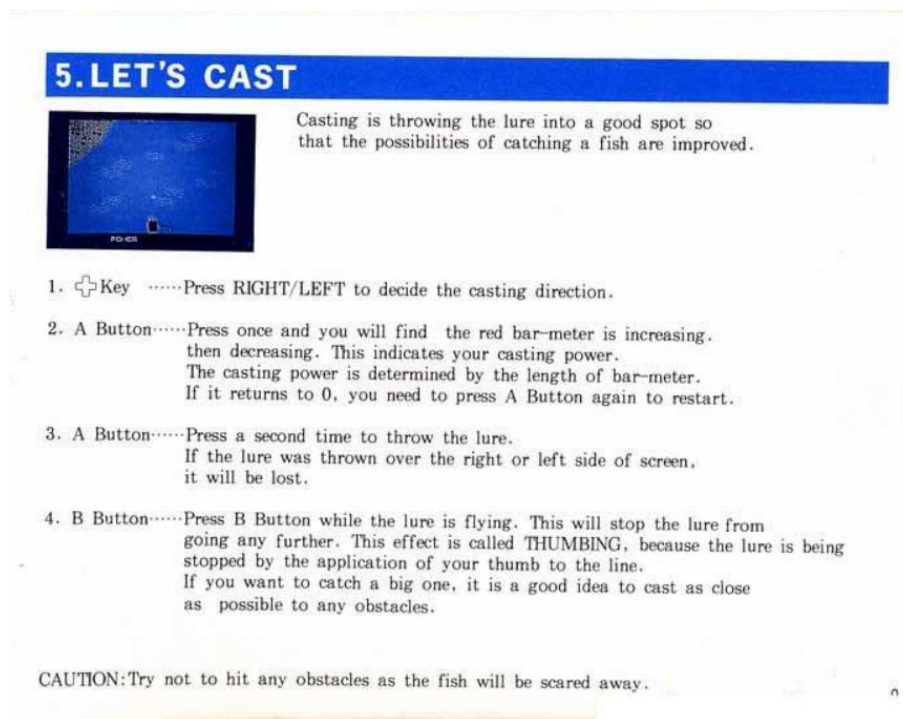


(EX1018, The Black Bass Instruction Manual, p.014.) Accordingly, when Dornbusch's controller is used to play "The Black Bass" the graphical element (the lure) is used to perform a selection function (the orientation of the lure and therefore the direction the lure travels) in response to the detected movement pattern.

353. Finally, it would have been understood and/or obvious from Dornbusch that the series of movements used to simulate casting would be used with an on-screen casting strength indicator to select casting power. Dornbusch teaches that the game controller can be used to control "casting" by detecting a specific set of movements—such as flicking the user's wrist so the rod changes from a tilted backward position to a tilted forward position as shown in the annotated Figure 4



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(EX1018, The Black Bass Instruction Manual, p.011.) Accordingly, a person of skill in the art would understand that Dornbusch discloses and/or renders obvious that **“the graphical element”** (the on-screen casting strength indicator) **“is configured to perform a selection function”** (selecting casting power) **“in response to the detected movement pattern”** (the casting motion).

6. Dependent Claim 14

354. For reference, claim 14 recites:

14. The handheld computing device of claim 13, wherein the detected movement pattern is a flick of the wrist.

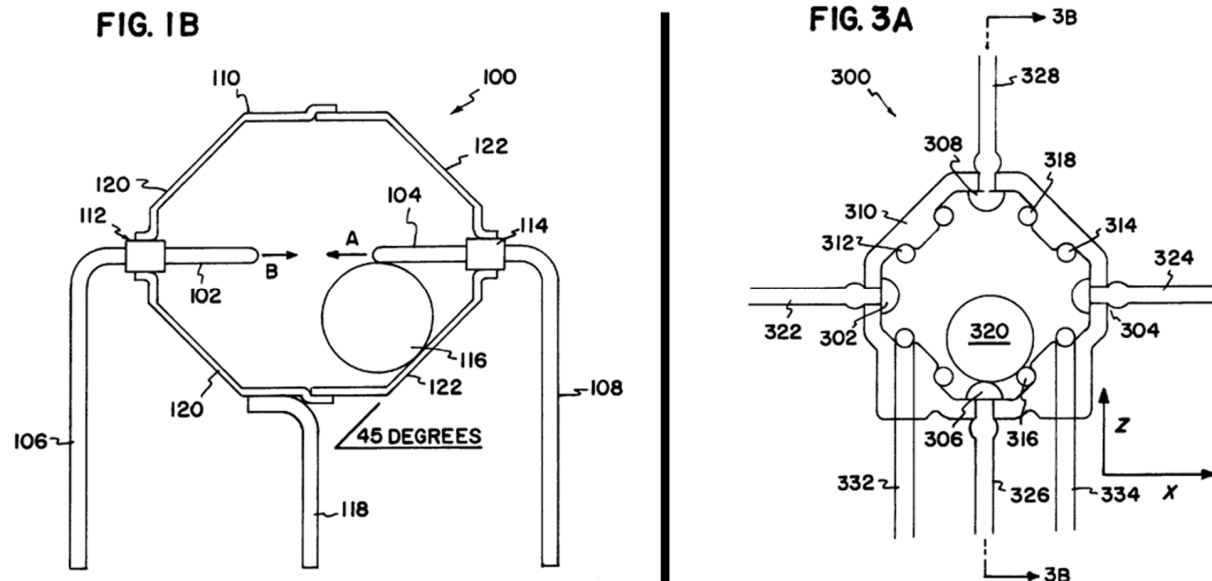
355. As discussed above, Dornbusch discloses that one of its **“detected**

movement pattern[s]” is a cast of a fishing line. (Dornbusch, 2:42-44, 5:21-33, Fig. 4.) Dornbusch discloses that such a casting motion is effectuated via a user physically manipulating a handheld fishing rod controller. (*Id.*, 4:29-34.) A POSITA would have understood a casting movement to be a “**flick of the wrist**,” as can be seen in the casting movement shown by the yellow arrow above in the annotated Figure 4. A POSITA would have understood that a “**flick of the wrist**” is involved in effectuating the casting motion, as it is in real-world fishing.

F. Grounds 9 and 10: Claims 2 and 3 Are Obvious Over Dornbusch in View of Uragami and Titus (Ground 9); Claims 2 and 3 are Obvious Over Dornbusch in View of Uragami, Moritome, Nakano, and Titus (Ground 10)

356. As explained above, it is my opinion that claims 2 and 3 of the '731 patent are obvious over Dornbusch in view of Uragami. Further, it is my opinion that claims 2 and 3 of the '731 patent are obvious over Dornbusch in view of Uragami, Moritome, and Nakano. Claims 2 and 3 would further have been obvious over (1) Dornbusch and Uragami or (2) Dornbusch, Uragami, Moritome, and Nakano in view of Titus (EX1011, U.S. Patent No. 5,955,713).

357. As explained above, Titus discloses tilt switch arrays, including those in Figures 1B and 3A:



(Titus, Figs. 1B, 3A.) Further, Titus's disclosed tilt switch arrays satisfy each limitation of claims 2 and 3 of the '731 patent, as I explained above.

358. A POSITA would have been **motivated to combine** Dornbusch with Titus. Dornbusch and Titus are analogous references in a similar field. For example, both references disclose tracking orientation or tilt of a device. (Dornbusch, 6:25-34, 10:28-40, 9:40-68; *id.*, Figs. 4, 5; Titus, 1:5-7 (“This invention relates in general to an apparatus for detecting the orientation of an object, and particularly to a tilt switch for detecting a particular orientation.”), 1:37-42.) Further, both references relate to handheld electronic devices. (Dornbusch, Fig. 2; *id.*, 1:5-16 (“The present invention relates to an electronic game controller responsive to the movements of a game player during game play.”), 2:27-31 (“What is needed is a game controller

which more accurately recreates the experience of fishing with a hook, line, and sinker.”); Titus, 1:8-11 (“Tilt switches and jitter switches are used in portable electronic devices, such as radio transceivers and paging units, to detect whether the unit is in an non-vertical orientation, and to detect movement of the device.”).)

359. A POSITA would have been further motivated to combine Dornbusch with Titus to enable more sophisticated tracking with fewer components. Dornbusch discloses the use of an array of mercury switches to track orientation. (Dornbusch, 5:30-6:25; *id.*, Fig. 3A.) Titus discloses tilt switch arrays in the form of a single unit that can track orientation. (Titus, 1:37-42 (“there is a need for a single tilt switch that can detect one of several orientations”).) Titus discloses advantages for such a device contained in a single unit, explaining that “[s]uch a tilt switch should take up less volume within the device, and require that the orientation of only the single tilt switch within the device be precisely established, rather than the orientation of a number of switches.” (*Id.*, 1:38-42.) A POSITA would have been motivated to implement Dornbusch’s orientation tracking per Titus’s disclosures, including for the advantages of a device that takes up less volume and requires less precise calibration. For example, for a handheld gaming device like Dornbusch (particularly the self-contained combination with Uragami), a POSITA would have sought to minimize device volume to provide a less bulky, lighter controller for improving the

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user experience.

360. A POSITA would have been further motivated to combine Dornbusch with Titus to implement Dornbusch's system without the use of mercury switches. For example, a POSITA would have recognized that mercury switches pose risks to users, since mercury is poisonous. A POSITA would have been motivated to replace the mercury switches in Dornbusch's system with a tilt switch array based on Titus's disclosures, using a conductive ball as the circuit closing means rather than poisonous mercury. A POSITA would have recognized that the risks of mercury are particularly acute for a video game controller like Dornbusch discloses, since a video game controller is likely to be used by children.

361. The concerns a POSITA would have had regarding mercury switches are confirmed in the prior art. For example, U.S. Patent No. 5,209,343 to Romano (EX1020, "Romano") discloses tilt switch designs using conductive balls. In the "Background of the Invention" section, Romano discloses:

Mercury tilt switches are fairly easy to manufacture, however, due to environmental concerns, it is becoming increasingly difficult to manufacture any product that includes mercury. Mercury is a highly toxic substance. As such, there exists a large number of federal, state and local guidelines controlling the use, storage and disposal of mercury. The increase in governmental regulation has increased the cost of manufacturing mercury switches to a point where alternative

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non-mercury tilt switches have become more competitive.

(Romano, 1:25-34.) As a result, Romano discloses using “a substitute free moving conductive element” in tilt switches, where “[a] common substitute is a single metal ball.” (*Id.*, 1:35-37.)

362. As Romano also indicates, a POSITA would have understood that conductive ball-based tilt sensors are more cost-effective than mercury switches. (Romano, 1:30-34.) A POSITA would have been motivated to limit the cost of Dornbusch’s game controller by substituting Titus’s conductive ball-based tilt sensors for Dornbusch’s mercury switches.

363. A POSITA would have had more than a reasonable expectation of success and could have implemented the proposed combination using conventional techniques without undue experimentation. A POSITA would have viewed mercury switches and tilt switches as interchangeable substitutes. (*E.g.*, Romano, 1:35-37.)

364. Dornbusch and Titus are analogous art to the ’731 patent for the same reasons as described above.

VI. NO SECONDARY CONSIDERATIONS OF NONOBVIOUSNESS

365. I am not aware of any evidence suggesting that the claims analyzed in this declaration are not obvious, such as the following secondary considerations: commercial success, unexplained results, long felt but unsolved need,

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industry acclaim, simultaneous invention, copying, skepticism by experts, and failure of others. I understand from counsel that Patent Owner has not identified any secondary considerations evidence in the district court litigation. Furthermore, as explained in **Part III.B**, I understand that “secondary considerations” may be used as indicia of nonobviousness provided that there is a nexus to the invention claimed.

366. To the extent Patent Owner later provides information it claims relates to secondary considerations, I reserve the right to supplement my analysis and opinions to comment on it.

VII. CONCLUSION

367. In signing this declaration, I recognize that it will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in this proceeding. If required, I will appear for cross-examination at the appropriate time. I reserve the right to offer opinions relevant to the invalidity of the challenged claims at issue and/or offer testimony in support of this declaration.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements are 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 18 U.S.C. § 1001.

Dated:

October 8, 2025

Respectfully submitted,



Nathaniel Polish

Appendix A

NATHANIEL POLISH, Ph.D.
Daedalus Technology Group, Inc.
350 Seventh Avenue
New York, NY 10001
(212) 684-3890

business experience

2019-present	President, Founder SuperAlert, Inc. SuperAlert has developed a range of wireless sensors used for monitoring building systems in large New York City residential buildings. SuperAlert manufactures, deploys, and operates sensor suites and generates notifications and alerts for building personnel and owners.	NEW YORK, NY
1980-present	President Daedalus Technology Group, Inc. Successor to NPS ASSOCIATES Co-founded computer consulting firm. Employs up to twenty people as needed.	NEW YORK, NY
clients include	Intellectual Property Consulting. Various anonymous clients.	NEW YORK, NY
	Consulting on patent valuation and strategy: Act as an advisor on technical and intellectual property matters to various clients. Developed intellectual property for various companies. 2001- present.	
	SpokenHub.	NEW YORK, NY
	Predictive dialer deployment and operation: During the 2012 election cycle assembled and ran a team of engineers to deploy, debug, and operate a large scale outbound calling server farm. This server farm supported hundreds of agents and millions of minutes of calling. 2012.	
	Risk Solutions International.	NEW YORK, NY
	Risk management: Developed technology platform to allow for complex question and answer sessions with airport managers. The results of the sessions then generated planning documents used in risk management. Results were published as part of a Transportation Research Board research program. 2011-2013.	
	Smart Systems/Specialty Acquirer.	NEW YORK, NY
	Advanced Transit fare collection: Founding member of board of directors. Advisor on technical and intellectual property matters. Developed intellectual property for the company. The company is engaged in the development and sale of advanced fare collection systems for mass transit using RFID technologies. 2004-present.	
	Skywi.	FORT WORTH, TX
	Wireless broadband: Founding board of directors member. Advisor on technical and intellectual property matters. The company provides a variety of wireless broadband services to semi-rural customers using mesh networks. 2004-2009	
	Placecorp.	NEW YORK, NY
	Wireless text messaging system: Designed and developed a very large scale, multi-platform text messaging system. Acted as the lead technologist for a startup. In this capacity attended many venture capital meetings and developed all technical sections to the business plans. The system integrated advanced Interactive Voice Response (IVR) with email, paging, and SMS messaging. Oversaw and planned initial development of very small paging device to be manufactured in very high volume. 2000-2001.	
	Marketboy.	NEW YORK, NY
	Distributed market making system: Provided a range of services in the areas of product definition, specification, and implementation strategy. Marketboy was a distributed system that allowed prospective purchasers and vendors to make bids and ask offers for proposed transactions. 2000.	
	Savos.	NEW YORK, NY
	Telephone to streaming audio bridge: Developed, designed and deployed an industrial strength IVR system that allows users to access streaming media via their cell phones. The system supports up to 96 streams on a single chassis. Developed web based content management system and interface for customizable user preferences. 2000.	

deliverENow.

NEW YORK, NY

Online delivery system: Developed a proof of concept prototype of online delivery system. This consisted of a stock clerk server written for Windows CE (Clio) with a CDPD network connection. It demonstrated how purchase and delivery information would be sent to an in-store stock person who prepares them for pickup by a member of the deliverENow courier network. Provided strategic technical advice. Served on board of advisors. Wrote technical specification of business and logistical components of the system. 2000.

Togglethis.

NEW YORK, NY

Animation distribution system: Developed critical components of initial version of email-delivered animation system. Components included MacroMedia Director Xtras as well as encryption functions. Developed tools to distribute and manage Togglethis's content, DTG built a custom UNIX email list-server. This server allowed Toggle administrators to create groups, upload episodes, and schedule the delivery of their content. Developed system architecture and language specification for the next version of the IC Engine, which drives the characters. 1998-1999.

JuniorNet.

BOSTON, MA

Children's on-line service: Designed, developed and lead the implementation of a large scale network system for delivery of children's entertainment and education content. Worked with the president and other key players to fit a technology strategy to corporate goals. System is required to serve from 200,000 to 1,000,000 subscribers and be supportable over three to five years. All project goals met within a \$1,000,000+ budget. 1997-2000.

One Click Charge.

NEW YORK, NY

Provide a wide range of consulting services starting with technology evaluation for the principal investor. Provided services in the areas of product definition, team formation and implementation strategy. Developed significant components of a substantial Internet micropayment and authentication system. 1998-2000.

Swatch.

WEEHAWKEN, NJ

Ticketing system: Implemented a radio frequency identification (RFID) based system for providing access to the 1998 Goodwill Games utilizing RFID tagged wristwatches. 1998-1999.

Instant Video Technologies, Inc./Burst.com

SAN FRANCISCO, CA

Burstware: Designed and developed a series of products to deliver digital video and audio materials over wide-area internet using consumer grade computers. Products were designed to fit within the client's existing patent portfolio. 1995-1997.

Technical evaluation: Provided technology strategy and evaluation services and acted as Technology Director. 1995-1997.

Assurenet.

BETHESDA, MD

Internet Insurance system: Designed and developed a system for utilization of the Internet for the distribution and control of insurance agent support software. System can handle tens of thousands of simultaneous users. Member of Board of Directors. 1995-2002.

New Zealand Antarctic Project (NZAP) and US Antarctic Program (USAP).

ANTARCTICA

Penguin Weighbridge: Designed, developed, and deployed system for tracking the comings and goings, weights, and Ids of Adelie penguins in their natural environment on three colonies on Ross Island, Antarctica. Systems run continuously for months in adverse conditions. System was upgraded and replaced in 2016. 1994-present.

Electronic Digital Documents, Inc.

NEW YORK, NY

Check Image Compression system: 1995-1999.

American Veterinary Identification Devices, Inc.

NORCO, CA

AVID reader: Designed and developed digital computer components of radio frequency identification system. Work involved imbedded microcontrollers and real-time digital signal processing in very noisy environment. Designed communications protocols including encryption and error checking schemes. Product in high volume (50,000 unit) production. 1988-1995.

Amprobe Instrument, Inc.

LONG ISLAND, NY

REMCON tester: Designed and implemented product life-cycle test fixture for a new and innovative solid state switch. Test fixture used by Underwriters Labs for approval. 1988.

Personal Computer Card Corporation

NEW YORK, NY

Smart Cards: Designed smart card reader/writer system. Performed general design and component selection and wrote software for smart card communications. System design implemented in commercial product. 1987.

The Dun & Bradstreet Corporation

NEW YORK, NY

Voice editing systems: Designed and built all parts of four generations of interactive voice editing systems. Editing systems produce output used in extensive, high quality speech synthesis system that is part of larger information delivery system. The systems are built on networks of computers in a variety of programming languages and systems. The system involved interactive user interfaces, screen windows, signal processing, and voice file systems. 1982-1991.

1997-2001

Co-Founder, Director and CTO

I-RECALL, INC.

NEW YORK, NY

Co-founded a company that developed software to enable note-taking and linking of notes to streaming media. Used platforms such as PalmPilot and CrossPad for note-taking and provided time-stamped links to audio and video media. Company sold to a focus group company.

1996-1999

Co-Founder, Director, CTO & Principal Product Designer

SOLILOQUY, INC.

NEW YORK, NY

Natural language interfaces to databases: Co-founded in 1996 a company to provide next generation interfaces to structured databases. Developed prototype system using speech recognition and speech synthesis to provide access to music and ecommerce databases. Raised \$1.5 million in angel investments. Company has raised a total of \$8 million through a variety of institutional and individual investors. Hired replacement CTO and exited company in 1999.

1991-1992

President & Principal Product Designer

SIMPLICITY COMPUTING, INC.

NEW YORK, NY

Co-founded in 1991 a computer peripherals manufacturing company concentrating on portable products with international mass-market appeal. Main product: Simplicity Portable Drive, an IBMPC parallel port connected, portable disk storage system. Marketed domestically and in 25+ countries. Products marketed direct via telemarketers, trade shows, sales reps, and national advertising. Products distributed through dealers, distributors and national catalog houses. Company employed 10 people.

- Wrote business plan and raised \$350,000 startup funding
- Established marketing plans
- Directed marketing of products in trade shows, national advertisements and focus groups
- Managed employees
- Designed hardware and software for products
- Supervised hardware & software implementation teams
- First units shipped less than six months from start of project
- Supervised all aspects of manufacturing and testing process
- Contracted with four manufacturing facilities and many suppliers for production
- Supervised and established call-in customer support services

1989-1999

President & CEO

MEASUREMENT & CONTROL PRODUCTS, INC.

NEW YORK, NY

Founded in August 1989 an electronic products development company. M&CP designs, develops, markets and sells its own products through retail, wholesale and catalog channels domestically and abroad. All manufacturing is contracted. Company was profitable in its first year of operation.

Flagship product:

BitView: Hand held RS-232 data communications diagnostic monitor. Invented, developed and produced hardware and software. Developed and oversaw implementation of marketing strategies, budgets, and business plans. Product currently in third production run.

education

1980-1993

COLUMBIA UNIVERSITY

NEW YORK, NY

Ph.D. in Computer Science, May 1993.

Thesis: *Mixed Distance Measures for the Optimization of Concatenative Vocabularies in Speech Synthesis.*

MPhil in Computer Science, December 1989.

MS in Computer Science, December 1987.

BA in Physics, Columbia College, May 1984.

teaching positions

1997

COLUMBIA UNIVERSITY

NEW YORK, NY

Adjunct Professor, Computer Science.

Advanced undergraduate course: Artificial Intelligence.

1989

COLUMBIA UNIVERSITY

NEW YORK, NY

Graduate Lecturer, Computer Science.

Advanced undergraduate course: Software Design. Taught 68 advanced undergraduates. Supervised two teaching assistants.

Students implemented full spreadsheet application under UNIX.

1984-1985

CITY UNIVERSITY OF NEW YORK

NEW YORK, NY

Adjunct Professor, Experimental Psychology.

Graduate-level course: Computer Methods in Experimental Psychology.

publications and patents

- 2024** Beth Polish, Nathaniel Polish, Seth Godin, and Robert Gehorsam. Real-time event and participant communication systems. United States Patent 11,962,628. April 16, 2024.
- 2022** Nathaniel Polish. Calibration apparatus and method. United States Patent 11,215,499. January 4, 2022.
- 2016** Michael L. Beigel, Nathaniel Polish, Steven R. Frank, and Robert E. Malm. Electronic identification system with improved sensitivity. United States Patent 9,430,728. August 30, 2016.
- 2010** Michael L. Beigel, Nathaniel Polish, Steven R. Frank, and Robert E. Malm. Electronic Identification System with Improved Sensitivity. United States Patent 7,737,821B2. June 15, 2010.
- 2009** Martin Silbernagl and Nathaniel Polish. Learning Fare Collection System for Mass Transit. United States Patent 7,568,617. August 4, 2009.
- 2009** Martin Silbernagl and Nathaniel Polish. Learning Fare Collection System for Mass Transit. United States Patent 7,566,003. July 28, 2009.
- 2009** Michael L. Beigel, Nathaniel Polish, Steven R. Frank, and Robert E. Malm. Electronic identification system with improved sensitivity. United States Patent 6,472,975. October 29, 2002.
- 2002** Nathaniel Polish. Bilateral speech system. Speech dialogs for database access. United States Patent 6,430,531. August 6, 2002.
- 1999** Nathaniel Polish. System and method for distributing and managing digital video information in a video distribution network. United States Patent 5,963,202. October 5, 1999.
- 1993** Michael L. Beigel, Nathaniel Polish and Robert E. Malm. Multi-Mode Identification System. Fundamental RFID technology. United States Patent 5,235,326. August 10, 1993.
- 1991** Nathaniel Polish. Mixed Distance Measures for Synthetic Speech Evaluation. In Proceedings of ICASSP-91, Toronto, Canada, 1991.
- 1988** Nathaniel Polish. A Distributed Signal Processing Facility for Speech Research. In Proceedings of AVIOS88, San Francisco, CA. October 4-6 1988.
- 1987** Nathaniel Polish. Mixed Distance Measures for Optimizing Concatenative Vocabularies for Speech Synthesis: A Thesis Proposal. Columbia University Department of Computer Science technical report number CUCS-310-87, 1987.
- 1983** M. Morris, N. Polish, B. Zuckerman, and N. Kaifu. The Temperature of Molecular Gas in the Galactic Center Region. The Astronomical Journal, 88(8):1228-1235, August 1983.

research interests	Computer Speech, Distributed Systems, Interactive Environments. Software Engineering, Systems Engineering, Technology Policy. Knowledge-Based Approaches to Signal Processing. Computational Physics, Non-Linear Dynamics.
professional societies	International Society for Electrical and Electronics Engineers (IEEE), Association of Computing Machinery (ACM), American Association for the Advancement of Science (AAAS).
other interests	Foreign Policy, Political Science, Long Distance Bicycling, United States Space Program.
grants	• AT&T Special Projects Grant of \$25,000 for synthetic speech, 1986. • Financial support for Ph.D. work was provided by the New York State Science and Technology Foundation Center for Advanced Technology in Computers and Information Systems at Columbia University. • Santa Fe Institute Complex Systems Summer School, 2003. Month-long workshop in agent-based models, non-linear systems, and complexity.
1982-present	Technology development projects Some technology development projects have included: Wildlife Tracking Systems: Implemented a remote monitoring system to track and weigh Adelie penguins on Ross Island, Antarctica. System was debugged on-site and made to function in adverse environmental circumstances. 1994-1997, 2016. Internet Systems: Implemented a LINUX Internet server with FTP and gopher services. Installed an Internet client for IBM/PC platform. 1994-1995. Image Compression Technology: Developed proof-of-concept system for a system to compress images of checks to very small file size. 1994. Biomedical Systems: Implemented a large biomedical system used in patient diagnostics. Provided all necessary materials for Food and Drug Administration compliance. 1992-1993. Synthetic Speech Systems: Implemented and supported several generations of synthetic speech systems for commercial as well as research purposes. 1985-1999. Graphics: Developed high-speed drivers for several graphical devices and evaluated their applicability for interactive uses. Devices included: Vectrix, RAMTEK, Apple Lisa, and IBM Enhanced Graphic Adapter. 1983-1987. Voice Boards: Specified function requirements for several generations of high quality voice boards for Q-bus (PDP-11), Apple, MultiBus, and IBMPC bus. Developed high-speed drivers for each of the boards. 1982-1986. Video Disk and Touch Screens: Developed experimental interactive system utilizing computer controlled video disks and touch screens. 1982.
1994-present	Intellectual property projects A separate document detailing intellectual property projects is available on request.
tools	Languages commonly used: - Pascal 1980-1988 - C 1985-present. - Other languages used: C++, Lisp, Java and Python . Assembler: - Intel 8048, 8051, 8088-pentium - Motorola 680xx - TI 320xx signal processors - Zilog Z8, Z80, PIC Protocols include: - TCP/IP, UDP, RPC and NFS Operating systems commonly used: - UNIX, MSDOS, Windows and p-system. In circuit emulators. Database tools. ARM processors for embedded systems. I²C bus interfacing.
contact information	polish@dtgroup.com Office: (212) 684-3890 Academic and business references available upon request.



Nathaniel Polish, Ph.D. ♦ Daedalus Technology Group, Inc. ♦ polish@dtgroup.com

Summary of Experience in Intellectual Property Matters, as of March 2025

Date	Case and Jurisdiction	Work Product	Counsel, Nature of Case and Additional Notes
06/2024 - present	<i>Valerie Torres and Rhonda Hyman, individually and on behalf of all others similarly situated, v. Prudential Financial, Inc, Activeprospect, Inc., and Assurance IQ, LLC.</i> Case No. 3:22-cv-07465-CRB. In The United States District Court For The Northern District of California San Francisco Division	Declarations; deposition.	Retained by Munger, Tolles & Ollson LLP (contact: Grace Davis-Fisher) representing Prudential. This is a class action related to alleged wire-tapping in connection with software to document user actions on a website. Case is ongoing.
07/2023 - 03/2025	Motorola Solutions, Inc. Petitioner v. STA Group LLC. Case IPR2023-01295, US Patent 8,994,830 B2. United States Patent and Trademark Office.	Declaration in support of invalidity in the context of an IPR, deposition.	Retained by Baker Botts (contact: Katharine Burke) representing Motorola. This is an IPR related to a patent concerning mobile communications by emergency services. The IPR was instituted and the patent was found invalid.
09/2022 - 05/2024	<i>Staton Techiya, LLC and Synergy IP Corporation v. Samsung Electronics Co. LTD and Samsung Electronics America, Inc.</i> Case No. 2:21-CV-004130-JRG-RSP. In The United States District For The Eastern District of Texas Marshall Division	Expert reports on non-infringement and invalidity; depositions.	Retained by Kirkland and Ellis (contact: Alex Henriques) representing Samsung. This is a patent dispute related to intelligent wireless headsets, noise cancellation, and speech detection. Case resolved in our favor due to issues of "unclean hands".
06/2022 - 07/2024	<i>NantWorks, et al. v. Niantic</i> No. 20-cv-06262-LB N.D. Cal.	Expert reports; depositions.	Retained by Cooley (contact: Allie Leeper) representing Niantic. This is a patent case involving technology for augmented reality applications and games. I am working on non-infringement and invalidity. Case dismissed on summary judgement of invalidity on section 101.
02/2022 - 11/2023	VB Assets, LLC v. <i>Amazon.com Inc. et al.</i> C.A. No. 1:19-cv-01410-MN In the United States District Court for the District of Delaware	Expert reports on infringement and validity; depositions; testimony at trial.	Retained by Wilson Sonsini (contact: Ryan Smith and James Yoon) representing VB Assets, LLC. This is a patent case involving speech recognition and natural language processing in the Alexa system. I testified at trial. We prevailed at trial and the jury found willfulness.
05/2021 - 06/2024	<i>Linkable Networks, Inc. v. Mastercard Incorporated and Mastercard International Incorporated.</i> Index No.:651964/2019 in the Supreme Court of the State of New York County of New York	Expert reports; depositions; testimony at trial.	Retained by Baker Botts (contact: Jennifer Tempesta) representing Mastercard. This is a misappropriation of trade secrets case. I testified at trial. We prevailed.
06/2021 - 11/2021	<i>USC IP Partnership, L.P. v. Facebook, Inc.</i> Civil Action No. 6:20-cv-00555-ADA In The United States District Court for the Western District of Texas Waco Division	Expert reports on infringement and invalidity; depositions.	Retained by Cooley (contact: Phillip E. Morton) representing Facebook. This is a patent dispute involving user interfaces and websites. This case was dismissed.

04/2019 - 07/2019	Samsung Electronics Co., LTD and Samsung Electronics America, Inc., Petitioners v. SpeakWare, Inc. Case IPR2019- XXXX, US Patent No. 6,397,186 United States Patent and Trademark Office	Declarations in support of invalidity in the context of an IPR.	Retained by Arnold & Porter (contact: Jeffrey Miller) representing Samsung. This is an IPR related to patents for speech interfaces. This case is closed.
12/2020 - 12/2022	Open Text Corp. v. Hyland Software, Inc. Case No. 8:20-cv-02116-DOC-ADS In the United States District Court for the Central District of California Southern Division	Declarations supporting claim construction; expert reports; depositions.	Retained by King & Spalding LLP (contact: Brit Davis) representing Open Text. This is a patent dispute involving technology related to digital content management. This case is settled.
05/2020 - 12/2021	Nice LTD and Mattersight Corp. v. Callminer, Inc. Case No. 18-2024-RGA-SRF In the United States District Court for the District of Delaware	Declarations.	Retained by DLA Piper LLP (contact: Tiffany Miller) representing Callminer, Inc. This is a patent dispute involving technology related to telephony integration. This case was settled.
10/2019 - 06/2021	Freshub, Inc., Freshhub, LTD. v. Amazon.com inc., Amazon Digital Services, LLC, Prime Now, LLC, Whole Foods Market Inc., Whole Foods Market Services, Inc. Case A-19-CV-00885-ADA In the United States District Court for the Western District of Texas	Expert report on infringement; expert report on validity; depositions; testimony at trial.	Retained by Kramer Levin (contact: Paul Andre) representing Freshub. This is a patent dispute concerning smart kitchen voice technologies. Testified at trial. The patents were found to be valid and not infringed.
03/2020 - 05/2022	Broadcom Corporation, et al. v. Netflix, Inc. Case No. 3:20-cv-04677-JD In the United States District Court for the Northern District of California San Francisco Division	Expert reports.	Retained by Thompson Knight (contact: Nadia Haghighatian). This is a patent case involving streaming content. This case is ongoing, but I am no longer involved.
06/2019 - 03/2022	Roku, Inc. petition for <i>inter partes</i> review of US 7,821,505; 7,787,309; 7,821,504; Attorney Docket No. 48331.3	Declarations, reply declarations, and a deposition.	Retained by Haynes and Boone (contacts: Raghav Bajaj and Philip Woo) representing Roku, Inc. This is a patent case involving user interfaces on handheld remote controls.
04/2019 - present	Vimeo, Inc and IAC/InterActiveCorp, v. British Telecommunications plc, IPR2019-00833 Case 1:18-vc-003366-VAC-CJB (D. Del.)	Filed several declarations.	Retained by McDonnell Boehnen Hulbert & Berghoff (contact: Jeffrey P. Armstrong) representing British Telecom. This is a patent case in district court as well as an IPR. This case is ongoing.
05/2018 - 12/2020	Retailmenot, Inc. v. Honey Science Corp. Case no. 18-937(CFC)(MPT) In the United States District Court for the District of Delaware	Expert declarations; help with infringement contentions; expert report; deposition.	Retained by Kirkland & Ellis (contact: Christopher DeCoro) representing Retailmenot. This is a patent case involving ecommerce websites for shopping. The case was settled.
01/2017 - 01/2020	Koninklijke Philips N.V. et al. v. Acer Inc. et al., Case No. 15-1170-GMS Koninklijke Philips N.V. et al. v. ASUSTeK Computer Inc. et al., Case No. 15-1125-GMS Koninklijke Philips N.V. et al. v. Double Power Tech. et al., Case No. 15-1130-GMS Koninklijke Philips N.V. et al. v. HTC Corp. et al., Case No. 15-1126-GMS Koninklijke Philips N.V. et al. v. Southern Telecom Inc., Case No. 15-1128-GMS Koninklijke Philips N.V. et al. v. Visual Land Inc., Case No. 15-1127-GMS Koninklijke Philips N.V. et al. v. YiFang USA, Inc., Case No. 15-1131-GMS In the United States District Court for the District of Delaware	Expert reports and depositions.	Retained by Fitzpatrick, Cella, Harper & Scinto and Venable (contacts: Christopher Gerson or Jonathan Sharret) representing Koninklijke Philips N.V. and U.S. Philips Corporation. This was a patent dispute. The case ended in settlement.

03/2018 - 02/2019	<i>Alarm.com et al v. SecureNet Technologies LLC</i> , Case No. 1:15-cv-00807-GMS In the United States District Court for the District of Delaware	Four expert reports on invalidity and non-infringement; analysis of source code; two depositions; testimony at trial.	Retained by Cooley LLP (contact: Erik B. Milch) representing SecureNet Technologies. This case was a patent case involving home security products and internet technologies. I was handling both non-infringement and invalidity. We prevailed at trial.
01/2018 - 09/2018	<i>Ameranth, Inc. v. Pizza Hut, Inc., et al.</i> Case No. 11-cv-1810 JLS In the United States District Court Southern District of California	Expert report and deposition.	Retained by Baker Botts LLP (contact: Michael E. Knierim) representing Grubhub, Inc. and Seamless North America, LLC. This was a patent case involving data processing in the hospitality industry. I was asked to provide opinions concerning invalidity on a variety of grounds. We prevailed on a motion for summary judgment of unpatentability.
04/2018 - 09/2021	<i>MModal Services Ltd. v. Nuance Communications, Inc.</i> Case No. 1:18-cv-00901-WMR In the United States District Court for the Northern District of Georgia Atlanta Division	Declaration regarding claim terms; deposition. Expert report concerning non-infringement; expert report concerning invalidity; deposition.	Retained by Weil, Gotshal & Manges LLP (contact: Sudip Kundu) representing Nuance Communications, Inc. This is a patent case involving speech recognition technology. I have prepared a report regarding certain claim terms. This case settled shortly before trial.
04/2018 - 04/2022	<i>BookIT Oy Ajanvarauspalvelu v. Bank of America Corporation and Bank of America, N.A.</i> Case No. 3:17-cv-02557-K In The United States District Court for the Northern District of Texas Dallas Division	Declarations regarding claim terms.	Retained by Winston & Strawn, LLP representing Bank of America. This is a patent case. I am involved with a number of invalidity issues. This case settled favorably to the client.
08/2017- 06/2018	<i>Darren Pederson v. Apple Inc.</i> Case No. 1:12-cv-235530 In the Santa Clara County Superior Court	Declaration in support of opposition to class certification; deposition.	Retained by Morrison & Foerster LLP (contact: David M. Walsh) representing Apple, Inc. This is a class action case regarding the operation of Apple TV products. I was involved with a number of issues around class certification.
01/2017 - 04/2019	<i>Koninklijke Philips N.V. et al. v. Acer Inc. et al.</i> Case No. 15-1170-GMS In the United States District Court for the District of Delaware		Retained by Venable LLP representing Koninklijke Philips N.V. et al.
03/2016 - 01/2018	<i>Doug Baird, Goug Hesse and Bob Schmitt on Behalf of Blinkmind, Inc. v. Joe Baird, Nathan Stratton, Michael Tessler, Exario Networks Inc, and Broadsoft, Inc.</i> Case No. 2015-16576 In The District Court of Harris County, TX, 270th Judicial District.	Analysis of source code and documents related to allegations of copying. Expert report; deposition.	Retained by Cooley LLP (contact: Jon Graves) representing Broadsoft. This case involves allegations of theft of trade secrets and copying. The case settled.
11/2015 - 06/2017	<i>Phoenix Technologies LTD. v. VMware, Inc.</i> Case No. 15- cv-014140-HSG In The United States District Court North District of California	Expert report regarding a number of issues having to do with issues related to the definition of terms; deposition; testimony at trial.	Retained by Cooley LLP (contact: Whitty Somvichian) representing Phoenix Technologies. This is a contracts matter involving copyright. I offered opinions related to the meaning of certain terms used in a contract.
05/2015 - 05/2015	<i>Chestnut Hill Sound, Inc. v. Apple Inc.</i> Case No.15-cv-261 (D. Del.) In The United States District Court for the District of Delaware	Declaration in support of Apple's opposition to preliminary injunction.	Retained by Desmarais LLP (contact: Alan Kellman) representing Apple Inc. This is a patent matter involving control of multimedia streams in home entertainment networks.

04/2015 - 07/2016	<i>Mobile Telecommunications Technologies, LLC v. BlackBerry Corporation</i> Case No. 3:12-cv-01652-M (N.D. Tex.) In the United States District Court for the Northern District of Texas Dallas Division	Expert report on non-infringement and invalidity; deposition; testimony at trial.	Retained by McDermott Will & Emery (contact: Leigh Martinson) representing Blackberry. I am handling invalidity as well as non-infringement. This is a patent case involving a number of issues related to smartphones and messaging. Testified at trial. We prevailed.
03/2015 - 03/2017	<i>WAG Acquisition LLC v. Gattyan S.a.r.l. et al.</i> Case No. 2:14-cv-2832-ES-JAD (D. N.J.) In the United States District Court District of New Jersey	Declarations in four IPRs; deposition.	Retained by Baker & McKenzie LLP (contacts: Kevin O'Brien and Matt Dushek) representing the defendants. This is a patent matter involving streaming media. I submitted declarations in four IPRs in this case.
02/2015 - 02/2017	<i>Comcast Cable Communications LLC, et al. v. Sprint Communications Company L.P. et al.</i> , Case No. 2:12-cv-0859 (E.D. Pa)	Expert report on invalidity; deposition; testimony at trial.	Retained by McGuire Woods LLP (contact: George J. Barry III) representing Sprint Inc. This is a patent matter involving the architecture of messaging servers in a cell phone network.
12/2014 - 05/2015	<i>Enterprise Systems Technologies S.a.r.l. v. Apple Inc.</i> C.A. No. 1:14-cv-00765-UNA In the United States District Court for the District of Delaware	Declaration submitted for IPR.	Retained by Ropes & Gray LLP (contact: Stefan Geirhofer) representing Apple Inc. This was a patent matter involving a district court case, an ITC case, and an IPR. The technology mobile messaging. This case settled.
11/2014 - 04/2015	<i>Solocron Media, LLC v. Verizon Communications Inc., et al</i> Case No. 2:13-cv-1059 (E.D. Tex.) In the United States District Court Eastern District of Texas Marshall Division	Expert report on invalidity.	Retained by Wiley Rein LLP (contact: Scott Felder) representing Verizon. This was a patent matter. I prepared a report on invalidity and assisted with a report on non-infringement. This case terminated favorably for Verizon before I was deposed.
10/2014 - 02/2015	<i>Recogni Corp, LLC v. Nintendo Co. Ltd., et al.</i> Case No. 2:12-cv-01873-RAJ In the U.S. District Court Western District of Washington		Retained by Orrick, Herrington & Sutcliffe LLP (Contact: Doc Daybell) representing Nintendo Co. Ltd.
07/2014 - 01/2016	<i>Aylus Networks, Inc. v. Apple Inc.</i> Case No: 3:13-cv-04700-EMC. In the United States District Court Northern District of California San Francisco Division	Declarations in support of claim construction as well as summary judgment; expert reports on non-infringement and invalidity; deposition.	Retained by DLA Piper (contact: Mark Fowler) representing Apple, Inc. I was handling non-infringement as well as invalidity. This was a patent matter involving control of multimedia streams in home entertainment networks. This case was dismissed on summary judgment favorable to Apple.
5/2014 - 10/2014	<i>Jobdiva, Inc. v. Monster Worldwide, Inc.</i> Case no: 13 Civ. 8229 (KBF) In the United States District Court for the Southern District of New York	Declaration on infringement; deposition.	Retained by Kirkland and Ellis (contact: James Marina) representing Jobdiva. This was a patent matter involving methods of search and display of resumes. I offered a declaration that was most of an expert report. This case settled.
12/2013 - 06/2014	<i>Straight Path IP Group, Inc., v. LG Electronics, Inc. et.al</i> C.A. No. 1:13-cv-00933 Investigation No. 337-TA-892	Expert report on non-infringement; deposition.	Retained by Finnegan (contact: Aidan Skoyles) representing LG Electronics, Inc. This was a patent matter regarding smart televisions. This case has been stayed.
11/2013 - 12/2013	<i>Glaxosmithkline, LLC v. Genentech, Inc.</i> Case No: 10-799-GMS. In the United States District Court for the District of Delaware	Expert report on an evidentiary matter; deposition.	Retained by Desmarais (contact: Xiao Li) representing GSK. I offered opinions regarding the quality of certain metadata information associated with several files at issue in the case.
9/2013 - 9/2014	<i>Profectus Technology LLC v. Huawei Technologies Co. LTD, et al.</i> Case No. 6:11-cv-00474. In the United States District Court for the Eastern District of Texas Tyler Division	Expert report on non-infringement.	Retained by Baker Botts (contact: Tammy Pennington) representing Dell. This patent matter dealt with technologies used in electronic picture frames. This case settled.

9/2013 - 3/2014	<i>Black Hills Media v. Samsung, LGE et al., Certain Digital Media Devices, including Televisions, Blu-Ray Disc Players, Home Theater Systems, Tablets and Mobile Phones, Components Thereof and Associated Software.</i> Investigation No. 337-TA-882. United States International Trade Commission	Expert report on non- infringement; deposition; testimony at hearing.	Retained by Finnegan (contact: Houtan Esfahani) representing LGE. This was a patent case involving cell phone power systems.
6/2013 - 2/2015	<i>OpenText S.A. v. Alfresco Software LTD; Alfresco Software, Inc.; and Carahsoft Technology Corporation.</i> Case No. 2:13CV320AWA/LRL. In the United States District Court for the Eastern District of Virginia	Expert reports on infringement and validity; depositions; tech tutorial.	Retained by Cooley LLP (contact: Frank Pietrantonio) representing OpenText. My patents were dropped from trial.
05/2013 - present	<i>Hartford Fire Insurance Company v. Progressive Corporation and Progressive Casualty Insurance Company.</i> Case No. 1:12- cv-02444. In the United States District Court for the Northern District of Ohio Eastern Division	Expert report on claim construction; deposition.	Retained by Baker Botts (contact: Robert Scheinfeld) representing Hartford. I am handling both infringement as well as validity.
10/2012 - 04/2013	<i>MobileMedia Ideas, LLC v. HTC Corporation and HTC America, Inc.</i> In the United States District Court for the Eastern District of Texas, Marshall Division	Expert reports; deposition.	Retained by Desmarais LLP (contact: Alan Kellman) representing MMI. This is a patent dispute involving user interfaces to cell phones. I am handling both infringement and validity.
10/2012 - 04/2014	<i>Nokia Corporation, Nokia Inc., and Intellisync Corp v. HTC. Certain Electronic Devices, Including Mobile Phones and Tablet Computers, and Components Thereof.</i> Investigation No. 337-TA-847. United States International Trade Commission	Expert reports; depositions; testimony at hearing.	Retained by Desmarais LLP (contact: Alan Kellman) representing Nokia. This was a patent dispute involving user interfaces to cell phones. I handled both infringement and validity. My patent was dropped from the case during the hearing.
09/2012 - 04/2017	<i>Intellectual Ventures I, LLC et al. v. AT&T Mobility LLC et al.</i> Civil Action No. 12-CV-193-LPS (D.Del.)		Retained by Baker Botts (contact: Robert Maier) representing AT&T Mobility, LLC.
8/2012 - 10/2015	<i>Potter Voice Technologies, LLC v. Apple Inc. et al.</i> CV 1:12-cv-01096-REB-CBS In The United States District Court for the District of Colorado	Declaration in support of summary judgment; expert reports.	Retained by Cooley LLP (contact: Timothy Teter) representing Apple Inc. This was a patent dispute involving Natural Language Processing on smartphones. I handled both infringement and validity. This case was favorably dismissed on summary judgment.
08/2012 - 10/2014	<i>OpenTV, Inc. v. Netflix Inc.</i> Case No. 3:14-cv-01525 In the United States District Court for the District of Delaware	Declaration regarding a motion for summary judgment.	Retained by Kirkland & Ellis LLP (contact: Matthew Topic) representing OpenTV. I submitted a declaration in opposition to a motion for summary judgment regarding section 101 issues.
08/2012 - 12/2012	<i>J2 Global Communications, Inc. v. EasyLink Services International Corp.</i> Case No. 09-4189-DDP (AJWx) In The United States District Court Central District of California Western Division		Retained by Perkins Coie LLP (contact: Timothy Carroll) representing EasyLink Corp. I handled both infringement and validity. This was a patent dispute regarding enterprise fax and messaging systems.
06/2012 - 8/2017	<i>EasyWeb Innovations, LLC v. Twitter, Inc.</i> Civil Action No CV 11-4550-JFB-WDW. In The United States District Court for the Eastern District of New York	Expert reports; deposition.	Retained by Desmarais LLP (contact: Alan Kellman) representing EasyWeb. This is a patent dispute involving messaging technologies. I am handling both infringement and validity.

06/2012	Cisco	Declaration.	Retained by Haynes and Boone LLP (contact: Andrew Ehmke) representing Cisco. This was an IPR case and I submitted a declaration in the matter.
02/2012 - 06/2014	<i>Emblaze LTD v. Apple Inc.</i> Case No 4:11-CV-01079 SBA. In The United States District Court for the Northern District of California	Markman tutorial; Expert report on non-infringement; tech tutorial; testimony at trial.	Retained by Greenberg Traurig LLP (contact: James DeCarlo) representing Apple, Inc. The case was ultimately tried by DLA Piper (contact: Mark Fowler). This was a patent dispute. The case involved technology for distribution of multimedia over the Internet. The trial concluded with the jury finding no infringement.
12/2011 - 04/2013	<i>Apple Inc. v. Samsung Electronics Co, LTD.</i> Case No. CV12-00630 In The United States District Court for the Northern District of California San Jose Division	Expert declaration; deposition.	Retained by Gibson Dunn LLP (contact: Joshua Furman) representing Apple Inc. This is a patent dispute involving multi-database search on a mobile device. I am handling both infringement and validity. We received a pre-trial injunction on the products in question.
12/2011 - 08/2012	<i>NorthMobile Tech, LLC v. Simon Property Group, Inc.</i> Case No. 3:11-cv-287 In The United States District Court Western District of Wisconsin	Expert report; declarations.	Retained by Perkins Coie LLP (contact: Timothy Carroll) representing Simon Property Group. This was a patent dispute involving a location based marketing application on smartphones. I am handling both infringement and validity. We prevailed pretrial.
11/2011 - 09/2015	<i>Oasis Research, LLC v. ADrive LLC, et al.</i> Case No. 4:10-CV-435-MHS-ALM In The United States District Court for the Eastern District of Texas Sherman Division	Expert reports; deposition.	Retained by Desmarais LLP (contact: Alan Kellman) representing Oasis Research LLC. I am handling both infringement and validity. This is a patent dispute regarding on line backup and storage. This case settled.
08/2011 - 06/2014	<i>Apple Inc. and Next Software, Inc. v. Motorola, Inc. and Motorola Mobility, Inc.</i> Case No. 10-CV-662 (BBC) In The United States District Court for The Western District of Wisconsin	Expert reports.	Retained by Weil, Gotshal & Manges LLP (contacts: Kevin Kudlac and Elizabeth Weiswasser) representing Apple, Inc. This was a patent dispute. The case involved technology for the interface of DSPs in cell phones. I handled both infringement as well as validity. This case was dismissed pretrial by Judge Posner.
06/2011 - 02/2012	<i>Creative Kingdoms, LLC and Medici Portfolio LLC v. Nintendo Co. Ltd. . Certain video game systems and Wireless controllers and Components thereof.</i> Investigation No.337-TA-770 In The United States International Trade Commission	Expert report; deposition; testimony at hearing.	Retained by Cooley LLP (contacts: Tim Teter and Matthew Brigham) representing Nintendo Co. Ltd. This was a patent dispute. The case involved technology used in wireless and motion sensing controllers. I handled invalidity. We prevailed at the hearing.
02/2011 - 11/2011	<i>WiAv Solutions LLC v. Motorola Mobility, Inc, Nokia Corp., Nokia, Inc, Sony Ericsson Mobile</i> Civil Action No: 3:09-cv-447-LO In The United States District Court for The Eastern District of Virginia	Expert report; deposition.	Retained by Finnegan, Henderson, Farabow, Garrett & Dunner LLP (contacts: Kenie Ho and Christopher Schultz) representing WiAv Solutions LLC. This was a patent dispute. The case involved technology for speech codecs used in GSM cell phones. I handled the infringement side of the case. This case settled.
08/2010 - 04/2011	<i>Apple Inc. v. Nokia Corporation and High Tech Computer Corp. (HTC). Certain Personal Data and Mobile Communications Devices and Related Software.</i> Investigation No. 337-TA-710 United States International Trade Commission	Expert reports; depositions; testimony at hearing.	Retained by Kirkland & Ellis LLP (contacts: Marc Sernel and Eric Hayes) representing Apple Inc. This was a patent dispute. The case involved technology for the interface of DSPs in cell phones. I handled both infringement as well as validity.

07/2010 - 11/2010	<i>ACQIS LLC v. Appro International, Inc., Clear Cube Technology, Inc., Dell Inc., Fujitsu Computer Systems Corp., Hitachi America, Ltd., Hewlett-Packard Co., International Business Machines Corp., NEC Corp. of America, NEX Computers, Inc., Sun Microsystems, Inc. and Super Micro Computer, Inc.</i> Case No. 6:06-cv-00148 In the United States District Court for the Eastern District of Texas	Expert report on invalidity and non-infringement.	Retained by Covington & Burling LLP (contact: Chris Martiniak) representing Hewlett Packard. This was a patent matter involving computer blade servers. The case settled.
04/2010 - 06/2010	<i>Illinois Computer Research LLC v. Harpo Productions, Inc. et al</i> Case Number: 1:2008cv07322 In The United States District Court for The Northern District of Illinois Eastern Division	Expert report; deposition.	Retained by Jackson Walker LLP (contacts: Michael Locklar and Charles Babcock) representing Harpo Productions, Inc. This was a patent dispute. The case involved technology for display of books on a website. This case settled.
02/2010 - 06/2010	<i>Motorola Inc. v. Research Motion Limited et al</i> <i>Certain wireless communication server system software, wireless handheld devices and battery packs.</i> Investigation No. 337-TA-706 United States International Trade Commission	Expert report.	Retained by Ropes & Gray (contacts: Paul M. Schoenhard and Steven Pepe) representing Motorola, Inc. This was a patent dispute. The case involved technology used in pagers and cell phones as well as their servers. This case settled.
08/2009 - 10/2010	<i>Balthaser Online, Inc. v. Network Solutions, LLC.</i> Civil Action No. 2:08-cv-430 In The United States District Court Eastern District of Texas Marshall Division	Expert report.	Retained by Dickstein Shaprio LLP (contacts: Alfred R. Fabricant and Lawrence C. Drucker) representing Balthaser Online, Inc. This was a patent dispute. The case involved technology for the display of rich media applications on a web site. This case settled.
05/2009 - 05/2010	<i>Nuance Communications Inc. et al v. Tell me Networks Inc.</i> Case Number: 1:2006cv00105 In The United States District Court for The District of Delaware	Expert report.	Retained by McKool Smith (contact: Luke F. McLeroy) representing Nuance Communications. This was a patent dispute. The technology involved techniques for using speech recognition in telephone information systems. This case ended in summary judgment for the defendant.
12/2008 - 12/2009	<i>TruePosition Inc. v. Andrew Corp, C.A.</i> Case No. 05-0747-SLR (D. Del) U.S. District Court for the District of Delaware	Declaration; expert report.	Retained by Kirkland & Ellis LLP (contact: Avinash Lele) representing Andrew Corp, C.A. Patent infringement case concerning technology for determining location of a cell phone using information from several cell phone towers. I provided an analysis of a workaround approach.
10/2008 - 01/2010	<i>RealTime Data LLC. v. Packeteer, Inc.</i> Case No. 6:2008cv00144 U.S. District Court for the Eastern District of Texas	Expert report; depositions; trial prep.	Retained by Ropes & Gray LLP (contact: Anthony Pastor) representing RealTime Data, LLC. Patent infringement case concerning data compression, storage, and transmission. This case settled on first day of trial.
10/2008 - 09/2009	<i>Thomson Reuters (Scientific) Inc. v. David A. Von Moll, Comptroller of the Commonwealth of Virginia and George Mason University</i> Civil Action No. CL2008-17114 Circuit Court of Fairfax County Virginia	Expert report.	Retained by Edwards Angell Palmer & Dodge LLP (contacts: Glenn Pudelka and Barry Kramer) representing Thomas Reuters (Scientific) Inc. Contracts dispute centered around allegations of reverse engineering of software. This case ended in summary judgment.
04/2008 - 12/2008	<i>International Business Machines Corporation v. Asustek Computer, Inc. Certain Computer Products, Computer Components and Products contain Same.</i> Investigation No. 337-TA-628 United States International Trade Commission	Expert reports; declarations; depositions; testimony at hearing.	Retained by Cadwalader Wickersham & Taft LLP (contacts: John Moehringer and Christopher Hughes) representing IBM in this matter. This was an US ITC investigation regarding infringement of a number of IBM patents by computers produced and sold by Asustek. The technology involved computer control of cooling systems for computers. I was involved with infringement as well as validity issues.

10/2007 - 05/2008	<i>Lucent, Alcatel-Lucent, and Multimedia Patent Trust v. Microsoft</i> Case no. 06-CV- 0684-H (LAB) U.S. District Court for the Southern District of California	Expert reports; depositions; testimony at trial.	Retained by Kirkland & Ellis LLP (representing Lucent Technologies) (contacts: Robert Appleby and John Desmarais) and Baker Botts LLP (representing Alcatel-Lucent). I advised on infringement as well as validity of U.S. Patents 5,838,319 and 5,977,971. Gave trial testimony regarding invalidity of the '971 patent: jury found the patent was invalid.
03/2000 - 01/2009	<i>National Music Publishers' Association et al. v. XM Satellite Radio Inc.</i> Civil Action 06-CV-3733(LAK) In The U.S. District Court for the Southern District of New York		Retained by Gibson Dunn & Crutcher LLP representing National Music Publishers' Association. Copyright dispute concerning the impact of various XM Satellite Radio products. I provided an analysis of source code and functionality of several XM devices.
06/2006 - 02/2007	<i>Lucent v. Gateway, Microsoft, Dell</i> Case no. 02-CV-2060-B (LAB) Case no. 03-CV-0699-B (LAB) Case no. 03-CV-1108-B (LAB) U.S. District Court for the Southern District of California	Expert reports; depositions; testimony at trial.	Retained by Kirkland & Ellis LLP representing Lucent Technologies (contacts: Robert Appleby and John Desmarais). I worked on the infringement of Patents 5,341,457 and 5,627,938 as well as validity of these patents. At trial, I testified to regarding infringement of the '457, '938 and '080 patents. This matter concluded with a successful verdict and an award to Lucent of \$1.5 billion.
02/2006	<i>Board of Regents of the University of Texas v. Benq America Corp et al.</i> Civil Action No. A:05CA181 U.S. District Court for the Western District of Texas	Markman Hearing Testimony; Expert reports; deposition; tech tutorial.	Retained by Quinn Emanuel Urquhart Oliver & Hedges LLP (contacts: Evette Pennypacker and Kevin Johnson) representing Benq America et al. Patent infringement. For a Markman (claim construction) hearing, prepared and presented a technology tutorial and testified before a special master. Prepared reports and gave deposition regarding invalidity and inoperability technology in the patent at issue. Claim construction hearing led to summary judgment in Benq America's favor.
2006	<i>Telefonaktiebolaget LM Ericsson et al. v. Samsung Electronics Company Ltd.</i> Investigation No. 337-TA-577 U.S. International Trade Commission	Expert reports and depositions.	Retained by Kirkland & Ellis LLP (contacts: Bao Nguyen, Adam Gill and Michael Pieja) representing Samsung in several patent infringement claims brought by Ericsson. Claims involved technologies for messaging, speech encoding, and speech recording within various GSM cell phones. This case settled just prior to hearing.
07/2005 - 02/2006	<i>Encyclopedia Britannica Inc. v. Alpine Electronics of America Inc. et al.</i> Civil Action No. 05-359 U.S. District Court for the Western District of Texas	Expert report; deposition.	Retained by Baker Botts LLP (contact: David Wille) representing Encyclopedia Britannica, Inc. Patent infringement. Prepared report on the definiteness of certain claim terms, and was deposed on this matter. This case is ongoing but inactive.
2005 - present	<i>Advanced Analytics Inc. v. Citigroup Global Markets Inc.</i> Case No. 04 Civil 3531 (LTS) U.S. District Court for the Southern District of New York	Declarations and expert reports; deposition.	Retained by Cleary Gottlieb Steen & Hamilton LLP (contacts: David Williams and Chris Moore) representing Citigroup Global Markets, Inc. Theft of trade secrets. I have been involved in software analysis in this case. The case involved software used to price complex financial instruments. Refuting the claims required software analysis as well as statistical analysis of certain elements of the systems involved. This case pending.
05/2005 - 09/2005	<i>Atronic International GMBH v. SAI Semi-specialists of America Inc.</i> Case No. 03-CV-4892 (TCP) (MLO) U.S. District Court for the Eastern District of New York	Expert report; deposition.	Retained by Ford Marrin Esposito Witmeyer & Gleser LLP (contact: Edward M. Pinter) representing Atronic International. Contracts dispute. I have acted primarily to rebut another witness regarding what would have been reasonable behavior for a customer of an electronic parts supplier. This case settled.

02/2005 - 03/2006	<i>Tivo Inc. v. Echostar Communications Corporation</i> Case No. 2-04cv01 DF U.S. District Court for the Eastern District of Texas	Expert report; deposition; testimony at trial.	Retained by Morrison & Foerster (contact: Karl Kramer) representing Echostar. This case involved digital video recorder (DVR) technology. My work focused on the invalidity of the Tivo patent. I found many pieces of prior art including complete systems that were presented at trial. Tivo prevailed at trial. Most of the claims were subsequently found invalid on re-exam. This case has been the subject of many appeals.
12/2004 - 05/2006	<i>Foundry Networks Inc. v. Lucent Technologies Inc.</i> Case No. 2:04-CV-40 (TJW) (E.D. Tex.) U.S. District Court for the Eastern District of Texas	Expert reports.	Retained by Kirkland & Ellis LLP (contacts: Jenny Lee and Jeanne Heffernan) representing Lucent Technologies. I advised on infringement as well as validity of U.S. Patent 5,649,131. In addition to generating several reports, I supported the drafting of motions and declarations. This case settled shortly before trial.
07/2004 - 01/2005	<i>Voice Capture Inc. v. Intel Corporation, Dialogic Corporation, and Nuance Communications, Inc.</i> No. 4:04-cv-40340 U.S. District Court for the Southern District of Iowa	Expert report.	Retained by Gary Cary (contact: Edward Sikorsky) representing Intel Corporation. The case involved Voice Capture's allegation of patent infringement by Intel in the area of interactive voice response systems. In producing an invalidity report on the patent, I analyzed the patent and prior art in great detail. I also provided an expert report on invalidity and an analysis of a rebuttal report. The case settled.
05/2004 - 03/2005	<i>Dolby Laboratories Inc. v. Lucent Technologies Inc.</i> Case No. C 01-20709 JF (RS) U.S. District Court for the Northern District of California	Expert report.	Retained by Kirkland & Ellis LLP (contact: Alan Kellman) representing Lucent Technologies. This case involved infringement of a number of Lucent's patents by Dolby's AC3 codec. The case settled.
03/2003	<i>Agere Systems Inc. v. Broadcom Corporation</i> Civil Action No. 03-3138 U.S. District Court for the Eastern District of Pennsylvania	Expert report.	Retained by Kirkland & Ellis LLP (contacts: Bryan Hales and Edward Runyan). The case involved Agere's allegation of patent infringement by Broadcom in the area of speech compression used in various Broadcom telephone products. I analyzed the operation of a speech codec used in digital telephones; worked with counsel and other experts to prepare reports. This case settled.
10/2001	<i>AT&T Corp. v. Microsoft Corporation</i> Civil Action No. 01 CV 4872 (WHP) U.S. District Court for the Southern District of New York	Expert reports; deposition; testimony at trial.	Retained by Cooley Godward Kronish LLP (contacts: Frank Pietrantonio and Stephen Neal) representing AT&T. The case involved AT&T's allegation of patent infringement by Microsoft in the area of speech compression. I analyzed the operation of three speech codecs and worked with counsel and other experts to prepare reports. I was deposed and gave testimony at trial. After the presentation of our case, the matter settled; details of the settlement are confidential. Elements of this case reached the U.S. Supreme Court.
2000	<i>Data System Analysis Inc. v. The Netplex Group Inc., Technology Development Systems Inc. and Xcellenet Inc.</i> Civil Action No. 97-4652 (JBS-RBK) U.S. District Court for the District of New Jersey	Expert reports; deposition.	Retained by Saul Ewing LLP (contact: Michael Lampert) representing Netplex. Data Systems Analysis (DSA) brought suit against Netplex in a contract matter regarding software claimed by both companies. I was retained to analyze the disputed software and determine a method for computing damages. My expert report found that "functionality" and "effort required to create" were both better metrics than "number of lines of software", the measurement proposed by DSA. I was deposed for several days in this case, provided analysis of other expert reports and assisted in preparing counsel for depositions. This case settled.

01/1998 - 01/2001	<i>System Management Arts Inc. (SMARTS) v. Avesta Technologies Inc. and David Zager</i> 97 Civil 8101 (RWS) U.S. District Court for the Southern District of New York	Expert reports; deposition.	Initially retained by Kramer Levin Naftalis & Frankel LLP (contact: Thomas H. Moreland) representing SMARTS. In early 2000 SMARTS retained Proskauer Rose LLP (contact: Kenneth Rubenstein). The case involved a SMARTS patent in the area of automatic diagnostics of faults in communications networks. I analyzed an Avesta system with similar claimed capabilities and produced an expert report. I also gave deposition and participated extensively in technological analysis and strategic discussions of all aspects of the case. This case settled.
1997	<i>Knowledge Based Technologies Inc. v. International Business Machines Corp.</i> Case No. 96-9461 (JSR) U.S. District Court for the Southern District of New York	Expert reports; deposition.	Retained by Morris, Nichols, Arsht & Tunnell LLP (contact: Karen Jacobs Loudon) representing Knowledge Based Technologies. Contract dispute regarding the application of fuzzy logic techniques. I generated an expert report that analyzed several forms of fuzzy logic software to determine whether the software was independently developed. I also was deposed in this case. This case settled.