

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VALVE CORPORATION.

Petitioner,

v.

IMMERSION CORPORATION

Patent Owner.

Case No. TBD

Patent No. 7,336,260

DECLARATION OF JEAN RENARD WARD

Valve Exhibit 1003 Valve v. Immersion
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I. INTRODUCTION

1. My name is Jean Renard Ward. I have been retained by Wolf, Greenfield & Sacks, P.C., counsel for Petitioner Valve Corp. to assess Claims 1-7 (“the challenged claims”) of U.S. Patent No. 7,336,260 (“the ’260 patent”) (EX1001). I am being compensated for my time at the rate of \$500 per hour, plus actual expenses. This is consistent with the rate I generally charge for this sort of work. My compensation is not dependent in any way upon the outcome of the *inter partes* review of the ’260 patent, nor on the outcome of any related litigation.

2. I expect to make myself available for deposition in this matter. This Declaration is based on information currently available to me. I reserve the right to continue my investigation and study, which may include a review of documents and information that may be produced, as well as a review of deposition testimony from depositions for which transcripts are not yet available or that may yet have taken place in this matter. Therefore, I expressly reserve the right to expand or modify my opinions as my investigation and study continue, and to supplement my opinions in response to any additional information that becomes available to me, any matters raised by Immersion or the Patent Office, and/or other opinions provided by Immersion’s experts, or in light of any relevant orders by an appropriate authoritative body.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

3. I received an SBEE degree (combined program in Electrical Engineering and Computer Science) from the Massachusetts Institute of Technology as a member of the class of 1973.

4. I am a practicing engineer. For a number of years, I have primarily been doing consulting projects and contract development work under the business name of Rueters-Ward Services. I have worked professionally in the general field of software engineering and relevant hardware for approximately 50 years, primarily in pen/touch computing and related technologies, applications of public-key cryptography, and web development. In recent years, my major projects have concerned pen/touch computing: also referred to simply as pen computing or touch computing. Pen computing refers to computing that makes use of a pen, stylus (including a finger), or other touch-sensitive tool, and a tablet or touchscreen. This is contrasted with computing that makes use of devices such as a physical keyboard or a physical mouse.

5. During and immediately after my university studies, from 1973 to 1977, I worked at Data General Corporation on compilers and source-level emulation tools for a number of programming languages.

6. For the next approximately 17 years, I worked primarily on many aspects of pen computing, both software and hardware, at a number of development

companies. From 1977 to 1987, I was heavily involved in the development of base technology and three generations of pen-computing products of Pencept Inc., a pioneering commercial company for pen-computing technology that I co-founded. Pencept filed for and was granted a number of patents for my work during that time. My contributions included developing novel techniques for gesture and handwriting recognition, new paradigms for pen- and stylus-based user interfaces, two generations of an applicative computer language for gesture and handwriting recognition, and engineering solutions to problems with touchscreens and digitizing tablets.

7. While at Pencept, I participated in the re-engineering of off-the-shelf commercial tablets that detected touch from an electronic stylus; the engineering evaluation of off-the-shelf tablet technologies, including at least one having transparent touchscreen sensors that responded both to finger touches and to touch by a specialized stylus; and the design of a custom electronic tablet responsive to an electromagnetic stylus.

8. During that time and in the years following, I authored or co-authored a number of peer-reviewed articles concerning pen-computing, generative models for handwriting variability, and digitizer/touchscreen technologies and error behaviors.

9. These articles are listed in my CV, which is EX1004 to this declaration.

I was an invited speaker at an international research conference on handwriting recognition in Montreal, Canada. I also made presentations concerning gesture input for Pencept and its competitors to the Graphical Kernel System (GKS) and Programmer's Hierarchical Interactive Graphics System (PHIGS) standardization committees for computer graphics systems, and organized and chaired a panel discussion concerning real-world problems of handwriting recognition technology at another academic conference. I was also invited to visit and speak to the research groups in pen computing at a number of major computer technology companies, including IBM in the United States and the AEG-Telefunken Research Center in Germany.

10. In 1989, I joined the Freestyle development group at Wang Laboratories as a Software Architect. Freestyle was a direct-manipulation pen-computing system that integrated stylus- and voice-input and annotations. During my tenure there, Wang filed for and later was granted U.S. and international patents for my work on simulating virtual keyboard and mouse input from stylus user input on a touch-sensitive tablet. In addition, I was the lead engineer for Wang on a joint hardware project with for a low-power, touchscreen technology using a capacitive stylus for a line of highly-portable handheld computers.

11. In 1991, at the end of Freestyle development, I joined Slate Corporation, a company formed to develop pen-centric applications for both the new Pen-Point (GO Corporation) and Pen Windows (Microsoft) operating systems for tablet and touchscreen computers. During that time, I was Slate's representative and the co-chair of a number of meetings involving GO Corporation, Microsoft, and other companies concerning the JOT cross-platform storage-level standard for compressed electronic ink data, and was the primary author of the first draft for that standard. I made presentations regarding the history of pen computing to technical groups interested in the topic. I also conducted tutorials on touchscreen/pen interfaces and technology at two annual meetings of the Society for Information Display, the leading engineering society for display technologies.

12. From approximately 1993 onward, my professional work has been primarily as an independent developer and consultant in the areas of applications of public-key cryptography and computer security, in addition to pen/touch computing.

13. Since the late 1980s, I have maintained an extensive library of references relating to pen-computing, touchscreens, and related technical subjects. I have continually published a working annotated bibliography of these references on the internet for more than 20 years.

14. In about 1985 to 1987, I was preparing an article for publication in the IEEE journal "Systems Man and Cybernetics", which included a substantial review

of problems presented by handwriting variability in the field of handwriting and gesture recognition using touch screens and tablets. About this same time, I also prepared a tutorial article for the IEEE publication Computer Graphics and Applications on some of the broad variety of touch screen and tablet technologies and an introduction to their technical limitations. In the course of preparing those articles, I began keeping a bibliography in electronic form, with annotations, to assist in referencing the articles. I also spent several days, for each article, doing technical research in the MIT engineering library – the Internet did not exist at that time. At the end of those projects, I had an electronic database of several hundred references with annotations. To assist me in keeping up to date and preparing possible future presentations or articles (such as a presentation I gave a few years later on the history of pen and touchscreen computing), I decided to add other references I collected in my professional work, and to continue adding references of interest.

15. When the Internet became available, a number of technical people in computer-related fields began publishing their technical materials on the Internet as a service to each other. As a service to those with an interest in the field, I also began posting my bibliography online in about the early 1990s. In more recent years, because of my professional work and because of the relation to applications, the bibliography also contains references related to computer security, cryptography, and DRM digital rights management.

16. The bibliography is available on my professional web site at www.ruetersward.com, and on a number of mirrors. The annotations appearing in the bibliography were written by me to provide a short statement/reminder of what I thought was interesting and/or relevant about each reference at the time. It has been my usual practice to update the bibliography at irregular periods several times a year or more often, as I had time. The bibliography has been cited in refereed technical papers by others, by the USPTO, and in academic degree theses such as at M.I.T.

17. I obtained copies of the many of the publications and references in the course of the projects I have worked on throughout my career, others through my independent reading and study. I keep hard or electronic copies of the majority of the references as part of my personal records. I have read the references in my bibliography because of my professional work, my intellectual interests, to keep up to date with developments in pen-computing and other fields, and/or to record the history of the field.

18. I also have a personal collection of touch screen and touch tablet devices that I have acquired over the years. These include equipment from past projects I have worked on, as well as other items I considered of note, including a very early model portable phone with an integrated touch screen and display, a very early calculator that used an electromechanical touchpad for handwritten entry of

calculations, at least one model of a very early PDA with an integrated touch screen and display and handwriting recognition, and various models from the early 1990's of portable touchscreen computers running one or another complete touchscreen operating systems, and devices such as smartphones with haptic/vibrotactile feedback.

19. A copy of my curriculum vitae with descriptions of my education, professional achievements, and qualifications is attached to this declaration as EX1004. It includes a listing of relevant industry experience, publications, presentations, and prior testimony.

III. MATERIALS REVIEWED AND CONSIDERED

20. My findings, as explained below, are based on my years of education, research, experience, and background in the fields of software engineering, haptics programming, human-computer interaction and/or pen and touch computing, as well as my investigation and study of relevant materials for this declaration. When developing the opinions set forth in this declaration, unless noted otherwise, I have assumed the point of view of a person having ordinary skill in the art (“POSITA”), as set forth in Section V below. In forming my opinions, I have studied and considered the materials identified in the list below:

Exhibit	Description
1001	U.S. Patent No. 7,336,260
1002	Prosecution History of U.S. Patent No. 7,336,260
1005	U.S. Patent Application Publication No. 2001/0008849 (“Komata”)
1006	U.S. Patent No. 6,597,347 (“Yasutake”)
1007	Japanese Unexamined Patent Application Publication No. 11-212725 (“Tsuji”) and Certified Translation of same
1008	WO 99/66997 (“Rosenberg”)
1009	U.S. Patent No. 5,977,867
1010	<i>Apple Inc. v. Immersion Corp.</i> , IPR2016-01884, Paper 11 (Apr. 3, 2017) (Institution Decision)
1011	<i>Apple Inc. v. Immersion Corp.</i> , IPR2016-01884, Paper 11 (Jan. 4, 2017) (Patent Owner Preliminary Response)
1012	<i>Apple Inc. v. Immersion Corp.</i> , IPR2016-01884, Paper 11 (July. 3, 2017) (Patent Owner Response)

1013	<i>Apple Inc. v. Immersion Corp.</i> , IPR2017-01369, Paper 7 (Nov. 21, 2017) (Institution Decision)
1014	Complaint, <i>Immersion Corp. v. Apple Inc., et al.</i> , 1:16-cv-00325-RGA, Doc. 1 (D. Del.)
1015	Plaintiff's Preliminary Infringement Contentions in <i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-00712-TL (W.D. Wash.) (served Oct. 20, 2023)
1016	Exhibit A to Plaintiff's Preliminary Infringement Contentions in <i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-00712-TL (W.D. Wash.)
1017	<i>Apple Inc. v. Immersion Corp.</i> , IPR2017-01369, Paper 39 (Mar 22, 2018) (Termination Decision)
1018	<i>In re Certain Mobile and Portable Electronic Devices Incorporating Haptics</i> , Inv. No. 337-TA-990, 1004, Order No. 42 (ITC Feb. 2, 2017)
1019	Federal Court Management Statistics (September 2023)
1020	U.S. Patent Application Publication No. 2001/0009036
1021	<i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-00712-TL, Dkt. No. 46 (W.D. Wash. Nov. 11, 2023)
1022	Negroponte, "HUNCH An Experiment in Sketch Recognition" in UCLA, Environmental Design: Research and Practice, Proceedings of the EDRA 3/ar 8 Conference (1972)
1023	Foley, Fundamentals of Interactive Computer Graphics (1982) (excerpts)
1024	Buxton, "There's More to Interaction than Meets the Eye" in Norman, ed., User Centered Systems Design (1986)
1025	Rosch, "Alternative Input-Digitizing Tablets-Pointing the Way to Easier Input," PC Magazine, p. 227 (Nov. 28, 1989)
1026	U.S. Patent No. 5,491,495
1027	Buxton, "Issues and Techniques in Touch-Sensitive Tablet Input," SIGGRAPH '85, 19:3, 215 (1985)
1028	U.S. Patent No. 4,202,041
1029	U.S. Patent No. 494,562

1030	Davis, "The RAND Tablet: A Man-Machine Graphical Communication Device" in Proceedings-Fall Joint Computer Conference (1964)
1031	U.S. Patent No. 3,482,241
1032	U.S. Patent No. 5,708,460
1033	U.S. Patent No. 6,492,979
1034	U.S. Patent No. 5,510,813
1035	Buxton, "Touch Gesture and Marking," ch. 7 in Baecker, ed., Readings in Human-Computer Interaction (1995)
1036	U.S. Patent No. 6,160,489
1037	Strong, "An Electrotactile Display," IEEE, Trans. On Man-Machine Sys., mms-11:1 (Mar. 1970)
1038	Massie, "Initial Haptic Explorations with the Phantom: Virtual Touch Through Point Interaction" MIT Thesis (1996)
1039	Bliss, "Optical-to-Tactile Image Conversion for the Blind," IEEE, Trans. On Man-Machine Sys., mms-11:1 (Mar. 1970)
1040	European Patent Publication No. EP0265011A1
1041	U.S. Patent No. 5,388,992
1042	IBM, "Mouse Ball-Actuating Device with Force and Tactile Feedback," IBM Technical Disclosure Bulletin 32:9B (Feb. 1990)
1043	Fukumoto, "Active Click Tactile Feedback for Touch Panels," CHI 2001 Interactive Posters (2001)
1044	PCT Publication No. WO9200559A1
1045	Massie, "The Phantom Haptic Interface—A Device for Probing Virtual Objects" in ASME, Dynamic Systems and Control (1994)
1046	U.S. Patent No. 5,982,352
1046	U.S. Patent No. 5,982,352
1047	U.S. Patent No. 6,131,097
1048	U.S. Patent No. 6,337,678
1049	U.S. Patent No. 6,219,034

1050	U.S. Patent No. 6,219,032
1051	U.S. Patent No. 4,885,565
1052	U.S. Patent No. 6,424,333
1053	U.S. Patent No. 5,995,026
1054	U.S. Patent No. 5,235,868
1055	U.S. Patent No. 6,005,551
1056	Minsky, “Computational Haptics” MIT Thesis (1995)
1057	U.S. Patent No. 2,272,070

IV. MY UNDERSTANDING OF THE RELEVANT LAW

21. I am not an attorney. My knowledge of the law is that of a lay person. As I am not a legal expert, I offer no opinions on the law. Unless noted otherwise, wherever I may use a term which has some special meaning in a legal context, I imply no such special legal meaning should be assigned to use of that term. Further, as I have no special expertise in the law, I am likely unaware whether a term even might or might not have some special legal meaning, nor what any such meaning might be.

22. In developing my opinions, Petitioner’s attorneys (“Counsel” for short) discussed various relevant legal principles with me. When I have thought that my understanding could be based inadvertently in some part on my experience elsewhere, I have sought to confirm or correct that understanding with Counsel. I understood these principles when they were explained to me and have relied upon

such legal principles, as explained to me, in the course of forming the opinions set forth in this declaration. I summarize my understandings in this respect as follows:

23. I understand that “*inter partes* review” (IPR) is a proceeding before the United States Patent & Trademark Office for evaluating the patentability of an issued patent’s claims based on prior-art patents and printed publications.

24. I understand that, in this proceeding, Petitioner has the burden of proving that the challenged claims of the ’260 patent are unpatentable by a preponderance of the evidence. I understand that “preponderance of the evidence” means that a fact or conclusion is more likely true than not true.

25. I understand that, in IPR proceedings, claim terms in a patent are “construed” or given their ordinary and customary meaning as understood by a person of ordinary skill in the art (“POSITA”) in the context of the entire patent and the prosecution history pertaining to the patent. If the specification or prosecution history provides a special definition for a claim term that differs from the meaning the term would otherwise possess, that special definition controls. I have applied these standards in my analysis and in deriving the opinions in this declaration.

26. I understand that a patent or other publication must first qualify as prior art before it can be used to render a patent claim anticipated or obvious. I understand that whether or not a particular reference qualifies as prior art is a legal

determination: as I am not a lawyer, I have relied on Counsel to inform me as to whether a reference qualifies as prior art.

27. I understand that determining whether a particular patent or printed publication constitutes prior art to a challenged patent claim can require determining the effective filing date (also known as the priority date) to which the challenged claim is entitled. I understand that for a patent claim to be entitled to the benefit of the filing date of an earlier application to which the patent claims priority, the earlier application must have described the claimed invention in sufficient detail to convey with reasonable clarity to the POSITA that the inventor had possession of the claimed invention as of the earlier application's filing date. I understand that a disclosure that merely renders the claimed invention obvious is not sufficient written description for the claim to be entitled to the benefit of the filing date of the application containing that disclosure.

28. I understand that for an invention claimed in a patent to be patentable, it must be, among other things, new (novel—*i.e.*, not anticipated) and not obvious from the prior art. My understanding of these two legal standards is set forth below.

A. Legal Standard for Anticipation

29. I understand that for a patent claim to be “anticipated” by the prior art (and therefore not novel), each and every limitation of the claim must be found, expressly or inherently, in a single prior-art reference. I understand that a claim

limitation is disclosed for the purpose of anticipation if a POSITA would have understood the reference to disclose the limitation based on inferences that a POSITA would reasonably be expected to draw from the explicit teachings in the reference when read in light of the POSITA's knowledge and experience.

30. I understand that a claim limitation is inherent in a prior art reference if that limitation is necessarily present when practicing the teachings of the reference, regardless of whether a person of ordinary skill recognized the presence of that limitation in the prior art

B. Legal Standards of Obviousness

31. I understand that if a patent claim is not anticipated, a patent claim may be invalid if it would have been obvious in view of a single prior-art reference or a combination of prior-art references.

32. I understand that a patent claim is obvious if the differences between the subject matter of the claim and the prior art are such that the subject matter as a whole would have been obvious to a person of ordinary skill in the relevant field at the time the invention was made. Specifically, I understand that the obviousness question involves a consideration of:

- the scope and content of the prior art;
- the differences between the prior art and the claims at issue;
- the knowledge of a person of ordinary skill in the pertinent art; and

- if present, objective factors indicative of non-obviousness, such as commercial success, long-felt but unresolved needs, failure of others, etc. sometimes referred to as “secondary indicia” or “secondary considerations.” To my knowledge, Patent Owner has not asserted any such secondary considerations with respect to the ’260 patent.

33. I understand that in order for a claimed invention to be considered obvious, a POSITA must have had a reason for combining teachings from multiple prior-art references (or for altering a single prior-art reference, in the case of obviousness in view of a single reference) in the fashion proposed.

34. I further understand that in determining whether a prior-art reference would have been combined with other prior art or with other information within the knowledge of a POSITA, the following are examples of approaches and rationales that may be considered:

- combining prior-art elements according to known methods to yield predictable results;
- simple substitution of one known element for another to obtain predictable results;
- use of a known technique to improve similar devices in the same way;

- applying a known technique to a known device ready for improvement to yield predictable results;
- applying a technique or approach that would have been “obvious to try,” *i.e.*, choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success.
- known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art;
- some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior-art reference or to combine prior-art reference teachings to arrive at the claimed invention. I understand that this teaching, suggestion or motivation may come from a prior-art reference or from the knowledge or common sense of one of ordinary skill in the art.

35. I understand that a universal motivation known in a particular field to improve technology can provide a motivation to combine prior art references even absent any hint or suggestion in the references themselves. I also understand that obviousness is determined in light of all the facts and that a given course of action often has simultaneous advantages and disadvantages, and that this does not

necessarily obviate the existence of a motivation to combine teachings from multiple references.

36. I understand that for a single reference or a combination of references to render the claimed invention obvious, a POSITA must have been able to arrive at the claimed invention by modifying, implementing, or combining the teachings of the applied references.

37. My understanding of any other legal principles is discussed where relevant in my declaration.

V. THE PERSON OF ORDINARY SKILL IN THE ART

38. I understand that the novelty of a patent claim is based on the point of view of a Person of Ordinary Skill in the Art (“POSITA”). I understand that a POSITA is a hypothetical person of ordinary inventive skill in the relevant art, who would also be aware and understand the teachings of all possible prior art references. I also understand that a POSITA is not an automaton, but a person of ordinary creativity. I have applied this standard throughout my declaration.

39. I was asked to provide an opinion as to the level of skill for a POSITA as of November 1, 2001.

40. The '260 patent relates to detecting pressures placed on an input device (such as a simple mechanical button) and providing tactile sensations (such as vibrations) to that same device based on the detected pressure. The input devices

can range from mechanical buttons to non-mechanical softkeys presented on a touchscreen, and the devices that the '260 patent identifies as suitable for its "invention" include a wide range of electronic devices, ranging from consumer devices like mobile phones to more commercial devices like an Automated Teller Machine. EX1001, 2:66-3:13.

41. In the context of the '260 patent and the relevant prior art, a POSITA in this matter would have a bachelor's degree in electrical engineering, computer science, or a related field, plus at least two years of industry or graduate level experience with software engineering, haptics programming, and/or human-computer interaction, including experience with user-interfaces and applications involving touchscreens, touchpads, and related devices as well as with the basic electronic and hardware operation of such devices.

42. In reaching this opinion as to the hypothetical POSITA, I have considered the types of problems encountered in the art, the prior art solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level and professional capabilities of workers in the field

43. I have at least the qualifications of a POSITA. In many aspects my qualifications and expertise exceed that of a POSITA. However, I have also worked

with many people who fit the characteristics of the POSITA, and I am familiar with their level of skill in and around November 1, 2001.

44. When developing my opinions for this declaration, and unless otherwise noted, my analysis and conclusions are based on the point of view and expertise of a POSITA.

VI. PRIMARY REFERENCES CONSIDERED

45. As discussed more fully in Section XI, my analysis in this declaration focuses primarily on the following references:

Reference	Exhibit No.	Shorthand
U.S. Patent Appl. Publ. No. 2001/0008849	EX1005	Komata
Japanese Unexamined Patent Application Publication No. 11-212725	EX1013	Tsuji
International Appl. Publ. No. WO 99/66997	EX1023	Rosenberg

46. I have been informed by Counsel that each of Komata, Tsuji, and Rosenberg is prior art to Claims 1-7 of the '260 patent.

VII. SUMMARY OF MY OPINIONS

47. As discussed more fully in Section XI, my opinion is that Claims 1-7 of the '260 patent are each unpatentable. In particular, I have concluded that:

- Komata anticipates and/or renders obvious Claims 1-7.
- Tsuji anticipates and/or renders obvious Claims 1-7.

- Rosenberg anticipates and/or renders obvious Claims 1-7

VIII. AN OVERVIEW OF THE STATE OF THE RELEVANT ART

48. As part of my analysis and review, I considered what would be known and understood by a POSITA as of November 1, 2001, which Counsel has informed me is the earliest potential priority date for Claims 1-7. The following overview, of course, cannot be exhaustive.

A. An Overview of Touchpads and Similar Devices

49. The following is not intended to provide a narrow definition of any term, but to show the breadth of understanding a POSITA would have in considering the art, and teachings of the art.

50. In context, a POSITA would understand that touchpads broadly include a class of sensor devices that sense a touch or contact in some fashion and produce a useful signal in response.¹ A given touchpad device may be intended primarily to

¹ I give further notes of terms for touchpad below. For ease in reading, I will generally just use the terms “touchpad” or “digitizer” (short for “tablet digitizer”). Exceptions may be in a particular context such as when quoting from a reference, or may be inadvertent. A POSITA would understand this in no way implies any distinction of teachings.

be used to detect touches by a particular type of object, such as a finger or a special stylus.

51. Many touchpad devices have a flat surface to be touched. Touchpad devices include devices usable for pointing, in that they can be used to input position values for a touch on a surface (for example, “x” and “y co-ordinates”, or sometimes only a single position ordinate). Thus they may be used as locator devices – that is, they can be used to input a position or location – and general teachings regarding locator devices would apply.

52. Other terms used to describe touchpad-type devices include proximity sensors, touch(-sensitive) surface/device, contact sensor, touchscreen, tablet, touch tablet, touch plate, digitizer tablet/pad/panel (also just “digitizer”), touch panel, stylus input device, telautograph, telescriber, cursor pad, handwriting input transducer, electronic/digital writing board or writing plaque, electronic drawing board, scriptoscope, electronic/digitizing pantograph, electrographic/graphical input device, light pen/gun, graphics table/tablet, telewriter, writing telegraph, electrowriter, touch mouse, electronic/digital whiteboard, touch(-sensitive) display, tabletop (touch) display, and so forth. Further terms used to describe touchpad devices or equivalents technology include positional input device, handwriting terminal, touch sensitive orthogonal data field input device, etc.

53. If encountering a reference that used the terms touchpad and touchscreen (for example) distinctly, a POSITA would recognize that a touchscreen has been taught to be constructed using a transparent touchpad integrated with a display, as well as other ways to integrate with a display.² A POSITA would understand that a reference to a touchscreen also teaches a touchpad, or that the teachings may be applied to a touchpad, and vice versa, as for all these devices.

54. A POSITA would also know and understand that some touchpad devices only provide contact/non-contact information, or only pressure/force information, or a valuator input, and no direct X/Y (or X/Y/Z) position information. A POSITA would also know and could apply teachings of how devices could be used to provide locator input, nonetheless. For example, a POSITA would know that X/Y position values (that is, locator input) can be done by combining two valuator inputs by using one input for an X value and another for a Y value.

55. A POSITA would have been familiar with the teachings of locator devices and other types of devices, such as explained in references that teach

² For example, this is described in EX1022, (Negroponte, “HUNCH An Experiment in Sketch Recognition”) on page 22-1-4: “The tablet has...a transparent surface which permits it to be used vertically in front of the display with the minor inconvenience of a half inch parallax [sic] (figure 6).”

classification of input devices by their use into locator, evaluator, pick, and other types of input devices.³ A POSITA would understand that touchpads are readily used as locator devices, and that locator devices generally may be substituted one for another in a system with only readily-understood changes, such as converting relative position input to absolute position or vice-versa, or converting a force into to relative position information, etc. A POSITA would therefore understand that teachings regarding one kind of locator device (for example: mouse, joystick, or light pen) may be applied to other kinds of locator devices (for example: touchpad, gaze tracker, or stylus tablet).

56. On this point, a POSITA would know and understand that it was a conventional practice for vendors of touchscreen, tablet, and touchpad devices to include or provide a mouse-like “relative” output mode or a “mouse driver” software so that their device could be substituted more readily for a computer mouse in the large number of existing computer applications and computer systems.⁴

³ For example, EX1023 (Foley, “Fundamentals of Interactive Computer Graphics” (1982)) and EX1024, (Buxton, “There’s More to Interaction than Meets the Eye”).

⁴ For example, a POSITA would have known how this is noted in EX1025 (PC Magazine, “Alternative Input--Digitizing Tablets-Pointing the Way to Easier Input”) at page 228.

57. A POSITA would be well-aware that many touchpads also provide additional information beyond X/Y position information, such as a force/pressure (or pseudo-force/pressure) value or proximity height. Force/pressure as well as proximity values may be used as a “z” ordinate input values, as may values from additional input devices. Other information that some devices provide about a touch or contact may include lateral forces/pressures, contact area (which may be used as a surrogate for force/pressure, *e.g.*, pressing harder with a compliant fingertip tends to increase the contact area), thermal information, contact area shape or orientation, touches (or near-touches) by multiple objects, information about the type of object (*e.g.* a special stylus vs. a finger), etc.

58. While many touchpad devices provide position information for the touch, a POSITA would also understand the term to include touchpads that simply report a touch on the pad (without providing information about where on the pad the touch occurred). Further, a POSITA would understand that touch pads that report position may also comprise multiple smaller touchpad component sensors, the position information being derived from which sensor component(s) indicated a touch or degree of touch.

59. A POSITA would also know and understand the teachings of virtual/simulated/logical devices that may be implemented comprising a touchpad, and that the virtual devices are intended to be, and are, obvious equivalents to their

non-virtual models. For example, touch-buttons, keys, sliders, and keypads, keyboards, computer mice, trackballs, and also virtual touchpads may be emulated via or in areas on a touchpad device, or using data from a touchpad device. This would include understanding that multiple such virtual devices may be implemented on a single physical touchpad. Thus a POSITA would also understand that properties and teachings of the physical devices may be applied to the virtual devices.

60. Similarly, a POSITA would also find it equally obvious to replace a virtual device with an equivalent physical device.

61. A POSITA would know and understand techniques for implementing many different virtual devices with touchpads, including virtual rotary devices such as scroll wheels, rotary selectors, knobs, and jog dials/wheels. Virtual devices provide the same functionality as the equivalent physical device, but in a simulated fashion. On this point, a POSITA would also be abundantly aware of the teachings of virtual keypads and keyboards producing “typed” characters on a display, and virtual buttons.⁵

⁵ Exemplary references include: EX1026 (U.S. Patent No. 5,491,495) (teaching implementations of simulated/virtual keyboards, computer mice, and touchpads); EX1027, (Buxton, “Issues and Techniques in Touch-Sensitive Tablet Input”)

62. Historically, a POSITA would know that the technology for touchpads (with reporting of position and at least one bit of pressure information) date back at least to the telautograph,⁶ and touchpads were integrated with digital computers by the 1960's;⁷ thus, a POSITA would be aware that the range of relevant prior art is both very deep and very broad.

63. Location information could be determined more-or-less directly (*e.g.*, from actual position on the surface, or from which sub-component(s) reported a detection), or indirectly or algorithmically (*e.g.*, from a computation involving detected forces at edges or corners of the surface, or from propagation times for an

(teaching advantages of virtual input devices in general, and of pressure sensing with a larger number of levels of pressure); EX1028 (U.S. Patent No. 4,202,041) (describing dynamically variable keyboard terminal, teaching “soft” keyboards, referencing virtual pushbuttons in prior art).

⁶ For example, although perhaps not the earliest reference, EX1029 (U.S. Patent No. 494,562) is one such reference.

⁷ For example: EX1030 (Davis, “The RAND Tablet: A Man-Machine Graphical Communication Device”) (teaching a stylus-tablet touch input device for interactive use with a computer); EX1031 (U.S. Patent No. 3,482,241) (teaching a touch display (touchscreen) measuring changes in capacitance).

acoustic, optical, or magnetostrictive signal, or reflections). A POSITA would also know that sensing need not be incorporated into a touch surface itself. For example, position could be detected via one or more light beams above the working surface, via camera-based imaging, via sensors behind the surface, or via a pantographic mechanism separate from the surface.

64. A POSITA would also know that a touch on a surface may be detected in many ways, including indirectly by a proxy for physical contact, such as proximity or force/pressure signals of a sensor of the surface exceeding some threshold, or by a force-sensitive or mechanical switch in the tip of a stylus separate from the surface.

65. To the extent there may be an attempt to argue that a touchpad or touch-sensitive device in the prior art must respond to an “actual” touch, a POSITA would have known that common technologies for touchpads included capacitive sensing of proximity, and electromagnetic signal coupling with an electronic stylus. Capacitive sensors work by measuring changes in capacitance, either self-capacitance or mutual-capacitance,⁸ caused by a conductive object in proximity. It would be well

⁸ A POSITA would appreciate that self-capacitance sensors measure an increase in capacitance to ground, and mutual-capacitance sensors measure a decrease in capacitance between two conductors. On this point, a POSITA would also be

known to a POSITA that capacitive sensors may not respond at all to a touch by a non-conductive object (such as a plastic stylus or a pencil), since they induce no change in capacitance. It would also be well-known that they may not respond to finger touches if the user is wearing a non-conductive glove, has particularly dry skin, or under some grounding conditions, and that they can respond with false touches due to water droplets, etc.⁹

66. On the same point, a POSITA would know that the electromagnetic sensors would generally not respond to any touch by a finger, but only by a particularly-matching electronic stylus.

67. A POSITA would know also about similar quirks of other sensing technologies, such as optical sensing. In general, a POSITA would understand that touches are detected functionally.

familiar with the practical complexities of capacitively-coupled noise and poor grounding.

⁹ This all would have been abundantly well known to a POSITA, but it is mentioned, for example, in EX1032 (U.S. Patent No. 5,708,460) at 1:29-30 (“Accordingly, such [a capacitive type] system will not respond to touch with a glove or a non-capacitive stylus.”).

68. A POSITA would also understand the many ways multiple sensor technologies had been and could be integrated in one device, to multiple effects.¹⁰

B. An Overview of Haptics

69. A POSITA would be familiar with the term “haptics” as referring to a relation to contact or touch involving the human body. In the context of the relevant art it would have been used to characterize both input to a system via touch, and output or display from a system and perceived by one or more of the human senses

¹⁰ One of many such examples a POSITA would have known, is EX1033 (U.S. Patent No. 6,492,979 (“Kent”)). Kent teaches incorporating both FSR (force sensing resistor) and capacitive sensing in one device and various alternatives, including using capacitive sensing for position and FSR sensing for pressure, and also using either or both in determining position to accomplish greater reliability of performance. *See, e.g.,* Kent, Abstract, 3:14-16 (“In one embodiment of the invention, projective-capacitive sensors are used as the primary sensor and one or more force sensors are used to obtain touch validation.”). Kent also cites to multiple further examples in its own prior art, such as EX1034, U.S. Patent No. 5,510,813, as an example of using resistive/conducting to determine a touch position and capacitive sensing for detecting the force of the touch. Kent, 1:64-2:5.

of touch.¹¹ A POSITA would also know that other terms used in the art, such as “tactile,” “kinesthetic,” “tactual,” “force output,” etc. had also been used interchangeably with “haptic” in various contexts, and would understand the meanings in context.

70. For ease in reading, I will generally use the terms ‘haptic’ and ‘tactile.’ Concerning haptic output or display, a POSITA would be familiar with multiple examples of and techniques for haptic output and feedback, including forces, vibrations, and electrical stimulation, as well as patterns of haptic output.¹²

71. In addition to haptic/touch input devices (discussed in part above along with touchpad haptic input devices), a POSITA would have been familiar with

¹¹ For example, a POSITA would have known how EX1035 (Buxton, “Touch Gesture and Marking,” chapter 7 of Baecker, *Human-Computer Interaction*) discusses both haptic input and haptic output, as well as force feedback.

¹² For example, EX1036 (U.S. Patent No. 6,160,489) teaches the use of a plurality of distinctive tactile alert patterns (vibrations) generated with an axially offset counterweight driven by a motor, since audible alerts may not be heard. EX1037 (Strong, “An Electrotactile Display”) teaches direct electro-tactile stimulation of the nerves in touching fingers, using different amplitudes to indicate different touch areas and boundaries.

multiple kinds of electronically-controlled haptic/tactile actuators for output of haptic effects. These would include voice-coil actuators,¹³ oscillatory or piezoelectric actuators,¹⁴ solenoids,¹⁵ and electromagnetic¹⁶ actuators, among many others.

¹³ For example, EX1038 (Massie, “Initial Haptic Explorations with the Phantom: Virtual Touch Through Point Interaction”) teaches piezo elements and voice-coil speakers as vibrotactile actuators.

¹⁴ For example, EX1039 (Bliss, “Optical-to-Tactile Image Conversion for the Blind”) describes piezoelectric actuators for producing tactile vibrations at small spacing.

¹⁵ For example, EX1040 (European Patent Publication No. EP0265011A1) teaches using piezoelectric or electromagnetic tactile elements as a matter of design choice for a computer mouse: a computer processor sends signals to activate the tactile elements, such as to produce vibrations while the cursor coincides to a special area.

¹⁶ For example, EX1041 (U.S. Patent No. 5,388,992) teaches voice-coil or small motor transducers to produce tactually perceived vibrations. and also teaches directly converting output sound signals to tactile vibrations.

72. A POSITA would be familiar with various techniques involving force-based feedback or output, such as simulations of real-world sensation. As one example, a POSITA would be familiar with techniques for simulating clicks, frictions, textures, and resistive forces, via special and/or temporal patterns of vibrations.¹⁷

73. A POSITA would also be aware of the broad motivations for incorporating haptic feedback in interactive systems such as to take the place of lacking haptic feedback of mechanical systems,¹⁸ providing “cue” information about

¹⁷ For example, EX1042 (IBM, “Mouse Ball-Actuating Device with Force and Tactile Feedback”) teaches tactile outputs for clicks, vibrations, crossing over line boundaries, and making mouse detents. It also teaches different tactile feedback for different regions, such as stepping over a grid or into an illegal zone. EX1043 (Fukumoto, “Active Click Tactile Feedback for Touch Panels”) teaches generating click feel sensations to a tapping fingertip using short periods of vibration, vibrating the whole touch panel. EX1044 (PCT Publication No. WO9200559A1) teaches simulating textures via vibrations when the user’s finger or stylus is moving across a surface, as well as “soft” function keys.

¹⁸ For example, EX1045 (Massie, “The PHANToM Haptic Interface—A Device for Probing Virtual Objects”) teaches the importance of haptic cues and “feeling the

an object or some status,¹⁹ a confirmation that an input or gesture was accomplished successfully,²⁰ to provide different haptic feedback or output to indicate an action on a particular region or software element,²¹ or to provide output and feedback

[virtual] buttons click”, when virtual buttons substitute for physical buttons/switches with the absence of sound.

¹⁹ As one example, EX1046 (U.S. Patent No. 5,982,352) teaches a “digitizer” pad or touchscreen incorporating tactile feedback cues, both passive and active, via piezo vibrators, air blasts, sound waves or the like, as well as sensing of force location.

²⁰ For example, EX1047 (U.S. Patent No. 6,131,097) teaches the use of haptic cues, for example to indicate a particular selection has actually occurred.

²¹ For example, EX1048 (U.S. Patent No. 6,337,678) teaches graphical buttons, and a control processor receiving commands which specify the type of haptic response each touch exhibit, with different feels between disabled and enabled buttons. EX1049 (U.S. Patent No. 6,219,034) teaches associating operating system user interface elements, such as buttons, with types of tactile commands, as well as teaching profiles. EX1050 (U.S. Patent No. 6,219,032) teaches associating force sensations with graphical objects, to assist the user in selecting a desired function or to inform the user of graphical objects.

circumstances in which audio, visual, or other output or display might not be effective.²²

74. As well as this, a POSITA would know the teachings of providing varying feedback depending on force/pressure levels of an input.²³

75. In addition, a POSITA would also be aware of the historical range of teachings of vibrational and force haptic feedback, including feedback based on a pressure sensor input, in critical situations. Accordingly, a POSITA would appreciate the width and depth of the range of relevant prior art.

²² For example, EX1051 (U.S. Patent No. 4,885,565) teaches tactile feedback to indicate a successful selection via a touchscreen, because audio feedback may be masked by radio or road noise, and to minimize taking away visual contact.

²³ For example, a POSITA would know the teachings of references such as: EX1052 (U.S. Patent No. 6,424,333), which teaches vibrational feedback of varying levels depending on the force or pressure input by a user on an object.

IX. OVERVIEW OF THE '260 PATENT

A. An Overview of the Patent Specification

76. In this section, unless otherwise noted, all citations are to the '260 patent.

77. The '260 patent is entitled “Method and Apparatus for Providing Tactile Sensations.” As described in its Abstract, the patent concerns products and processes for providing tactile sensations to input devices or electronic devices. Abstract.

78. In describing the background of the relevant art, the patent’s specification states that: “Conventional electronic devices, such as mobile telephones and Personal Digital Assistants (PDAs), include visual displays. A user of such devices interacts with the visual display using any one of a number of input devices.” 1:19-22.

79. The patent then gives many examples of input devices. These include mechanical input devices such as mechanical switches, buttons, computer mice, keyboards, and keypads as well as non-mechanical input devices such as touchpads and “softkeys” shown on a touchscreen, etc. *See, e.g.*, Abstract, 1:12-59, 2:2-20.

80. According to the patent, mechanical input devices typically provided “physical feedback” to a user, *e.g.*, the click sensation felt when a user presses a button on a keyboard or keypad. 1:30-34. The patent then alleges that “[w]hen a

flat surface interface device is used, such as a touchpad..., these simple mechanical cues are unavailable to the user.” 1:51-53. In other words, the patent alleged (incorrectly) that touchpads existing as of November 2001 did not provide feedback to users.

81. Despite implying that touchpads did not provide feedback to users, the patent nonetheless acknowledges that it was already known in the art to include vibratory feedback to the user with conventional touchpads. More specifically, the patent cites EX1009 (U.S. Patent No. 5,977,867) as one example of a then-existing touchpad that included “vibratory feedback.” 2:6-8.

82. The patent goes on to assert that “conventional systems and methods are limited” in that “[t]hey lack a full range of functionality assistance to a user interacting with an electronic device,” and “such systems and methods still require considerable visual attention from the user.” 2:6-12. I did not find that the specification provided an explanation of what would constitute a “full range of functionality assistance to a user,” nor does it identify what specific functionality might be lacking allegedly from the prior art.

83. Without further explaining what the asserted weaknesses of the prior art might be, nor how the teachings of the patent might overcome those weaknesses, the patent describes products and processes “for providing tactile sensations to input devices or electronic devices” in response to events such as “the level of pressure

86. In Figure 2 above, the apparatus 60 has “multiple input devices includ[ing] twelve fixed or pre-assigned alphanumeric input buttons 10a-l, three pre-assigned function buttons 11a-c, and three assignable function buttons 12a-c.” 5:38-43. These are also shown in Figure 3.

87. Figure 2 also depicts apparatus 60 as including an actuator 61 and a controller 9. 7:65-66; 8:13-14. “[A]ctuator 61 is in communication with the various input devices, and is configured to provide vibrations of varying frequencies, magnitudes, and waveforms to the input devices.” 8:2-5.

88. According to the patent, each input device (*e.g.*, the buttons shown in Figures 2 and 3) has “means for determining or sensing pressure.” 5:48-49. As the patent explains:

The input device is capable of resolving multiple levels of pressure placed on the input device, and of transmitting a signal associated with the level of pressure placed on the input device. These multiple levels of pressure may be defined by, for example, the physical location of, or distance traveled by, a switch-type input device in the x-plane when pressed by a user (higher/lower), the magnitude of pressure placed on a touchpad-type input device, or other means.

5:50-57. In other words, each button can detect a pressure level that has been applied to it (*e.g.*, by a user’s finger pressing the button), and that detection can be based on the actual “magnitude of pressure placed on” the button or more simply the amount of distance the button was moved due to the application of force on the button.

89. The patent identifies a wide variety of different devices that can detect multiple levels of pressure and which are suitable as input devices. 3:27-31. According to the patent, “any analog or digital” switch is “[s]uitable” and those that can resolve more than one level of pressure are preferred. 8:43-49.

90. Turning specifically to the buttons shown in Figure 2, the patent explains:

Each of the buttons 10 is capable of resolving multiple levels of pressure placed on the buttons 10. For example, the button 10 i (corresponding to the number 9 on the keypad) is capable of resolving five levels of pressure placed on the button 10 i. In the embodiment shown, the first level is a state in which no pressure is placed on the button by a user, the second level being a first magnitude of pressure placed on the button (greater than no pressure placed by the user), the third level being a second magnitude of pressure placed on the button (where the second magnitude of pressure is different from or greater than the first magnitude), the fourth level being a third magnitude of pressure placed on the button (where the third magnitude is different from or greater than the second magnitude), and the fifth level being a fourth magnitude of pressure placed on the button (where the fourth magnitude is different from or greater than the third).

5:60-6:9.

91. Based on the different levels of pressure, different input signals can be sent to the electronic device. 5:58-6:9. For example, the second through fifth detected levels of pressure could be associated with an input signal for each of letters W through Z, *e.g.*, the second level corresponds with W, the third level corresponds with X, the fourth level corresponds with Y, and the fifth level corresponds with Z. 6:27-36.

92. In addition to providing control signals to an electronic device, the detected pressure levels are also used to provide tactile feedback in the form of vibrations to the user. For example, “the controller 9” (depicted above in Figure 2) “receives an input signal from one of the input devices” and “then analyzes the input signal received to determine a signal to transmit to the actuator 61.” 8:9-12.

93. The signals sent to the actuator 61 are called “output control signals” and they cause the actuator to vibrate. 8:13-25. For example, a “first control output signal is one that causes the actuator to provide a vibration of a certain, first frequency,” and a “second control output signal is one that causes the actuator to provide a vibration of a certain, higher frequency, and so on.” 8:19-23. The patent explains that “the vibrations provided may be of the same frequency.” 8:23-25.

94. The patent’s Figure 9 (below) provides an example of a table that a controller can use to associate a particular pressure level with a particular tactile sensation:

INPUT DEVICE	INPUT SIGNAL	POSITION DATA	PRESSURE DATA	FUNCTION	TACTILE SENSATION
1	--	Location 1	< Pressure 1	Search	Sensation 1
	Input 1	Location 1	Pressure 1 <=	Select	Sensation 2
2	--	Position 1	--	On	Sensation 3
	--	Position 2	--	Off	Sensation 4
3	Input 2A	--	Pressure 1	9	Sensation 5
	Input 2B	--	Pressure 2	W	Sensation 6
	Input 2C	--	Pressure 3	X	Sensation 7
	Input 2D	--	Pressure 4	Y	Sensation 8
	Input 2E	--	Pressure 5	Z	Sensation 9
4	Input 3	--	Pressure 1	Menu 1	Sensation 10
		--	Pressure 2	Menu 2	Sensation 11
		--	Pressure 3	Menu 3	Sensation 12
5	--	--	Pressure 1	2	Sensation 13
		--	Pressure 2	A	Sensation 14
		--	Pressure 3	B	Sensation 15
		--	Pressure 4	C	Sensation 16
6	Input 4	Position 1	Pressure 1	Function 1	Sensation 17
	Input 5	Position 2	Pressure 2	Function 2	Sensation 18
	Input 6	Position 3	Pressure 3	Function 3	Sensation 19
7	Input 7	Location 1	Pressure 1	Function 1	Sensation 20
	Input 8	Location 2	Pressure 2	Function 2	Sensation 21
--	AMBIGUOUS	--	--	--	Sensation 22
--	Function Failure	--	--	--	Sensation 23

FIG. 9

95. When the controller receives a signal indicating that a particular pressure level has been applied to an input device and detected, the controller uses the table shown above to associate the pressure level to a particular tactile sensation. The controller uses that information to cause “an actuator to cause the input device to vibrate at a frequency” associated with the tactile sensation. 14:53-57.

96. For example, in the table of Figure 9, if the controller received a signal indicating Pressure 1 on Input Device 5, then the controller causes the actuator to output Sensation 13. 14:43-57. Similarly, if the controller received a signal indicating Pressure 3 on Input Device 5, then the controller causes the actuator to output Sensation 15. 14:58-15:15. The table also associates different pressure levels

with different functions for the electronic device, e.g., Pressure 1 on Input Device 5 selects the number “2” on the device. 14:43-57.

B. An Overview of the Prosecution History

97. I have reviewed the prosecution history of the patent which is exhibit EX1002.

98. The Applicants’ originally filed Claims 1 and 2 are reproduced below:

1. (Previously Presented) A computer-readable medium having instructions, the instructions including instructions that cause a processor to:

- detect a first pressure on a first input device;
- provide a first tactile sensation to the first input device;
- detect a second pressure on the first input device, the second pressure greater than the first pressure; and
- provide a second tactile sensation to the first input device.

2. (Previously Presented) The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:

- detect a third pressure on the first input device, the third pressure greater than the second pressure; and
- provide a third tactile sensation to the first input device.

EX1002 at 159.

99. As seen above, the originally-filed Claim 1 recited a “computer-readable medium” that, among other things, detected a first and second pressure and

provided a first and second tactile sensation. Originally-filed claim 2, on the other hand, recited detecting first, second, and third pressures as well as providing three tactile sensations.

100. In an initial office action, the Examiner rejected Claim 1 (and its dependent claims) in view of Yasutake (EX1006), but found claim 2 (and its dependents) allowable. EX1002, 184-190. The Applicants subsequently attempted to distinguish Claim 1 from Yasutake, arguing that “Yasutake does not disclose ‘provide a first tactile sensation to the first input device, the first tactile sensation based at least in part on the first pressure’” because, although the Applicants admitted that “the Yasutake device may be fitted with ‘tactile sensation generators,’ and that such generators can be used to output effects” allegedly “[o]utputting effects is not the same as ‘provide a first tactile sensation to the first input device, the first tactile sensation based at least in part on the first pressure.’” EX1002, 207-216. The Applicants were not able to convince the Examiner who applied a second reference (US Patent No. 6,781,569 (“Gregorio”)) and stated “it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the first and second tactile sensations in response to differen[t] pressures, as taught by Gregorio et al., in the device of Yasutake.” EX1002, 222-228. After this, the Applicants elected to cancel Claim 1, and re-wrote Claim 2 as an independent claim. EX1002, 234-238. The Examiner allowed the re-written claims.

101. In the Examiner's notice of allowance, the Examiner pointed to the requirement in Claim 1 that the processor "detect a third pressure on the first input device, the third pressure greater than the second pressure" as the reason for allowance, and said that while Yasutake taught "detecting first pressure and second pressure, and of providing first and second tactile sensations," it did not disclose detecting a third pressure and providing a third tactile sensation. EX1002, 257-259

X. CLAIM INTERPRETATION

102. I understand that claim terms are construed according to their ordinary meaning in light of the specification and prosecution history.

A. "Input Device"

103. I understand that the Board previously determined the broadest reasonable interpretation of the term "input device" is "a device by which a user can interact with an electronic device to provide instructions, responses, and other input to the electronic device." EX1010, 10.

104. In my opinion, that prior construction is an appropriate construction in view of the specification because the specification broadly describes "input devices" as any mechanical or non-mechanical device that a user uses to "interact[]" with an electronic device. For example, the specification states that:

A user of such [electronic] devices interacts with the visual display using any one of a number of input devices. Examples of such input devices include computer mice, joysticks, trackballs, steering wheels, stylus, tablets, pressure-sensitive spheres, scroll wheels, keyboards, and

keypads. The user provides instructions, responses, and other input to the device using such input devices.

1:19-27 (emphasis added).

105. The specification likewise describes the mechanical buttons on “conventional mobile telephones and PDAs” as input devices that a user interacts with to control the device, *e.g.*, to input an alphanumeric character. 1:28-39. The specification also describes “touchpads” and the “graphically generated buttons or softkeys” displayed on a touchscreen as input devices. 1:51-59. Figure 5 depicts such an embodiment in which the input devices are both the touchpad 30 itself as well as the individual “softkey[s]” displayed through the touchpad. 11:11-55 (explaining that the “softkeys” “provide the same functionality as the mechanical keys on a conventional telephone keypad”).

106. Accordingly, in my opinion an “input device” as recited in Claims 1-7 is “a device by which a user can interact with an electronic device to provide instructions, responses, and other input to the electronic device.”

B. “Single Contact” a.k.a. “Single Touch”²⁴

107. I understand that in a prior IPR proceeding, the Patent Owner argued that at least Claims 1-2 of the ’260 patent were limited to detecting multiple

²⁴ From my reading of the record, it appears that the Patent Owners used the term “single contact,” while the Board used the term “single touch.”

pressures during “an interaction” (pre-institution) or “a single contact” (post-institution). EX1011, 4-6; EX1012, 3, 24. In other words, the various pressures recited in the claims (first, second, third, etc.) needed to be detected during a single press, touch, or contact, and thus could not be detected in separate presses, touches, or contacts.

108. I also understand that the Board rejected this construction at institution. According to the Board, the claims “do not define any temporal relationship between the [pressure] detections and thus fail to require detecting the first, second, and third pressures must occur at the same time, continuously, or as part of a single touch interaction.” EX101028, 21-23. Having reviewed the claim language and the specification, I agree with the Board’s prior understanding on this point.

109. I start first with the claims themselves. I have reproduced claim 1 below with labels added for ease of reference.

1[PRE]. A computer-readable medium having instructions, the instructions including instructions that cause a processor to:

[1A] detect a first pressure on a first input device,

[1B] provide a first tactile sensation to the first input device, the first tactile sensation based at least in part on the first pressure;

[1C] detect a second pressure on the first input device, the second pressure greater than the first pressure; and

[1D] provide a second tactile sensation to the first input device, the second tactile sensation based at least in part on the second pressure;

[1E] detect a third pressure on the first input device, the third pressure greater than the second pressure; and

[1F] provide a third tactile sensation to the first input device.

110. There is nothing in the plain language of the claim that would require the “first pressure,” the “second pressure,” and the “third pressure” to be detected during a single press or contact with the input device. The only limitation that the Applicants placed on those three pressures is a quantitative limitation, *i.e.*, the third pressure must be greater than the second pressure, which must be greater than the first pressure. A POSITA would understand that this quantitative relationship between the pressures can be detected over multiple presses or contacts with an input device and therefore a single press or contact is not required by the claim language.

111. The claim is written broadly and covers scenarios in which the processor detects the three recited pressures more-or-less simultaneously, scenarios in which they are detected during a single continuous user contact or touch with the input device, and also scenarios in which the processor detects the pressures during separate contacts with the device. A POSITA would understand that all of these scenarios are within the scope of the claim.

112. Turning to the specification, it contains no teachings that would re-define or narrow the claims' otherwise broad plain language. For example, I note that the patent describes an embodiment in which a controller periodically "monitors" an input device, *i.e.*, Input Device 5 (*see* FIG. 9), over several "passes" to detect whether pressure is being applied to the input device during a particular pass. EX1001, 14:43-15:15; FIG. 9. The specification does not place any restrictions on the timing of the passes: this makes sense, since it might well be that a user would do one "touch" at a pressure to enter the number "2", and a subsequent "touch" at a pressure to enter the letter "B."

113. Returning to Figure 9 (below; annotation added), there are four tactile sensations (Sensations 13 through 16) associated with Pressures 1 through 4 for Input Device 5.

INPUT DEVICE	INPUT SIGNAL	POSITION DATA	PRESSURE DATA	FUNCTION	TACTILE SENSATION
1	--	Location 1	< Pressure 1	Search	Sensation 1
	Input 1	Location 1	Pressure 1 <=	Select	Sensation 2
2	--	Position 1	--	On	Sensation 3
	--	Position 2	--	Off	Sensation 4
3	Input 2A	--	Pressure 1	9	Sensation 5
	Input 2B	--	Pressure 2	W	Sensation 6
	Input 2C	--	Pressure 3	X	Sensation 7
	Input 2D	--	Pressure 4	Y	Sensation 8
	Input 2E	--	Pressure 5	Z	Sensation 9
4	Input 3	--	Pressure 1	Menu 1	Sensation 10
		--	Pressure 2	Menu 2	Sensation 11
		--	Pressure 3	Menu 3	Sensation 12
5	--	--	Pressure 1	2	Sensation 13
		--	Pressure 2	A	Sensation 14
		--	Pressure 3	B	Sensation 15
		--	Pressure 4	C	Sensation 16
6	Input 4	Position 1	Pressure 1	Function 1	Sensation 17
	Input 5	Position 2	Pressure 2	Function 2	Sensation 18
	Input 6	Position 3	Pressure 3	Function 3	Sensation 19
7	Input 7	Location 1	Pressure 1	Function 1	Sensation 20
	Input 8	Location 2	Pressure 2	Function 2	Sensation 21
--	AMBIGUOUS	--	--	--	Sensation 22
--	Function Failure	--	--	--	Sensation 23

FIG. 9

114. In the “monitoring passes” embodiment, the controller would “monitor” Input Device 5 over separate “passes,” such that during a first “pass” Pressure 1 is detected, and Sensation 13 is output, and on “a later monitoring pass” Pressure 3 is detected and Sensation 15 is output. EX1001, 14:43-63. Notably, the controller does not detect intermediate²⁵ Pressure 2 nor whether the pressure on Input Device 5 falls to zero between monitoring passes. In other words, the controller detects distinct pressures that have a mathematical relationship (*i.e.*, Pressure 3 is

²⁵For a simpler illustration, I have assumed that Pressures 1 through 4 are progressively greater, although this need not be the case: other Pressures could be intermediate.

greater than Pressure 1), and can do so even if those pressures were created by three distinct contacts on the input device. Imposing a temporal restriction on the instances of pressure detection would exclude this embodiment by requiring that Input Device 5 monitor the pressure continuously and recognize any intermediate pressure inputs.

C. “Pressure”

115. I understand from Counsel that the Patent Owner previously asserted the '260 patent against Apple Inc. in an International Trade Commission investigation. I also understand from Counsel that during the course of that litigation, the Patent Owner argued that “pressure” should be construed as “application of force from a contact,” and that the Administrative Law Judge at the International Trade Commission agreed. EX1018 at 34-38, 43.

116. Having reviewed the claim language and the specification, I agree with the construction of “pressure” that the Patent Owner previously advocated for and which the International Trade Commission adopted. I note here also that it is consistent with the informal use in the art of “force” and “pressure” as interchangeable/equivalent terms.

117. Further on this point, a “pressure,” without other context, could be defined as “force per unit area,” but the specification of the '260 patent is explicit

that “multiple levels of pressure” can be detected by means other than calculating force per unit area. Specifically, the patent states:

Embodiments of the present invention include an input device having a means for determining or sensing pressure. The input device is capable of resolving multiple levels of pressure placed on the input device, and of transmitting a signal associated with the level of pressure placed on the input device. These multiple levels of pressure may be defined by, for example, the physical location of, or distance traveled by, a switch-type input device in the x-plane when pressed by a user (higher/lower), the magnitude of pressure placed on a touchpad-type input device, or other means.

5:48-57 (emphasis added).

118. Sensing or determining pressure based on the physical location or the distance traveled by an input device is a process that does not require detecting the specific “force per unit area” that has been applied to the input device. The patent thus teaches a POSITA that “pressure,” as recited in the claims, is the “application of force from a contact.”

D. “first/second/third/fourth tactile sensation”

119. I also understand from Counsel that during the course of its prior International Trade Litigation with Apple, the Patent Owner argued that the “first/second/third/fourth tactile sensation” recited in the claims “can be the same or different from the other claimed tactile sensations.” I understand that the Administrative Law Judge at the International Trade Commission agreed. EX1042 at 34-38, 43. I also agree.

120. As noted earlier, the patent specification is quite clear that there are embodiments in which the control signals sent to an actuator result in the actuator providing “vibrations...of the same frequency.” 8:23-25. Specifically, the patent explains:

[T]he controller 9 of FIG. 2 is configured such that when the controller 9 receives a signal associated with the second [pressure] level from button 10i (the “9” key), the controller 9 sends a first control output signal to the actuator, and when the controller receives a signal associated with the third [pressure] level from the button 10i, the controller sends a second control output signal to the actuator 61, and so on. The first control output signal is one that causes the actuator to provide a vibration of a certain, first frequency. The second control output signal is one that causes the actuator to provide a vibration of a certain, higher frequency, and so on. In other embodiments, the vibrations provided may be of the same frequency.

8:13-25 (emphasis added); *see also* 9:60-64 (“In other embodiments, the first and second pre-selected frequencies are the same.”).

121. The plain language of the claims also make clear that the “first/second/third/fourth tactile sensation” recited in the claims could be different sensations or they could be the same. In particular, dependent claim 6 specifically requires one tactile sensation (“the fourth tactile sensation”) to be different from another tactile sensation (“the first tactile sensation”). The lack of any such narrowing language in the parent claims reinforces my opinion that absent such language, the claimed “first/second/third/fourth tactile sensation” need not be different.

122. Given this evidence, I conclude that a POSITA would have understood that the “first/second/third/fourth tactile sensation[s]” recited in the claims could be different sensations, or they could be the same.

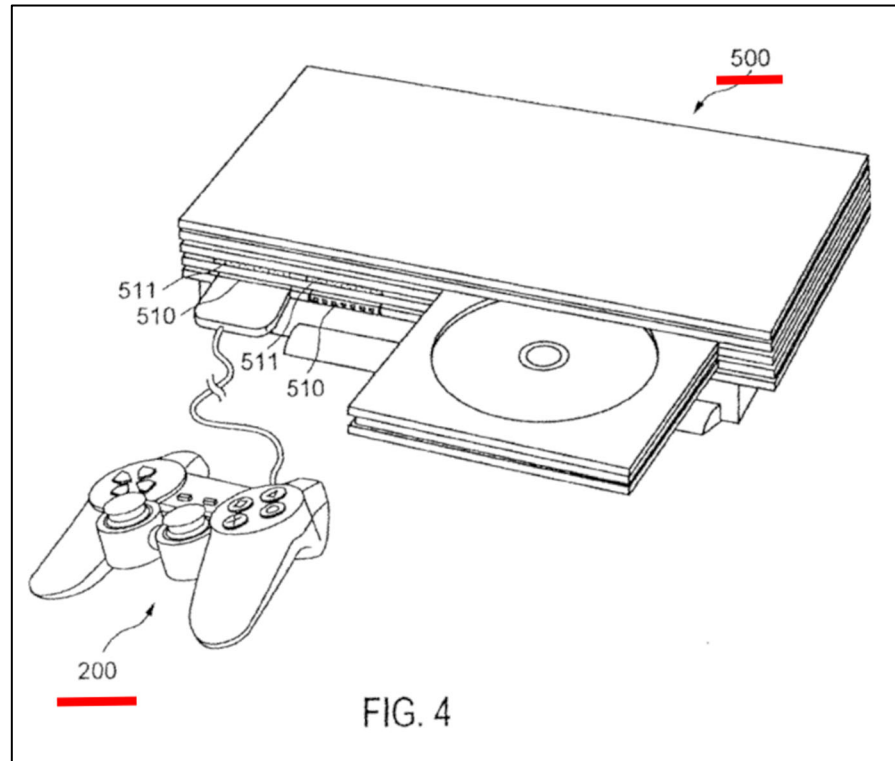
XI. GROUNDS FOR UNPATENTABILITY

123. To the extent that “unpatentability” may have a special legal meaning, I use the term only to indicate that I find a claim to be either anticipated or obvious based on my analysis.

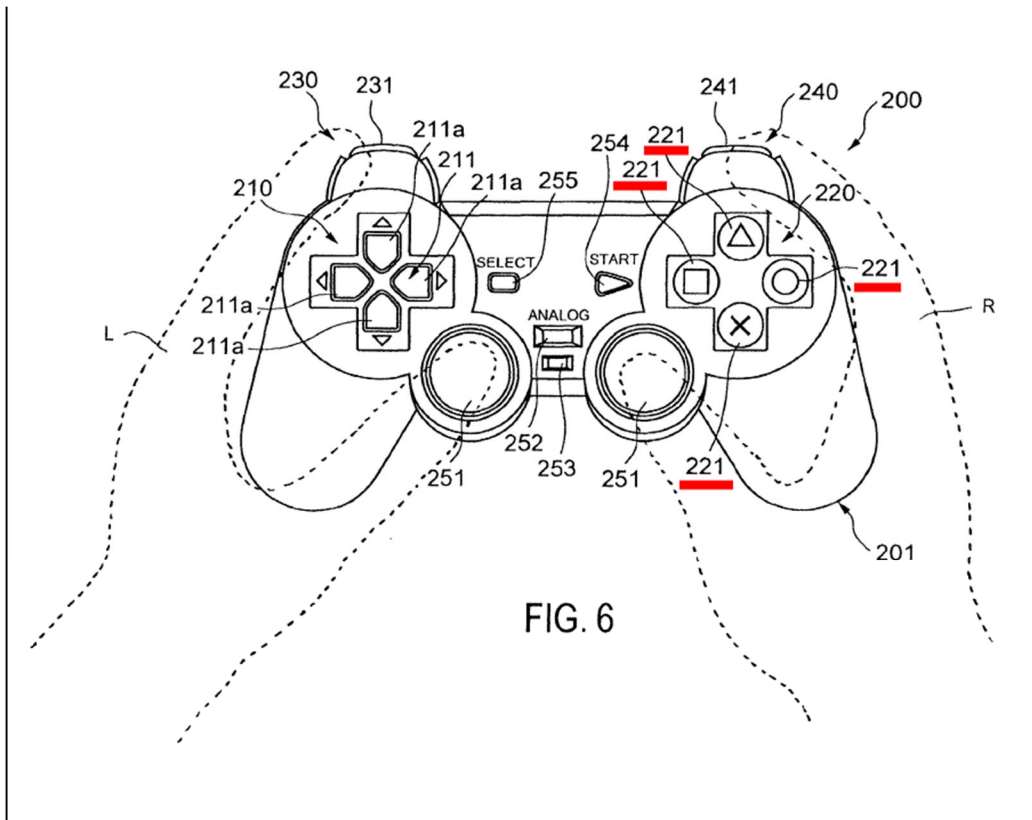
A. Ground 1: Claims 1-7 Are Anticipated by and/or Obvious Over Komata

1. Overview of Komata (EX1005)

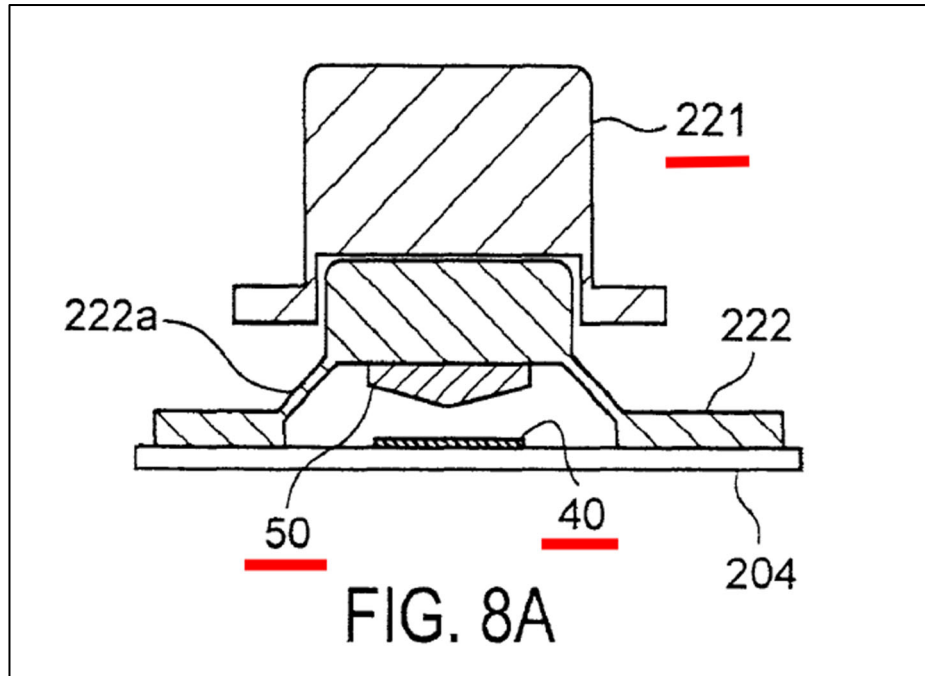
124. Komata discloses a “method and computer to provide control of vibrations of a controller used in video game machines.” Komata at Abstract. Figure 4 (below, annotations added) shows an exemplary videogame machine (Komata at [0056]):



125. As shown above, the videogame machine includes a controller 200 connected to an entertainment system 500. Komata at [0057]. As shown in Figure 6 (below, annotations added), controller 200 includes a plurality of pressure-sensitive buttons 221, *i.e.*, input devices. Komata at [0031], [0069]. It also includes a vibration generator comprising a motor and a rotating member. Komata at [0031]. For example, the right-hand side of controller 200 includes “four cylindrical control buttons 221...having identifying marks such as ‘O’ (circle), ‘X’ (cross), ‘Δ’ (triangle) and ‘□’ (quadrangle).” Komata at [0069].

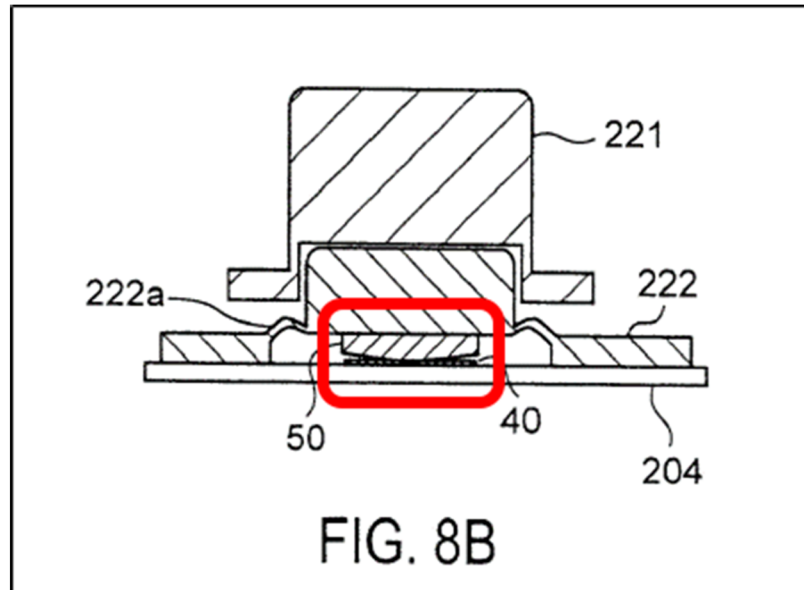


126. As shown in Figure 8a (below, annotations added), buttons 221 each include a “resistor 40” and a “conducting member 50” (Komata at [0076]-[0078]):

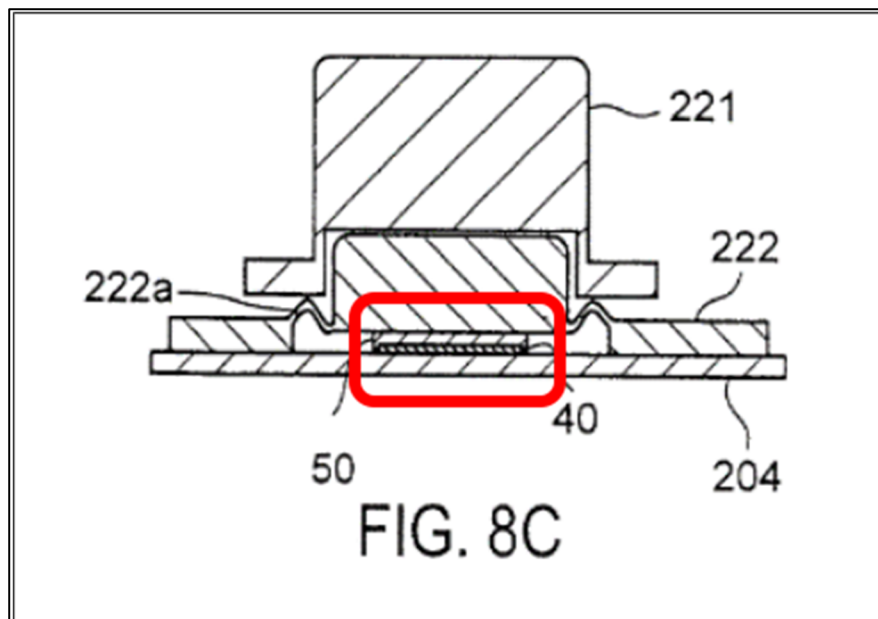


127. Komata states that the resistor 40 and conducting member 50 together form pressure-sensitive devices, that is, they form pressure-sensing sensors: “The resistors 40 and conducting members 50 form pressure sensitive devices” that “have resistance values that vary depending on the pushing pressure received from the control buttons 221.” Komata at [0079].

128. As shown above in Figure 8A, when the button 221 is not being pressed, there is a space between the resistor 40 and the conducting member 50; in other words, they are not in contact. As a user presses the button, the space between the resistor 40 and the conducting member 50 narrows until the tip of the conducting member 50 (which is deformable) touches the resistor as shown in Figure 8B (below, annotation added).



129. As the user continues to press the button, the conducting member 50 will deform so that the contact area between it and the resistor “expands” (Komata at [0082]) as shown in Figure 8C (below, annotation added):



130. The pressure-sensitive device for each button outputs a voltage to an A/D converter. This voltage varies with the applied pressure. Komata at [0079], [0084]-[0089]. More specifically, the resistor outputs a “fixed analog signal (voltage) $V_{\min}$ ” when the power to the controller is first turned on and this voltage remains the same “until the conducting member 50 contacts the resistor 40.” Komata at [0086]. When the conducting member contacts the resistor, “the surface area of contact between” the two components “increases in response to the pushing pressure on the control button 221, and thus the resistance of the resistor 40 is reduced so the analog signal (voltage) output from the output terminal 40c of the resistor 40 increases.” Komata at [0087]. The voltage will increase until it “reaches the maximum $V_{\max}$ when the conducting member 50 is most deformed.” Komata at [0088].

131. The voltage from the resistor is output to an A/D converter which converts the analog voltage signal to a digital signal. Komata at [0089]. The digital signal represents values in the range of “0-255,” and those values are provided to the entertainment system. Komata at [0032]. The entertainment system then sends a drive signal to the controller with the button being pressed by a user, a different controller that another person is using, or both. Komata at [0032]-[0034]; Claim 1.

132. The drive signal that the system sends the controller(s) is calculated using “a pressure-sense value-drive signal conversion table.” Komata gives an

example of such a table in Figure 2 (below), converting each of the digital values 0 to 255 into a corresponding drive signal P0 to P255. Komata at [0036]. The drive signal is sent to one or both controllers connected to the system, and the motor of a vibration generator within the controller(s) causes a vibration to be generated and felt by a user holding the controller(s). Komata at [0036], [0044]; *see also* Komata at [0031] (describing a vibration generator), [0117]-[0120] (same); FIGS. 10, 15, 17-20.

PRESSURE-SENSE VALUE	DRIVE SIGNAL
0	0
1	P 1
⋮	⋮
2 5 5	P 2 5 5

FIG. 2

133. Komata further teaches an exemplary “program for generating vibration depending on the pressure-sensed values” which may be recorded on a

recording medium. Komata at [0040]-[0041]. In the program, the pressure is detected on a first controller and the vibration is provided on a second controller. Komata at [0044]-[0046]. However, Komata also teaches that “when one of the two players pushes a pressure-sensitive switch, vibration may be generated on both controllers 200 (one’s own and the other player’s).” Komata at [0034]; *see also* Claim 1 (“causes vibrations in...said controller or another controller”).

134. As Figure 2 illustrates, Komata teaches sensing 256 different pressure levels (0-255) and generating 256 corresponding different drive signals (P0-P255) that cause the controller(s) to vibrate.

2. Claim 1

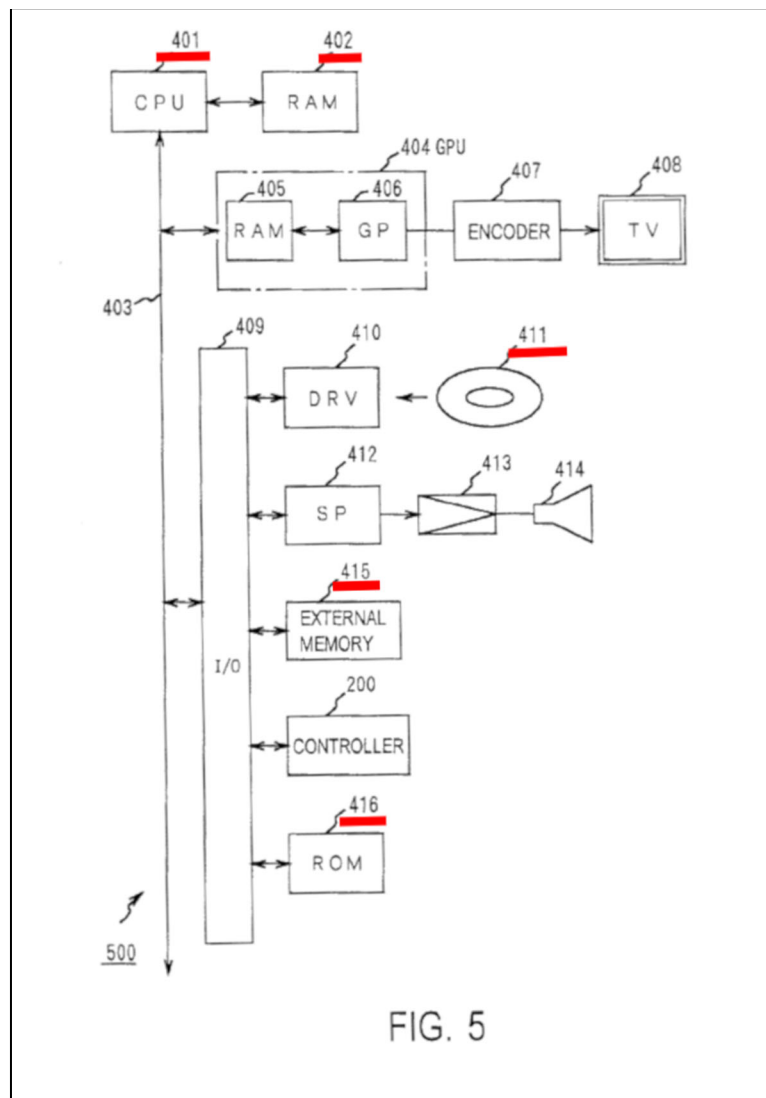
- a. **[1PRE]: “A computer-readable medium having instructions, the instructions including instructions that cause a processor to:”**

135. If the preamble is limiting, Komata discloses a “*computer-readable medium having instructions*” that cause a processor to perform the steps recited in limitations [1A] to [1F].

136. Komata says that its “program for generating vibration depending on pressure-sensed values may be supplied either recorded alone on an optical disc or other recording medium.” Komata at [0041]; *see also* Komata at [0006]; Claim 1 (“recording medium on which is recorded a computer-readable and executable

program”). Komata thus quite clearly discloses a “*computer-readable medium having instructions,*” as claimed.

137. On this point, Komata’s Figure 5 (below, annotations added) identifies several computer-readable media that to which CPU 401 has access: RAM 402, optical disk 411, external memory 415 consisting of flash memory, and ROM 416 which stores the operating system and the like.



138. Komata further explains that its “program” is “run by the entertainment system 500 and executed by its CPU,” *e.g.*, CPU 401 shown above in Figure 5. Komata at [0041]; FIG. 5. A POSITA in 2001 would understand that a CPU like the one disclosed in Komata is a central *processing* unit and that a CPU is a type of “*processor*,” as claimed.

139. For that matter, the '260 patent explains that its “controller,” which performs the pressure-sensing and vibration-generating functions discussed above in Section IX, “can be the CPU associated with the electronic device.” EX1001 at 13:47-49; *see also* EX1001 at 5:27-29. The '260 patent thus underscores that the “*processor*” that performs the claimed pressure-sensing and vibration-generating functions can be a CPU just like the one Komata discloses.

b. [1A]: “detect a first pressure on a first input device”

140. Komata’s stored program code, when executed, causes the entertainment system’s CPU to “*detect a first pressure on a first input device*,” as claimed.

141. First off, both Komata’s controller 200 and each of that controller’s buttons 221 are “*input devices*,” as claimed, because each is used to interact with the entertainment system 500, *e.g.*, to “change the state of [] game characters.” Komata at [0069]; *see also* Komata at [0070] (explaining that buttons on the controller “may be allocated functions for moving the left arm, right arm, left leg[,] and right leg of

the character”); [0091]; Figure 6. Komata’s controller 200 and each of the controller’s buttons 221 is therefore an “*input device*,” as claimed, under the interpretation of “*input device*” that I discussed above in Section X because each is used to “interact” with the entertainment system 500, an electronic device.

142. The entertainment system’s CPU “*detect[s] a first pressure on*” each button 221 (and thus on the controller 200 which houses and includes those buttons). As discussed above in my overview of Komata, each button 221 includes a resistor 40 and conducting member 50 that “form [a] pressure-sensitive device[s]” which generates “resistance values that vary depending on the pushing pressure received from the control buttons 221.” Komata at [0079].

143. The pressure-sensitive device of each button 221 outputs a voltage that varies with the pressure applied to an A/D converter. Komata at [0079], [0084]-[0089]. Komata states more specifically:

First, since a voltage is applied to the resistor 40 when the power is turned on, even if the control button 221 is not pressed, a fixed analog signal (voltage) $V_{\min}$ is provided as the output from the output terminal 40 c. Next, even if the control button 221 is pressed, the resistance value of this resistor 40 does not change until the conducting member 50 contacts the resistor 40, so the output from the resistor 40 remains unchanged at $V_{\min}$.

If the control button 221 is pushed further and the conducting member 50 comes into contact with the resistor 40, the surface area of contact between the conducting member 50 and the resistor 40 increases in response to the pushing pressure on the control button 221, and thus the resistance of the resistor 40 is reduced so the analog signal (voltage) output from the output terminal 40c of the resistor 40 increases.

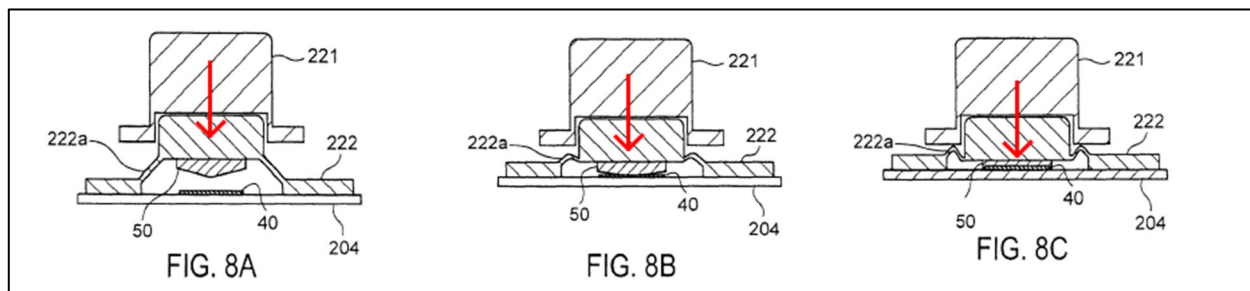
Furthermore, the analog signal (voltage) output from the output terminal 40c of the resistor 40 reaches the maximum $V_{\max}$ when the conducting member 50 is most deformed.

FIG. 10 is a block diagram showing the main parts of the controller 200. An MPU 14 mounted on the internal board of the controller 200 is provided with a switch 18, an A/D converter 18 and two vibration generation systems. The analog signal (voltage) output from the output terminal 40c of the resistor 40 is provided as input to the A/D converter 16 and is converted to a digital signal.

Komata at [0086]-[0089] (emphasis added).

144. Komata's Figs. 8A-8C (reproduced below, annotations added) show a progression as the control button 221 is depressed from an initial position (Fig. 8A) through an initial contact with the resistor 40 (Fig. 8B) and to an increased contact area (Fig. 8C). As the pressure a user places on the button increases, the voltage output via resistor 40 increases, resulting in a range of possible analog outputs (voltages output via the resistor) conveying information about the applied pressure.

Komata at [0087].



145. Komata further explains that “the analog output from the pressure-sensitive devices is converted by an A/D converter to digital values in the range 0-255 and provided to the entertainment system 500.” Komata at [0032]; FIG. 2.

Because the “[c]hanges in the level of the analog signal output from the output terminal 40c of the resistor 40 correspond to changes in the pushing pressure received from the control button 221,” then “the digital signal outputted from the A/D converter 16 corresponds to the pushing pressure on the control button 221 (control element) from the user.” Komata at [0091].

146. Based on Komata’s disclosures, a POSITA would understand that each digital value between 0 to 255 represents a different amount of “pushing pressure” that has been applied to the button such that each digital value corresponds to a unique application of force. Each digital value is thus a “*pressure*” under the interpretation of that term that I discussed above in Section X.C.

147. Because Komata teaches that “digital values in the range 0-255” are “provided to the entertainment system 500,” (Komata at [0032]), Komata discloses that the entertainment system’s CPU “*detect[s] a first pressure*,” as claimed. Each of the 0 to 255 digital values it receives is a unique “pressure.”

148. Accordingly, Komata’s program code causes the entertainment system’s CPU, *i.e.*, “*processor*,” to “*detect a first pressure*,” *i.e.*, one of the pressures corresponding to digital values 0-255,” *on a first input device*,” *i.e.*, controller 200 and/or the button 221 being pressed on controller 200.

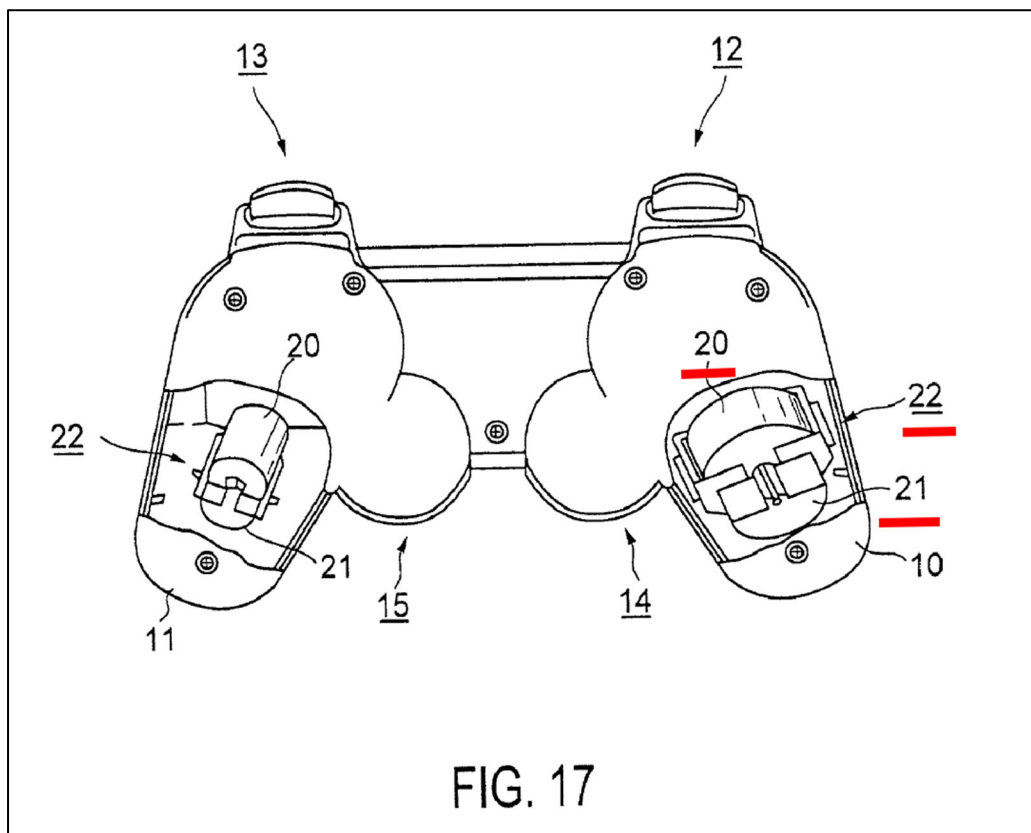
- c. **[1B]: “provide a first tactile sensation to the first input device, the first tactile sensation based at least in part on the first pressure”**

149. Komata’s stored program code, when executed, causes the entertainment system’s CPU to “*provide a first tactile sensation to the first input device, the first tactile sensation based at least in part on the first pressure,*” as claimed.

150. As discussed above in my overview of Komata, the voltage output via resistor 40 in one of Komata’s buttons 221 is output to an A/D converter that converts the analog signal (voltage) to a digital signal. Komata at [0089]. The digital signal represents values in the range of “0-255,” and those values are provided to the entertainment system. Komata at [0032]. The entertainment system, via its CPU, then sends a drive signal to a controller 200, *e.g.*, the controller in which the button 221 is being pressed. Komata at [0032]-[0034]; Claim 1.

151. The drive signal sent to the controller is calculated using “a pressure-sense value-drive signal conversion table.” Komata gives an example of such a table in Figure 2, associating each of the digital values 0 to 255 to a corresponding drive signal P0 to P255. Komata at [0036]. The drive signal is sent to controller 200, and a vibration generator system within the controller causes a vibration to be felt on both the controller and on the button 221 that has been pressed. Komata at [0036], [0044].

152. As shown in Figure 17 (below, annotations added for the right side), “the vibration generation system mechanism 22 consists of a motor 20 driven by drive signals supplied from the entertainment system 500 and an eccentric member 21 attached to the driveshaft 20a²⁶ of the motor 20.” Komata at [0117]. Komata provides further details regarding the vibration generation system in paragraphs [0118]-[0120] and Figures 10, 15, 18-20.



153. Komata explains that vibrations caused by the vibration generation system “are transmitted via the side walls [of the controller] to the handle parts, and

²⁶Driveshaft 20a is shown in Komata’s Figures 18-19.

thus vibrations are transmitted to the user's fingers." Komata at [0028]. This is also depicted in Figure 20 (below) which uses wiggly lines to indicate vibrations occurring:

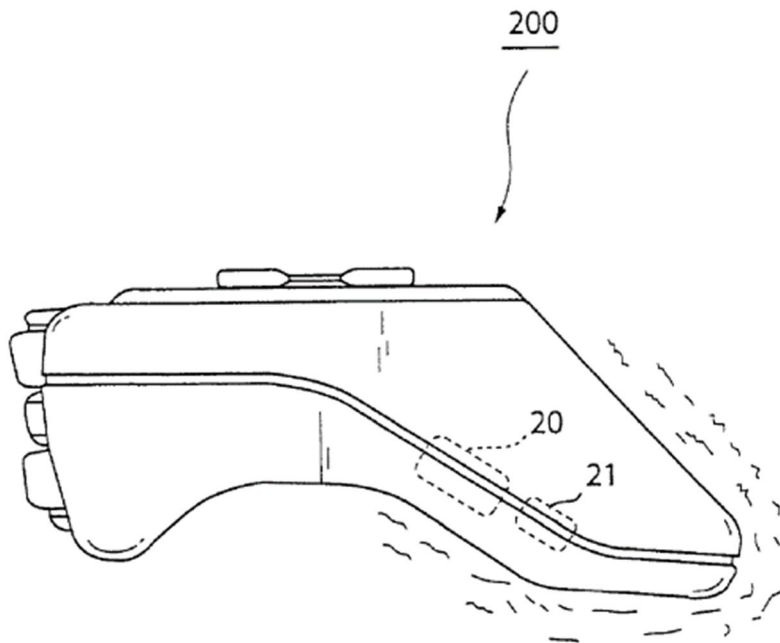


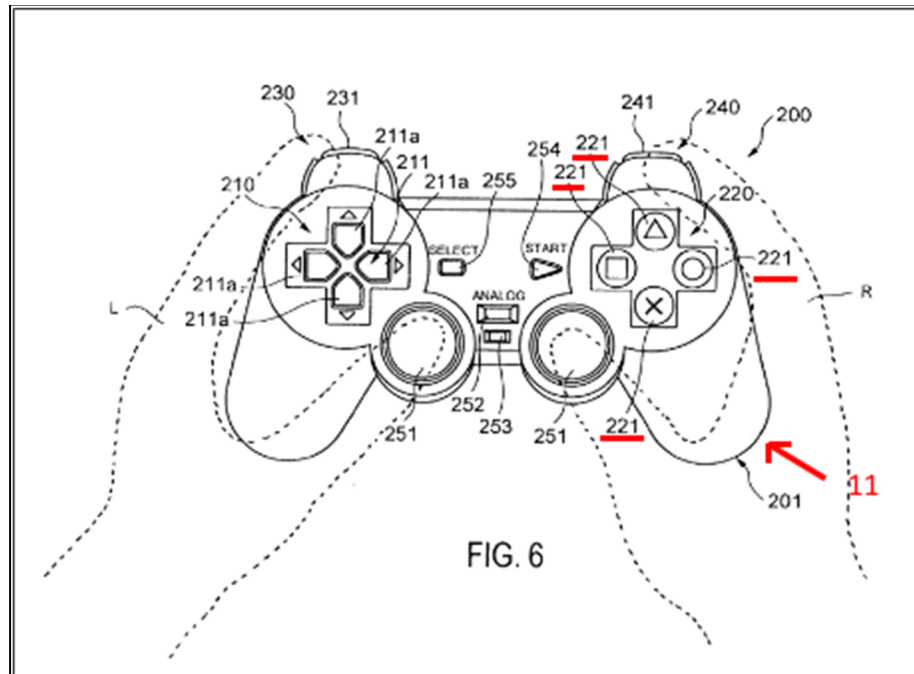
FIG. 20

154. As the '260 patent explains, "*tactile sensations*," as claimed, "include vibrations," just like those Komata generates. EX1001, 3:48-51.

155. As see in Figure 6 (below, annotations added), buttons 221 are inset within second handle part 11²⁷, and thus the buttons receive direct vibrations from

²⁷Second handle part 11 is labeled in Figure 17: I have added it below as an annotation.

the vibration generator within the second handle part as well as indirect vibrations from the generator within the first handle part. Komata at [0120]-[0121] (explaining that each handle can have “different sizes of motors” so that different vibrations can be felt in each handle); FIG. 20.



156. As discussed above regarding limitation [1A], the drive signal that the entertainment system’s CPU sends to the controller to drive the controller’s vibration system is based on a particular digital pressure-sense value that the entertainment system’s CPU derived based on the digital signal (*i.e.*, “0-255”) that the CPU received from an A/D converter in the controller. Komata at [0032]-[0036], [0089], *see also* Komata at [0122]; Figure 2 (reproduced above).

157. For example, when the entertainment system’s CPU utilizes the same table depicted in Komata’s Figure 2, then if the CPU detects Pressure-Sense Value

1 from the A/D converter, it sends to controller 200's vibration generating system the Drive Signal 1, which causes a vibration to be felt on both the controller 200 and on the button 221 that has been pressed.

158. Komata's Figure 20 (reproduced above) illustrates controller 200 vibrating, confirming that the CPU *"provide[s] a first tactile sensation to the"* controller. Komata at [0119].

159. Moreover, the controller is a unitary structure, so causing the handle parts 10 and 11 of the controller 200 to vibrate would also cause the button 211 to vibrate: thus the CPU also *"provide[s] a first tactile sensation to the"* button being pressed. On this point, I note that the '260 patent describes vibrating a button via mechanical coupling, such as by first vibrating a printed-circuit board which in turn vibrates a switch which in turn vibrates multiple buttons or switches. EX1001, 9:34-44. Further on this point, a POSITA would understand that how an actuator's actions are applied to an object is a usual matter of design and implementation choice, such as whether an actuator is "directly" connected to an object, or "indirectly" through some number of other components.²⁸ For example, at 3:56 to 3:60, the '260 patent makes specific reference to the use of coupling components:

²⁸ A POSITA would already have been abundantly familiar with such design choices from the prior art: for example, EX1043 (Fukumoto, "Active Click Tactile Feedback

In addition, the actuator can include a flexure, for example an arrangement of flexible material, couple[d] to the rotating shaft of a DC motor or step motor to transform the rotation of the motor shaft into vibrations or other haptic sensations.

EX1001 at 3:56-60 (emphasis added)

160. For an additional example, the '260 patent's Figure 2 shows a single actuator 61 that is separate from the multiple buttons, and thus it would vibrate all the buttons simultaneously by propagating a vibration through the printed-circuit board to each individual button. *See also* EX1001 at 4:39-42 ("The vibrotactile actuator 6 can also be mounted to a portion of the case or housing of the electronic device in which the apparatus 1 is disposed, communicating the tactile sensations to the entire electronic device.") (emphasis added). *See also* EX1001 at 3:67-4:3, ("Tactile sensations can also be delivered to the input device 2 from a speaker included with an electronic device into which the apparatus is placed, for example _____ for Touch Panels") teaches attaching a vibration transducer actuator to the body of a PDA to convey tactile feedback to finger-tip on the PDA's touchscreen, instead of using transparent buttons with a click feel over the display panel. It also teaches that tactile feedback and audio output can be generated from just one device, that clicks can be expressed by a short burst of vibration, and providing the same tactile vibration both to the grasping hand, and also to the tapping finger-tip of the other hand.

the speaker in a mobile telephone or in a personal computer.”) (emphasis added).

The '260 Patent also describes an embodiment depicted in Fig. 1 in which the vibrations are delivered indirectly. Specifically, “[t]he tactile sensations generated by the actuator 6 propagate through the lever arm 7 to the input device 2.” EX1001 at 4:23-25 (emphasis added); *see also* EX1001 at Fig. 1, 3:14 to 5:37). Accordingly, the '260 Patent teaches providing vibrations indirectly to an input device, which was already taught by Komata, as explained above.

161. In view of at least the above disclosures, Komata therefore teaches “*provid[ing] a first tactile sensation to the first input device,*” i.e., controller 200 and/or the button 221 being pressed on controller 200, “*the first tactile sensation based at least in part on the first pressure,*” as claimed.

d. [1C]: “detect a second pressure on the first input device, the second pressure greater than the first pressure”

162. Komata’s stored program code, when executed, causes the entertainment system’s CPU to “*detect a second pressure on the first input device, the second pressure greater than the first pressure,*” as claimed.

163. As discussed above for limitation [1A], the entertainment system’s CPU “detect[s] a [] pressure on the first input device” by receiving a digital pressure-sense value from the A/D converter, and using that value to detect up to 256 distinct pressures being applied to a button 221 that is being pressed, with each distinct

pressure represented by a distinct digital pressure-sense value 0-255. Komata at [0032]; Figure 2 (reproduced above).

164. I note here that from the description regarding an A/D converter, a POSITA would understand that the A/D conversion necessarily converts analog signals to a finite number of discrete levels, and thus that this teaches representation of discrete pressures.

165. Because Komata teaches that the analog signals that its pressure-sensitive devices output range from a minimum voltage (or no pressure) to a maximum voltage (or most pressure) (Komata at [0086]-[0088]), POSITAs would have understood Komata's Pressure-Sense Values 0 to 255 to represent that voltage range with 0 representing minimum pressure and 255 corresponding to maximum pressure. *See also* Komata at [0054] (referring "to the increase or decrease of pressure-sensed values"); [0091].

166. As an example, and as discussed for limitation [1A], the CPU can detect digital Pressure-Sense Value **1** ("*the first pressure*"). The CPU can also detect digital Pressure-Sense Value **10** ("*a second pressure*") when a user has pushed button 221 down with greater pressure (*i.e.*, either farther down during a single contact with the button or on a separate press of the button) to create the voltage needed for the A/D converter to generate and send to the CPU the digital Pressure-Sense Value **10**. A POSITA would have understood that Pressure-Sense Value **10**

represents “*pressure on the first input device*,” i.e., controller 200 or the button 221 being pressed on the controller, that is “*greater than*” the pressure represented by Pressure-Sense Value 1.

e. **[1D]: “provide a second tactile sensation to the first input device, the second tactile sensation based at least in part on the second pressure”**

167. Komata’s stored program code, when executed, causes the entertainment system’s CPU to “provide a second tactile sensation to the first input device, the second tactile sensation based at least in part on the second pressure,” as claimed.

168. As discussed above for limitation [1B], Komata’s CPU generates a drive signal that corresponds to the pressure-sense value the CPU receives from the controller’s A/D converter. Komata at [0032]-[0036]; FIG. 2. The CPU sends the drive signal to the controller with the button 221 being pressed, and a vibration generator system within that controller causes a vibration to be felt by a user pressing the button. Komata at [0032]-[0034], [0036], [0044], [0122], claim 1.

169. Similar to the discussion above for limitation [1C], Komata’s stored program code, when executed, causes the entertainment system’s CPU to “detect a second pressure,” e.g., digital Pressure Sense Value 10. The program code would then also cause the CPU to send a drive signal, e.g., Drive Signal 10, to the vibration system of the controller with the button 221 being pressed so that a vibration is

provided to the controller, including the button 221 being pressed on it. The vibration is a “second tactile sensation” that is “*based at least in part on the second [detected] pressure,*” as claimed.

170. As I explained above in Section X.D where I discussed the meaning of “*first/second/third/fourth tactile sensation,*” the claimed “*second tactile sensation*” can be the same or different as the claimed “*first tactile sensation*” such that any second “*tactile sensation*” would meet the claimed “*second tactile sensation.*”

171. Regardless, I also note that Komata teaches that the “magnitude” of the vibration that its controller(s) output can “depend on a magnitude” of the sensed-pressure. For example, claim 4 teaches “causing vibration in vibration means based on the output value from said pressure-sensitive means, a magnitude of said vibration is determined depending on the magnitude of said output value” (emphasis added) and claim 7 teaches “causing vibration in vibration means based on the output value from said pressure-sensitive means includes means of determining the magnitude of said vibration depending on the magnitude of said output value.” (emphasis added). *See also* Komata at [0041] (“generating vibration depending on pressure-sensed values”); [0053] (“vibration depending on the pressure-sensed value”); [0054] (“pressure-senses values” can be “allocate[ed] various vibration patterns”).

172. Because the digital Pressure-Value **10** represents a greater magnitude of pressure than digital Pressure-Value **1**, the corresponding Drive Signal **10** would cause the controller's vibration system to generate a vibration with greater magnitude than that caused by Drive Signal **1**. Komata thus discloses a "*second tactile sensation*," even if the claims were somehow construed to require that each claimed "*tactile sensation*" be different.

f. [1E]: "detect a third pressure on the first input device, the third pressure greater than the second pressure"

173. Komata's stored program code, when executed, causes the entertainment system's CPU to "*detect a third pressure on the first input device, the third pressure greater than the second pressure*" as claimed.

174. As discussed above for limitations [1A] and [1C], the entertainment system's CPU "detect[s] a [] pressure on the first input device" by receiving a digital pressure-sense value from the A/D converter, and using that value to detect up to 256 distinct pressures being applied to button 221, each pressure represented by a digital pressure-sense values 0-255. Komata at [0032]; FIG. 2.

175. For example, as discussed for limitations [1A] and [1C], the CPU can detect digital Pressure-Sense Values **1** (*i.e.*, "*first pressure*"), and it can detect digital Pressure-Sense Value **10** (*i.e.*, "*second pressure*"). Using the same process, the CPU can also detect digital Pressure-Sense Value **100** when a user has pushed button 221 down with greater pressure (*i.e.*, either farther down during a single contact with the

button or on a separate press of the button) to create the voltage needed for the A/D converter to generate and send to the CPU the digital Pressure-Sense Value **100** (*i.e.*, “*third pressure*”).

176. A POSITA would have understood that Pressure-Sense Value **100** represents “*pressure on the first input device,*” *i.e.*, controller 200 or the button 221 being pressed on the controller, that is “*greater than*” the pressure represented by Pressure-Sense Value **10**, *i.e.*, the “*second pressure,*” as claimed (see the discussion of element 1C above).

g. [1F]: “provide a third tactile sensation to the first input device.”

177. Komata’s stored program code, when executed, causes the entertainment system’s CPU to “*provide a third tactile sensation to the first input device,*” as claimed.

178. As discussed above for limitations [1B] and [1D], Komata’s CPU generates a drive signal that corresponds to the pressure-sense value the CPU receives from the controller’s A/D converter. Komata at [0032]-[0036]; FIG. 2. The CPU sends the drive signal to the controller with the button 221 being pressed, and a vibration generator system within that controller causes a vibration to be felt by a user pressing the button. Komata at [0032]-[0034], [0036], [0044], [0122], claim 1.

179. Similar to the discussion above for limitations [1C] and [1E], Komata’s stored program code, when executed, causes the entertainment system’s CPU to

“*detect a third pressure,*” e.g., digital Pressure Sense Value **100**. The program code would then also cause the CPU to send a drive signal, e.g., Drive Signal **100**, to the vibration system of the controller with the button 221 being pressed so that a vibration is provided to the controller, including the button 221 being pressed on it. The vibration is a “*third tactile sensation*” that is “*based at least in part on the third [detected] pressure,*” as claimed.

180. As I explained above in Section X.D when I discussed the meaning of “*first/second/third/fourth tactile sensation,*” the claimed “*third tactile sensation*” can be the same or different as the claimed “*first tactile sensation*” and/or the claimed “*second tactile sensation*” such that any third “*tactile sensation*” would meet the claimed “*third tactile sensation.*”

181. Regardless, I also note that Komata teaches that the “magnitude” of the vibration that its controller(s) output can “depend on a magnitude” of the sensed-pressure. For example, claim 4 teaches “causing vibration in vibration means based on the output value from said pressure-sensitive means, a magnitude of said vibration is determined depending on the magnitude of said output value” (emphasis added) and claim 7 teaches “causing vibration in vibration means based on the output value from said pressure-sensitive means includes means of determining the magnitude of said vibration depending on the magnitude of said output value.” (emphasis added).

182. Because the digital Pressure-Value **100** represents a greater magnitude of pressure than digital Pressure-Values **1** and **10**, the corresponding Drive Signal **100** would cause the controller's vibration system to generate a vibration with greater magnitude than that caused by Drive Signals **1** and **10**. Komata thus discloses a "*third tactile sensation*," even if the claims were somehow construed to require that each claimed "*tactile sensation*" be different.

3. Claim 2

- a. **[2PRE]: "The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:"**

183. If the preamble is limiting, Komata discloses a "*computer-readable medium having instructions*" that cause a processor to perform the steps recited in limitations [2A] to [2B] for the same reasons that it discloses limitation [1PRE].

- b. **[2A]: "detect a fourth pressure on the first input device, the fourth pressure greater than the third pressure"**

184. Komata's stored program code, when executed, causes the entertainment system's CPU to "*detect a fourth pressure on the first input device, the fourth pressure greater than the third pressure*," as claimed.

185. As discussed above for limitations [1A], [1C] and [1E], the entertainment system's CPU "detect[s] a [] pressure on the first input device" by receiving a digital pressure-sense value from the A/D converter, and using that value

to detect up to 256 distinct pressures being applied to the button 221, each pressure represented by digital pressure-sense values 0-255. Komata at [0032]; FIG. 2.

186. For example, as discussed for limitations [1A], [1C] and [1E], the CPU can detect digital Pressure-Sense Values **1** (*i.e.*, “*first pressure*”), **10** (*i.e.*, “*second pressure*”), and **100** (*i.e.*, “*third pressure*”). Using the same process, the CPU can also detect digital Pressure-Sense Value **200** when a user has pushed button 221 down with greater pressure (*i.e.*, either farther down during a single contact with the button or on a separate press of the button) to create the voltage needed for the A/D converter to generate and send to the CPU the digital Pressure-Sense Value **200** (*i.e.*, “*fourth pressure*”).

187. A POSITA would have understood that Pressure-Sense Value **200** represents “*pressure on the first input device,*” *i.e.*, controller 200 or the button 221 being pressed on the controller, that is “*greater than*” the pressure represented by Pressure-Sense Value **100**, *i.e.*, the “*third pressure,*” as claimed (see discussion of element 1C above).

c. [2B]: “provide a fourth tactile sensation to the first input device.”

188. Komata’s stored program code, when executed, causes the entertainment system’s CPU to “*provide a fourth tactile sensation to the first input device,*” as claimed.

189. As discussed above for limitations [1B], [1D], and [1F], Komata's CPU generates a drive signal that corresponds to the pressure-sense value the CPU receives from the controller's A/D converter. Komata at [0032]-[0036]; FIG. 2. The CPU sends the drive signal to the controller with the button 221 being pressed, and a vibration generator system within that controller causes a vibration to be felt by a user pressing the button. Komata at [0032]-[0034], [0036], [0044], [0122], claim 1.

190. Similar to the discussion above for limitations [1C], [1E], and [2A], Komata's stored program code, when executed, causes the entertainment system's CPU to "*detect a fourth pressure,*" e.g., digital Pressure Sense Value **200**. The program code would then also cause the CPU to send a drive signal, e.g., Drive Signal **200**, to the vibration system of the controller with the button 221 being pressed so that a vibration is provided to the controller, including the button 221 being pressed on it. The vibration is a "*fourth tactile sensation*" that is "*based at least in part on the fourth [detected] pressure,*" as claimed.

191. As I explained above in Section X.D where I discussed the meaning of "*first/second/third/fourth tactile sensation,*" the claimed "*fourth tactile sensation*" can be the same or different as the claimed "*first tactile sensation,*" the claimed "*second tactile sensation,*" and/or the claimed "*third tactile sensation*" such that any fourth "*tactile sensation*" would meet the claimed "*fourth tactile sensation.*"

192. In any case, I again note that Komata teaches that the “magnitude” of the vibration that its controller(s) output can “depend on a magnitude” of the sensed-pressure. For example, claim 4 teaches “causing vibration in vibration means based on the output value from said pressure-sensitive means, a magnitude of said vibration is determined depending on the magnitude of said output value” (emphasis added) and claim 7 teaches “causing vibration in vibration means based on the output value from said pressure-sensitive means includes means of determining the magnitude of said vibration depending on the magnitude of said output value.” (emphasis added).

193. Because the digital Pressure-Value **200** represents a greater magnitude of pressure than digital Pressure-Values **1, 10 and 100**, the corresponding Drive Signal **200** would cause the controller’s vibration system to generate a vibration with greater magnitude than that caused by Drive Signals **1, 10 and 100**. Komata thus discloses a “*fourth tactile sensation*,” even if the claims were somehow construed to require that each claimed “*tactile sensation*” be different.

4. **Claim 3: The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to provide the first tactile sensation to a second input device.**

194. Komata's stored program code, when executed, causes the entertainment system's CPU to "*cause the processor to provide the first tactile sensation to a second input device,*" as claimed.

195. Komata discloses an embodiment in which its entertainment system is used by two players simultaneously to play a head-to-head reaction-based game. Specifically, Komata explains:

As an example, a head-to-head timing game which uses vibration generation will be now described. The game is played as follows. With two controllers 200 connected to the entertainment system 500, when one of the two players pushes a pressure-sensitive switch, vibration is generated on the other controller 200. If desired, when one of the two players pushes a pressure-sensitive switch, vibration may be generated on both controllers 200 (one's own and the other player's).

In this state, when one player pushes the pressure-sensitive switch of his/her controller 200, vibration is generated on the other player's controller 200. At this time, when vibration is generated on the controller 200 of the other player, the other player reacts and pushes the pressure-sensitive switch. The player is given points depending on the response speed at this time.

Komata at [0034]-[0035] (emphasis added); *see also* Komata at [0040]-[0052] (describing steps performed for the head-to-head game).

196. As the underline emphasis highlights, Komata's two-player game includes sending a vibration **both** to the controller 200 with the button 221 being

pressed, ***and*** to the controller 200 that the other player is holding. This vibration “depend[s] on the pressure-sensed value.” Komata at [0053]. Specifically, Komata explains that a drive signal corresponding to a digital pressure-sense value detected at the controller with the button being pressed is sent to the vibration generator at the other player’s controller. Komata at [0044].

197. A POSITA would understand that in an embodiment where the vibration is felt at ***both*** controllers, the same drive signal²⁹—the one corresponding to a digital pressure-sense value detected at the controller with the button being pressed—is sent to the vibration generator in each controller such that the same vibration is generated at each controller. *See, e.g.*, Komata at [0034] (“If desired, when one of the two players pushes a pressure-sensitive switch, vibration may be generated on both controllers 200 (one’s own and the other player’s).”).

198. In such a scenario, Komata’s stored program code, when executed, causes the entertainment system’s CPU to provide the vibration discussed for limitation 1B (i.e., “*the first tactile sensation*”) to be provided on both (1) the controller 200 and the button 221 on the controller that is being pressed (i.e., either being the “*first input device*”), and (2) the other user’s controller and its distinct set

²⁹ A POSITA would understand that this is the same drive signal, even if (for implementation reasons) it were recoded (say, for transmission processing).

of buttons 221, either of which is “*a second input device*,” as claimed. In this fashion, the same vibration (i.e., “*the first tactile sensation*”) is provided to both the first and second inputs devices.

199. Separately, even apart from the head-to-head two-controller scenario, Komata’s stored program code, when executed, causes the entertainment system’s CPU to provide the vibration discussed for limitation 1B to a “*second input device*,” as claimed, because the vibration is provided to the entirety of controller 200, including the other control buttons 221 that are not being pressed, each of which is also an “*input device*.” In other words, the vibration discussed for limitation 1B is provided not only to the button 221 that is being pressed but also to the other buttons on the controller 200. This is consistent with the ’260 patent which describes the use of “a single vibrotactile actuator outputting the same sensation to all of the buttons simultaneously.” EX1001, 13:17-20.

200. Accordingly, Komata’s stored program code, when executed, causes the entertainment system’s CPU to provide the vibration discussed for limitation 1B (i.e., “*the first tactile sensation*”) to be provided on both (1) the controller 200 and the button 221 on the controller that is being pressed (i.e., either being the “*first input device*”), and (2) a different button 221 on that controller (i.e., any one of which being the “*second input device*”). Komata thus discloses claim 3 for this separate reason too.

201. On this point, I note that there is neither anything in the plain claim language, nor in the '260 specification, that requires any tactile effects of any of the claims to be provided to the first input device and to the second input device separately, nor exclusively, nor any particular teaching that that would be a preferable alternative.

5. Claim 4: “The computer-readable medium of claim 3 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to provide the second tactile sensation to the second input device.”

202. Komata’s stored program code, when executed, causes the entertainment system’s CPU to “*provide the second tactile sensation to the second input device,*” as claimed.

203. For the same reasons I discussed above for claim 3, when playing Komata’s two-player head-to-head reaction-based game, Komata’s stored program code, when executed, causes the entertainment system’s CPU to provide the vibration discussed for limitation 1D (i.e., “*the second tactile sensation*”) to be provided on both (1) the controller 200 and the button 221 on the controller that is being pressed (i.e., either being the “*first input device*”), and (2) the other user’s controller and its distinct set of buttons 221, either of which is “*a second input device,*” as claimed. In this fashion, the same vibration (i.e., “*the second tactile sensation*”) is provided to both the first and second inputs devices.

204. Separately, and for the same reasons I discussed above for claim 3, Komata's stored program code, when executed, causes the entertainment system's CPU to provide the vibration discussed for limitation 1D (i.e., "*the second tactile sensation*") to be provided on both (1) the controller 200 and the button 221 on the controller that is being pressed (i.e., either being the "*first input device*"), and (2) a different button 221 on that controller (i.e., any one of which being the "*second input device*").

6. Claim 5

- a. **[5PRE]: "The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:"**

205. If the preamble is limiting, Komata discloses a "*computer-readable medium having instructions*" that cause a processor to perform the steps recited in limitations [5A] to [5B] for the same reasons that it discloses limitation [1PRE].

- a. **[5A]: "detect a fourth pressure on a second input device"**

206. Komata's stored program code, when executed, causes the entertainment system's CPU, i.e., "*processor*," to "*detect a fourth pressure on a second input device*," as claimed.

207. As discussed with respect to Claims 3 and 4, the "*second input device*" in Komata is any of (1) a second controller 200 being used to play a game with the first controller 200, (2) a button 221 on that second controller when it used to play a

game with the first controller 200, or (3) a button on the first controller 200 that is different from the button is the “*first input device*” recited in limitation [1A].

208. Regardless of which of the above-identified “*second input device[s]*” is used, Komata’s stored program code, when executed, causes the entertainment system’s CPU to perform the same process discussed with respect to limitations [1A], [1B], [1E], and [2A] to detect a pressure that is being applied to the “*second input device*.” For example, when a second user presses a button 221 on the second controller 200, the entertainment system’s CPU would detect a digital pressure-sense value, *e.g.*, digital Pressure-Sense Value **250**, that constitutes a “*fourth pressure*” as claimed. [0034]-[0036]; [0042]-[0053] (describing an exemplary head-to-head two-player game).

b. [5B]: “provide a fourth tactile sensation to the second input device.”

209. Komata’s stored program code, when executed, causes the entertainment system’s CPU, *i.e.*, “*processor*,” to “*provide a fourth tactile sensation to the second device*,” as claimed.

210. As discussed with respect to Claims 3 and 4 (as well as limitations [1B], [1D], and [1E]), Komata’s stored program code, when executed, causes the entertainment system’s CPU to cause a vibration to occur based on the digital pressure-sense values it detects from a button being pressed on either controller. Therefore, when the CPU detects a “*fourth pressure*,” *e.g.*, digital Pressure-Sense

Value **250**, it would cause a vibration to be provided based on that pressure detection, *i.e.*, “*a fourth tactile sensation.*”

211. As explained with respect to Claims 3 and 4, that vibration would be provided to both controllers and thus it is provided to the “*second input device,*” *i.e.*, the second controller 200, a button 221 being pressed on that controller, and/or another button 221 on the first controller 200 that is different from the button 221 that was pressed with respect to limitation [1A].

7. Claim 6: “The computer-readable medium of claim 5, the fourth tactile sensation different from the first tactile sensation.”

212. As I discussed above with respect to claim 5, Komata’s program code causes the entertainment system’s CPU to “*provide a fourth tactile sensation to the second input device,*” as claimed. For example, the CPU provides a sensation that corresponds to Pressure-Sense Value **250** (*i.e.*, “*a fourth pressure*”) by issuing a corresponding drive signal, for example., Drive Signal **250**, to the vibration generation system associated with the second input device which can be any of the input devices I identified above in limitation 5A.

213. Komata further discloses that the “*fourth tactile sensation*” is “*different from the first tactile sensation,*” *i.e.*, the sensation cited in limitation [1B]. For example, Komata discloses that each pressure-sense value has a corresponding drive signal which is provided to the vibration generator as seen in Figure 2 below:

PRESSURE-SENSE VALUE	DRIVE SIGNAL
0	0
1	P 1
⋮	⋮
2 5 5	P 2 5 5

FIG. 2

214. Komata further has claims reciting that the “magnitude” of the vibration that is provided to a controller “is determined depending on [the] magnitude” of the output from a pressure-sensitive device, *e.g.*, resistor 40 and conducting member 50. *See* Komata at Claim 4 and Claim 7, discussed above. Komata thus teaches (and even claims) providing vibrations whose magnitudes (*i.e.*, intensities) vary depending on the amount of pressure being exerted onto the input device. *See also* Komata at [0041] (“generating vibration depending on pressure-sensed values”); [0053] (“vibration depending on the pressure-sensed value”); [0054] (“pressure-senses values” can be “allocate[ed] various vibration patterns”).

215. For example, when the “*fourth tactile sensation*” is based on digital Pressure-Value **250** and Drive Single **250** (as was discussed above regarding Claim 5), then it would have a higher magnitude (*i.e.*, intensity) than “*the first tactile*

sensation” which is based on Pressure Value 1 and Drive Signal 1 (as was discussed for limitation [1B]).

216. If Komata is found not to disclose providing different tactile sensations, then nonetheless doing so would have been obvious in view of Komata’s explicit teachings that the “magnitude” of vibrations that are output should depend on the “magnitude” of the pressures sensed. Varying the vibration based on how much pressure a user applies to the input device would have given users a “heightened sense of reality” (Komata at [0003]) because a stronger press would have resulted in a stronger vibration. Komata at [0053] (“As described above, in the present invention, a novel idea is that vibration depending on the pressure-sensed value is provided as an output from the other player's controller, and thus the scope of game creation can be broadened.”) (emphasis added).

8. Claim 7

- a. **[7PRE]: “The computer-readable medium of claim 5 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:”**

217. If the preamble is limiting, Komata discloses a “*computer-readable medium having instructions*” that cause a processor to perform the steps recited in limitations [7A] to [7B] for the same reasons that it discloses limitation [5PRE].

- a. **[7A]: “detect a fifth pressure on the second input device, the fifth pressure greater than the fourth pressure”**

218. Komata’s stored program code, when executed, causes the entertainment system’s CPU to “*detect a fifth pressure on a second input device, the fifth pressure greater than the fourth pressure*” as claimed.

219. As discussed with respect to Claims 3-4 and limitation [5A], the “*second input device*” in Komata is any of (1) a second controller 200 being used to play a game with the first controller 200, (2) a button 221 on that second controller when it used to play a game with the first controller 200, or (3) a button on the first controller 200 that is different from the button is the “*first input device*” recited in limitation [1A].

220. Regardless of which of the above-identified “*second input device*” is used, Komata’s stored program code, when executed, causes the entertainment system’s CPU to perform the same process discussed with respect to limitations [1A], [1B], [1E], [2A], and [5A] to detect a pressure that is being applied to the “*second input device*.”

221. For example, when a second user presses a button 221 on the second controller 200, the entertainment system’s CPU would detect a digital pressure-sense value, *e.g.*, digital Pressure-Sense Value **255**, that constitutes a “*fifth pressure*” as claimed. Komata at [0034]-[0036]; [0042]-[0053] (describing an exemplary head-

to-head two-player game). That pressure is also greater than the “*fourth pressure*” which generated a digital Pressure-Sense Value **250**, *i.e.*, the pressure needed to generate digital Pressure-Sense Value 255 is greater than the pressure needed to generate digital Pressure-Sense Value 250. See discussion above for limitation [1C].

b. [7B]: “provide a fifth tactile sensation to the second input device.”

222. As discussed with respect to Claims 3 and 4 (as well as limitations [1B], [1D], [1E], and [5B]), Komata’s stored program code, when executed, causes the entertainment system’s CPU to cause a vibration to occur based on the digital pressure-sense values it detects from a button being pressed on either controller. Therefore, when the CPU detects a “*fifth pressure*,” *e.g.*, digital Pressure-Sense Value **255**, it would cause a vibration to be provided based on that pressure detection, *i.e.*, “*a fifth tactile sensation*.”

223. As explained with respect to Claims 3 and 4, that vibration would be provided to both controllers and thus it is provided to the “*second input device*,” *i.e.*, (1) the second controller 200, (2) a button 221 being pressed on that controller, and/or (3) another button 221 on the first controller 200 that is different from the button 221 that was pressed with respect to limitation [1A].

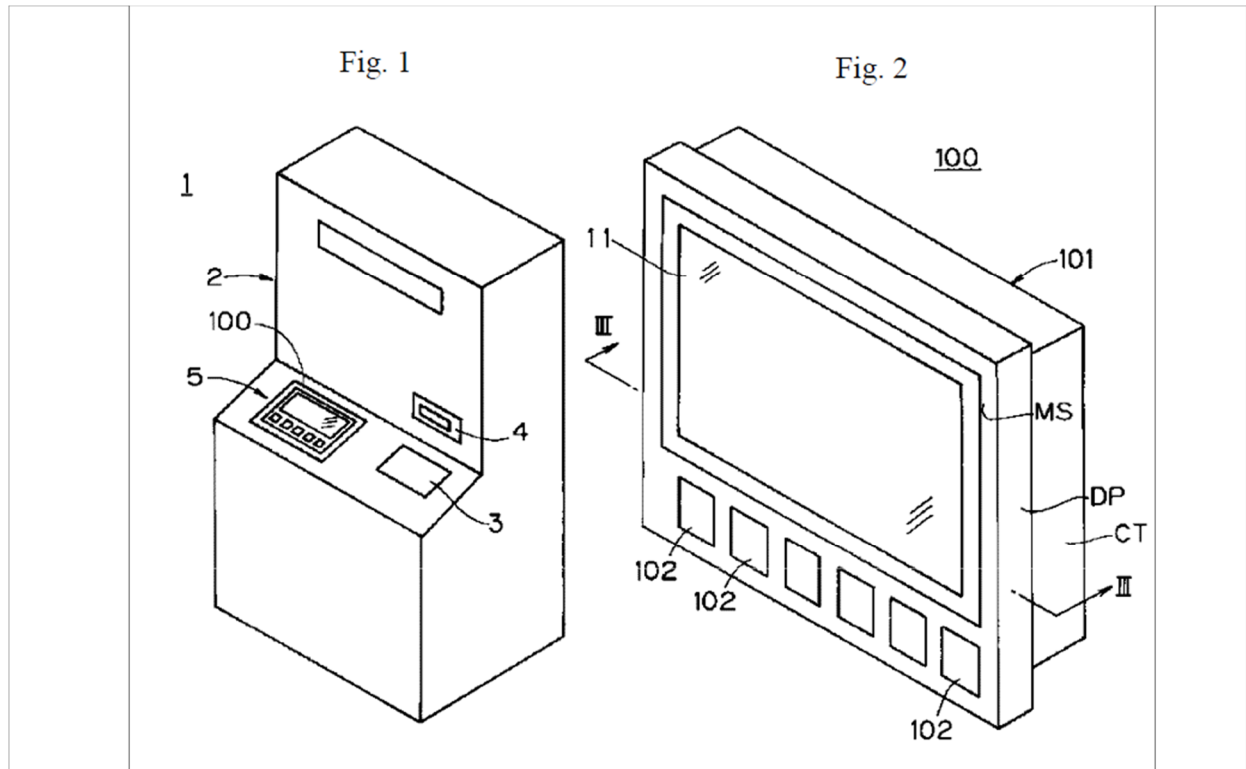
B. Ground 2: Claims 1-7 Are Anticipated by and/or Obvious Over Tsuji

1. Tsuji (EX1007)

224. Tsuji discloses an “information display device” for use with various electronic devices like an ATM or a gaming device. Tsuji at [0001]; FIGS.1-2, 17. Tsuji explains that devices with touch panels “are in wide use” but “lack a sense of touch...for indicating that operation inputs have been performed.” Tsuji at [0002]-[0003]. To address this problem, Tsuji discloses a device that “uses a mechanical reaction such as a vibration...as a response to an operation input,” which “give[s] an operator a reliable sense of operation.” Tsuji at [0014].

225. Tsuji’s display device uses a “piezoelectric element” that is a “bi-directional function means,” meaning that it can both output vibrations and also generate a voltage indicative of a pressure. Tsuji at [0016]. As Tsuji explains, on one hand, “a mechanical reaction such as a vibration...is generated when an electrical signal is applied” to the piezoelectric element, and “on the other hand, an electrical reaction such as voltage...is generated when a pressing force is applied.” Tsuji at [0016]-[0018].

226. Tsuji’s Figures 1 and 2 (below) illustrate an ATM (element 1) that incorporates “an information display device 100” in accordance with Tsuji’s invention (Tsuji at [0040]-[0043]):



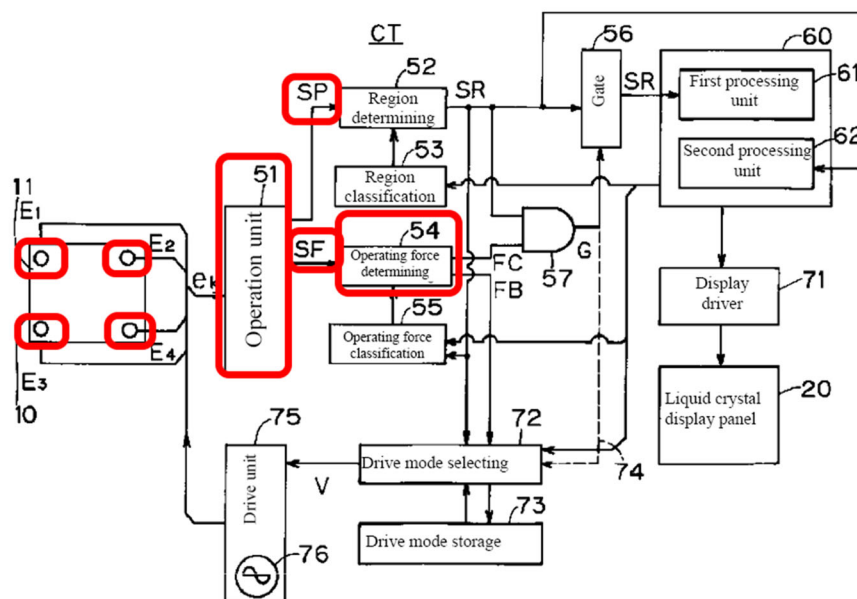
227. Tsuji's Figures 3 and 4 (below, annotations added) illustrate a cross-section view of the display device (Figure 3) and a see-through plan view of its display (Figure 4) (Tsuji at [0044]-[0047]):

229. As noted above, the piezoelectric elements are used both to sense that the user has touched an operating region (and where he/she has done so) and to output vibrations to the touchscreen. Tsuji at [0016]-[0018]; [0047]-[0048]. For example, Tsuji explains that when the piezoelectric elements vibrate, “this vibration...is propagated to the operating surface 11” seen in Figure 3. Tsuji at [0112]; *see also* Tsuji at [0121]-[0122] (explaining that when the piezoelectric elements vibrate, “[t]his mechanical reaction is propagated to operating panel 10 in FIG. 3, which thus vibrates or slightly displaces operating surface 11”). “This

vibration is felt by an operator touching the operating surface, which thus allows said operator to know that his/her operational input has been accepted successfully.” Tsuji at [0122]. The determination of which operating region is touched and the operating force is described for example at Tsuji [0048] to [0102].

230. Figure 7 (below, annotations added) illustrates Tsuji’s control circuit (CT). Tsuji at [0080]. Although Figure 7 depicts “a hardware circuit,” Tsuji teaches that the circuit can be “realized with software using a microcomputer” such that the hardware circuit portions “are functionally realized using the MPU [*i.e.*, microcomputer] and memory of said microcomputer.” Tsuji at [0080]. By 2001, a POSITA would have known—consistent with Tsuji—that hardware-circuit functionality can be implemented in software using conventional processors.

Fig. 7

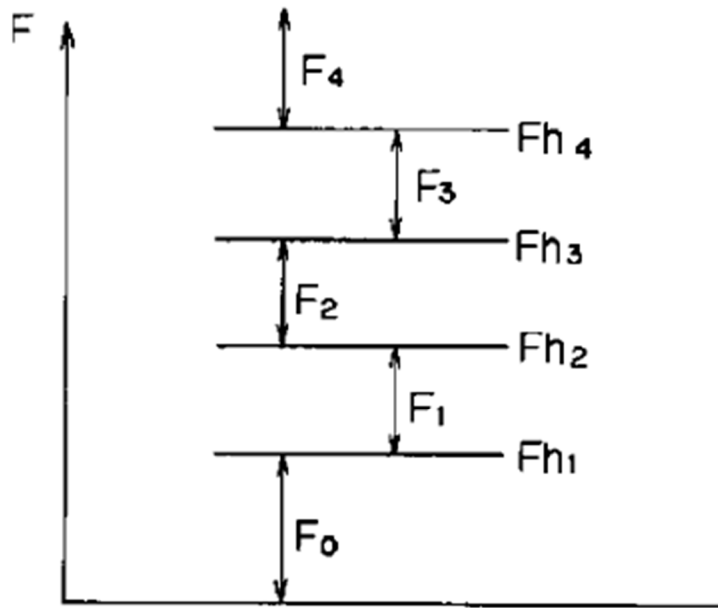


231. As seen above, the element voltages e_k of each piezoelectric element E1-E4 are output to an operation unit 51. Tsuji at [0081]-[0082]. Tsuji explains that these voltages are based on “pressure” that is applied to the display (as detected by the piezoelectric elements), *e.g.*, from a user pressing the display with his or her finger. Tsuji at [0051]; *see also* Tsuji at [0018] (explaining that the piezoelectric elements “convert[] mechanical pressure into voltage”); [0082].

232. Based on the element voltages e_k of each piezoelectric element, the operation unit 51 detects an “operating force F” and outputs “an operating force signal SF showing the operating force” to an operating force determining unit 54. Tsuji at [0084]-[0085], [0092]. In other words, the mechanical pressure applied to Tsuji’s display device is converted to a voltage which is then converted into an operating force signal SF that is applied to an operating force determining unit 54.

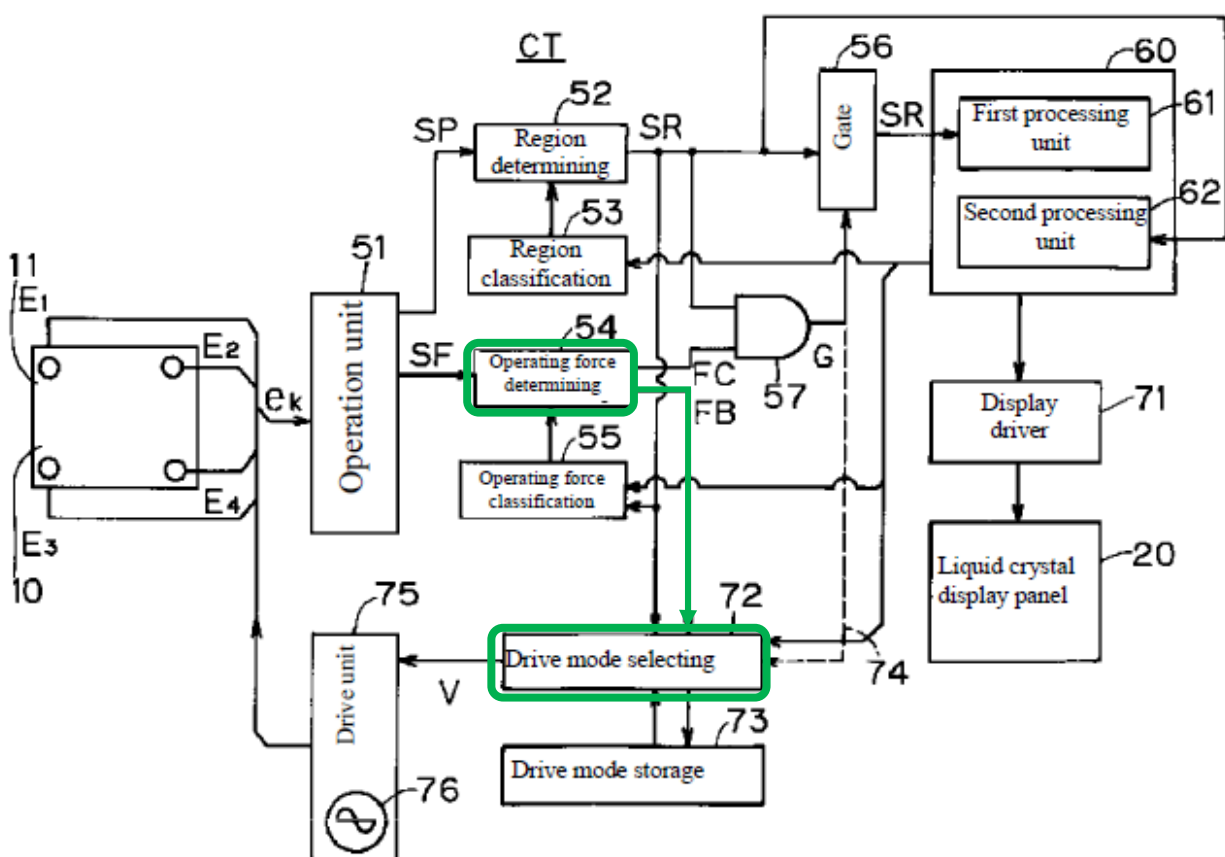
233. Determining unit 54 has access to a “plurality of thresholds Fh1 through Fh4,” and these four thresholds are used to determine whether the operating force F (which is indicative of the pressure exerted on the piezoelectric elements) falls into one of five “force classifications”: F0 through F4. Tsuji at [0091], [0093]-[0100]. The force thresholds are for increasing levels of force (and thus increasing levels of pressure): Fh1 is the minimum force threshold, and Fh4 has the greatest magnitude. Tsuji at [0093]-[0101]. This is illustrated in Figure 11 which I have reproduced below:

Fig. 11



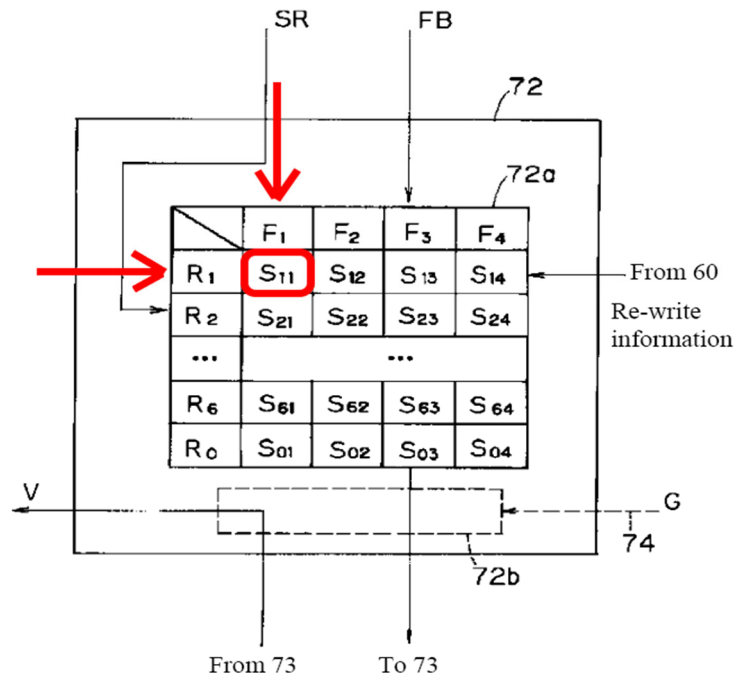
234. An “operating force determining signal” (“FB”) (illustrated in FIG. 7 immediately below, green annotation), indicative of the detected force classification, is sent to drive mode selection unit 72 and the information is used to determine how to drive the piezoelectric elements using a table such as the one depicted in Figure 13 (farther below, annotations added). Tsuji at [0101]-[0102], [0107]-[0109].

Fig. 7

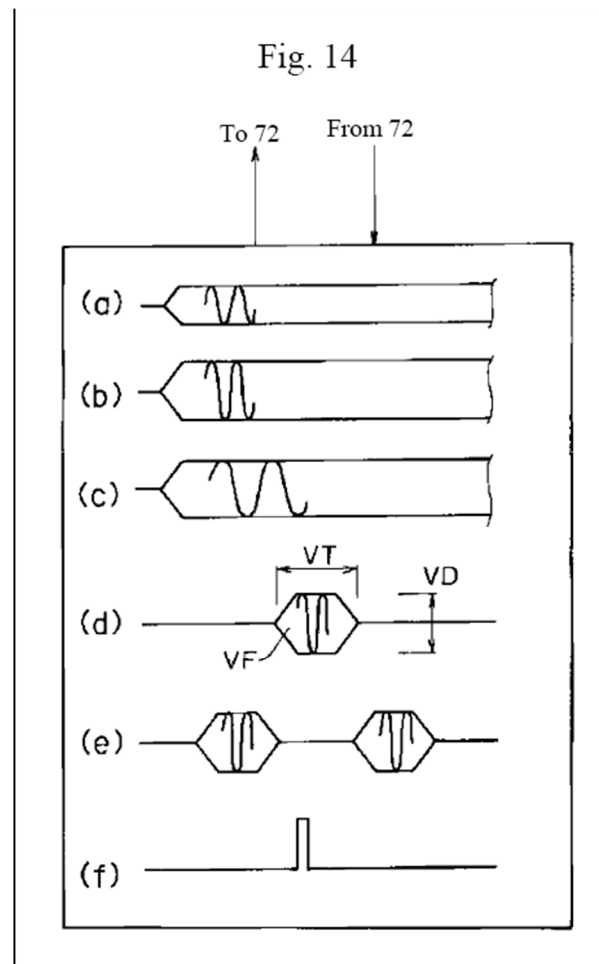


235. For example, if “force classification” F1 were detected in region R1, then signal S11 would be selected and define a drive mode to drive the piezoelectric elements. Tsuji at [0108], [0110]. This is illustrated in the annotations added to Tsuji’s Figure 13 below:

Fig. 13

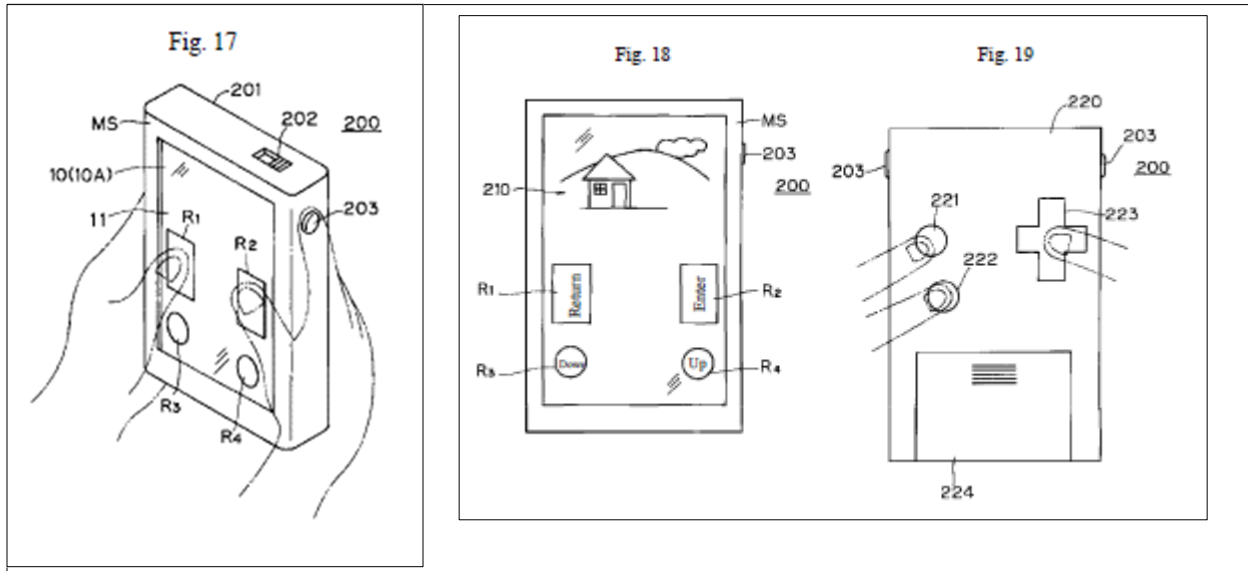


236. Figure 14 (reproduced below) depicts exemplary drive modes, each providing a different form of vibration. Tsuji at [0111]. The vibration provides “a tactile action intended to notify the operator that the operation was received.” Tsuji at [0112].



237. A POSITA would understand that Figure 14 above exemplifies a variety of stored drive modes for producing distinct tactile sensations via vibrations: (a) is for performing a continuous vibration having a small amplitude; (b) a continuous vibration having a larger amplitude; (c) a vibration mode having a different frequency; (d) and (e) vibrations for a short period of time, done once or done twice; and (f) a single vibration or pulse. Tsuji at [0109].

238. Tsuji's Figures 17-19 (below) illustrate a gaming-system embodiment of its invention: in Figure 17 the operating regions R1 through R4 are visible, Figures 18 and 19 are flat front and rear views, respectively. Tsuji at [0146]-[0153]:



1. Claim 1

- a. **[1PRE]: “A computer-readable medium having instructions, the instructions including instructions that cause a processor to:”**

239. If the preamble is limiting, Tsuji discloses a “*computer-readable medium having instructions*” that cause a processor to perform the steps recited in limitations [1A] to [1F].

240. Tsuji teaches that its “control circuit” depicted in Figure 7 can be “realized with software using a microcomputer” such that the hardware circuit portions depicted in Tsuji’s Figure 7 “are functionally realized using the MPU [*i.e.*, microcomputer] and memory of said microcomputer.” Tsuji at [0080], [0082]. A

POSITA would recognize that Tsuji's "microcomputer" is a "*processor*," as claimed. As its name implies, a microcomputer is a term for a small computer, and a microcomputer includes either a microprocessor, central processing unit, or similar processing circuit to execute software instructions.

241. The "software" that Tsuji says its microcomputer uses to perform the control circuit's functionality are "*instructions*" stored in a "*computer-readable medium*," *i.e.*, Tsuji's "memory." A POSITA would know that computer software, such as Tsuji's software, is a set of "*instructions*," as claimed.

242. Alternatively, if Tsuji were found not to disclose that its "software" for performing steps [1A] to [1F] is stored in the microcomputer's memory, then storing that software in the microcomputer's memory would have been obvious to a POSITA because it was routine and well-known to store computer software in a computer-readable medium like memory, *e.g.*, RAM, for access by a processor.

b. [1A]: "detect a first pressure on a first input device"

243. Tsuji's stored program code, when executed, causes the microcomputer to "*detect a first pressure on a first input device*," as claimed.

244. To start, as I explained above in Section X.A, an "*input device*" is "a device by which a user can interact with an electronic device to provide instructions, responses, and other input to the electronic device." Tsuji discloses two types of "*input devices*."

245. Specifically, both (a) Tsuji's overall display device 100 and also (b) its operating regions (*e.g.*, R1-R7 for the ATM embodiment and R1-R4 for its gaming-system embodiment) are “*input devices*” because each is used to interact with an electronic device, *e.g.*, an ATM or a gaming system. Tsuji at [0046] (clicking the “Deposit” region “notifies the bank host computer” that the user wants to deposit money); [0046] (“Regions R1 through R7...serve as operating regions for bank users.”); [0145]-[0147] (game device operator “performs operations by pressing these operating regions R1 through R4”); FIGS. 1-4 (depicting the ATM embodiment) FIG. 17-18 (depicting the gaming-system embodiment).

246. A POSITA would also understand the operating regions to be “*input devices*” because the POSITA would recognize them readily as virtual input devices, *e.g.*, virtual button devices, implemented on a touchpad input device or touch surface. This teaching was well-known in the art as I discuss above in Section VII.A. To the extent it may be argued that the first and second input devices of the claims must be distinct physical devices, I find no such teaching in the '260 patent. In addition, it would be obvious to a POSITA that the regions simulate buttons, and could be replaced by physical buttons as a straightforward design choice.

247. Tsuji's microcomputer “*detect[s] a first pressure on*” each operating region (and thus on display device 100 as well). As discussed above in my overview of Tsuji, piezoelectric elements E1-E4 in display device 100 produce voltages that

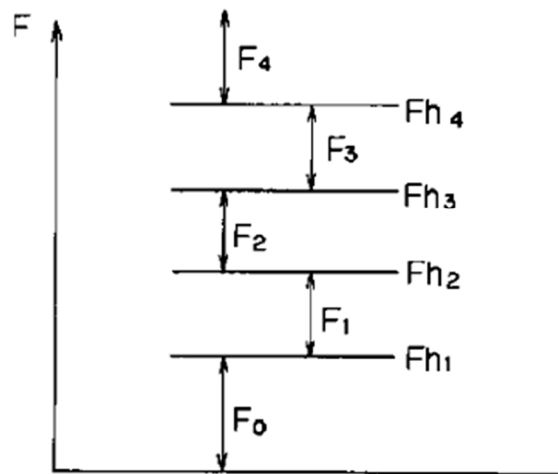
the microcomputer uses to detect a pressure that has been applied to the display, *e.g.*, when a user presses one of the operating regions R1 through R7 in the ATM embodiment. Tsuji at [0018] (explaining that the invention “convert[s] mechanical pressure into voltage”); [0081]-[0085] (describing how “pressing force” is sensed), [0091]; FIG. 7. For example, Tsuji explains that “because voltage is generated at both ends of each piezoelectric element E1 through En when pressure is applied..., a force k (k = 1 to n) applied to these piezoelectric elements E1 through En can be known.” Tsuji at [0051].

248. Tsuji calls the pressure it senses or detects based on the voltages from the piezoelectric elements an “operating force F.” As I explained above in Section X.C, “*pressure*” in the context of the ’260 patent is “application of force from a contact.” Tsuji’s “operating force F” is thus a pressure measurement because it is the amount of force that has been applied by a user’s finger contacting display device 100, *e.g.*, by pressing down on one of operating regions R1 to R7.

249. Tsuji further explains that the microcomputer compares the operating force F to a “plurality of thresholds Fh1 through Fh4” to determine whether the operating force (*i.e.*, the pressure exerted on the piezoelectric elements) falls into one of five “force classifications”: F0 through F4. Tsuji at [0091], [0093]-[0101]. As shown in Tsuji’s Figure 11 (below), the force classifications go up as the amount

of force (*i.e.*, pressure) increases with F0 being the lowest classification and F4 being the highest classification.

Fig. 11



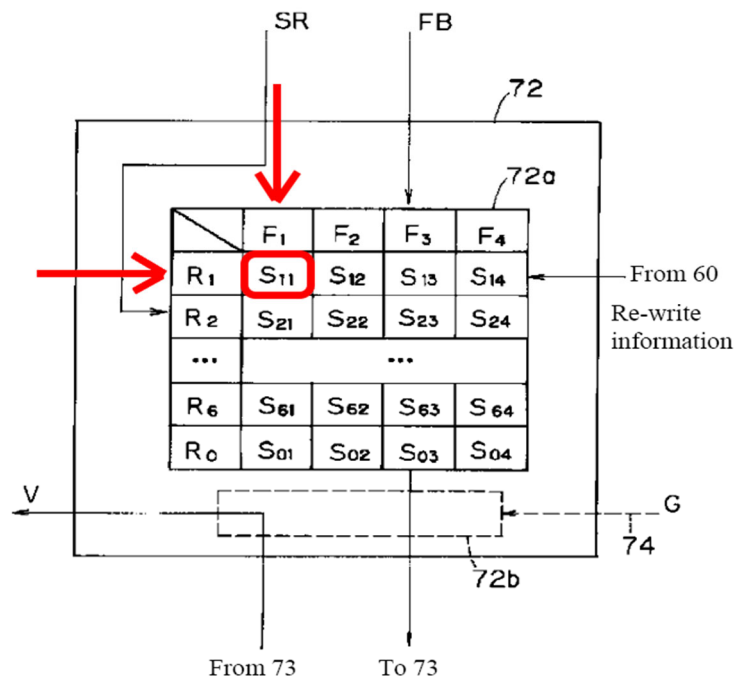
250. Because the microcomputer can detect into which of five force classifications a particular operating force F (*i.e.*, “pressure”) applied to a specific region of device 100 falls, the microcomputer “*detect[s] a first pressure,*” as claimed, for example, it detects a pressure falling into the F1 classification.

- c. **[1B]: “provide a first tactile sensation to the first input device, the first tactile sensation based at least in part on the first pressure”**

251. Tsuji’s stored program code, when executed, causes the microcomputer to “*provide a first tactile sensation to the first input device, the first tactile sensation based at least in part on the first pressure,*” as claimed.

252. As discussed above in my overview of Tsuji, Tsuji's microcomputer uses an "operating force determining signal" ("FB"), which is indicative of the detected force classification, to determine how to drive the piezoelectric elements, and uses the table depicted in Figure 13 (below, annotations added) to do so (Tsuji at [0101], [0102], [0107]-[0109]):

Fig. 13



253. As shown above, if, for example, the detected "first pressure" falls into force classification F1 and the microcomputer determines that the pressure was exerted in Region R1, signal S11 is used to place the piezoelectric elements into a drive mode selected from a "variety of drive modes." Tsuji at [0107]-[0109]; [0130]; [0181]; FIG. 14 (depicting drive modes with different frequencies, amplitudes, and

timing). Each drive mode causes the piezoelectric elements to generate “a mechanical reaction such as a vibration...of an operating surface as a response to an operation input from a device side.” Tsuji at [0014]-[0016]; [0109]-[0111]; FIG. 14 (depicting various drive modes, reproduced and described above at paragraph 236).

254. The vibration is provided to give an operator of the device “a reliable sense of operation.” Tsuji at Abstract; [0008]; [0014]; *see also* Tsuji at [0014]-[0018]. In other words, the vibration gives the operation confirmation that a particular region R1 through R7 was successfully selected. Tsuji at [0021] (explaining that the mechanical reaction, *e.g.*, vibration, that is output to the operating surface of the display device “is captured as a sense of touch of an operator”); [0110]-[0112] (“When the operator presses down on one of the operating regions R1 through R7 with at least a predetermined force, a tactile action intended to notify the operator that the operation was received is generated by a vibration or slight sliding of the operating surface.”).

255. For example, Tsuji’s ATM example uses the piezoelectric elements as “driving means for gently vibrating the operating panel 10 based on said pressing.” Tsuji at [0047]. Because the vibration is provided onto the “operating surface” of the device panel, it is felt on both **(a)** display device 100, and **(b)** each of its operating regions, including the one that was pressed to generate the pressure detected in limitation [1A].

256. Tsuji's microcomputer thus "*provide[s] a first tactile sensation,*" i.e., a vibration corresponding to a particular drive mode, "*to the first input device,*" i.e., display device 100 and/or the operating region on that device's operating surface that the user has pressed, and "*the first tactile sensation based at least in part on the first pressure,*" i.e., the particular drive mode used is based on the force classification into which the operational force (i.e., "*pressure*") falls as discussed for limitation [1A].

d. [1C]: "detect a second pressure on the first input device, the second pressure greater than the first pressure"

257. Tsuji's stored program code, when executed, causes the microcomputer to "*detect a second pressure on the first input device, the second pressure greater than the first pressure,*" as claimed.

258. Tsuji's microcomputer uses the same process I discussed above for limitation [1A] to detect "*a second pressure.*" Specifically, it detects an "operating force" (i.e., "*pressure*") applied to an operating region on display device 100 and determines into which of five "force classifications" F0-F4 that "operating force" falls. These classifications include a pressure (e.g., one that falls within the F2 classification) greater than the "*the first pressure*" of limitation 1A (e.g., one that fell within the F1 classification). Tsuji at [0095] (explaining that the "F" for Fh2 is

greater than for Fh1); FIG. 11 (depicting F2 as requiring more operational force than F1).

259. Tsuji's microcomputer thus "*detect[s] a second pressure,*" e.g., an operating force (*i.e.*, "*pressure*") falling into the F2 classification, "*on the first input device,*" *i.e.*, display device 100 and/or the same operating region on that device's operating surface that the user has pressed in limitation [1A], "*the second pressure greater than the first pressure,*" as claimed.

260. Tsuji teaches that the detected "*second pressure*" (and all other detected pressures) can be a pressure that is detected during a single press or contact by the user onto an operating region R1 through R7. For example, Tsuji teaches that "a stronger vibration" can be "applied as the operating force F gets larger." Tsuji at [0111] (emphasis added). In other words, Tsuji's microcomputer can detect when the force applied to the display device or a particular region (*e.g.*, R1) increases, that is, "gets larger," from one force classification (*e.g.*, F1) to another (*e.g.*, F2), and can do so in a single contact as the user exerts more pressure. Tsuji thus also satisfies the "single contact" claim construction that the Patent Owner advanced before the International Trade Commission and which I discuss above in Section X.B.

- e. **[1D]: “provide a second tactile sensation to the first input device, the second tactile sensation based at least in part on the second pressure”**

261. Tsuji’s stored program code, when executed, causes the microcomputer to “provide a second tactile sensation to the first input device, the second tactile sensation based at least in part on the second pressure,” as claimed.

262. Tsuji’s microcomputer uses the same process I discussed above for limitation [1B] to “*provide a second tactile sensation to the first input device.*” Specifically, it uses the table in Tsuji’s Figure 13 to place the piezoelectric elements into a drive mode that corresponds with a detected pressure.

263. Tsuji’s microcomputer thus “*provide[s] a second tactile sensation,*” *i.e.*, a vibration corresponding to a particular drive mode, “*to the first input device,*” *i.e.*, display device 100 and/or the operating region on that device’s operating surface that the user has pressed, and “*the second tactile sensation based at least in part on the second pressure,*” *i.e.*, the drive mode used is based on the force classification (e.g., F2) into which the operational force (*i.e.*, “pressure”) falls as I discussed for limitation [1C].

264. As explained in Section X.D, the claimed “*tactile sensations*” can be the same or different such that any second “tactile sensation” meets the claimed “*second tactile sensation.*” Accordingly, the vibration that the drive mode

associated with classification F2 generates is a “*second tactile sensation*” that is “*based at least in part on the second [detected] pressure,*” as claimed.

f. [1E]: “detect a third pressure on the first input device, the third pressure greater than the second pressure”

265. Tsuji’s stored program code, when executed, causes the microcomputer to “*detect a third pressure on the first input device, the third pressure greater than the second pressure,*” as claimed.

266. Tsuji’s microcomputer uses the same process I discussed above for limitations [1A] and [1C] to detect “*a third pressure.*” Specifically, it detects an “operating force” (*i.e.*, “*pressure*”) applied to an operating region on display device 100 and determines into which of five force classifications (F0-F4) that “operating force” falls. These classifications include a pressure (*e.g.*, one within the F3 classification) that is greater than the threshold to which “*the second pressure*” of limitation 1C was classified (*e.g.*, one within the F2 classification). Tsuji at FIG. 11 (depicting F3 as requiring more operational force than F2); [0094] (explaining that operating force “at a given time” is compared to force thresholds to determine into which force classifications the then-exerted force falls).

267. The microcomputer thus “*detect[s] a third pressure,*” *e.g.*, an operational force (*i.e.*, “*pressure*”) falling into the F3 classification, “*on the first input device,*” *i.e.*, display device 100 and/or the same operating region on that

device's operating surface that the user pressed for limitations [1A] and [1C], "*the third pressure greater than the second pressure*," as claimed.

268. As I discussed above for limitation [1C], Tsuji teaches that the detected "*third pressure*" (and all other detected pressures) can be a pressure that is detected during a single press or contact by the user onto an operating region R1 through R7. For example, Tsuji teaches that "a stronger vibration" can be "applied as the operating force F gets larger." Tsuji at [0111] (emphasis added). In other words, Tsuji's microcomputer can detect when the force applied to the display device or a particular region (*e.g.*, R1) increases, that is, "gets larger," from one force classification (*e.g.*, F1) to another (*e.g.*, F2) to another (*e.g.*, F3), and can do so in a single contact as the user exerts more pressure. Tsuji thus also satisfies the "single contact" claim construction that the Patent Owner advanced before the International Trade Commission and which I discuss above in Section X.B.

g. [1F]: "provide a third tactile sensation to the first input device."

269. Tsuji's stored program code, when executed, causes the microcomputer to "*provide a third tactile sensation to the first input device*," as claimed.

270. Tsuji's microcomputer uses the same process I discussed above for limitation [1B] and [1D] to "*provide a third tactile sensation to the first input device*." Specifically, it uses the table in Tsuji's Figure 13 to place the piezoelectric elements into a drive mode that corresponds with a detected pressure.

271. Tsuji's microcomputer thus "*provide[s] a third tactile sensation,*" i.e., a vibration corresponding to a particular drive mode, "*to the first input device,*" i.e., display device 100 and/or the operating region on that device's operating surface that the user has pressed, and "*the third tactile sensation based at least in part on the third pressure,*" i.e., the drive mode used is based on the force classification (e.g., F3) into which the operational force (i.e., "*pressure*") falls as I discussed for limitation [1E].

272. As explained in Section X.D, the claimed "*tactile sensations*" can be the same or different such that any second "tactile sensation" meets the claimed "*second tactile sensation.*" Accordingly, the vibration that the drive mode associated with classification F3 generates is a "*third tactile sensation*" that is "*based at least in part on the third [detected] pressure,*" as claimed.

2. Claim 2

- a. **[2PRE]: "The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:"**

273. If the preamble is limiting, Tsuji discloses a "*computer-readable medium having instructions*" that cause a processor to perform the steps recited in limitations [2A] to [2B] for the same reasons that it discloses limitation [1PRE].

- b. [2A]: “detect a fourth pressure on the first input device, the fourth pressure greater than the third pressure”

274. Tsuji’s stored program code, when executed, causes the microcomputer to “*detect a fourth pressure on the first input device, the fourth pressure greater than the third pressure,*” as claimed.

275. Tsuji’s microcomputer uses the same process I discussed above for limitations [1A], [1C], and [1E] to detect “*a fourth pressure.*” Specifically, it detects an “operating force” (*i.e.*, “*pressure*”) applied to an operating region on display device 100 and determines into which of five force classifications (F0-F4) that “operating force” falls. These classifications include a pressure (*e.g.*, one within the F4 classification) that is greater than the threshold to which “*the third pressure*” of limitation 1E was classified (*e.g.*, one within the F3 classification). Tsuji at FIG. 11 (depicting F3 as requiring more operational force than F2); [0094] (explaining that operating force “at a given time” is compared to force thresholds to determine into which force classifications the then-exerted force falls).

276. The microcomputer thus “*detect[s] a fourth pressure,*” *e.g.*, an operational force (*i.e.*, “*pressure*”) falling into the F3 classification, “*on the first input device,*” *i.e.*, display device 100 and/or the same operating region on that device’s operating surface that the user pressed for limitations [1A] and [1C], “*the fourth pressure greater than the third pressure,*” as claimed.

277. As I discussed above for limitation [1C], Tsuji teaches that the detected “*fourth pressure*” (and all other detected pressures) can be a pressure that is detected during a single press or contact by the user onto an operating region R1 through R7. For example, Tsuji teaches that “a stronger vibration” can be “applied as the operating force F gets larger.” Tsuji at [0111] (emphasis added). In other words, Tsuji’s microcomputer can detect when the force applied to the display device or a particular region (*e.g.*, R1) increases, that is, “gets larger,” from one force classification (*e.g.*, F1) to another (*e.g.*, F2) to another (*e.g.*, F3), and can do so in a single contact as the user exerts more pressure. Tsuji thus also satisfies the “single contact” claim construction that the Patent Owner advanced before the International Trade Commission and which I discuss above in Section X.B.

c. [2B]: “provide a fourth tactile sensation to the first input device.”

278. Tsuji’s stored program code, when executed, causes the microcomputer to “*provide a fourth tactile sensation to the first input device*,” as claimed.

279. Tsuji’s microcomputer uses the same process I discussed above for limitation [1B], [1D], and [1F] to “*provide a fourth tactile sensation to the first input device*.” Specifically, it uses the table in Tsuji’s Figure 13 to place the piezoelectric elements into a drive mode that corresponds with a detected pressure.

280. Tsuji’s microcomputer thus “*provide[s] a fourth tactile sensation*,” *i.e.*, a vibration corresponding to a particular drive mode, “*to the first input device*,”

i.e., display device 100 and/or the operating region on that device's operating surface that the user has pressed, and "*the fourth tactile sensation based at least in part on the fourth pressure,*" *i.e.*, the drive mode used is based on the force classification (*e.g.*, F4) into which the operational force (*i.e.*, "*pressure*") falls as I discussed for limitation [2A].

281. As explained in Section X.D, the claimed "*tactile sensations*" can be the same or different such that any second "tactile sensation" meets the claimed "*second tactile sensation.*" Accordingly, the vibration that the drive mode associated with classification F4 generates is a "*fourth tactile sensation*" that is "*based at least in part on the fourth [detected] pressure,*" as claimed.

3. Claim 3: The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to provide the first tactile sensation to a second input device.

282. Tsuji's stored program code, when executed, causes the microcomputer to "*provide the first tactile sensation to a second input device,*" as claimed.

283. As I explained above with respect to limitation [1B], Tsuji's microcomputer generates a drive signal (*e.g.*, S11) to place the piezoelectric elements into a drive mode selected from a "variety of drive modes." Tsuji at [0107]-[0109]; [0130]; [0181]; FIG. 14 (depicting drive modes with different frequencies, amplitudes, and timing). Each drive mode causes the piezoelectric

elements to generate “a mechanical reaction such as a vibration...of an operating surface as a response to an operation input from a device side.” Tsuji at [0014]-[0016]; [0109]-[0111]; FIG. 14 (depicting various drive modes, reproduced and described above at paragraph 236).

284. Tsuji further explains that the generated vibration is provided to the entire operating surface 11 of Tsuji’s display device 100. Tsuji at Abstract (explaining that the piezoelectric elements “cause[] the operating surface 11 to vibrate”); [0014] (“[T]he operating surface can be vibrated using a piezoelectric element...to give an operator a reliable sense of operation.”); [0114] (“operating surface 11 is...made to vibrate”).

285. For example, Tsuji’s ATM example uses the piezoelectric elements as “driving means for gently vibrating the operating panel 10 [and thus operating surface 11] based on said pressing.” Tsuji at [0048]; *see also* [0122] (“This mechanical reaction is propagated to operating panel 10 in FIG. 3, which thus vibrates or slightly displaces operating surface 11.”). Tsuji’s gaming-system embodiment also uses the piezoelectric elements to provide “a vibration like a traveling wave that travels from one end of the operating surface 11 to the other.” Tsuji at [0151]; FIG. 17.

286. Because the entire operating surface 11 vibrates, when the pressure discussed for limitation [1A] was detected and caused the “*first tactile sensation*” to

be provided to one operating region (e.g., R1), that vibration was also felt at each of the other operating regions (e.g., R2), any one of which is a “*second input device*,” as claimed. Regarding this point, I note that the ‘260 patent sets forth clearly that that in a softkey embodiment, “a single vibrotactile actuator outputting the same sensation to all the buttons simultaneously can be used.” EX1001, 13:11-25. Tsuji’s disclosure is similar to this embodiment in the ‘260 patent.

4. Claim 4: “The computer-readable medium of claim 3 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to provide the second tactile sensation to the second input device.”

287. Tsuji’s stored program code, when executed, causes the microcomputer to “*provide the second tactile sensation to a second input device*,” as claimed.

288. As discussed for claim 3, Tsuji’s piezoelectric elements provide vibrations simultaneously to all operating regions on display 11. Tsuji’s microcomputer thus “*provides the second tactile sensation*” discussed in limitation 1D, to “*a second input device*,” as claimed.

5. Claim 5

- a. [5PRE]: “The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:”**

289. If the preamble is limiting, Tsuji discloses a “*computer-readable medium having instructions*” that cause a processor to perform the steps recited in limitations [5A] to [5B] for the same reasons that it discloses limitation [1PRE].

- b. [5A]: “detect a fourth pressure on a second input device”**

290. Tsuji’s stored program code, when executed, causes the microcomputer to “*detect a fourth pressure on a second input device,*” as claimed.

291. As I explained above with respect to limitation [1A], Tsuji’s display device includes several operating regions, each of which is an “*input device.*” For example, Figure 4’s ATM embodiment has seven selectable operating regions (R1-R7) and Figure 17’s gaming system embodiment has four such regions (R1-R4). [0046]; [0145].

292. Tsuji’s microcomputer detects a pressure on any of the operating regions in the manner discussed above for limitation [1A], *i.e.*, it detects an operating force F based on the amount of pressure a user applies to a selectable operating region. Tsuji’s microcomputer thus “*detect a fourth pressure on the second input device,*” *i.e.*, any pressure that is not identical to the claimed first, second, or third

pressures and which is exerted on an operating region different than the operating region that was pressed to generate the “*first pressure*” recited in limitation [1A].

c. [5B]: “provide a fourth tactile sensation to the second input device.”

293. Tsuji’s program code causes the microcomputer to “*provide a fourth sensation to the second input device,*” as claimed.

294. Tsuji’s microcomputer uses the same process discussed above for limitation [1B], [1D], [1F], and [2B] to “*provide a fourth tactile sensation to the second input device,*” *i.e.*, it uses the table in Tsuji’s Figure 13 to place the piezoelectric elements into a drive mode that corresponds with the force classification into which the detected pressure (*i.e.*, Tsuji’s operating force F) falls.

295. Tsuji’s microcomputer thus “*provide[s] a fourth tactile sensation,*” *i.e.*, a vibration corresponding to a particular drive mode, “*to the second input device,*” *i.e.*, the operating region on display device 100’s operating surface that the user has pressed and which is different than the region pressed in limitation [1A], as discussed above.

296. As explained in Section X.D, the claimed “*tactile sensations*” can be the same or different such that any second “tactile sensation” meets the claimed “*second tactile sensation.*” Accordingly, the vibration that the drive mode associated with whichever force classification the detected “*fourth pressure*” falls

into is a “*fourth tactile sensation*” that is “*based at least in part on the fourth [detected] pressure,*” as claimed.

6. Claim 6: “The computer-readable medium of claim 5, the fourth tactile sensation different from the first tactile sensation.”

297. Tsuji’s stored program code, when executed, causes the microcomputer to provide a “*fourth tactile sensation different from the first tactile sensation,*” as claimed.

298. As discussed above with respect to limitation [1B], Tsuji’s microcomputer uses Figure 13’s table to generate a signal that places the piezoelectric elements into a particular drive mode. Tsuji at [0107]-[0109]; FIG. 13. As Figure 13 illustrates, a different signal is generated for each unique combination of operating region and force classification, and therefore a POSITA would have understood that the drive mode associated with each signal results in a different vibration being felt by a user. This is consistent with Figure 14 which depicts unique drive modes, each generating a different vibration pattern (Tsuji at [0109]), and with Tsuji’s explanation that certain regions (but not all) can be assigned “weak vibrations” (Tsuji at [0111]).

299. Accordingly, a POSITA would understand Tsuji to disclose that the “*first tactile sensation*” generated in limitation [1B], *e.g.*, the sensation associated with force classification F1 and Region 1, would be different from the “*fourth tactile*

sensation,” i.e., the sensation associated with a different force classification (e.g., F4) and a different operating region (e.g., R2).

300. If Tsuji is argued not to disclose claim 6, then it would have been obvious to a POSITA to include instructions in the computer-readable medium that would cause the “fourth tactile sensation” provided to one operating region to feel different from the “first tactile sensation” provided to a different operating region. For example, the use of different tactile sensations would have been a readily-apparent way to indicate that different operating regions have been selected as part of indicating a successful selection, *e.g.*, an operating region for “DEPOSIT” in the ATM embodiment may have a weaker vibration associated with it than “CALL ATTENDANT” because the latter is likely a more significant/unusual event. Tsuji at FIG. 4 (depicting ATM screen).

7. Claim 7

- a. [7PRE]: “The computer-readable medium of claim 5 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:”**

301. If the preamble is limiting, Tsuji discloses a “*computer-readable medium having instructions*” that cause a processor to perform the steps recited in limitations [7A] to [7B] for the same reasons that it discloses limitation [5PRE].

- b. [7A]: “detect a fifth pressure on the second input device, the fifth pressure greater than the fourth pressure”

302. Tsuji’s stored program code, when executed, causes the microcomputer to “*detect a fifth pressure on the second input device, the fifth pressure greater than the fourth pressure,*” as claimed.

303. As I discussed above with respect to limitation [5A], Tsuji’s microcomputer detects a pressure on an operating region (“*second input device*”) that is different from the operating region discussed in limitation [1A] (*first input device*). See also above my discussion regarding limitation [1A].

304. Tsuji’s microcomputer therefore “*detect[s] a fifth pressure on the second input device,*” i.e., any pressure on the second operating region that is not identical to the claimed first, second, or third pressures and which is also greater than the fourth pressure. This would occur, for example, when the second operating region has been pushed harder (or more softly) than it was when the fourth pressure was detected. Moreover, a POSITA would have understood the number of “force classifications” used in implementing Tsuji (*see* Tsuji at Fig. 11) was a matter of design choice, and it would have been obvious for a POSITA to add an additional force classification to those (F0-F4) shown in Tsuji Fig. 11. A POSITA would have had a reasonable expectation of success in doing so because a POSITA could add additional thresholds (e.g., Fh5) corresponding to greater force or create a new force

threshold Fh5 and adjust the other force thresholds Fh1-Fh4 to create a greater granularity of classification (for example, by dividing the classified force into six (F0-F5) force classifications rather than five (F0-F4)), while maintaining the same range of forces. On this point, Tsuji states that “while operating force classifications F0 through F4 have been defined for this example, the number of force classifications can be changed based on the displayed content at a given time.”

Tsuji at [0091] (emphasis added).

c. [7B]: “provide a fifth tactile sensation to the second input device.”

305. Tsuji’s stored program code, when executed, causes the microcomputer to “*provide a fifth tactile sensation to the second input device,*” as claimed.

306. Tsuji’s microcomputer uses the same process discussed above for limitation [1B], [1D], [1F], [2B], and [5B] to “*provide a fifth tactile sensation to the second input device,*” *i.e.*, it uses the table in Tsuji’s Figure 13 to place the piezoelectric elements into a drive mode that corresponds with the force classification into which the detected pressure (*i.e.*, Tsuji’s operating force F) falls.

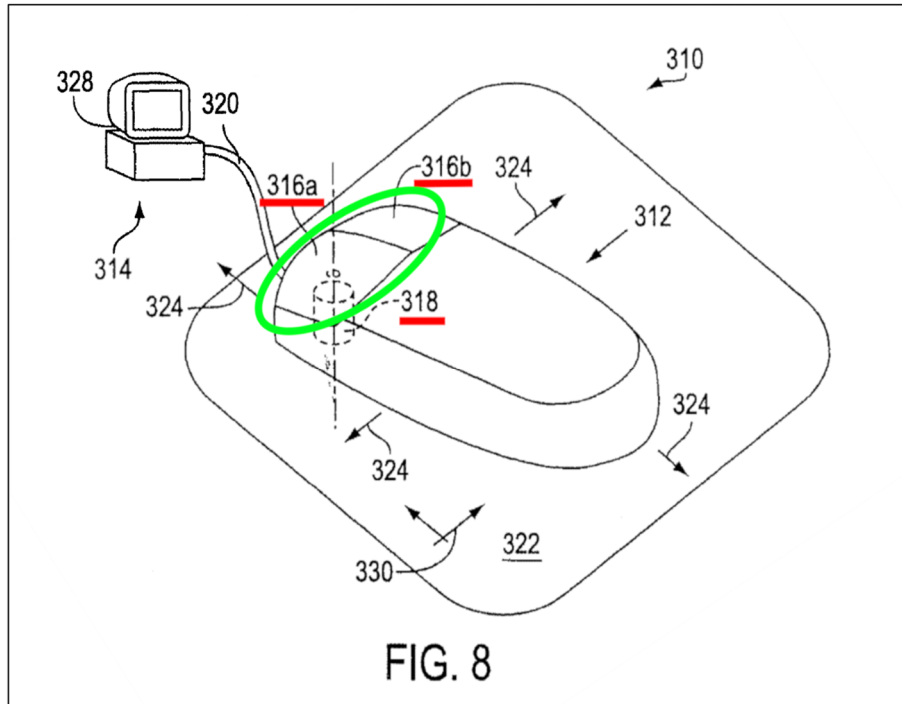
307. Tsuji’s microcomputer thus “*provide[s] a fifth tactile sensation,*” *i.e.*, a vibration corresponding to a particular drive mode, “*to the second input device,*” *i.e.*, the operating region on display device 100’s operating surface that the user has pressed and which is different than the region pressed in limitation [1A], as discussed above.

308. As explained in Section X.D, the claimed “*tactile sensations*” can be the same or different such that any second “tactile sensation” meets the claimed “*second tactile sensation.*” Accordingly, the vibration that the drive mode associated with whichever force classification the detected “*fourth pressure*” falls into is a “*fourth tactile sensation*” that is “*based at least in part on the fourth [detected] pressure,*” as claimed.

C. Ground 3: Claims 1-7 Are Anticipated by and/or Obvious Over Rosenberg

1. Rosenberg (EX1008)

309. Rosenberg discloses a mouse with pressure-sensitive buttons and “an actuator” that “produce[s] forces” on those buttons. Rosenberg at 24:1-2. An exemplary mouse with two buttons (316a, 316b) and an actuator (318) is shown below in Figure 8 (annotations added) (Rosenberg at 23:15-24:3):



310. As with a conventional mouse, a user pushes button 316a (or 316b) “down (in the degree of freedom of the button approximately along axis z) toward actuator 318 to provide a command the computer,” for example to select an item.

Rosenberg at 25:23-30. On this point, Rosenberg teaches the following:

“[A] sensor can be used to detect the precise position of the button 316(a) in its range of motion (degree of freedom). For example, each position of the button can be sensed as a different analog value and used as an analog value or a digital value in processing the button position. This allows the host computer 314 (or local microprocessor) to determine the position of the button and to control a force output based on that position.”

Rosenberg at 25:33-26:4 (emphasis added).

311. Rosenberg further teaches that one button 316a or the other 316b, or both may be selected or pressed by the user: “Buttons 316a and/or 316b are selected

by the user as a ‘command gesture’ when the user wishes to input a command signal to the host computer 314.” Rosenberg at 25:23-24 (emphasis added). A POSITA would recognize this as describing “chording” of the two buttons, or pressing both buttons of a conventional mouse at the same time, as was well-known in the art. This is referenced by the added annotation in green in Figure 8 above: a POSITA would readily see also from Figure 8 that a user could conveniently press both buttons in a single press, for that matter by a single finger: for example, they are immediately adjacent, and are pressed in essentially the same direction.

312. Rosenberg teaches that one sensor for detecting the button’s position within its degree of freedom is “a force sensing switch to detect the amount of force applied to button [316a].” Rosenberg at 28:23-24. Rosenberg does not provide further details regarding its “force sensing switch,” but that makes sense given that such switches, and the functionality they provide, were well known to a POSITA.

313. A POSITA would have been well familiar with common force sensing switches as they were conventional by 2001. A POSITA would know that they are conventional, for example, from U.S. Patent No. 5,995,026 (EX1053, “Sellers”):

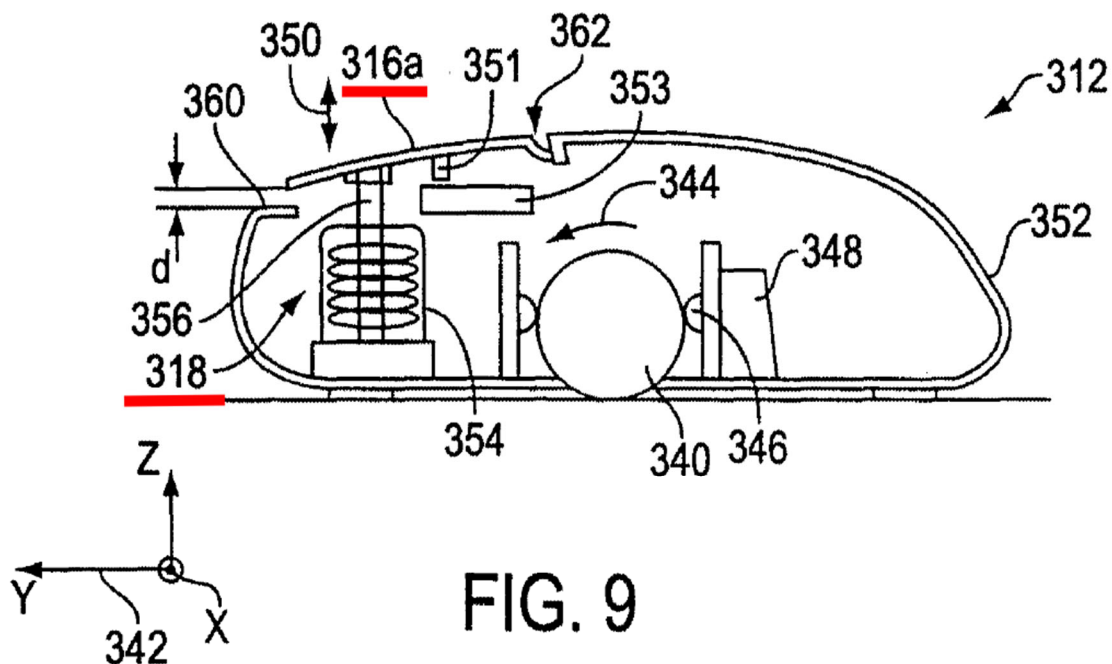
Incorporated in the membrane sheet 40 in underlying horizontal registry with the resilient domes 36 are a spaced series of force sensing resistor (FSR) switches 44. These switches are of a conventional design and are of the type commonly used, for example, in computer pointing devices such as touch pads and pointing sticks.

EX1053 (Sellers) at 4:33-38 (emphasis added).

314. With a conventional force sensing switch, the switch detects the amount of force applied to the switch and then either converts that analog signal (e.g., a voltage signal) to a digital signal itself or sends the analog signal to an analog-to-digital converter that will perform the conversion.³⁰

315. Figure 9 (below, annotations added) shows a cross-sectional view of the mouse 312 of Figure 8. Rosenberg at 25:11-12. Actuator 318 outputs forces against button 316a in the “direction shown by arrow 350..., *i.e.*, in the degree of freedom of button 316.” Rosenberg at 26:5-7. A single actuator “can provide forces simultaneously to both buttons 316a and 316b” or “each button 316 can be provided with its own actuator.” Rosenberg at 26:25-29. The forces the actuator(s) output include a “spring effect” wherein the “magnitude of [the] force sensation is dependent on the distance of the button from the origin of the spring.” Rosenberg at 30:29-33.

³⁰ See, e.g., EX1054 (U.S. Patent No. 5,235,868).



316. In its claims, Rosenberg recites a “force feedback mouse” with a sensor that “detects a range of at least three positions” of a button as well as one where the “output force” that an actuator applies to the mouse’s button is “dependent, at least in part, on [the] position of [the] button in [its] degree of freedom.” Rosenberg at 37:28-38:22. Moreover, as I explained above, Rosenberg also teaches explicitly that the sensor used to detect the position of the button may alternatively be a force sensing switch to detect the amount of force applied to any of the buttons. Rosenberg at 28:23-24.

2. Claim 1

- a. [1PRE]: “A computer-readable medium having instructions, the instructions including instructions that cause a processor to:”**

317. If the preamble is limiting, Rosenberg discloses a “*computer-readable medium having instructions*” that cause a processor to perform the steps recited in limitations [1A] to [1F].

318. For example, Rosenberg explains that either (1) a “host computer” with a “host microprocessor” or (2) a “local microprocessor” within the mouse itself “determine[s] the position of the button and [] control[s] a force output based on that position.” Rosenberg at 7:29-30; 25:33-26:4. Rosenberg thus discloses that a “*processor*,” as claimed, controls the mouse’s force-feedback functionality. A POSITA in 2001 would have been well-aware that computer-mouse devices would be interfaced to a processor both for input, and for a processor to command tactile force feedback.

319. Rosenberg teaches further that the host computer’s processor “retrieves and stores instructions and other necessary data from RAM and ROM.” Rosenberg at 7:35-8:1.

320. Similarly, Rosenberg teaches that the mouse’s local processor uses “software instructions” to perform force-feedback functionality and that such instructions are stored in a local memory that is “RAM and/or ROM.” Rosenberg at

9:30-32, 11:19-21 (“Local memory 27, such as RAM and/or ROM, is preferably coupled to microprocessor 26 in interface device 14 to store instructions for microprocessor 26 and store temporary and other data.”); *see also* Rosenberg at 10:18-34.

321. The “RAM” or “ROM” from which the host or local processor accesses instructions to perform Rosenberg’s force-feedback functionality is a “*computer readable medium*,” as claimed, and the accessed instructions are “*program code*,” as claimed.

b. [1A]: “detect a first pressure on a first input device;”

322. Rosenberg’s stored program code, when executed, causes Rosenberg’s processor to “*detect a first pressure on a first input device*,” as claimed.

323. To start, Rosenberg’s physical buttons 316a and 316b are used to “input a command signal to the host computer” to manipulate a “graphical environment in a variety of ways.” Rosenberg at 25:23-30. Therefore, a POSITA would understand that each button 316 (also the computer mouse of which they are a part) is an “*input device*,” as claimed, under the interpretation of “*input device*” that I discussed above in Section X because each is used to “interact” with a computer, an electronic device.

324. Rosenberg’s processor “*detect[s] a first pressure on*” each button 316. Specifically, as discussed above in my overview of Rosenberg, Rosenberg’s mouse includes a “force sensing switch” that “is used to detect the position of [] button

316a” within its range of movement by “detect[ing] the amount of force applied to [the] button.” Rosenberg at 28:20-25; *see also* Rosenberg at 30:31-33 (“a more sophisticated sensor 413 is preferably used to sense the position of the button 316a in its degree of freedom.”).

325. As I explained above in Section X.C, “*pressure*” in the context of the ’260 patent is “application of force from a contact.” Rosenberg’s detection of the “amount of force applied to [the] button” is thus a pressure measurement because it is the amount of force that has been applied by a user’s finger contacting the mouse, *e.g.*, by pressing down on button 316a.

326. Also as noted, a POSITA would have known while reading the ’260 patent that the terms “force” and “pressure” are very often used interchangeably in references in the art.

327. Rosenberg further teaches that it is the processor that detects the force application to the button using a sensor. For example, by using a “continuous-range sensor,” like a force sensing switch, “each position of the button can be sensed as a different analog value and used as an analog value or a digital value in processing the button position. This allows the host computer 314 (or local microprocessor) to determine the position of the button and to control a force output based on that position.” Rosenberg at 25:33-26:4 (emphasis added); *see also* 38:19-20 (“detects a range of at least three positions of said button in said degree of freedom of said

button”). By “determin[ing] the position of the button” in Rosenberg’s force sensing-sensor embodiment, the host or local microprocessor “*detect[s] a first pressure on a first input device,*” as claimed, that is it detects a pressure corresponding to one or several positions of the button within its degree of freedom.

c. [1B]: “provide a first tactile sensation to the first input device, the first tactile sensation based at least in part on the first pressure;”

328. Rosenberg’s stored program code, when executed, causes Rosenberg’s processor to “*provide a first tactile sensation to the first input device, the first tactile sensation based at least in part on the first pressure,*” as claimed.

329. Rosenberg’s mouse includes “an actuator 318 which is operative to produce forces on one or more buttons of the mouse 312,” (emphasis added) for example button 316a. Rosenberg at 24:1-3. The actuator does so in response to instructions from the host or local processor. Rosenberg at 25:33-26:4; 28:26-28. The “force sensations” that the actuator produces are “tactile sensations,” as claimed, such as “a jolt, vibration, a constant force, and a texture force.” Rosenberg at 3:14-15; *see also* Rosenberg at 17:17-18:5 (further discussing kinds of sensations, such sensations varying in magnitude).

330. Rosenberg teaches that the force sensation(s) the actuator produces on button 316a is “based on” the “position of the button.” Rosenberg at 25:33-26:4; *see also* Rosenberg at 38:21-22 (“the output force is dependent, at least in part, on

said position of said button in said degree of freedom”). For example, Rosenberg teaches a force sensation that the actuator provides that mimics or simulates a mechanical spring. Rosenberg at 30:29-30 (explaining that no physical spring is required because the “spring force” may be provided by the actuator “rather than...by a mechanical spring”). Rosenberg explains that: “The magnitude of this force sensation is dependent on the distance of the button from the origin of the spring.” Rosenberg at 30:30-31. In other words, the magnitude of the force sensation that the actuator provides on button 316a increases as the pressure applied by the user increases pressure/force to push the button farther down. Rosenberg at 30:29-34.

331. A POSITA would be well aware of spring effects and how they are simulated in electronic devices using an actuator. Mention of springs or spring effects in context would have brought to mind familiar teachings from references such as EX1055 (U.S. Patent No. 6,005,551 (“Osborne”)) which teaches simulating springs and their restoring force effects using force profiles downloaded by a host computer to a controller, or EX1056 (Minsky “Computational Haptics”), which refers to simulation of springs in its own prior art in section 3.3.³¹ A POSITA also

³¹Osborne and Minsky are cited only as illustrations that a POSITA would have been well aware of the concepts.

would have known this from Rosenberg's discussion of restoring spring forces (concerning Figs. 11A to 11c). For that matter, in context it would have been well within the insight and understanding of a POSITA to simulate spring effects simply from a lesson in a lower-level course in physics or engineering concerning Hooke's Law, which models a spring as exerting a continuous restoring force proportional to displacement distance.

332. As explained for limitation [1A], "the position of the button" corresponds to "*the first pressure*" in Rosenberg's force-sensing-sensor embodiment. Rosenberg's stored program code, when executed, thus causes the host or local processor to "*provide a first tactile sensation,*" *i.e.*, one of Rosenberg's "force sensations," *e.g.*, "spring effect," *to the first input device,*" for example button 316a, "*the first tactile sensation based at least in part on the first pressure,*" that is based on the position of button 316a as determined by a force sensing sensor.

d. [1C]: "detect a second pressure on the first input device, the second pressure greater than the first pressure;

333. Rosenberg's stored program code, when executed, causes Rosenberg's processor to "*detect a second pressure on the first input device, the second pressure greater than the first pressure,*" as claimed.

334. As discussed above for limitation [1A], Rosenberg's host or local processor "detect[s] a [] pressure on the first input device" by receiving from a force

sensing sensor data in the form of analog or digital values that indicates “each position” of button 316a within its degree of freedom. Rosenberg at 25:33-26:6 (“In a different continuous-range button embodiment, a sensor can be used to detect the precise position of the button 316a in its range of motion (degree of freedom). For example, each position of the button can be sensed as a different analog value and used as an analog value or a digital value in processing the button position. This allows the host computer 314 (or local microprocessor) to determine the position of the button and to control a force output based on that position.”) (emphasis added); 38:19-20 (“A force feedback mouse as recited in claim 30 wherein said sensor detects a range of at least three positions of said button in said degree of freedom of said button.”).

335. On this point, a POSITA would know that the use of digital values teaches the detection of discrete positions and discrete pressures/forces, since digital values are quantized to discrete values – for example, an eight-bit analog-to-digital converter would output 256 discrete values (0-255). Rosenberg itself teaches that conversion to binary or digital values are necessary so that they can be interpreted by the microprocessor or host computer system. Rosenberg at 12:16-31. A POSITA would expect the analog-to-digital converter in Rosenberg to teach at least a 5-bit converter with at least 32 discrete values for positions/pressures. This is inasmuch

as a POSITA would know that even historically early electronic analog-to-digital converters already provided five bits of resolution.³²

336. Using that same process discussed above for limitation [1A], the processors (host computer and/or microprocessor) detect additional pressures, that is, the processors detect pressure corresponding to “each position” of the button from its rest position until a stop position. Rosenberg at 25:33-26:4 (“each position”); 38:19-20 (“at least three positions of said button in said degree of freedom”); *see also* 26:19-20 (“The button 316a can thus move a distance d from a rest position to the lowest position before the stop prevents further movement.”); Figure 9 (“distance d” depicted on the left).

337. Rosenberg’s program code thus causes the processors to “*detect a second pressure*” that is “*greater than the first pressure*,” as claimed. For example, if the position of button 316a determined in limitation [1A] (i.e., “*the first pressure*”) is an initial position just lower than the button’s rest position, then Rosenberg’s stored program code, when executed, causes the processor to “*detect a second*

³² Since a POSITA would have a basic knowledge of electronics, a POSITA would be aware of references such as EX1057 (U.S. Patent No. 2,272,070) which had five-bit resolution, or in any case expect an A/D converter to support at least five bits or more.

pressure” that is “*greater than the first pressure*” when detecting that the button is positioned some amount lower, e.g., it is pushed farther down. (For that matter, alternatively the rest position also corresponds to a first pressure, namely a pressure of zero.).

- e. **[1D]: “provide a second tactile sensation to the first input device, the second tactile sensation based at least in part on the second pressure;”**

338. Rosenberg’ stored program code, when executed, causes Rosenberg’s processor to “*provide a second tactile sensation to the first input device, the second tactile sensation based at least in part on the second pressure,*” as claimed.

339. As I discussed above for limitation [1B], Rosenberg’s processor instructs the actuator to output a force sensation (*i.e.*, “tactile sensation”) on button 316a, and that instruction is “based on” the “position of the button.” Rosenberg at 25:33-26:6 (“In a different continuous-range button embodiment, a sensor can be used to detect the precise 35 position of the button 316a in its range of motion (degree of freedom). For example, each position of the button can be sensed as a different analog value and used as an analog value or a digital value in processing the button position. This allows the host computer 314 (or local microprocessor) to determine the position of the button and to control a force output based on that position.”) (emphasis added); *see also* Rosenberg at 38:21-22 (“A force feedback

mouse...wherein said output force is dependent, at least in part, on said position of said button in said degree of freedom.”).

340. Accordingly, when as discussed for limitation [1C], Rosenberg’s processor “*detect[s] a second pressure*,” the processor would instruct the actuator to output a force sensation based on that detected pressure, i.e., “*a second tactile sensation*.” For example, when the force sensation is a “spring effect,” the processor instructs the actuator to output a force sensation with greater magnitude than the force sensation output in response to the first detected pressure so as to simulate the increasing resisting force of a mechanical spring. Rosenberg at 30:29-34.

f. [1E]: “detect a third pressure on the first input device, the third pressure greater than the second pressure; and”

341. Rosenberg’s stored program code, when executed, causes Rosenberg’s processor to “*detect a third pressure on the first input device, the third pressure greater than the second pressure*,” as claimed.

342. As I discussed above for limitations [1A] and [1C], Rosenberg’s processor “detect[s] a [] pressure on the first input device” by receiving from a force sensing sensor data (e.g., analog or digital values) indicating “each position” of button 316a within its degree of freedom. Rosenberg at 25:33-26:6; 38:19-20. Using that process, the processor detects additional pressures, i.e., pressure

corresponding to “each position” of the button from its rest position until a stop position. Rosenberg at 25:33-26:4; 26:19-20; 38:19-20; FIG. 9.

343. Rosenberg’s processor thus “*detect[s] a third pressure*” that is “*greater than the second pressure*,” as claimed. For example, if the position of button 316a determined in limitation [1C] (i.e., “*the second pressure*”) is some amount lower than an initial position determined in limitation [1A], then Rosenberg’s stored program code, when executed, causes the processor to “*detect a third pressure*” that is “*greater than the second pressure*” when the button is positioned some amount lower than [1C]’s position, *e.g.*, it is pushed farther down. Rosenberg at 38:19-20 (“at least three positions of said button in said degree of freedom”).

g. [1F]: “provide a third tactile sensation to the first input device.”

344. Rosenberg’s stored program code, when executed, causes Rosenberg’s processor to “*provide a third tactile sensation to the first input device*,” as claimed.

345. As I discussed above for limitations [1B] and [1D], Rosenberg’s processor instructs an actuator to output a force sensation (*i.e.*, “*tactile sensation*”) on button 316a, and that instruction is “based on” the “position of the button.” Rosenberg at 25:33-26:6 (“In a different continuous-range button embodiment, a sensor can be used to detect the precise position of the button 316a in its range of motion (degree of freedom). For example, each position of the button can be sensed as a different analog value and used as an analog value or a digital value in

processing the button position. This allows the host computer 314 (or local microprocessor) to determine the position of the button and to control a force output based on that position.”) (emphasis added); *see also* Rosenberg at 38:21-22 (“A force feedback mouse...wherein said output force is dependent, at least in part, on said position of said button in said degree of freedom.”).

346. Accordingly, when as discussed for limitation [1E], Rosenberg’s processor “*detect[s] a third pressure,*” the processor would instruct the actuator to output a force sensation based on that detected pressure, *i.e.*, “*a third tactile sensation.*” For example, if the force sensation is a “spring effect,” then the processors would instruct the actuator to output a force sensation with greater magnitude than the force sensation output in response to either the first detected pressure or the second detected pressure so as to simulate the increasing resistance of a mechanical spring. Rosenberg at 30:29-34.

347. A POSITA would also understand that Rosenberg’s teachings to encompass Patent Owner’s “single contact” construction for sensing pressures that I discussed above in Section X.B. A POSITA would understand that Rosenberg refers to detecting changing positions during a single contact when it teaches a “continuous-range button embodiment,” and the use of a sensor that “detect[s] the precise position of the button 316a in its range of motion” (Rosenberg at 25:34-35) (emphasis added), as well as from references to a “continuous range sensor”

(Rosenberg at 4:22, 40:6 (emphasis added)). Rosenberg also refers to “games or simulations where the mouse 312 is used as the primary input device” in which a user naturally would be pressing continually and varying the pressure, while receiving tactile sensations, such as outputting “vibration ... when a user-controlled racing car is driving on a dirt shoulder.” Rosenberg at 31:28-20. In particular, Rosenberg’s “spring effect,” because it simulates a mechanical spring, would be one in which the effect is output during a continuous press of button 316, *i.e.*, the actuator outputs more resisting force during a single press as button moves farther down.

3. Claim 2

- a. **[2PRE]: “The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:”**

348. If the preamble is limiting, Rosenberg discloses a “*computer-readable medium having instructions*” that cause a processor to perform the steps recited in limitations [2A] to [2B] for the same reasons that it discloses limitation [1PRE].

- b. **[2A]: “detect a fourth pressure on the first input device, the fourth pressure greater than the third pressure”**

349. Rosenberg’s stored program code, when executed, causes Rosenberg’s processor to “*detect a fourth pressure on the first input device, the fourth pressure greater than the third pressure*” as claimed.

350. Using the process described for limitations [1A], [1C], and [1E], Rosenberg's processor detects additional pressures beyond the first three detected pressures, *i.e.*, pressure corresponding to "each position" of the button from its rest position until a stop position. Rosenberg at 25:33-26:4; 26:19-20; 38:19-20; FIG. 9. Rosenberg's teaching that its force sensing sensor detects "each position" of button 316a within its degree of freedom and its teaching that "at least three positions of said button" are detected would have been understood by a POSITA to be a disclosure of detecting four (or more) positions.

351. At a minimum, Rosenberg's teachings would have given a POSITA reason to detect at least a fourth pressure: among other things, a POSITA would readily understand that doing so would have the benefit of providing more precise force feedback.

352. Moreover, even if Rosenberg is considered to not expressly disclose detecting a fourth button position, that would have been an obvious way to implement what Rosenberg discloses. The '260 patent does not disclose that there is anything critical about detecting four (or five) different pressures. On this point, a POSITA would have understood that detecting four (or five) different button positions would have beneficially provided more design flexibility than detecting only three, such as to allow for more precise force feedback, or smoother transitions in effects, such as to simulate a more realistic spring in accordance with Hooke's

Law (as noted above at paragraph 331) than detecting only three. A POSITA would have had a reasonable expectation of success in doing so because the analog output of Rosenberg's sensor provides the ability to detect four (or five) different button positions.

353. Rosenberg's stored program code (or an obvious implementation of Rosenberg), when executed, thus causes the processors to "*detect a fourth pressure*" that is "*greater than the third pressure*," as claimed. For example, when the position of button 316a is determined in limitation [1E] (i.e., "*the third pressure*") to be some amount lower than the position determined in limitation [1E], then Rosenberg's program code causes the processor to "*detect a fourth pressure*" that is "*greater than the third pressure*" when the button is positioned some amount lower than [1E]'s position. Rosenberg at 38:19-20.

c. [2B]: "provide a fourth tactile sensation to the first input device."

354. Rosenberg's stored program code, when executed, causes Rosenberg's processor to "*provide a fourth tactile sensation to the first input device*" as claimed.

355. As discussed above for limitations [1B], [1D] and [1F], Rosenberg's stored program code, when executed, causes the host or local processor to instruct the actuator to output a force sensation (i.e., "*tactile sensation*") on button 316a, and that instruction is "based on" the "position of the button." Rosenberg at 25:33-26:4; *see also* 38:21-22 ("said output force is dependent, at least in part, on said position

of said button in said degree of freedom”). Accordingly, when as discussed for limitation [2A], Rosenberg’s processor “*detect[s] a fourth pressure*,” the processor would instruct the actuator to output a force sensation based on that detected pressure, i.e., “*a fourth tactile sensation*.”

356. For example, when the force sensation is a “spring effect,” the processor instructs the actuators to output a force sensation with greater magnitude than the force sensation output in response to the first three detected pressures so as to simulate the increasing resistance of a mechanical spring. Rosenberg at 30:29-34.

4. Claim 3: “The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to provide the first tactile sensation to a second input device.”

357. Rosenberg’s stored program code, when executed, causes Rosenberg’s processor to “*provide the first tactile sensation to a second input device*,” as claimed.

358. Rosenberg’s mouse includes button 316b that also provides “commands to the computer system.” Rosenberg at 23:33-34. Button 316b is thus “*a second input device*,” as claimed under the interpretation of that term that I set forth above in Section X.A.

359. Rosenberg further teaches an embodiment in which “a single actuator 318 can provide forces simultaneously to both buttons 316a and 316b.” Rosenberg

at 26:25-29. Accordingly, Rosenberg causes its processors to provide “*the first tactile sensation*” discussed in limitation 1B, to “*a second input device*,” as claimed.

360. On this point, Rosenberg also teaches that both buttons 316a and 316b can be pressed at the same time, in the well-known “chording” fashion of a common computer mouse: see discussion above in my overview of Rosenberg regarding Figure 8. This would re-enforce a POSITA’s understanding that when pressing both buttons (two distinct input devices) at the same time, the first tactile sensation provided to the first input device button is also provided to the second input device button.

5. Claim 4: “The computer-readable medium of claim 3 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to provide the second tactile sensation to the second input device.”

361. Rosenberg’s stored program code, when executed, causes Rosenberg’s processor to “*provide the second tactile sensation to the second input device*,” as claimed.

362. As discussed for claim 3, Rosenberg’s actuator provides force sensations “simultaneously to both buttons 316a and 316b.” Rosenberg’s stored program code thus causes its processors to provide “*the second tactile sensation*” discussed in limitation 1D, to “*a second input device*,” as claimed.

6. Claim 5

- a. [5PRE]: “The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:”**

363. If the preamble is limiting, Rosenberg discloses a “*computer-readable medium having instructions*” that cause a processor to perform the steps recited in limitations [5A] to [5B] for the same reasons that it discloses limitation [1PRE].

- b. [5A]: “detect a fourth pressure on a second input device”**

364. Rosenberg’s stored program code, when executed, causes Rosenberg’s processor to “*detect a fourth pressure on the second input device*,” as claimed.

365. Rosenberg’s button 316b includes “sensors similar” to the sensor that button 316a includes, for example a force sensing sensor. Rosenberg at 28:25; see also the discussion above at §XI.C.2.b regarding Rosenberg’s sensors in the context of limitation [1A]. Rosenberg’s processor thus “*detect[s] a fourth pressure on the second input device*” in either of two ways.

366. First, a pressure of any magnitude detected on button 316b is a different pressure than the first, second, and third pressures detected on button 316a.

367. Second, to the extent the “*fourth pressure*” is construed to require a pressure of a different magnitude than the first, second and third pressures, then an obvious implementation of Rosenberg’s button 316b detects four distinct pressures for the same reasons that button 316a does. Button 316b’s sensor detects a pressure

in the same manner that button 316a's sensor detects pressure, *i.e.*, by determining the position of button 316b within its degree of freedom. See discussion of limitation [1A] above. Rosenberg's processors thus "*detect a fourth pressure on the second input device,*" that is, any pressure put on 316b that is not identical to the claimed first, second, or third pressures detected on button 316a.

c. [5B]: "provide a fourth tactile sensation to the second input device."

368. Rosenberg's stored program code, when executed, causes Rosenberg's processor to "*provide a fourth tactile sensation to the second input device*" as claimed.

369. Rosenberg's button 316b can also "be provided with forces," either by sharing a single actuator with button 316a or having its own actuator. Rosenberg at 26:25-29. Whichever actuator button 316b uses would operate the same as button 316a's actuator. See my discussion above regarding limitation [1B]. Accordingly, as discussed for limitation [5A], when Rosenberg's processor "*detect[s] a fourth pressure*" on button 316b, the code would also cause the processor to instruct that button's corresponding actuator to output a force sensation on button 316b based on that detected pressure, *i.e.*, "*a fourth tactile sensation.*"

7. Claim 6: “The computer-readable medium of claim 5, the fourth tactile sensation different from the first tactile sensation.”

370. Rosenberg’s stored program code, when executed, causes Rosenberg’s processor to provide a “*fourth tactile sensation different from the first tactile sensation,*” as claimed.

371. Rosenberg discloses that the “output force” that its actuator provides “is dependent, at least in part, on said position of said button in said degree of freedom.” Rosenberg at 38:21-22; *see above* §XI.C.2 (explaining that the button’s position corresponds to a particular pressure). When “*the fourth tactile sensation*” discussed in claim 5 is based on a position of button 316b (*i.e.*, “*a fourth pressure*”) that is different than the position of button 316a that triggers “*the first tactile sensation*” (*i.e.*, “*a first pressure*”), the “output force,” *i.e.*, force sensation, of the two “*tactile sensations*” would also be different.

372. For example, if the “output force” is a spring effect, then the amount of resistive force that the actuator outputs onto button 316b in response to “*a fourth pressure*” will be different than the amount the actuator outputs in response to the other pressures, each of which corresponds to a different position of the button within its degree of freedom and thus each corresponding to a different position of depression for the simulated “spring.” Put more simply, when the “fourth pressure” is based on a position of the button lower than the other pressures, the resistive force

output in response that fourth pressure will be greater than that produced for the other three pressures. Additionally, in an embodiment in which button 316b has its own actuator, the tactile sensation that its actuator produces is necessarily “different” from the tactile sensation that the actuator for button 316a produces.

8. Claim 7

- a. [7PRE]: “The computer-readable medium of claim 5 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:”**

373. If the preamble is limiting, Rosenberg discloses a “*computer-readable medium having instructions*” that cause a processor to perform the steps recited in limitations [7A] to [7B] for the same reasons that it discloses limitation [5PRE].

- b. [7A]: “detect a fifth pressure on the second input device, the fifth pressure greater than the fourth pressure;**

374. When executed, Rosenberg’s stored program code causes Rosenberg’s processor to “*detect a fifth pressure on the second input device, the fifth pressure greater than the fourth pressure,*” as claimed.

375. As I discussed above with respect to limitation [5A], Rosenberg’s button 316b includes “sensors similar” to the sensor that button 316a includes, for example, a force sensing sensor. Rosenberg at 28:25; see also my discussion above regarding Rosenberg’s sensors in the context of limitation [1A] above at §XI.C.2.b.

Rosenberg's processor thus "*detect[s] a fifth pressure on the second input device, the fifth pressure greater than the fourth pressure*" in either of two ways.

376. First, a pressure of any magnitude detected on button 316b is a different pressure than the first, second, and third pressures detected on button 316a, and it is thus the claimed "*fifth pressure*" so long as it is a pressure put on button 316b that is not identical to the claimed fourth pressure, *e.g.*, button 316b has been pushed farther down than it was when the fourth pressure was detected as discussed for limitation [5A].

377. Second, to the extent the "*fifth pressure*" is construed to require a pressure of a different magnitude than the first, second and third pressures, then an obvious implementation of Rosenberg's button 316b detects five distinct pressures for the same reasons that button 316a does. Button 316b's sensor detects a pressure in the same manner that button 316a's sensor detects pressure, *i.e.*, by determining the position of button 316b within its degree of freedom. See discussion of limitation [1A] above, §XI.C.2.b. Rosenberg's processors thus "*detect a fifth pressure on the second input device, the fifth pressure greater than the fourth pressure*" that is, any pressure put on 316b that is not identical to the claimed first, second, or third pressures and which is also greater than the fourth pressures, *e.g.*, button 316b has been pushed farther down than it was when the fourth pressure was detected.

c. [7B]: “provide a fifth tactile sensation to the second input device.”

378. Rosenberg’s stored program code, when executed causes Rosenberg’s processor to “*provide a fifth tactile sensation to the second input device,*” as claimed.

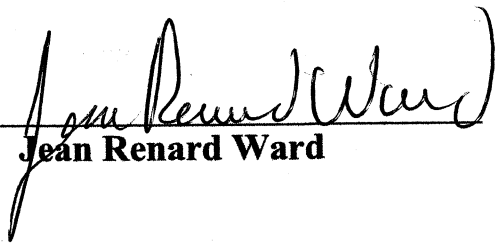
379. As discussed above for limitations [1B], [1D], [1F] and [5B], Rosenberg’s processor instructs the actuator to output a force sensation (*i.e.*, “*tactile sensation*”) on a button, and that instruction is “based on” the “position of the button.” Rosenberg at 25:33-26:4; *see also* Rosenberg at 38:21-22. Accordingly, when as discussed for limitation [7A], Rosenberg’s processor “*detect[s] a fifth pressure,*” the processor would instruct the actuator associated with button 316b to output a force sensation based on that detected pressure, *i.e.*, “*a fifth tactile sensation.*”

380. For example, if the force sensation is a “spring effect,” then the processors would instruct the actuator to output a force sensation with greater magnitude than the force sensation output in response to fourth detected pressure (*i.e.*, the first pressure detected on button 316b) so as to simulate the increasing resistance of a mechanical spring. Rosenberg at 30:29-34.

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

I declare under penalty of perjury that the foregoing is true and correct.

Dated: 18 January 2024



Jean Renard Ward

U.S. PATENT NO. 7,366,260 CLAIM LIST

#	Limitation
1.PRE	A computer-readable medium having instructions, the instructions including instructions that cause a processor to:
1.a	detect a first pressure on a first input device;
1.b	provide a first tactile sensation to the first input device, the first tactile sensation based at least in part on the first pressure;
1.c	detect a second pressure on the first input device, the second pressure greater than the first pressure; and
1.d	provide a second tactile sensation to the first input device, the second tactile sensation based at least in part on the second pressure;
1.e	detect a third pressure on the first input device, the third pressure greater than the second pressure; and
1.f	provide a third tactile sensation to the first input device.
2.PRE	The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:
2.a	detect a fourth pressure on the first input device, the fourth pressure greater than the third pressure; and
2.b	provide a fourth tactile sensation to the first input device.
3	The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to provide the first tactile sensation to a second input device.
4	The computer-readable medium of claim 3 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to provide the second tactile sensation to the second input device.
5.PRE	The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:
5.a	detect a fourth pressure on a second input device; and
5.b	provide a fourth tactile sensation to the second input device.
6	The computer-readable medium of claim 5, the fourth tactile sensation different from the first tactile sensation.

#	Limitation
7.PRE	The computer-readable medium of claim 5 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:
7.a	detect a fifth pressure on the second input device, the fifth pressure greater than the fourth pressure; and
7.b	provide a fifth tactile sensation to the second input device.
8.PRE	The computer-readable medium of claim 1 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:
8.a	upon detecting the first pressure, provide a first signal indicating a first alphanumeric character;
8.b	upon detecting the second pressure, provide a second signal indicating a second alphanumeric character; and
8.c	upon detecting the third pressure, provide a third signal indicating a third alphanumeric character.
9.PRE	The computer-readable medium of claim 8 further comprising stored instructions, the stored instructions including instructions which, when executed by a processor, cause the processor to:
9.a	upon detecting the first pressure, display the first alphanumeric character;
9.b	upon detecting the second pressure, display the second alphanumeric character; and
9.c	upon detecting the third pressure, display the third alphanumeric character.