

Paper No. ____

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. 9,430,042

PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.1 *et seq.*

TABLE OF CONTENTS

I.	MANDATORY NOTICES	xi
A.	Real Party-In-Interest – § 42.8(b)(1).....	xi
B.	Related Matters – § 42.8(b)(2)	xi
1.	United States Patent & Trademark Office	xi
2.	District Court Matters	xi
C.	Counsel and Service Information – § 42.8(b)(3) and (b)(4)	xi
II.	INTRODUCTION	1
III.	CERTIFICATION OF STANDING	3
IV.	TABLE OF GROUNDS	3
V.	THE '042 PATENT	4
A.	Challenged Claims	7
B.	Level of Ordinary Skill in the Art.....	8
C.	Prosecution History	8
VI.	CLAIM INTERPRETATION	10
VII.	UNPATENTABILITY GROUNDS.....	10
A.	Ground 1: Claims 1-19 Obvious Over Ichinose and Levin	10
1.	Ichinose (EX1015)	10
2.	Levin (EX1016)	11
3.	The Ichinose-Levin Combination	13
4.	Claim 1	17
5.	Claim 2: “The method of claim 1, further comprising generating a system signal associated with a system to be manipulated, the system signal based at least in part on the input signal, and wherein generating a system signal and generating the vibrotactile signal occur substantially simultaneously.”.....	21
6.	Claim 3: “The method of claim 1, wherein the vibrotactile signal is based at least in part on the input signal.”	22

7.	Claim 4: “The method of claim 1, wherein the vibrotactile signal is further based in part on the status of the input device.	23
8.	Claim 5: “The method of claim 1, further comprising determining whether to generate a vibrotactile signal.”	24
9.	Claim 6: “The method of claim 5, wherein determining whether to generate a vibrotactile signal is based at least in part on a status of the system to be manipulated.”	24
10.	Claim 7: “The method of claim 1, further comprising determining one of a plurality of virtual detents to generate.”	25
11.	Claim 8: “The method of claim 1, wherein the detent profile comprises a first detent profile, and further comprising receiving a second detent profile.”.....	26
12.	Claim 9.....	26
13.	Claim 10.....	28
14.	Claim 11-14.....	29
15.	Claim 15.....	29
16.	Claim 16: “control a system based at least in part on a manipulation of the input device.”.....	31
17.	Claim 17: “determine whether to generate a detent signal”	31
18.	Claim 18: “actuator is coupled to a housing of the input device”.....	31
19.	Claim 19: “the input device comprises a sensor”	31
B.	Ground 2: Claims 1-19 Are Obvious Over Wang in view of Ichinose.....	32
1.	Wang (EX1022)	32
2.	Ichinose	34
3.	The Wang-Ichinose Combination.....	34
4.	Claim 1	35
5.	Claim 2.....	39
6.	Claim 3	41

7.	Claim 4.....	42
8.	Claim 5.....	42
9.	Claim 6.....	43
10.	Claim 7.....	43
11.	Claim 8.....	43
12.	Claim 9.....	44
13.	Claim 10.....	45
14.	Claim 11-14.....	46
15.	Claim 15.....	46
16.	Claim 16.....	48
17.	Claim 17.....	48
18.	Claim 18.....	48
19.	Claim 19.....	48
C.	Ground 3: Claims 1-19 Are Anticipated By Rosenberg-I.....	49
1.	Rosenberg-I (EX1009).....	49
2.	Claim 1.....	51
3.	Claim 2.....	57
4.	Claim 3.....	58
5.	Claim 4.....	59
6.	Claim 5.....	60
7.	Claim 6.....	60
8.	Claim 7.....	60
9.	Claim 8.....	61
10.	Claim 9.....	61
11.	Claims 10-14.....	63
12.	Claim 15.....	64
13.	Claim 16.....	65
14.	Claim 17.....	65
15.	Claim 18.....	66

16.	Claim 19.....	66
D.	Ground 4: Claims 1-19 Obvious Over Rosenberg-I and Goldenberg	66
1.	Goldenberg (EX1007).....	66
2.	The Rosenberg-Goldenberg Combination	67
3.	Claims 1-19	70
VIII.	NO BASIS FOR DISCRETIONARY DENIAL	72
A.	<i>Fintiv</i>	72
1.	Potential for Stay.....	72
2.	Timing of Trial.....	72
3.	Litigation Investment	73
4.	Issue Overlap.....	73
5.	Litigation Defendants.....	73
B.	<i>Advanced Bionics</i>	74
1.	Step 1: The Petition Advances Art and Arguments Not Previously Considered	74
2.	Step 2: The Office Erred Materially	74
IX.	CONCLUSION.....	75
X.	CLAIM LISTING	78

TABLE OF AUTHORITIES

CASES

<i>10X Genomics, Inc. v. Bio-Rad Labs</i> , IPR2020-00086, Paper 8 (Apr. 27, 2020)	52
<i>Advanced Bionics v. Med-El</i> , IPR2019-01469, Paper 6 (Feb. 13, 2020).....	74, 75
<i>Apple Inc. v. Fintiv, Inc.</i> , IPR2020-00019, Paper 11 (Mar. 20, 2020)	72, 73
<i>Bowtech, Inc. v. MCP IP, LLC</i> , IPR2019-00382, Paper 12 (Aug. 6, 2019).....	75
<i>KSR Int’l. Co. v. Teleflex, Inc.</i> , 550 U.S. 398 (2007)	14, 34, 55, 68
<i>Markforged Inc. v. Continuous Composites, Inc.</i> , IPR2022-00679, Paper 7 (Oct. 25, 2022).....	73
<i>Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.</i> , 868 F.3d 1013 (Fed. Cir. 2017)	10
<i>Nokia of Am. Corp. v. TQ Delta</i> , IPR2022-00471, Paper 11 (Aug. 18, 2022).....	72
<i>Samsung Elecs. v. Netlist, Inc.</i> , IPR2022-00063, Paper 13 (May 5, 2022)	73, 74
<i>Sand Revolution II v. Continental Intermodal Group–Trucking</i> , IPR2019-01393, Paper 24 (June 16, 2020)	72, 74
<i>Sony Interactive v. Quantum Imaging</i> , IPR2023-00954, Paper 11 (Dec. 11, 2023)	73
<i>Uber Techs., Inc. v. X One, Inc.</i> , 957 F.3d 1334 (Fed. Cir. 2020)	17, 70

STATUTES

35 U.S.C. § 102	3
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35 U.S.C. § 103	3
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35 U.S.C. § 315(b)	73
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REGULATIONS

37 C.F.R. § 42.100(b)	10
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37 C.F.R. § 42.104(a).....	3
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APPENDIX LISTING OF EXHIBITS

Exhibit	Description
1001	U.S. Patent No. 9,430,042
1002	Prosecution History of U.S. Patent No. 9,430,042
1003	Declaration of Jean Renard Ward
1004	CV of Jean Renard Ward
1005	U.S. Provisional Application No. 60/877,333
1006	European Patent No. 2126667
1007	U.S. Patent No. 6,636,197
1008	U.S. Patent Application Publication No. US 2006/0038781
1009	U.S. Patent No. 6,429,846
1010	U.S. Patent No. 5,734,373
1011	U.S. Patent No. 6,243,078
1012	U.S. Patent Application Publication No. US 2006/0119573
1013	U.S. Patent No. 5,977,867
1014	U.S. Patent No. 6,128,006
1015	U.S. Patent No. 6,819,990
1016	U.S. Patent No. 6,686,911
1017	U.S. Patent No. 6,917,867
1018	U.S. Patent Application Publication No. US 2007/0222765
1019	Plaintiff's Preliminary Infringement Contentions, <i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-00712 (W.D. Wash.) (served Oct. 20, 2023)
1020	Amended Joint Status Report and Discovery Plan, <i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-00712, Dkt No. 45 (W.D. Wash) (filed Nov. 2, 2023)
1021	Exhibit C to Plaintiff's Preliminary Infringement Contentions, <i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-00712 (W.D. Wash.) (served Oct. 20, 2023)

1022	International Application Publication Number WO 02/102616
1023	U.S. Patent Application Publication No. US 2006/0047386
1024	U.S. Patent Application Publication No. US 2007/0120830
1025	U.S. Patent No. 6,157,372
1026	U.S. Patent No. 6,418,362
1027	International Application Publication Number WO 97/25821
1028	International Application Publication Number WO 00/65553
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1031	Buxton, “There’s More to Interaction than Meets the Eye” in Norman, ed., User Centered Systems Design (1986)
1032	Rosch, “Alternative Input--Digitizing Tablets-Pointing the Way to Easier Input,” PC Magazine p. 227 (Nov. 28, 1989)
1033	U.S. Patent No. 5,491,495
1034	Buxton, “Issues and Techniques in Touch-Sensitive Tablet Input,” SIGGRAPH ‘85, 19:3, 215 (1985)
1035	U.S. Patent No. 4,202,041
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1038	U.S. Patent Application Publication No. 2006/0291666A1
1039	International Application Publication Number WO 2006/020305
1040	U.S. Patent Application Publication No. 2007/0222765A1
1041	U.S. Patent No. 494,562
1042	Davis, “The RAND Tablet: A Man-Machine Graphical Communication Device” in Proceedings-Fall Joint Computer Conference (1964)

1043	U.S. Patent No. 3,482,241
1044	U.S. Patent No. 5,708,460
1045	U.S. Patent No. 6,492,979
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1051	Bliss, “Optical-to-Tactile Image Conversion for the Blind,” IEEE, Trans. On Man-Machine Sys., mms-11:1 (Mar. 1970)
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1056	International Application Publication Number WO 92/00559A1
1057	U.S. Patent Application Publication No. 2006/0241864A1
1058	U.S. Patent No. 5,782,639
1059	U.S. Patent Application Publication No. 2006/0049010
1060	International Application Publication Number WO 2004/042693
1061	U.S. Patent Appl. No. 2003/0030619
1062	U.S. Patent No. 6,424,333
1063	European Application Publication No. EP 0799597A1
1064	U.S. Patent No. 5,719,561
1065	U.S. Patent No. 5,973,441

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1067	U.S. Patent No. 5,451,924
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1072	U.S. Patent No. 6,337,678
1073	U.S. Patent No. 6,219,034
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1075	U.S. Patent No. 4,885,565
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1080	West, “Developing High Quality Data Models,” EPISTLE (1996)
1081	U.S. Patent Application Publication No. 2003/0122779
1082	Leonard, “Windows XP Hacks and Mods For Dummies” (2005)
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1084	<i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-00712, Dkt. No. 15 (Proof of Service) (May 18, 2023)

I. MANDATORY NOTICES

A. Real Party-In-Interest – § 42.8(b)(1)

Petitioner Valve Corporation is the real party-in-interest.

B. Related Matters – § 42.8(b)(2)

1. United States Patent & Trademark Office

U.S. Patent No. 9,430,042 (“the ’042 patent”) was filed on December 27, 2007 as Application No. 11/965,046 and claims priority to U.S. Provisional Application No. 60/877,333, which was filed on December 27, 2006.

2. District Court Matters

The ’042 patent is asserted in the following case: *Immersion Corp. v. Valve Corp.*, 2:23-cv-00712-TL (W.D. Wash.).

C. Counsel and Service Information – § 42.8(b)(3) and (b)(4)

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A power of attorney is submitted with this petition. Counsel for Petitioner consents to service of all documents via electronic mail.

Petitioner requests *inter partes* review of claims 1-19 of the '042 patent.

II. INTRODUCTION

The '042 patent describes an input device (*e.g.*, a knob or touchpad) that a user manipulates to control one or more electronic systems. The challenged claims are limited to input devices that are touchpads, and which control multiple systems like a car's separate radio and heating systems.

The patent's touchpad detects the motion of a user's finger(s) and sends that information to a processor, which then determines whether to manipulate some aspect of a system the touchpad controls, *e.g.*, increasing the volume on the car radio. Touchpads for controlling electronic systems were well known.

The purported novelty of the patent is the alleged discovery that touchpads would be more intuitive if they provided tactile feedback to users that mimics what users feel when using mechanical knobs or sliders. EX1001, 1:22-44. The patent thus discloses an actuator that outputs vibrotactile feedback simulating a mechanical “detent” like the discrete clicks felt when turning a traditional mechanical knob. *Id.*

Vibrotactile feedback for touchpads, however, was not new. *E.g.*, EX1013, 1:10-43; EX1009, 1:41-62; EX1003 (“Ward”), ¶¶46-74. And providing vibrotactile feedback in the form of simulated mechanical detents—or “virtual detents” as the '042 patent calls them—was known too, a fact patent owner conceded in a European

counterpart to the '042 patent. EX1006, [0005]. The challenged claims should not have issued.

Ground 1 demonstrates that claims 1-19 would have been obvious over Ichinose (EX1015) and Levin (EX1016). Ichinose discloses a touchpad that controls multiple systems within a car and outputs vibrotactile feedback to the driver. Ichinose does not provide specific details regarding the types of vibrotactile feedback provided, but Levin discloses numerous forms of vibrotactile feedback—including those that mimic mechanical detents—specifically for use in cars. Claims 1-19 would have been obvious over Ichinose and Levin.

Ground 2 demonstrates that claims 1-19 are obvious over Wang (EX1022) and Ichinose. Wang discloses a system that uses virtual knobs and sliders to control various systems within a car and an actuator to emulate mechanical detents when a driver rotates virtual knobs or pushes virtual sliders via an input device located on the steering wheel. Ichinose would have given POSAs reason to implement Wang's input device as a touchpad, thus rendering the claims obvious.

Ground 3 demonstrates that claims 1-19 are anticipated by Rosenberg-I (EX1009) under the interpretation of the claims that patent owner is advancing in related litigation. Rosenberg-I is patent owner's own patent, and the '042 patent impermissibly claims the same technology patent owner publicly disclosed years earlier in Rosenberg-I.

Ground 4 demonstrates that claims 1-19 would have been obvious over Rosenberg-I and Goldenberg (EX1007). The claims require a “*detent profile*” that associates haptic data with virtual detents. Rosenberg-I discloses detent profiles but does not explicitly call them “detent profiles.” If patent owner argues that Rosenberg-I lacks a “*detent profile*,” then such profiles are disclosed by Goldenberg, a reference patent owner already admitted discloses “haptic feedback simulating detents.” EX1006, [0005]. POSAs had reasons to use Goldenberg’s “profiles” to implement Rosenberg-I, rendering obvious claims 1-19.

III. CERTIFICATION OF STANDING

The '042 patent is available for IPR and Petitioner is not barred or estopped from requesting IPR of its claims. 37 C.F.R. §42.104(a).

IV. TABLE OF GROUNDS

Petitioner requests cancellation of claims 1-19 as follows.

Ground	Reference(s)	Claim(s)	Basis
1	Ichinose + Levin	1-19	103
2	Wang + Ichinose	1-19	103
3	Rosenberg-I	1-19	102
4	Rosenberg-I + Goldenberg	1-19	103

Each reference is prior art under pre-AIA §102(b) based on these publication dates:

Reference	Publication
Rosenberg-I	2002-08-06
Goldenberg	2003-10-21
Ichinose	2004-11-16
Levin	2004-02-03
Wang	2002-12-27

Levin was cited in an Information Disclosure Statement (EX1002, 406), but was never discussed. The other references were not cited during prosecution.

V. THE '042 PATENT¹

The '042 patent is directed to providing virtual detents via vibrotactile feedback. Abstract; 1:14-18. It describes a “virtual detent” as vibrotactile feedback that simulates a mechanical detent. 1:30-43; 3:6-15. Mechanical detents are physical mechanisms that provide resistance to movement, *e.g.*, rotational or linear movement. 1:30-42; Ward, ¶¶75-80; EX1002, 267. Detents can be used to “divide a rotation into discrete increments” similar to discrete “clicks-stops” experienced when rotating the knob on a traditional radio. 1:30-42; Ward, ¶¶75-80.

According to the patent, mechanical devices like knobs or sliders were being replaced by electronic controls that were less intuitive because they did not provide similar experiences. 1:22-37. “For example, without click-stops or ‘detents,’ or otherwise a sense of mechanical resistance, it may be difficult to obtain a similar

¹ Unless otherwise noted, citations in Section V are to EX1001.

experience from an electronic substitute for a traditional mechanical control device.”

1:33-37. The patent thus sought to simulate in electronic devices the physical feedback detents provided in mechanical devices.

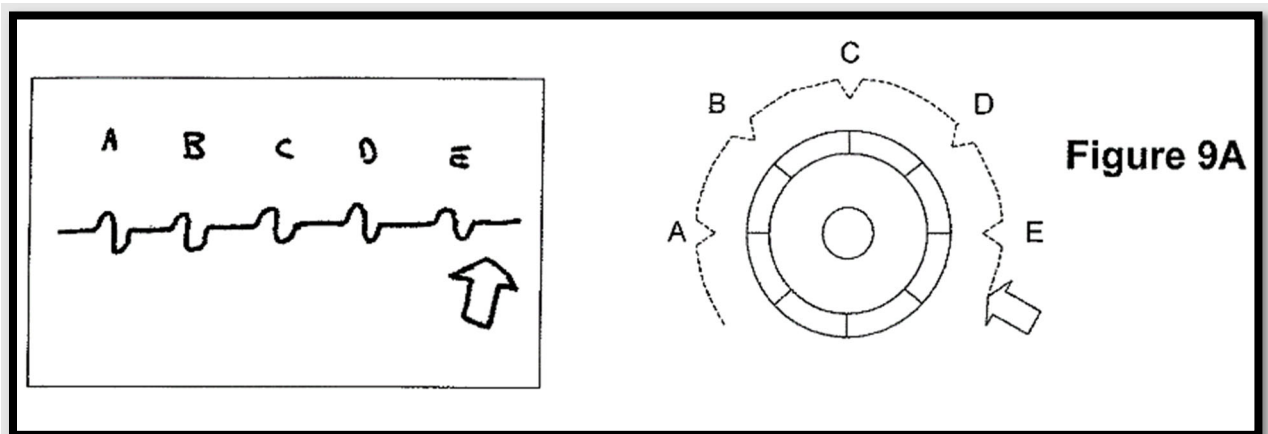
The patent discloses a system that includes an input device (*e.g.*, a touchpad) as well as a processor, sensor, and actuator. 3:24-30; FIG. 1. The sensor detects manipulation of the input device (*e.g.*, a finger moving on the touchpad) and sends an input signal to the processor which, *inter alia*, outputs a signal to the actuator to produce a vibrotactile effect. 3:61-4:38; Ward, ¶¶80-82.

The actuator “simulate(s) mechanical feedback through vibrotactile feedback” and “provide(s) the perception of a detent (*i.e.*, a virtual detent) without the traditional means necessary for a mechanical detent.” 5:66-6:4. As one example, the actuator provides vibrotactile feedback in the form of “a click effect replicating a mechanical click.” 6:4-11; 6:16-17 (“virtual detent may comprise a simulated click generated through a single pulse”). Because the actuator provides “vibrotactile feedback, in contrast to mechanical feedback,” it can provide “feedback to non-mechanical input devices” like touchpads. 6:21-37.

To cause the actuator to produce a vibrotactile effect, the processor accesses a “detent profile” and generates a “detent signal” based on the input signal and the accessed detent profile. 1:63-65, 4:35-60. Figures 9A-9H illustrate exemplary

virtual detent profiles. 13:36-38. These profiles can be stored in memory as computer code. 8:54-67.

As Figures 9A-9H illustrate, a “virtual detent profile” associates an input signal with a vibrotactile effect represented by force magnitudes that simulate a particular mechanical detent. 13:37-14:57; Ward, ¶¶83-86. For example, Figure 9A (below) shows a vibrotactile effect to be generated when a knob is rotated through discrete points A-E. 13:47-53. As the knob on the right-hand side is rotated from point A to E, the magnitude (and width) of vibrotactile feedback the actuator outputs on the knob is governed by the profile depicted on the left-hand side and that feedback simulates the rise-and-fall associated with conventional “click-stops.” 13:47-53; Ward, ¶85.



In some embodiments (and all challenged claims), the input device controls multiple systems such as “a car’s temperature system, navigation system, and/or communication system.” 11:1-3; 7:28-45; Ward, ¶¶87-89.

A. Challenged Claims

Claims 1-19 are reproduced in the Claim Listing (*infra* §IX), and independent claim 1 is reproduced below with labels added:

1[PRE]. A method comprising:

- [1A]** receiving an input signal comprising information associated with a manipulation of an input device configured to control a plurality of systems, wherein the input device comprises a touchpad;
- [1B]** receiving a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent; and
- [1C]** generating a vibrotactile signal configured to cause an actuator to produce a vibrotactile effect to the input device, the vibrotactile effect comprising the virtual detent.

Independent claim 9 is similar to claim 1 but requires “detecting a change in position” of the touchpad and “generating a detent signal based at least in part on...the [detected] change in position.” Independent claims 10 and 14 recite “non-transitory computer-readable medium” that store program code for executing the methods of claims 1 and 9, respectively. Independent claim 15 recites a “system” that includes a “processor” and “actuator” configured to perform claim 1’s method.

The dependent claims recite minor features that were known, such as generating a “system signal” (*e.g.*, on/off command) based on the “input signal”

(claims 2, 11), or determining whether to generate a vibrotactile effect “based on the status of the system to be manipulated,” *e.g.*, whether it is on or off (claims 5-6).

B. Level of Ordinary Skill in the Art

POSAs 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 technologies. Ward, ¶¶37-43.

C. Prosecution History

Claim 1 originally recited a method comprising “receiving an input signal comprising information associated with a manipulation of an input device,” and “generating a vibrotactile signal configured to cause an actuator to produce a vibrotactile effect to the input device, the vibrotactile effect comprising a virtual detent.” EX1002, 49; Ward, ¶¶90-99. That claim (and others) was rejected as obvious over Grant (EX1012) and Huang (EX1017). EX1002, 115-120.

In response to that and subsequent rejections, the applicant amended the claims several times, first limiting the “input device” to a “touchpad” (EX1002, 132-139), and later requiring it to control “a plurality of systems,” not just one. EX1002, 147-155, 206-215. In response to the latter amendment, the examiner rejected the claims as obvious over Grant and Nyysönen (EX1018). EX1002, 234-241.

The applicant responded by arguing that Nyysönen (or “Tuomo”) did not disclose “virtual detent[s].” EX1002, 254. The examiner disagreed. EX1002, 261-269. The examiner explained that although Nyysönen did not use the word “detent,” it discloses (a) vibrotactile feedback, and (b) “virtual knobs” that “are obviously divided into discrete increments” *i.e.*, “virtual detents.” EX1002, 267.

The applicant argued that Nyysönen does not disclose a virtual knob with discrete increments or “virtual detent[s],” and that while Nyysönen uses vibrotactile feedback, it did not disclose using such feedback with virtual knobs. EX1002, 280-281. The examiner maintained the rejection, and the applicant appealed. EX1002, 393-396, 400, 485-488.

The Board of Patent Appeals and Interferences reversed, finding that although Nyysönen discloses a virtual knob and vibrotactile feedback there was no disclosure of “virtual knobs having increments or haptic effects associated therewith” and thus no disclosure of a “virtual detent.” EX1002, 589-591. The claims were then allowed. EX1002, 1022.

This petition does not rely on Grant, Haung, or Nyysönen, but the petition shows that “virtual detents” were conventional before December 2006, a fact patent owner previously conceded. EX1006, [0005] (identifying EX1007-EX1008 as prior art teaching “haptic feedback simulating detents”).

VI. CLAIM INTERPRETATION

Claim terms are construed according to their ordinary meaning in light of the specification and prosecution history. 37 C.F.R. §42.100(b). Because the petition’s art plainly discloses each element of the challenged claims under any plausible construction, no outer boundary constructions are necessary. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

VII. UNPATENTABILITY GROUNDS

A. Ground 1: Claims 1-19 Obvious Over Ichinose and Levin

1. Ichinose (EX1015)²

Ichinose discloses a system for controlling a car’s devices. Abstract; 1:40-58.

The system includes a “touchpad 10...mounted on a steering wheel” (2:23-25):

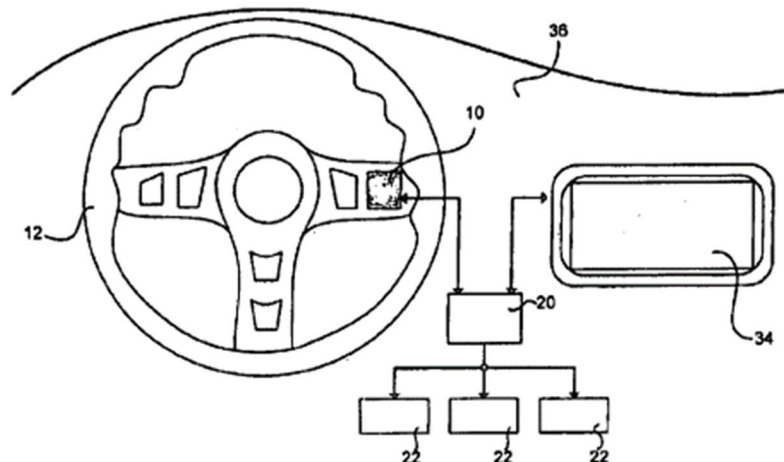


FIG. 1A

² Unless otherwise noted, citations in VII.A.1 are to Ichinose.

As a user “slide[s]” a finger “across” the touchpad, it “generates signals...allowing the user to interact with controllable devices 22 using the touchpad.” 2:33-39. Exemplary devices include “a radio, power windows, a heating and cooling system, and a navigation system.” 1:11-15; *see also* 3:48-61; FIG. 8.

A “cursor” presented on display 34 moves as the user touches the touchpad. 2:52-57; FIG. 1A. The user can position the cursor over a particular function and control the function, *e.g.*, “adjust the [radio’s] tuning” by “tapping the touchpad.” 2:62-3:9; FIG. 2A-5B; Ward, ¶¶103-109.

The touchpad includes “a feedback device” that “actuates, causing the user to experience a tangible vibration,” “provid[ing] the user with indicia relating to the user’s interaction with the touchpad [] and the display.” 4:5-24. For example, it actuates when “the user taps the touchpad 10 to select a function or device.” 4:24-33. “Other variations of the feedback device 80 are anticipated” and “[a]ny suitable actuator that is operable to provide vibration or tapping to the touchpad may be used.” 4:33-35.

2. Levin (EX1016)³

Like Ichinose, Levin discloses a “control panel” (Fig. 1 below) used in a car to control, *e.g.*, its heating and radio systems. 4:9-33.

³ Unless otherwise noted, citations in IV.A.2 are to Levin.

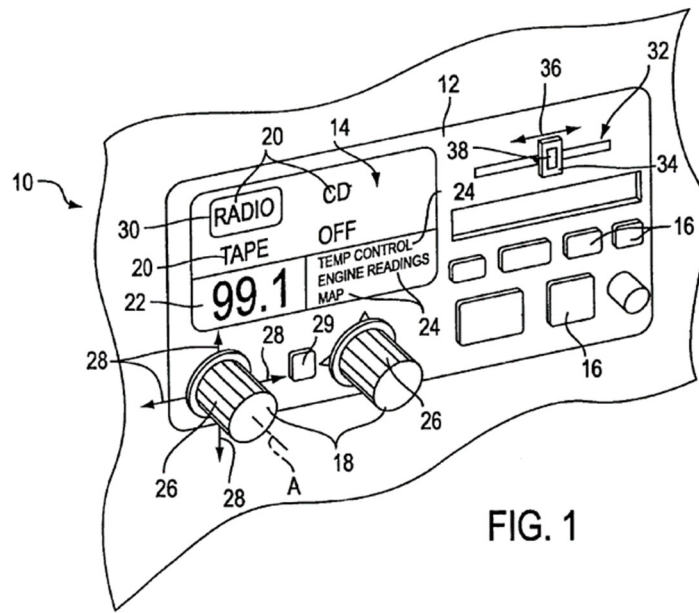


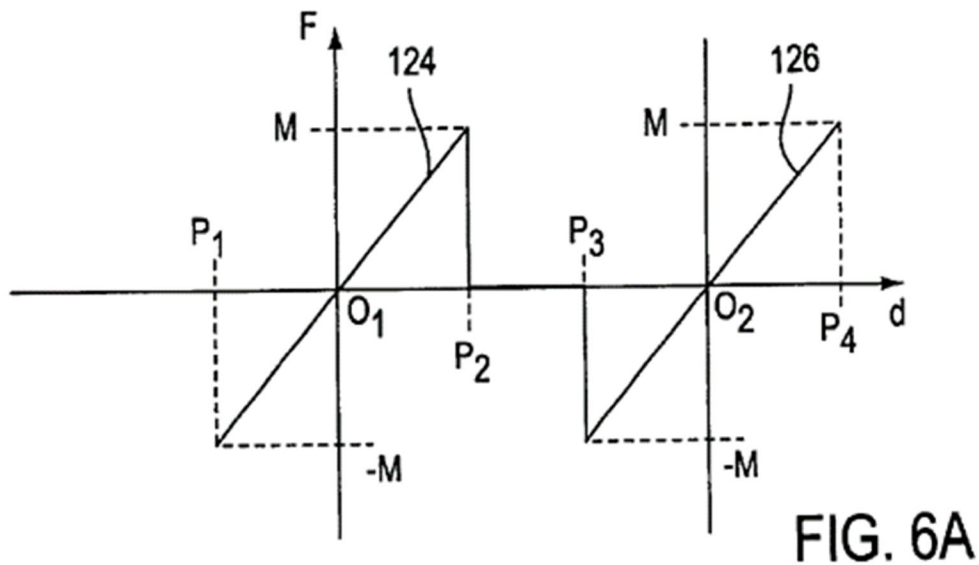
FIG. 1

Levin's panel includes "control knobs 18" that incorporate force feedback using an actuator. 5:30-50; 9:60-10:10. Feedback can also be used with a "slider" moving "in a linear degree of freedom." 14:16-21; claim 3; FIG.1 (element 32).

As a user turns the control knob to adjust a setting, *e.g.*, the car's temperature (5:30-50; 7:32-8:26; FIG. 2), "force detents" are output onto the knob to "indicate particular settings or how far the knob has rotated" (7:55-62). For example, "[t]emperature can preferably be adjusted by rotating knob 18, where force detents indicate each temperature setting." 8:21-26; 10:11-32. "[F]orce detents" allow the driver to "feel" a change in a system setting "so that the driver need not look at the display." 8:18-26; Ward, ¶¶110-113.

Levin's Figure 6A (below) illustrates a "detent force profile[...][that] can be implemented by a microprocessor or other controller based on instructions stored

in” memory. 14:30-35. “[C]urve 124,” seen below, “represents the force output for a single detent over a position range for the detent,” and “curve 126 represents another detent that is encountered shortly after leaving the previous detent curve 124 when turning the knob in a particular direction.” 14:30-15:8; Ward, ¶¶114-115.



3. The Ichinose-Levin Combination

POSAs had reasons to implement Ichinose’s system such that it used Levin’s “force detents” to simulate common mechanical detents like a simple mechanical “click.” *See, e.g.,* EX1001, 6:16-17 (“virtual detent may comprise a simulated click generated through a single pulse”); 8:41-43 (“one type of detent signal [is] as a click effect”); 11:59-63 (“click effect virtual detent”); Ward, ¶116.

Levin motivates the combination because it teaches that “force detents” beneficially allow drivers to “feel” a change in a vehicle setting without needing to

look at a display “which is particularly useful” when driving the vehicle. Levin, 8:15-19; 10:17-42; 3:31-33 (“provide[s] the user with greater control”); Ward, ¶117. Levin’s teaching aligns with Ichinose’s system which provides vibrotactile feedback so the driver “can be confident that a function or device was properly selected without directing his or her attention away from the road.” Ichinose, 4:31-33. Although Ichinose already provides vibrotactile feedback, it explains that “[o]ther variations...are anticipated,” and Levin’s “force detents” were known variations. Ichinose, 4:7-9 (“tangible vibration”); *id.*, 4:33-35 (“provide vibration”); Ward, ¶117.

Beyond Levin’s explicit motivation, implementing Ichinose to use Levin’s “force detents” would have been the use of a known technique (Levin’s “force detents” to simulate mechanical detents) to improve similar devices (vehicle control systems) in the same way (providing tactile feedback that minimizes distraction). Ward, ¶118. The use of such a known technique would have been obvious. *KSR Int’l. Co. v. Teleflex, Inc.*, 550 U.S. 398. 417 (2007).

The Ichinose-Levin combination augments Ichinose’s system by storing Levin’s “force detents” in a memory (as taught by Levin) that Ichinose’s “command processor” accesses to generate a feedback signal to Ichinose’s feedback device. Ichinose, 4:46-61; FIG. 8; Levin, 14:30-35; Ward, ¶119. Numerous uses of Levin’s force detent profiles in Ichinose’s system would have readily occurred to POSAs.

First, Ichinose teaches up and down arrow keys to adjust various system parameters like radio settings. For example, Figures 2A and 2B illustrate how a user moves a cursor (via the touchpad) onto a “tuning control button 56” to adjust the radio station by “tapping the touchpad” when the cursor is over the button. Ichinose, 2:47-3:9; *see also id.*, 3:19-46; FIGS. 3A-5B (showing similar functionality for other systems, including HVAC). Ichinose explains that its “feedback device 80 actuates when the user taps the touchpad 10 to select a function or device,” *e.g.*, when selecting the “tuning control button” to adjust the radio. Ichinose, 4:18-30; Ward, ¶120. Although Ichinose does not describe what vibrotactile feedback is provided when the user taps “tuning control button 56” to adjust the radio station, Levin teaches providing a “detent force (e.g., jolt)...to indicate how much a particular value has been changed. For example, a jolt can be output for each 10 MHz of frequency that is increased.” Levin, 7:55-8:2; FIG. 2; Ward, ¶¶120-122. POSAs thus had reason to output a “detent force (e.g. jolt),” *i.e.* a vibrotactile effect, each time a user taps the up/down button to change the radio frequency. Ward, ¶120; *see also* EX1021 at 13 (identifying feedback associated with a “Directional Pad,” *i.e.*, a click, as a “virtual detent”).

Second, Levin also teaches “the magnitude of the force detents can differ based on the value being controlled. For example, a radio frequency having a higher value might be associated with a stronger force detent, while a lower radio frequency

might be associated with a weaker force detent when it is displayed, thus informing the user generally of the radio station being displayed without requiring the user to look at the display 14.” Levin, 10:33-42. POSAs thus had reason to adjust the magnitude of the “detent force” that is output when users tap Ichinose’s “tuning control button” based on radio frequency. Ward, ¶123.

Third, Levin teaches that car settings can be adjusted via a “slider control 32” like the one depicted in Levin’s Figure 1. Levin, 7:7-31. POSAs would thus have understood that sliders were known alternatives to the up/down buttons that Ichinose uses. Ward, ¶124 (explaining, with corroboration, that virtual sliders were known). It would have been a matter of design choice for POSAs to replace Ichinose’s virtual up/down buttons with a virtual slider that users move with Ichinose’s cursor 54. Ward, ¶124. As the slider is moved linearly, “force detents are output for each station and/or each preset station previously programmed by the user.” Levin, 7:7-31; 10:11-46.

The above-described implementations relate to adjusting a radio, but POSAs would have understood that the implementations were applicable to other system settings like temperature. Ichinose, 3:31-46; FIGS. 4A-4B; Ward, ¶125.

POSAs would have reasonably expected success in implementing any of the above implementations because Levin’s “force detents” are executed by a processor (Levin, 19:54-20:3), like Ichinose’s command processor, and can be output by “any

of a variety of different types of actuators” (Levin, 10:1-5), which Ichinose’s system includes. Ichinose, 4:34-35 (“[a]ny suitable actuator”); Ward, ¶126. Although Levin discloses outputting “force detents” on a physical knob or slider, POSAs understood that similar detents could be output onto touchpads, like Ichinose’s touchpad, using conventional actuators. *Id.* The ’042 patent provides no details on how its actuator provides virtual detents to a touchpad, underscoring that such implementations details were known. EX1001, 6:32-45; Ward, ¶127; *Uber Techs., Inc. v. X One, Inc.*, 957 F.3d 1334, 1339 (Fed. Cir. 2020).

4. Claim 1

a. [1PRE]: “A method comprising:”

Ichinose-Levin’s system performs Ichinose’s “method for device control.” Ichinose, claim 17; Ward, ¶128.

b. [1A]: “receiving an input signal comprising information associated with a manipulation of an input device configured to control a plurality of systems, wherein the input device comprises a touch-pad;”

Ichinose-Levin’s system includes Ichinose’s “command processor 86” and “touchpad 10.” Ichinose, 4:36-67; FIG. 8. “[T]ouchpad 10 generates an input signal 84 indicative of user interaction with the touchpad 10,” and “command processor 86 processes [*i.e.*, receives] the input signal.” Ichinose, 4:36-40. Ichinose-Levin’s “command processor” thus “*receiv[es] an input signal comprising information*

associated with a manipulation of an input device...wherein the input device comprises a touch-pad,” as claimed. Ward, ¶129.

Ichinose-Levin’s “touchpad” is also “*configured to control a plurality of systems,*” *i.e.*, Ichinose’s “controllable devices 22,” *e.g.*, HVAC, audio, and navigation systems. Ichinose, 1:11-28 (detailing a plurality of controllable vehicle devices which are systems as claimed); 2:41-43; 4:65-67; claim 10 (“plurality of controllable devices”); FIG. 8 (“HVAC,” “audio,” and “navigation”); Ward, ¶130.

c. [1B]: “receiving a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent”

Ichinose-Levin’s “command processor” performs [1B].

As explained *supra* §VII.A.3., Ichinose-Levin stores Levin’s “detent force profiles” in memory and its “command processor” accesses (*i.e.*, “*receiv[es]*”) those profiles from memory “to generate a feedback signal 92” communicated to “feedback device 80” to provide “tangible feedback,” *i.e.*, vibrotactile feedback, to the driver when, for example, the driver is adjusting a vehicle system like the radio’s tuning. Ichinose, Abstract; 1:39-58; 2:63-67; 4:5-23; 4:36-61. Each “detent force profile” in Ichinose-Levin is “*associated with one of the systems,*” as claimed, because each profile is specific to a particular function the system being adjusted performs. Levin, 8:3-26 (explaining how different force feedback occurs when a driver interacts with different systems within the car”); 10:11-56 (similar); 11:37-

40; claim 56 (reciting a device that selects a “mode” and then outputs force sensations “associated with said mode”); Ward, ¶¶131-133.

Levin’s “detent force profiles” are each a “*detent profile comprising haptic data associated with a virtual detent,*” as claimed. For example, Levin explains that its “detent force profiles” include data that “represents the magnitude of force” an actuator outputs based on “position” of an input device. Levin, 14:30-45. With a touchpad, the “position” of the input device would correlate to the movement of a user’s finger across the touchpad from one position to another. Ward, ¶134.

Figure 6A (below) illustrates an exemplary “detent force profile” (Levin, 14:30-32):

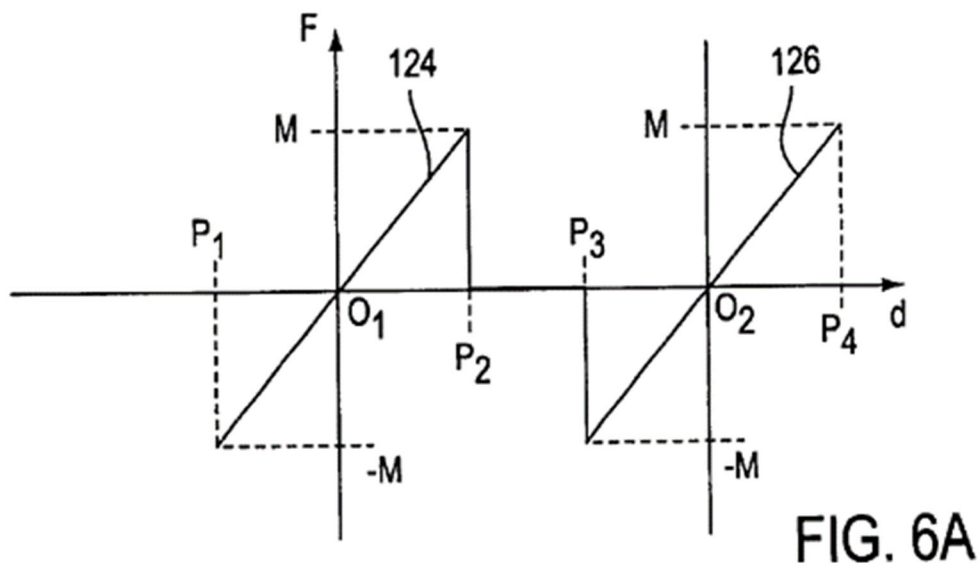


FIG. 6A

If a driver's finger starts on the touchpad at "the detent origin O1" and moves toward "the detent origin O2," "an increasing magnitude of force is output" until the user reaches P2 when force magnitude drops to zero. 14:59-64. This process repeats as the user's finger approaches the next detent. 15:3-8. The process illustrated in Figure 6A results in a "click" detent similar to the "clicks" experienced when sliding mechanical sliders. Ward, ¶¶135-136.

The detent profile depicted in Figure 6A would have been used with the virtual-slider implementation discussed *supra* §VII.A.3 in which successive detents or "clicks" are felt as the radio (or temperature) is changed by pushing the virtual slider. Ward, ¶137. For the other implementations where a "click" virtual detent is provided each time the up/down virtual button is tapped, POSAs would have understood that a similar "detent force profile" would have been used that included at least the magnitude of the vibration that the actuator would need to output to simulate the "click." Ward, ¶138; Levin, 10:16-17 ("force detents can be simple jolts"); 14:26-29; 23:23-33

Levin's "detent force profiles" are thus a "*detent profile comprising haptic data associated with a virtual detent,*" as claimed, and the "command processor" of Ichinose-Levin receives a "detent force profile" from memory to simulate one of the mechanical detents, *i.e.*, "*a virtual detent,*" discussed above. Ward, ¶139.

- d. [1C]: “generating a vibrotactile signal configured to cause an actuator to produce a vibrotactile effect to the input device, the vibrotactile effect comprising the virtual detent.”**

Ichinose-Levin’s “command processor” processor “generates [a] feedback signal 92,” *i.e.*, “a vibrotactile signal,” that is “communicated to the feedback device 80,” which is an actuator that outputs a vibrotactile effect (*e.g.*, vibration) in response to the feedback signal. Ichinose, 4:7-9; 4:33-35; 4:53-61; claim 17; FIGS. 7-8; Ward, ¶140. As discussed for [1B], the command processor in Ichinose-Levin generates the feedback signal based on one of Levin’s “force detent profiles,” which include haptic data associated with a virtual detent. Ward, ¶141.

- 5. Claim 2: “The method of claim 1, further comprising generating a system signal associated with a system to be manipulated, the system signal based at least in part on the input signal, and wherein generating a system signal and generating the vibrotactile signal occur substantially simultaneously.”**

Ichinose-Levin’s system performs claim 2’s method when a user uses the system’s touchpad to adjust a setting of one of the vehicle’s controllable devices, *e.g.*, tuning the radio. Ward, ¶¶142-145.

In response to an “input signal” that is “indicative of user interaction with the touchpad,” the command processor of Ichinose-Levin generates (1) “feedback signal 92” that causes the feedback device coupled to the touchpad to generate a vibrotactile effect, and (2) a “command signal 94” “communicated to the controllable devices

22.” Ichinose, 4:36-67; Ward, ¶143. The “command signal” is “*a system signal associated with a system to be manipulated, the system signal based at least in part on the input signal,*” as claimed.

Ichinose’s “command signal” and “feedback signals” are generated “*substantially simultaneously,*” as claimed. Ichinose explains that “feedback device 80 actuates *when* the user taps the touchpad 10 to select a function or device.” Ichinose, 4:28-30; *see also* 4:5-23. In other words, the feedback device vibrates in response to a feedback signal at substantially the same time as a selection is made that triggers the command signal. Ward, ¶144.

Generating both signals “*substantially simultaneously*” is also taught by Levin which suggests doing because its force feedback occurs when a system setting (e.g., radio channel) is changed. Levin, 7:11-24 (“*as* the user moves the knob 34, force sensations...can be output and felt by the user”; “motion left or right of knob...can control the radio frequency 22, where force detents are output for each station”); *see also* 2:49-52; 8:17-26; 11:28-36; Ward, ¶145.

6. Claim 3: “The method of claim 1, wherein the vibrotactile signal is based at least in part on the input signal.”

In Ichinose-Levin, “*the vibrotactile signal*” (i.e., “feedback signal 92”) “*is based at least in part on the input signal*” (i.e., “input signal 84”). Ichinose, 2:62-67; 4:36-61; FIGS. 2A-6; Ward, ¶146.

7. Claim 4: “The method of claim 1, wherein the vibrotactile signal is further based in part on the status of the input device.”

The '042 patent does not explain what “*status of the input device*” is, but patent owner has taken the position that claim 4 is met when the touchpad is used in a manner that causes a vibrotactile effect to occur. EX1021 at 15; Ward, ¶147.

In Ichinose-Levin, “*the vibrotactile signal,*” *i.e.*, “feedback signal 92,” “*is based in part on the status of the input device,*” under patent owner’s apparent interpretation of the claim. For example, Ichinose teaches that “feedback signal 92” is generated when a user is touching the touchpad in a manner indicating that an adjustment to a system setting has been selected. *Supra* §VII.A.4 (discussing [1C]); Ichinose, 2:62-67 (“The user may adjust the tuning 42 by positioning the cursor 54 over a tuning control button 56 and tapping the touchpad 10.”); 4:53-55; Ward, ¶148.

Because the “*vibrotactile signal*” is only generated when a user is contacting the touchpad at a particular location, the signal is “*based in part on the status of the input device,*” *i.e.*, whether a user is contacting the touchpad such that it positions a cursor over an object to be controlled (*e.g.*, button 56 in FIGS. 2A-2B or a virtual slider). Ward; ¶149; *supra* §VII.A.3. (discussing implementations of Ichinose-Levin).

Alternatively, it would have been obvious to implement Ichinose-Levin such that the “*vibrotactile signal*” in limitation [1C] is only generated when the touchpad is operational. Ward, ¶¶150-151; EX1001, 11:49-53.

8. Claim 5: “The method of claim 1, further comprising determining whether to generate a vibrotactile signal.”

The “feedback signal 92” in Ichinose-Levin is generated when a user positions a cursor “over a desired function,” *e.g.*, tuning button 56 in FIGS. 2A-2B or a virtual slider. Ichinose, 2:62-67; *supra* §VII.A.3. (discussing obvious implementations of Ichinose-Levin). Ichinose-Levin’s system thus “*determines whether to generate a vibrotactile signal,*” as claimed, at least because it generates a “feedback signal” only when a user is performing a particular action. Ward, ¶152.

9. Claim 6: “The method of claim 5, wherein determining whether to generate a vibrotactile signal is based at least in part on a status of the system to be manipulated.”

As discussed *supra* §VII.A.3., one implementation of Ichinose-Levin would result in the magnitude of the “detent force” that is output when a user taps Ichinose’s “tuning control button” being based on radio frequency, *i.e.*, lower frequencies have lower magnitude detents than higher frequencies. In this implementation, which vibrotactile signal Ichinose’s “command processor 86” generates depends on the radio system’s then-current frequency (*i.e.*, high or low), which is a “*status of the system to be manipulated,*” as claimed. Ward, ¶153.

Alternatively, it would have been obvious to implement Ichinose-Levin such that a “*vibrotactile signal*” is only generated when the system (*e.g.*, radio) the touchpad controls is *on* because, *e.g.*, doing so avoids user confusion. Ward, ¶153; EX1001, 11:49-53 (explaining system status includes on/off state).

10. Claim 7: “The method of claim 1, further comprising determining one of a plurality of virtual detents to generate.”

As discussed *supra* §VII.A.4.c ([1B]), Ichinose-Levin stores Levin’s “detent force profiles” in memory and its “command processor” accesses those profiles from that memory “to generate a feedback signal 92” communicated to “feedback device 80” to provide “tangible feedback,” *i.e.*, vibrotactile feedback, to the driver. Ichinose, Abstract; 1:39-58; 4:5-23; 4:36-61; Ward, ¶154. Each “detent force profile” is specific to a particular function a system performs. Levin, 8:3-26; 10:11-56; 11:37-40; claim 56; Ward, ¶154.

For example, the virtual detent discussed *supra* §VII.A.3 in which the magnitude of the detent varies depending on the radio channel frequency being selected is different than the standard “click” detent that is output when a virtual slider is moved to adjust the car’s temperature setting. Ward, ¶155. Ichinose-Levin thus includes a “*plurality of virtual detents*” as claimed. *Id.*

Ichinose-Levin “*determines one of a plurality of virtual detents to generate,*” as claimed, at least because the “detent force profile” that the “feedback signal” instructs an actuator to perform is selected from multiple “detent force profiles” that

Ichinose-Levin stores, *e.g.*, the “detent force profile” associated with changing radio stations must be selected rather the “detent force profile” associated with changing the vehicle’s temperature. Ward, ¶156.

11. Claim 8: “The method of claim 1, wherein the detent profile comprises a first detent profile, and further comprising receiving a second detent profile.”

As discussed *supra* §VII.A.4.c ([1B]) and §VII.A.10 (claim 7), Ichinose-Levin stores Levin’s “detent force profiles” in memory, and each profile is associated with a particular system being controlled. Accordingly, when a user switches from controlling a first system (*e.g.*, radio) to a second (*e.g.*, HVAC), the “command processor” in Ichinose-Levin would “*receiv[e] a second detent profile*,” as claimed, at least because it would receive a new “detent force profile” for the second system. Ward, ¶¶157-158.

12. Claim 9

a. [9PRE]

Supra §VII.A.44.a ([1PRE]); Ward, ¶159.

b. [9A]

Ichinose-Levin meets [9A] for the reasons it meets [1A]. The difference between the limitations is [9A] recites “*detecting a change in position of*” the touchpad. This claim language makes little sense when the “*input device*” is a touchpad because, unlike a knob, the touchpad’s position does not change when

used. Ward, ¶¶160-162. Patent owner, however, contends that the “*change in position*” is the change in position of a user’s finger on the touchpad. EX1021, 18-22 (citing “moving a finger across the surface of the trackpad” as a “change in position”).

Applying that construction, Ichinose-Levin’s meets [9A]. Specifically, in Ichinose-Levin, “touchpad 10 generates an input signal 84 indicative of user interaction with the touchpad 10” and “tracks the position” of a cursor that corresponds to the user’s interaction with the touchpad. Ichinose, 4:37-39; 4:46-61; Ward, ¶¶163-164. Ichinose-Levin’s system thus “*detect[s] a change in position of an input device,*” *i.e.*, movement of a finger from one position on the touchpad to another. *Id.*

c. [9B]

Supra §VII.A.4.c ([1B]); Ward, ¶165.

d. [9C]

Ichinose-Levin meets [9C] for the same reasons it meets [1C]. The difference between the limitations is [9C]’s requirement that “*generating*” the detent signal be based on, not only on the “*detent profile,*” but also “*the change in position*” detected on the touchpad. Ichinose-Levin’s system performs that additional step.

As discussed for [9A], Ichinose-Levin’s system “tracks the position” of a cursor that corresponds to the user’s interaction with the touchpad. Ichinose, 4:46-

61. Ichinose further teaches that “feedback signal 92,” *i.e.*, “*detent signal*,” is generated when a user is touching the touchpad in a manner indicating that an adjustment to a system setting has been selected, which occurs when the user “positions the cursor [] over” a particular function, *e.g.*, tuning button 56 or a virtual slider. Ichinose, 2:62-67; 4:53-55; *supra* §VII.A.4.c-d (discussing [1B] and [1C]); Ward, ¶¶166-168; *supra* §VII.A.3 (discussing Ichinose-Levin’s implementations).

Ichinose-Levin’s system thus generates “*the detent signal*” based at least in part on the “*change in position*” of the input device, *e.g.*, a user’s finger moves the cursor onto tuning button 56 or a virtual slider. Ichinose, 2:62-67; Ward, ¶169.

13. Claim 10

Claim 10 recites a CRM with program code “for” performing each step of method claim 1, which steps Ichinose-Levin performs as discussed for claim 1.

Ichinose’s system utilizes a “command processor” and “software module” to perform its functionality. Ichinose, 4:36-67; FIG. 8. POSAs understood that processor-implemented methods, like those Ichinose’s command processor performs, would have conventionally been stored on a CRM, and thus POSAs had reason to store on a CRM the program code needed to cause Ichinose’s command processor to perform the method steps of claim 1. Ward, ¶¶170-172. Levin would have further motivated POSAs to store Ichinose’s processor-implemented methods on a CRM because Levin teaches that its “detent force profiles,” which Ichinose-

Levin include, can be “based on instructions stored in a computer readable medium.”

Levin, 14:30-35; Ward, ¶¶173-174.

14. Claim 11-14

Claims 11-14 recites a CRM with program code “for” performing each step of method claims 2, 5, 7, and 9, respectively. Ichinose-Levin discloses claims 11-14 for the same reasons it discloses claim 10 (*i.e.*, “CRM”) and claims 2, 5, 7, and 9. Ward, ¶¶175-183.

15. Claim 15

a. [15PRE]: “A system comprising:”

Ichinose-Levin is an implementation of Ichinose’s “system” for controlling a vehicle’s devices. Ichinose, 4:36-37; FIG. 8; Ward, ¶184.

b. [15A]: “a touch-pad,”

Supra §VII.A.4.b (discussing [1A] and “touchpad 10”); Ward, ¶185.

c. [15B]: “a processor,”

Supra §VII.A.4.b (discussing [1A] and “command processor 86”); Ward, ¶186.

(1) [15B1] “the processor configured to receive an input signal and a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent,”

Supra §VII.A.4.b-c (discussing how “command processor 86” performs steps of [1A] and [1B]); Ward, ¶187.

(2) [15B2] “the processor further configured to generate a detent signal; and”

Limitation [15B2] is substantively identical to limitation [1C], which command processor 86 performs in Ichinose-Levin for the reasons discussed in *supra* §VII.A.4.d. The lone difference between the limitations is [15B2]’s use of the term “*detent signal*,” rather than “*vibrotactile signal*,” which [1C] uses. POSAs would have understood that the two “signals” are substantively identical, and that the “feedback signal 92” of Ichinose-Levin meets both limitations for the reasons discussed in *supra* §VII.A.4.d. EX1001, 4:35-39; Ward, ¶¶188-191.

d. [15C]: “at least one actuator”

Ichinose-Levin’s system includes “feedback device 80” which is an actuator (Ichinose, 4:24-35), and POSAs would interpret Ichinose’s Figure 7 to depict the actuator coupled to the housing of touchpad 10 (Ichinose, 2:10-11). Ward, ¶¶192-195. Alternatively, it would have been obvious to couple the actuator to the housing of the touchpad so that vibrotactile effects could be provided to the touchpad, which design Levin also teaches. Levin, Abstract (“actuator is coupled to the knob to output a force.”); Ward, ¶196.

16. Claim 16: “control a system based at least in part on a manipulation of the input device.”

As discussed *supra* §VII.A.5 (claim 2), Ichinose-Levin’s system performs a vehicle-control operation that is based on a user contacting the touchpad and which controls an aspect of a system, *e.g.*, radio. Ward, ¶197.

17. Claim 17: “determine whether to generate a detent signal”

Supra §VII.A.8 (claim 5); Ward, ¶198.

18. Claim 18: “actuator is coupled to a housing of the input device”

Supra §VII.A.15.d ([15C]); Ward, ¶199.

19. Claim 19: “the input device comprises a sensor”

Ichinose-Levin’s touchpad operates “by means of touch inputs as is known in the art.” Ichinose, 2:27-36. POSAs would have understood the touchpad to be a conventional touchpad which includes a “sensor,” *e.g.*, capacitive or resistive sensor, to sense a touch on the pad’s surface. Ward, ¶¶200-202. If not explicitly disclosed, using such sensor(s) in Ichinose-Levin’s touchpad would have been obvious because those were two common and well-known sensors for touchpads. Ward, ¶¶203-204.

B. Ground 2: Claims 1-19 Are Obvious Over Wang in view of Ichinose

1. Wang (EX1022)⁴

Wang discloses a system “for controlling...vehicle subsystems.” Abstract. The system includes a “haptic device” that a driver uses to manipulate a virtual control device shown on a display, and that “haptic device” provides “a force effect” so the driver “can feel a sense of touching or force through the haptic device while controlling...the vehicle systems.” *Id.*; Ward, ¶¶205-210.

In Wang’s system, “conventional physical knobs, levers and controls are replaced with virtual knobs, levers, controls and haptic technology.” 2:4-8. These “virtual” controls are displayed on a “virtual device panel” and each corresponds to particular “automobile hardware to be controlled.” 2:23-29; 4:2-4-8.

Figure 4 depicts an exemplary system with a virtual knob and slider (elements 15) shown on “virtual device panel 14,” and “haptic device 16” located on a steering wheel. 8:2-5.

⁴ Unless otherwise noted, citations in Section VII.B.1 are to Wang.

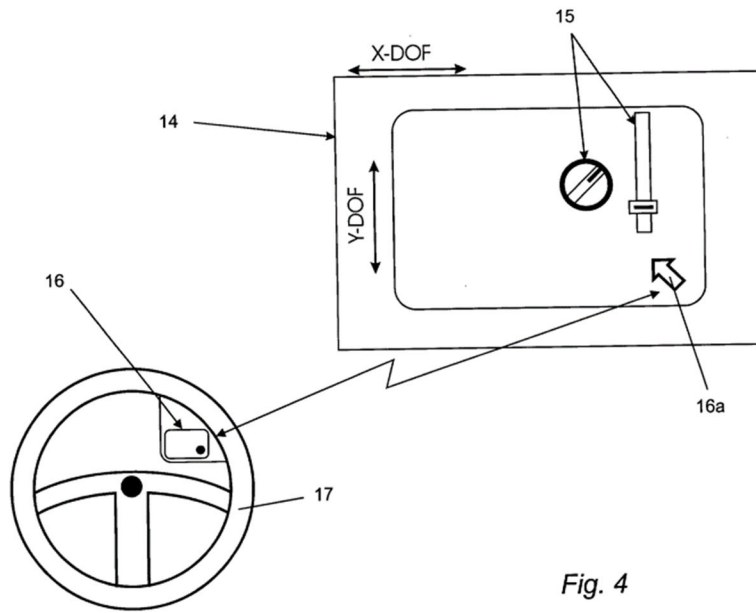


Fig. 4

The haptic device is a “thumb-actuated device” with actuators to generate “force effects.” 7:26-29; 9:20-28; 16:1-8; claim 13. The driver uses the input haptic device to position cursor 16a over a virtual knob or slider and manipulate (*e.g.*, rotate/push) the knob or slider, which causes the haptic device actuators to “emulate a series of detents as the knob rotates.” 8:29-31; 7:18-22 (“emulate...detent effects encountered while rotating the dial”); 16:22-24 (“turn virtual knobs and push virtual slides controls as if they are real.”); 16:30-17:2 (“each and every control feels like its mechanical counterpart”).

Wang’s system includes “control device/indicators library 20” that includes “software representing all possible controls and indicators that are available for a given dashboard system.” 10:7-9. “[T]he user selects the desired control/indicator from the library 20 and drags/copies it to the layout screen on the virtual device panel

14. Each control/indicator has associated properties whereby the user can set the type of effects, size, strength of force effects, etc.” 10:9-15.

2. Ichinose

Ichinose is discussed *supra* §VII.A.1.

3. The Wang-Ichinose Combination

Wang’s “haptic device 16” is not described in detail, but Wang teaches that it can be controlled by a driver’s “thumbs/fingers.” Wang, 16:6-8; claim 13. POSAs would have understood that one obvious implementation of the haptic device would have been a touchpad because that is a known input device that is controlled by a finger. Ward, ¶¶212-213.

As explained in Ground 1, Ichinose discloses the use of a haptic-enabled touchpad on a steering wheel to control automotive systems and output haptic feedback. *Supra* §VII.A.4.b. POSAs would have viewed using Ichinose’s “touchpad 10” to implement Wang’s haptic device 16 to be the simple substitution of one known element (Wang’s touch-sensitive haptic device) for another (Ichinose’s touchpad 10) to obtain predictable results. Ward; ¶¶214-220; *KSR*, 550 U.S. at 417.

The use of touchpads in automobile applications, including touchpads that provide haptic feedback, was well-known. Ward, ¶¶215-219 (citing, *e.g.*, EX1023-1026 as corroboration). Therefore, selecting Ichinose’s particular touchpad to

implement Wang's haptic device 16 would have also been a simple and routine design choice for POSAs. Ward, ¶220.

POSAs would have reasonably expected success in the Wang-Ichinose combination because touchpads, like Ichinose's touchpad 10, were conventional input devices by 2006 and their use to input coordinate signals to an electronic device, like Wang's virtual device panel would have required only routine skill. Ward, ¶221. Moreover, Wang's haptic device 16 already includes "actuators" to provide haptic feedback (Wang, 7:26-29), thus simplifying the process of incorporating Ichinose's actuator-driven touchpad. Ward, ¶221.

4. Claim 1

a. [1PRE]: "A method comprising:"

Wang-Ichinose's "haptic vehicle control system" performs a method of controlling vehicle systems and generating haptic feedback. Wang, 2:23-3:7; 15:29-17:15; Ward, ¶222.

b. [1A]: "receiving an input signal [from...] a touch-pad,"

Wang-Ichinose's system includes Wang's "supervisory/computer processor." Wang, 4:13-14 ("dashboard system is controlled via a computer/processor"); 5:1-13 ("supervisory/computer process 12 is the heart of the dashboard system"); FIG. 1; Ward, ¶223. As discussed herein, the "supervisory/computer processor" performs the claimed steps [1A] to [1C].

Wang-Ichinose's system includes Wang's "haptic device 16," implemented as a touchpad like Ichinose's touchpad 10. *Supra* §VII.B.3. The device "allows the user to interface with the virtual control devices/indicators displayed on the virtual device panel." Wang, 6:8-13; FIG. 1. "The operating position of the haptic device corresponds to that of a cursor 16a on the screen of the virtual device panel." 9:24-26. When implemented as a touchpad, POSAs would understand that the "operating position" is the position/movement of the user's finger on the touchpad and that the cursor's movement therefore corresponds to movement of the user's finger. Ward, ¶224.

Using the touchpad, the cursor can be positioned over a virtual control on the virtual device panel, which allows the control to be manipulated to control the system associated with that virtual control. Wang, 2:29-3:7 ("haptic device...manipulates the virtual control device," and "the plurality of automobile hardware can be controlled...according to virtual controls"); 6:15-26; 8:9-11. Accordingly, Wang's "haptic device 16" is an "*input device*," and in the Wang-Ichinose that input device is a "*touchpad*" as claimed. Ward, ¶225.

Wang's supervisory computer/processor "*receiv[es] an input signal comprising information associated with a manipulation of an input device*," i.e., haptic device 16 (implemented as a touchpad), because Wang's haptic device "communicates" with the virtual device panel via the supervisory

computer/processor and that processor “control[s] the haptic device.” Wang, 9:24-28; 5:1-13; Ward, ¶226.

“[H]aptic device 16” is “*configured to control a plurality of systems*,” as claimed because a driver uses it to control systems like the radio or air conditioning. Wang, 1:3-5 (“controlling...various subsystems...in a vehicle”); 2:18-19 (“plurality of subsystem can be controlled”); 3:2-7; 4:11-13; 16:15-17:15; Ward, ¶227.

c. [1B]: “receiving a detent profile...associated with a virtual detent”

Wang-Ichinose’s system includes “control devices/indicator library 20” that stores in memory “software representing all possible controls and indicators that are available for a given dashboard system.” Wang, 10:7-18. “Each control/indicator has associated properties whereby the user can set the *type of effects, size, strength of force effects, etc.*” Wang, 10:13-15. One such “effect” is an “emulate[d]...detent effect[] encountered while rotating [a virtual] dial.” Wang, 7:21-22; 8:6-9 (“Force effects to emulate the feel of a mechanical rotary knob or a slider...”), 8:29-31 (“emulate a series of detents as the knob rotates.”), 6:8-21 (with haptic device 16 a “virtual dial feels real”).

The “associated properties” stored in Wang’s “control devices/indicator library” include the type (*e.g.*, detent) and strength (*e.g.*, magnitude of force applied) of the effect. Wang, 10:7-15. The “associated properties” for a control device that

is, for example, a virtual knob is a “*detent profile comprising haptic data associated with a virtual detent,*” as claimed. Ward, ¶¶228-230.

Wang’s “supervisory computer/processor” “*receiv[es]*” from the “control devices/indicator library” the “associated properties,” *i.e.*, “*detent profile,*” that is “*associated with*” a particular virtual control for a system that a driver is manipulating, *e.g.*, the “associated properties” in the “library” corresponding, respectively, to a virtual temperature control knob being rotated or a radio frequency slider being moved linearly. 4:13-14 (“dashboard system is controlled via a computer/processor”); 5:1-13 (“the supervisory/computer process 12 is the heart of the dashboard system...responsible for...accessing the external memory”); 5:20-6:2 (describing how “control devices/indicator library” enables user to “select and drag various desired virtual control devices” onto the virtual display for manipulation); 10:8-22 (“control devices/indicator library...includes various software representing all possible controls and indicators that are available for a given dashboard system,” and is located in external memory or “incorporated into the supervisory computer/processor 12”); 11:24-12:17; FIG. 1; Ward, ¶231.

Accordingly, Wang’s “supervisory computer/processor” “*receiv[es]* a *detent profile associated with one of the systems,*” as claimed. Ward, ¶232.

d. [1C]: “generating a vibrotactile signal configured to cause an actuator to produce a...virtual detent.”

Wang-Ichinose’s system includes haptic device 16 (implemented as a touchpad) which includes “actuators” driven to “emulate[...]detent[s].” Wang, 7:26-29; 7:18-22 (describing emulated, *i.e.*, virtual, detent effects); 8:6-9 (“Force effects to emulate the feel of a mechanical rotary knob or a slider...”); 8:29-31 (“emulate a series of detents as the knob rotates.”); 6:8-21 (“virtual dial feels real”).

Wang’s “supervisory computer/processor” “is responsible for...controlling the haptic device 16.” Wang, 5:1-12. POSAs understood that the processor “control[s] the haptic device 16” by generating electronic signals sent to the device to drive its actuator(s). Ward, ¶¶233-238; 11:24-12:17 (“supervisory computer/processor 12” transforms information into command “signal[s]” for use by other electronic components). In Wang-Ichinose, these signals cause the actuator(s) to produce emulated detents, *i.e.*, vibrotactile effects, in accordance with the “associated properties” stored in the “control devices/indicator library” for the virtual control being manipulated. *Supra* §VII.B.4.c ([1B]); Ichinose, 4:7-35 (explaining touchpad 10’s actuator causes vibrations to be felt); Ward, ¶¶233-238.

Wang’s supervisory computer/processor thus meets [1C]. Ward, ¶¶233-238.

5. Claim 2

Wang-Ichinose meets claim 2 when a user uses haptic device 16 to adjust a setting of one of the vehicle’s controllable devices, *e.g.*, adjusting radio volume.

Wang's "*real-time* interface" 40 permits a vehicle's systems to be controlled by virtual controls on the dashboard. Wang, 2:8-3:8, 10:22-12:17, claims 24-26, Fig. 5:

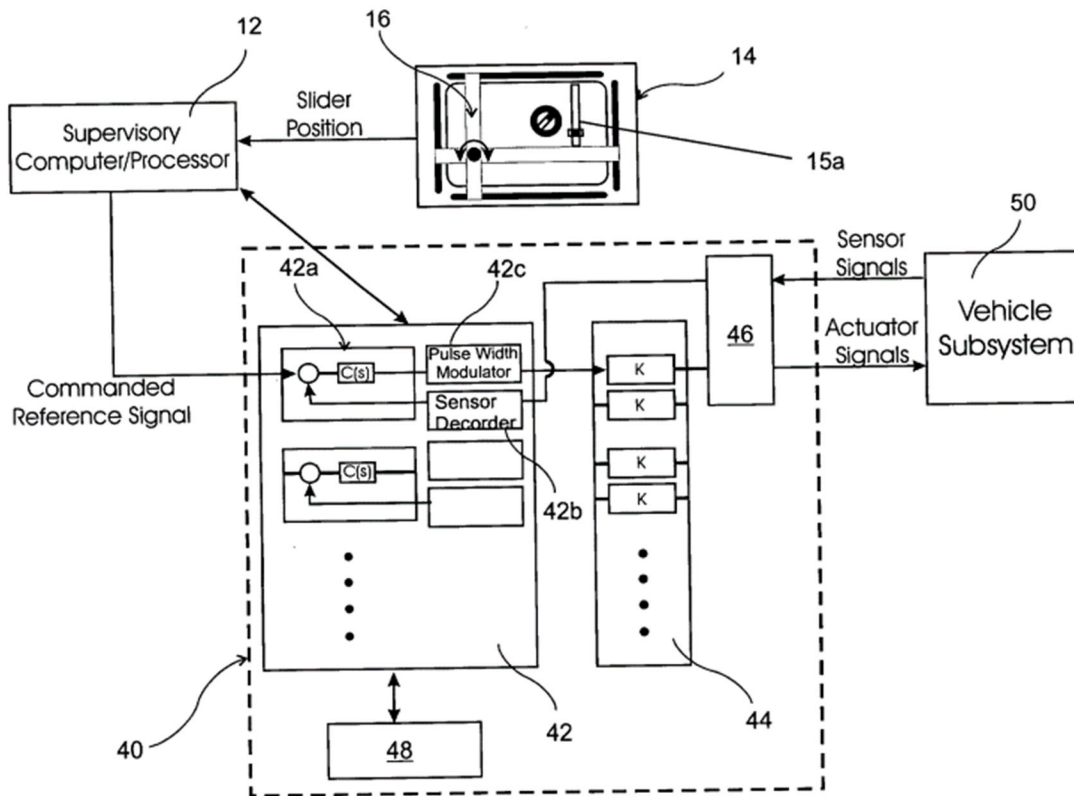


Fig. 5

Wang's "supervisory computer/processor...is responsible for... coordinating the functionality of the intelligent *real-time* interface 40." Wang, 5:1-9. When a driver adjusts a virtual control device (e.g., pushes a virtual slider or rotates a virtual knob), the supervisory computer/processor generates a "commanded reference signal" in real time to instruct the "real-time interface" to adjust a setting of the

system associated with the control device being adjusted. Wang, 11:24-12:17; Ward, ¶¶239-241.

POSAs understood that the “commanded reference signal” (*i.e.*, “a system signal”) is generated “*substantially simultaneously*” with the signal instructing the haptic device’s actuators to output a force effect that simulates a detent (discussed *supra* §VII.B.4.c ([1B])) because those effects are also generated in real-time to “emulate a series of detents as the knob rotates.” Wang, 8:29-30; 7:21-22 (“detent effects encountered while rotating the dial”); 2:20-22; 3:6-8 (same); claims 1 and 24; Ward, ¶242. The virtual knob’s rotation causes the supervisory computer/processor to generate at substantially the same time the signal(s) needed to actuate the haptic device’s actuators and to cause the “real-time interface” to adjust the system associated with the knob being rotated. *Id.*

6. Claim 3

In Wang-Ichinose’s system, the “*vibrotactile signal*” generated by the Wang’s supervisory processor is based on the input signal received from haptic device 16 (implemented as a touchpad). *Supra* §VII.B.4.b-d ([1A]-[1C]); Ward, ¶243; Wang, 8:29-30 (when the user rotates a virtual knob a vibrotactile signal is generated to “emulate a series of detents as [the virtual] knob rotates”); 7:21-22.

7. Claim 4

As explained *supra* §VII.A.7, the '042 patent does not explain what “*status of the input device*” is, but patent owner has taken the position that claim 4 is met when the touchpad is used in a manner that causes a vibrotactile effect to occur. EX1021 at 15. Ward, ¶244.

In Wang-Ichinose, the “*vibrotactile signal*” of [1C] is generated when a user manipulates a virtual control by using the touchpad (*supra* §VII.B.4.d; Wang, 2:15-17; 2:30-3:2; 6:13-26; 8:9-11), and thus the signal is “*based in part on the status of the input device*” under patent owner’s interpretation of the claim. Ward, ¶¶245-246.

Alternatively, it would have been obvious to implement Wang-Ichinose such that the “*vibrotactile signal*” in limitation [1C] is only generated when the touchpad is operational. Ward, ¶247; EX1001, 11:49-53.

8. Claim 5

Because the “*vibrotactile signal*” in Wang-Ichinose is generated by the processor when a user manipulates a virtual control (*supra* §VII.B.4.d; 2:15-17; 2:30-3:2; 6:13-26; 8:9-11) the system “*determin[es] whether to generate a vibrotactile signal,*” as claimed by determining whether (and how) the virtual control is manipulated by the user. Ward; ¶248.

9. Claim 6

The '042 patent explains that the “status of [a] system” can be simply whether it is on or off. EX1001, 11:49-52. An obvious implementation of Wang-Ichinose is one in which the system does not generate a vibrotactile signal when the system to be manipulated, *e.g.*, the radio, is turned off because the lack of a vibrotactile signal would helpfully indicate to the user that the system is off. Ward, ¶¶249-250.

10. Claim 7

Wang-Ichinose’s “control device/indicators library 20” stores “associated properties,” *i.e.*, “*detent profiles*,” for “all possible controls and indicators that are available for a given dashboard system.” 10:7-15; 16:15-17:2 (user can change virtual controls presented on the virtual device panel from “Environmental”-related controls to “Entertainment”-related controls); *supra* §VII.B.4.c ([1B]). The library thus stores a “*plurality of virtual detents*,” as claimed, and the command processor determines which of those “*virtual detents*” to generate based on which virtual “control” a user is manipulating and how it is manipulated. Ward, ¶251. For example, the command processor accesses different “associated properties” for a virtual slider for a HVAC system than for a virtual knob for a radio. Ward, ¶252.

11. Claim 8

As discussed for claim 7, Wang’s system includes “control device/indicators library 20,” which stores “*detent profiles*” for all the controls on the dashboard.

10:7-15. The “*detent profiles*” for first and second controls (e.g., a HVAC knob and radio slider) (Wang, 2:29-3:7; 6:15-26; 8:9-11) meet “first” and “second” “*detent profiles*” as claimed. *Supra* §VII.B.10; Ward, ¶253.

12. Claim 9

a. [9PRE]

See [1PRE]; Ward, ¶254.

b. [9A]

Wang-Ichinose meets [9A] for the same reasons it meets [1A]. The difference between the limitations is [9A]’s requirement that Wang’s system “*detect[] a change in position of*” the haptic input device (*i.e.*, touchpad). As discussed *supra* §VII.A.12, patent owner takes the position that the “*change in position*” is movement of a user’s finger on the touchpad. Under that interpretation, Wang’s system performs that additional step. Ward, ¶¶255-256.

For example, Wang’s system “emulate[s] a series of detents *as [a virtual] knob rotates.*” 8:29-30; 7:21-22 (“detent effects encountered *while rotating the dial*”). In Wang-Ichinose, to detect that a knob is “rotating,” Wang’s “command processor” detects a change in position of touchpad 10, *e.g.*, a user moves her finger clockwise from one point to another on touchpad 10. Wang, 6:15-26 (describing how haptic device manipulates virtual controls); 11:27-29 (“As the user moves the haptic device 16 in the Y direction, the virtual slider 15b moves and the recorded

slider position changes. The slider position is sent to the supervisory computer/processor 12...”); *see also* Ichinose, 4:36-40 (explaining how touchpad 10 generates an “input signal...indicative of user interaction with the touchpad”); Ward, ¶¶257-258. Wang’s system thus “*detect[s] a change in position of an input device,*” *i.e.*, a change associated with rotation of a knob or movement of a slider. Ward, ¶259.

c. [9B]

Supra §VII.B.4.c ([1B]); Ward, ¶260.

d. [9C]

Wang-Ichinose meets [9C] for the same reasons it meets [1C]. The difference between the limitations is [9C]’s requirement that Wang’s system “*generat[es]*” the detent signal based on, not only the “*detent profile,*” but also “*the change in position*” detected on the haptic input device (*i.e.*, touchpad). Wang’s system performs that additional step. For example, as discussed above for [9A], Wang’s devices “emulate detents” in part based on a “*change in position*” of a user’s finger on the touchpad. Ward, ¶¶261-263.

13. Claim 10

Claim 10 recites a CRM with program code “for” performing each step of method claim 1.

Wang’s “supervisory computer/processor” “is responsible for controlling the entire dashboard system.” 5:2-7. Wang’s processor accesses “control devices/indicator library 20” which “includes various software representing all possible controls and indicators that are available for a given dashboard system.” 10:7-16. Library 20, which “represent[s] all possible controls,” is either stored in “external memory” or “supervisory processor memory.” Wang, 10:14-21; FIG. 1. Either memory is a CRM, and therefore Wang discloses a CRM that stores program code, *i.e.*, library 20, for performing each step of claim 1. Ward, ¶¶264-266.

14. Claim 11-14

Claims 11-14 recites a CRM with program code “for” performing each step of method claims 2, 5, 7, and 9, respectively. Wang-Ichinose discloses claims 11-14 for the same reasons it discloses claim 10 (*i.e.*, “CRM”) and claims 2, 5, 7, and 9. Ward, ¶¶267-272.

15. Claim 15

a. [15PRE]

Wang-Ichinose discloses a “haptic vehicle control system.” Wang, 2:23-24; Ward, ¶273.

b. [15A]: “a touch-pad,”

Wang-Ichinose includes Wang’s haptic device implemented as a touchpad like Ichinose’s touchpad 10. Ward, ¶274; *supra* §VII.B.4.b (discussing [1A]).

c. [15B]: “a processor”

Supra §VII.B.4.b (discussing [1A] and “supervisory/computer processor”); Ward, ¶275.

(1) [15B1]

Supra §VII.B.4.b-c (discussing how “supervisory/computer processor” performs [1A] and [1B]); Ward, ¶276.

(2) [15B2]

Limitation [15B2] is substantively identical to limitation [1C], which supervisory/computer processor performs in Wang-Ichinose for the reasons discussed in *supra* §VII.B.4.d. The lone different between the limitations is [15B2] use of the term “*detent signal*,” rather than “*vibrotactile signal*,” which is used in [1C]. POSAs would have stand that the two “signals” are substantively identical, and that the signals the supervisory/computer processor sends to an actuator in Wang-Ichinose meets both limitations for the reasons discussed *supra* §VII.B.4.d. Ward, ¶¶277-280.

d. [15C]: “at least one actuator”

As discussed *supra* §VII.B.4.d ([1C]), Wang-Ichinose’s system includes one or more actuators built into the housing of Wang’s haptic input device (implemented as a touchpad) and which are actuated to “emulate detents,” *i.e.*, “*virtual detents*,” as claimed. Wang, 7:26-29 (“actuators...contained within the housing...of the

haptic device”); Ward, ¶¶281-282. As the actuator(s) is/are built into Wang’s touchpad, it is “*coupled to*” the touchpad and/or that would have been the conventional way to implement the actuator so that it could output haptic feedback onto the touchpad. Ward, ¶282.

16. Claim 16

Wang-Ichinose’s “supervisory/computer processor,” *i.e.*, “*the processor*” “*is further configured to control a system based at least in part on a manipulation of the input device,*” as claimed, because manipulation of Wang-Ichinose’s haptic device *i.e.*, touchpad 10, is “transformed into a commanded reference signal” that “is in a format that is recognized by the vehicle subsystem being controlled.” Wang, 11:30-12:17; 13:27-14:10; *supra* §VII.B.5 (claim 2); Ward, ¶283.

17. Claim 17

Supra §VII.B.9 (claim 5); Ward, ¶284.

18. Claim 18

Supra §VII.B.15.d (claim [15C]); Ward, ¶285

19. Claim 19

As discussed *supra* §VII.B.4.b, Wang’s “haptic device 16” is a touchpad, and POSAs understood touchpads include a “sensor,” *e.g.*, capacitive or resistive sensor, to sense a touch on the pads surface. Ward, ¶286. Using such sensor(s) in Wang’s

touchpad would also have been obvious because those were two common and well-known sensors for touchpads. *Id.*

C. Ground 3: Claims 1-19 Are Anticipated By Rosenberg-I

1. Rosenberg-I (EX1009)⁵

Rosenberg-I discloses a touchpad with an actuator that outputs haptic sensations (*e.g.*, vibrations). Abstract; *see* Ward, ¶¶287-290. Rosenberg-I’s “touchpad 16” can be on a laptop:

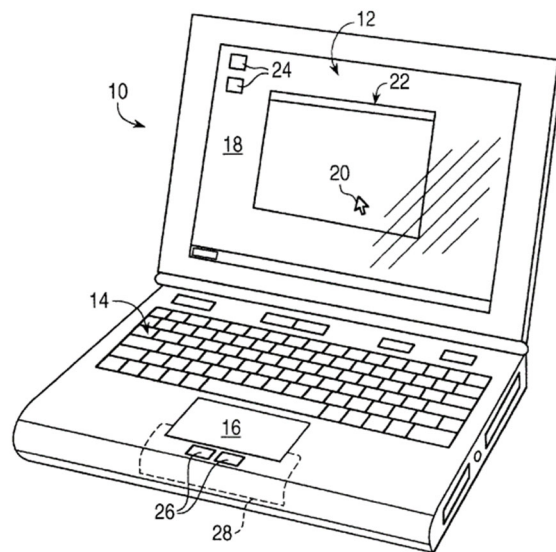


FIG. 1

1:65-2:5; 3:31-63.

The touchpad sends data to a processor indicating where a user is touching its surface. 4:5-8. An actuator generates “haptic sensations” output to the user touching

⁵ Unless otherwise noted, citations in Section VII.C are to Rosenberg-I.

the pad. 5:11-14. The “haptic sensations” include vibrations and are “computer-controlled” because a processor “control[s] the magnitude...of the force output of the actuator(s).” 5:11-22; 6:24-54.

Rosenberg-I’s touchpad “operates similarly to existing touchpads,” *i.e.*, moving a “fingertip on the touchpad” causes a “cursor [to be] moved in [a] graphical environment.” 4:43-49. Haptic sensations are “output on the pad based on interactions of the controlled cursor within the graphical environment” (11:22-26), and “[d]ifferent types of graphical objects can be associated with tactile sensations” (12:5-6).

Rosenberg-I discloses several haptic sensations that mimic detents. For example, Rosenberg teaches:

[W]hen a rate control or scrolling function is performed with the touchpad (through use of the cursor), a vibration can be displayed on the device to indicate that scrolling is in process. When reaching the end of a numerical range that is being adjusted (such as volume), a pulse can be output to indicate that the end of the range has been reached. Pulse sensations can be used to indicate the location of the “ticks” for discrete values or settings in the adjusted range.

12:50-64; Ward, ¶¶287-290.

Rosenberg-I also incorporates by reference U.S. Patent No. 5,734,373 (EX1010, “Rosenberg-II”), which Rosenberg-I says “describe[s] in greater detail” “[a]rchitectures and control methods that can be used for reading sensor signals and providing haptic feedback.” 6:49-54; Ward, ¶¶291-293.

Rosenberg-II teaches techniques for providing “force feedback using an interface device manipulated by a user.” Rosenberg-II, Abstract. Rosenberg-II’s techniques include using “force values that have been previously calculated or sampled and stored as a digitized ‘*force profile*’ in memory.” Rosenberg-II, 18:46-50. Rosenberg-II’s Figures 10-13 and 15-16 depict various force “profiles,” including one that provides a “detent sensation.” Rosenberg-II, 5:48-62, 38:1-3; Ward, ¶¶294-295. POSAs would have understood Rosenberg-I to incorporate Rosenberg-II’s disclosures regarding force “profiles” because those disclosures are ways to implement Rosenberg-I’s “control method[s]” for “providing haptic feedback.” 6:49-54; Ward, ¶296.

2. Claim 1

a. [1PRE]

Rosenberg-I performs a “method for providing haptic feedback to a touch input device.” Rosenberg-I, claim 37; Ward, ¶297.

b. [1A]

The processor in Rosenberg’s computer 10 (laptop) “*receiv[es] an input signal comprising information associated with a manipulation of an input device...wherein the input device comprises a touch-pad,*” as claimed.

Rosenberg-I’s touchpad 16 “inputs *a position signal*” to the processor “based on a location of user contact on the touch surface.” Abstract; 2:8-12; 4:6-8; 15:27-34; claim 37; Ward, ¶¶298-299.

Rosenberg-I touchpad is also “*configured to control a plurality of systems*” under the interpretation of that phrase that patent owner is advancing in the pending district court litigation. Specifically, patent owner has taken the position that “*a plurality of systems*” includes two different software applications running on the same device, *e.g.*, a web-browsing application and gaming application running on one videogame device. EX1021; *10X Genomics, Inc. v. Bio-Rad Labs*, IPR2020-00086, Paper 8 at 19 (Apr. 27, 2020) (“[J]udicial efficiency will be enhanced by allowing Petitioner to rely upon a claim construction that Patent Owner is relying upon...to assert infringement.”).⁶

Under patent owner’s interpretation of “*a plurality of systems*,” “touch pad 16” is “*configured to control a plurality of systems*” because computer 10 runs multiple different applications, including a web-browser and a gaming application, and the touchpad controls the user’s interaction with each application. 6:7-23 (describing the “wide variety” of “host application program(s)” that computer runs including a “video or computer game” and a “browser that implement HTML,” each

⁶ Petitioner reserves the right to dispute patent owner’s construction in the litigation.

of which “utilizes input from the touchpad 16”); Abstract; 4:43-64; Ward, ¶¶300-302.

Rosenberg-I thus meets [1A] under patent owner’s interpretation of the term “*a plurality of systems.*” Ward, ¶¶300-302.

c. [1B]

In operation, Rosenberg-I’s processor “*receiv[es] a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent,*” as claimed.

To start, Rosenberg-I discloses that its touchpad outputs haptic feedback. 2:54-55 (“haptic feedback to...a touchpad”); 4:65-67 (“touchpad 16 is provided with the ability to output haptic feedback”). This haptic feedback includes vibrations or pulses, *i.e.*, vibrotactile effects. Abstract (“haptic sensations on the touch input device can include pulses, vibrations....”); 2:41-44; Ward, ¶¶303-305.

Rosenberg-I’s haptic feedback mimics a mechanical detent, *i.e.*, provides “*a virtual detent,*” as claimed. For example, column 12 describes the use of “[p]ulse sensations...to indicate the location of ‘ticks’ for discrete values or setting in [an] adjusted range,” *e.g.*, volume. 12:57-59; 12:29-32 (describing “pulses” output when scrolling through a menu of items). Rosenberg-I’s “ticks” or “pulses” correspond with what the ’042 patent calls a “click effect virtual detent.” EX1001, 11:55-63; *see also id.*, 6:13-19; 13:47-53, FIG. 9A; Ward, ¶306. It also corresponds with a

“*virtual detent*” patent owner identifies in the related litigation. EX1021 at 8 (identifying “Scroll Wheel” behavior as a “*virtual detent*”).

Rosenberg-I further describes outputting a “pulse...to indicate the end of [a] range,” *e.g.*, volume, “has been reached.” 12:53-57; Ward, ¶¶307. It also discloses that the “strength and/or frequency of a vibration can be correlated with the adjustment of a control to indicate current magnitude of the volume or other adjusted value.” 12:61-64. This latter effect corresponds to the “hill virtual detent” depicted in the ’042 patent’s Figure 9C. EX1001, 13:63-14:5; Ward, ¶¶308.

Rosenberg-I thus discloses haptic feedback in the form of “*virtual detents*,” as claimed, and does so in multiple ways. Ward, ¶¶306-310.

At least via incorporation by reference of Rosenberg-II (*supra* p. 62), Rosenberg-I also discloses that its haptic feedback, *i.e.*, simulated detents, is generated using “force *profiles*” stored in memory, each of which comprises a “sequence of command parameters representing a force level to be applied to [an] actuator,” *i.e.*, “*haptic data*,” and each profile would have been associated with one of the mimicked mechanical detents discussed above “*associated with*” one or more systems that Rosenberg-I controls. Rosenberg-II, claims 41-43; 18:46-67 (describing “force values that have been previously calculated or sampled and stored as a digitized ‘force profile’ in memory or other storage device”); 35:42-46; FIGS. 10a-16 (depicting various “force profiles”); Ward, ¶¶311.

If Rosenberg-II's disclosures regarding "force profiles" are not incorporated into Rosenberg-I, POSAs had reasons to use Rosenberg-II's "force profiles" in Rosenberg-I. First, Rosenberg-I explicitly refers to Rosenberg-II for its disclosures of "control methods" for "providing haptic feedback" (Rosenberg-I, 6:49-54), giving POSAs reason to use Rosenberg-II's force profiles to implement Rosenberg-I. Ward, ¶¶312-313. Second, using Rosenberg-II's "force profiles" to create the vibrotactile effects that Rosenberg-I describes would have involved nothing more than the use of a known technique (Rosenberg-II's force profiles) to improve a similar device (haptic-feedback input device) in the same way to achieve predictable results (providing the device with a set of pre-defined vibrotactile effects). The use of such a "known technique" would have been obvious. Ward, ¶314; *KSR*, 550 U.S. at 417.

In operation, Rosenberg-I's processor receives a particular "force profile" stored in memory on the computer in response to a user interaction with a software program being controlled and uses that profile to command an actuator to output a particular virtual detent. 6:32-41 (touchpad "carry[s] out force commands received from the host, such commands including...the type of haptic sensation and parameters describing the commanded haptic sensation"); 15:11-17 (explaining user preferences, *e.g.*, desired haptic effects, "can be stored on the computer"); *see also* Rosenberg-II, claims 41-43 ("command parameters" in the form of "a digitized force

profile” are provided to the “microprocessor” from memory and “applied to [an] actuator by said microprocessor”), claim 58; Ward, ¶315.

For example, when a user uses the touchpad to increase the volume of a videogame that computer 10 is controlling, the processor accesses a “force profile” associated with that system (*i.e.*, the videogame), and the force profile has haptic data associated with a virtual detent such as “[p]ulse sensations...used to indicate the location of the ‘ticks’ for discrete values or setting in the adjusted [volume] range,” *i.e.*, a mechanical detent-type “tick” would be felt as each discrete volume level is passed. 11:28-29 (“Forces are preferably associated with the interactions of the cursor with displayed graphical objects.”); 12:5-6 (“Different types of graphical objects can be associated with tactile sensations.”); 12:27-49; 13:18-20 (“The user or developer can also preferably associate particular graphical objects with customized haptic sensations.”); 15:19-23; Ward, ¶316.

Rosenberg-I’s processor thus “*receiv[es] a detent profile associated with one of the systems,*” *i.e.*, a “force profile” associated with a system’s function (e.g., volume control for a videogame), “*comprising haptic data associated with a virtual detent,*” as claimed. Ward, ¶317.

d. [1C]

Rosenberg-I's processor "generat[es] a vibrotactile signal configured to cause an actuator to produce a vibrotactile effect to the input device, the vibrotactile effect comprising the virtual detent," as claimed.

The processor sends a "command signal," *i.e.*, the claimed "vibrotactile signal," to the actuator(s) coupled to the touchpad, causing the actuator to produce a vibrotactile effect comprising one of the virtual detent effects discussed above for limitation [1B], *e.g.*, a "pulse sensation" that micks a mechanical "tick." 5:18-22 ("[F]orces output on the touchpad 16 are considered 'computer-controlled' since a microprocessor...is controlling the magnitude and/or direction of the force output of the actuator(s) using electronic signals."); 6:24-27 (touchpad "process[es] command signals from the host's microprocessor"); claim 1 ("actuator outputs said force based on force information output by said processor"); claim 37; Ward, ¶¶318-319; EX1001, 6:16-18.

Rosenberg-I's processor thus meets [1C]. Ward, ¶¶320.

3. Claim 2

Rosenberg-I's computer performs claim 2's method when, for example, it performs Rosenberg-I's rate control or scrolling function.

For example, "*when*" computer 10 performs a "rate control or scrolling function...with the touchpad," *e.g.*, the computer adjusts the volume for a

videogame, “a vibration can be displayed on the device to indicate” that the action “is in process.” 12:50-53; 12:54-66 (describing additional virtual detents associated with a “rate control or scrolling function”); 14:27-31 (discussing “rate control task[s]”); Ward, ¶¶321-322. For the “rate control” or scrolling function to occur in the system being controlled, Rosenberg-I’s processor would “*generat[e] a system signal associated with [the] system to be manipulated,*” e.g., a volume control signal associated with the videogame that is being “rate controlled” by having its volume adjusted. Ward, ¶323.

The generated “*signal*” is “*based at least in part on the input signal*” that Rosenberg-I’s processors receives from the touchpad. 12:50-53 (“rate control or scrolling function is performed with the touchpad (*through the use of the cursor*)”); 15:26-44; Ward, ¶324.

Because the vibrotactile effect occurs “*when*” the “rate control or scrolling function” is occurring, e.g., the touchpad outputs a “pulse sensation” as volume on a videogame is adjusted, Rosenberg-I’s computer generates the “*system signal and...vibrotactile signal...substantially simultaneously,*” as claimed. Ward, ¶325.

4. Claim 3

As discussed for claims 1-2, Rosenberg-I’s computer performs a “rate control or scrolling function” that triggers “*the vibrotactile signal*” in limitation [1C]. That signal is “*based at least in part on the input signal,*” as claimed, because the “rate

control or scrolling function” is based on the “touchpad input signal.” 15:26-44; 12:50-66 (describing rate control and scrolling functions that occur due to “cursor” movement); 5:11-18; Ward, ¶326.

5. Claim 4

As explained *supra* §VII.A.7, the ’042 patent does not explain what “*status of the input device*” is, but patent owner has taken the position that claim 4 is met when the touchpad is used in a manner that causes a vibrotactile effect to occur. EX1021 at 15. Ward, ¶327.

Rosenberg-I’s “*vibrotactile signal*” in limitation [1C] is generated when a user is touching the touchpad in a manner that causes a rate control or scrolling function to be selected. *Supra* §VII.C.2.d; 5:11-18 (“Forces output on the pad can be at least in part based on the location of the finger on the pad”). Because the “*vibrotactile signal*” is generated when a user is contacting the pad in a manner indicative of a rate control function, the signal is “*based in part on the status of the input device,*” *i.e.*, how the touchpad is being used. Ward; ¶328; 16:62-17:6 (explaining that “when no objects are contacting the [touchpad],” then “haptic feedback” can “be stopped (actuators ‘turned off’).”).

Alternatively, it would have been obvious to implement Rosenberg-I such that the “*vibrotactile signal*” in limitation [1C] is only generated when the touchpad is operational. Ward, ¶¶329-330; EX1001, 11:49-53.

6. Claim 5

Rosenberg-I teaches that when performing a scrolling function on a list of menu items, “currently-disabled menu choices can have a weaker pulse, *or no pulse*, to indicate that the menu choice is not enabled at that time.” 12:36-38. Rosenberg-I’s computer thus “*determin[es] whether to generate a vibrotactile signal*,” as claimed. Ward, ¶331.

Likewise, Rosenberg-I teaches that the vibrotactile effects associated with a rate control or scrolling, *e.g.*, “pulse sensations” occurs “*when* a rate control or scrolling *is performed*” (12:50-53), meaning that Rosenberg-I’s processor determines whether to output a “pulse sensation” by determining whether rate control or scrolling is occurring. Ward, ¶332.

7. Claim 6

As explained for claim 5, Rosenberg-I’s laptop determines whether to generate a vibrotactile signal in part based on whether a menu item presented to the user is “currently-disabled,” which is “*a status of the system to be manipulated*.” Ward, ¶333.

8. Claim 7

When performing rate control or scrolling functions, Rosenberg-I’s laptop performs different vibrotactile effects that depend on the function being performed. 12:50-66; *supra* §VII.C.2.c (discussing [1B] and Rosenberg-I’s various virtual

detent effects). For example, when adjusting a range such as a system's volume level, Rosenberg-I's computer outputs "[p]ulse sensations...to indicate the location of the 'ticks' of discrete values or setting in the adjusted range," and a different, *e.g.*, strong, "pulse...to indicate that the end of the range has been reached." 12:50-66; Ward, ¶¶334-335. Rosenberg-I's computer thus determine whether to generate one of a plurality of detents including "tick"-type "pulse sensations" or "end of the range"-type pulse sensation depending on the rate control or scrolling function being performed. Ward, ¶336.

9. Claim 8

As discussed for claim 7, Rosenberg-I's computer generates different vibrotactile effects depending on, *e.g.*, what rate control or scrolling function is being performed. *Supra* §VII.C.8. To generate those different effects, the computer's processor "*receiv[es]*" from memory the "force profiles," *i.e.*, the claimed "*detent profile[s]*," corresponding to each effect. *Supra* §VII.C.2.c (discussing "force profiles"); Ward, ¶337.

10. Claim 9

a. [9PRE]

Supra §VII.C.2.a ([1PRE]); Ward, ¶338.

b. [9A]

Rosenberg-I meets [9A] for the same reasons it meets [1A]. The difference between the limitations is [9A]’s requirement that Rosenberg-I’s computer “*detect[s] a change in position of*” the touchpad. As explained *supra* §VII.A.12, patent owner has taken the position that the recited “*change in position*” is the change in position of a user’s finger on the touchpad, not a change in the touchpad’s own position. EX1021, 18-22. Rosenberg-I’s computer (via its processor) perform that additional step.

Rosenberg-I’s computer performs “a rate control or scrolling function...with the touchpad (through use of the cursor).” 12:50-51. Rosenberg-I teaches that this functionality is initiated “through use of the cursor” (*id.*) or when a user contacts a particular part of the touchpad (15:26-44). Ward, ¶¶339-342; 4:46-48 (explaining “cursor” movement correlates to fingertip movement on touchpad); 5:11-18; 11:23-26; 12:5-15. Rosenberg-I’s computer thus “*detect[s] a change in position of an input device,*” *i.e.*, movement of a user’s finger on the touchpad from a position that does not initiate the “rate control or scrolling function” to one that initiates those function(s). Ward, ¶343.

c. [9B]

Supra §VII.C.2.c (limitation [1B]); Ward, ¶344.

d. [9C]

Rosenberg-I meets [9C] for similar reasons as [1C]. [9C] requires that the detent signal is generated not only on the “*detent profile*,” but also “*the change in position*” discussed in [9A]. Rosenberg-I’s computer perform that additional step.

For example, as discussed above for [9A], Rosenberg-I’s computer initiates a “rate control or scrolling function” in part based on a “*change in position*” of a user’s finger on the touchpad, *i.e.*, the finger moves in a manner indicative of a scrolling or rate control selection being made. Ward, ¶¶345-347.

11. Claims 10-14

Claims 10-14 recite a “non-transitory computer-readable medium on which is encoded program code” (hereinafter, “CRM”) “for” performing steps that correspond to steps in method claims 1-2, 5, 7, and 9 according to the table below. Rosenberg-I’s processor performs all these steps as discussed in Ground 3’s sections addressing those claims. Ward, ¶¶348-358.

CRM Claim	Corresponding Method Claim
10	1
11	2
12	5
13	7
14	9

Rosenberg-I's method is "computer-controlled" and performed by a processor. 5:18-22; 3:51-53. POSAs would have understood that Rosenberg-I's processor performs the methods of claims 1-2, 5, 7, and 9 (and the steps in claims 10-14) by executing instructions ("program code") stored in memory (a "non-transitory computer-readable medium") because that is how processors worked by 2006. Ward, ¶350. Additionally, Rosenberg-II (which Rosenberg-I incorporates by reference, *supra* p. 62), discloses that electronic devices perform haptic feedback based on "program instructions" stored on a "computer readable medium." Rosenberg-II, 42:35-56; Ward, ¶350.

If considered not to be disclosed by Rosenberg-I, storing program code for performing Rosenberg-I's haptic feedback method in a computer-readable medium would have been the conventional and obvious way to implement Rosenberg-I's processor, as Rosenberg-II teaches. Rosenberg-II, 42:40-47; Ward, ¶351.

12. Claim 15

a. [15PRE]

Rosenberg-I's touchpad, processor, and actuator together form a haptic-feedback "computer system." 1:65-67; claim 1; Ward, ¶359.

b. [15A]: "touch-pad,"

Supra §VII.C.2.b (discussing [1A] and "touchpad 16"); Ward, ¶¶360-361.

c. [15B]: “a processor”

Supra §VII.C.2.b (discussing [1A] and processor of computer 10); Ward, ¶362.

(1) [15B1]

Supra §VII.C.2.b-c (discussing how computer 10’s processor performs [1A] and [1B]); Ward, ¶363.

(2) [15B2]

The “*vibrotactile signal*” Rosenberg-I generates to produce a virtual detent (*supra* §VII.C.2.d ([1C])) is a “*detent signal*.” Ward, ¶¶364-367; EX1001, 4:35-39.

d. [15C]: “at least one actuator.”

As discussed *supra* §VII.C.2.d ([1C]), Rosenberg-I’s laptop includes an actuator(s) “*coupled to*” the touchpad to produce a vibrotactile effect comprising a “*virtual detent*.” Abstract (“one or more actuators coupled to...the touchpad”); 2:14-19; 3:9-15; FIG. 3-4; Ward, ¶368.

13. Claim 16

As discussed *supra* §VII.C.3 (claim 2), Rosenberg-I’s laptop performs a rate control or scrolling operation that controls an aspect of a system (*e.g.*, volume) based on a user contacting the touchpad which is “manipulation” of the touchpad (“*input device*”) as claimed. Ward, ¶369.

14. Claim 17

Supra §VII.C.6 (claim 5); Ward, ¶370.

15. Claim 18

Supra §VII.C.12.d ([15C]); Ward, ¶371.

16. Claim 19

Rosenberg-I’s touchpad includes “sensors...to report the position of the user’s finger on the touch pad.” 6:24-29; 1:46-49; 9:15-17; claim 37; Ward, ¶372.

D. Ground 4: Claims 1-19 Obvious Over Rosenberg-I and Goldenberg

If patent owner argues that Rosenberg-II’s “force profiles” are not incorporated into Rosenberg-I and/or would not have been obvious to implement in Rosenberg-I, then implementing Rosenberg-I to use a “*detent profile*,” as claimed, would have been obvious in view of Goldenberg.

1. Goldenberg (EX1007)

Goldenberg is patent owner’s patent. Patent owner has previously conceded Goldenberg discloses an “input device” for “providing haptic feedback *simulating detents*.” EX1006, [0005].

Goldenberg’s device is a control knob for a computer. Goldenberg, 4:21-39. “The knob 26 is preferably provided with force feedback” that can “have the tactile feel of detents” which “affords a cleaner, richer user experience.” *Id.*, 6:56-67.

Goldenberg’s knob outputs force effects including “vibrations, detents, [and] jolts or pulses.” *Id.*, 13:1-3. “A basic force sensation,” that Goldenberg outputs, “is *force detents* that are output at particular predefined or regularly-spaced rotational

positions of the knob to inform the user how much the knob has rotated and/or to designate a particular position of the knob.” *Id.*, 13:14-17; 16:11-19 (“standard detent force effects” provided when moving between menu items); claim 2. “[D]ifferent sets of *detent force profiles* can be stored in a memory device on the device and a particular set can be provided on the knob 26 by a microprocessor or other controller in the device.” *Id.*, 13:31-34; Ward, ¶¶374-378.

Although Goldenberg’s exemplary input device is a knob, its effects “can be used in a variety of force feedback devices besides rotational devices.” Goldenberg, 25:57-62; 12:19-22 (“non-rotational contexts”).

2. The Rosenberg-Goldenberg Combination

POSAs had reasons to implement Rosenberg-I’s laptop such that its processor accesses Goldenberg’s “*detent force profile[s]*” from memory to generate vibrotactile feedback that simulates the detents disclosed by Goldenberg, *e.g.*, when performing Rosenberg-I’s rate control or scrolling functionality. Ward, ¶379.

First, Goldenberg motivates the combination because it teaches that its “force detents” provide “a cleaner, richer user experience,” and POSAs would have sought to provide such user experiences in Rosenberg-I’s computer using detent force profiles as Goldenberg teaches. Goldenberg, 6:56-67; Ward, ¶380.

Second, Goldenberg provides details on how to simulate detents for the rate control and scrolling functions Rosenberg-I’s computer performs. Ward, ¶381. For

example, Goldenberg discloses a “standard detent force effect” where detents are output when scrolling through “successive item[s] in a linear menu.” Goldenberg, 16:11-25; FIG. 4; 2:40-42 (“A detent force can be output when cursor moves from one menu item to a different menu item.”); 21:15-22:16 (discussing “detent model” and “scrolling list force model”); FIG. 6. It likewise discloses “a jolt force” that is “stronger in magnitude than normal detents, [and] which informs the user that the end of a value range or other range has been reached.” *Id.*, 19:27-33. POSAs would have understood that these “detent” effects would work with Rosenberg’s rate control function and scrolling functions. Ward, ¶¶382-383. POSAs would therefore have looked to Goldenberg to provide details regarding how to simulate mechanical detents for Rosenberg-I’s rate control and/or scrolling functions. Ward, ¶384.

Third, applying Goldenberg’s technique for simulating mechanical detents—*i.e.*, using “force detent profiles”—to Rosenberg-I’s laptop that also simulates mechanical detents is no more than the combination of familiar elements according to known methods to yield the predictable result of input devices that simulate mechanical detents. Ward, ¶385; *KSR*, 550 U.S. at 416.

The Rosenberg-Goldenberg combination stores Goldenberg’s “force detent profiles” in memory on Rosenberg-I’s laptop so that its processor accesses the stored profiles to generate command signals to send to the actuator(s) coupled to the touchpad, the command signals causing the actuator to simulate mechanical detents

in accordance with the particular “force detent profile” that is accessed. Ward, ¶386; Goldenberg, 11:32-36 (describing computer with memory); 13:31-34 (“detent force profiles” are stored in memory). When a user performs a rate control or scrolling operation that Rosenberg-I describes (*e.g.*, scrolling through a list or adjusting volume) using Rosenberg-I’s touchpad, the laptop’s processor receives from memory a “force detent profile” as taught by Goldenberg that is associated with the system operation being controlled (*e.g.*, the profile for a “standard detent force effect[]” used when scrolling menus). Ward, ¶387; Goldenberg, 16:11-19.

POSAs would have reasonably expected success in implementing the Rosenberg-Goldenberg combination because Goldenberg teaches that its “force detent profiles” can be used when controlling a “home computer” like Rosenberg-I’s laptop. Goldenberg, 4:21-39; Ward, ¶388. Moreover, Goldenberg’s “force detent profiles” are accessed and executed by a processor, like the processor in Rosenberg-I’s laptop, and can be output by an actuator(s), which Rosenberg-I’s laptop includes. Goldenberg, 9:7-27 (identifying exemplary known processors); *id.*, 10:11-30 (listing suitable actuators); Rosenberg-I, 2:29-30 (describing exemplary actuators); Ward, ¶388.

Goldenberg’s teachings are also useful in “force feedback devices besides rotational devices” (Goldenberg, 25:57-62), which POSAs understood encompasses Rosenberg-I’s touchpad. Ward, ¶389. Goldenberg’s teaching is consistent with

POSAs’ understanding that vibrotactile detents can be output to touchpads, like Rosenberg-I’s, using conventional actuators. *Id.* The ’042 patent itself provides no details on how its actuator provides virtual detents, underscoring that such implementations details were known. Ward, ¶389; *Uber Techs.*, 957 F.3d at 1339.

3. Claims 1-19

The lone distinction between Ground 3 and Ground 4 is the latter’s use of Goldenberg’s “force detent profiles,” which is relevant limitations [1B], [10B], [14B], and [15B1]. For other limitations in claims 1-19 the Rosenberg-Goldenberg combination meets those limitations for same reasons Rosenberg-I alone does. *Supra* VII.A.

For limitations [1B], [10B], [14B], and [15B1], in Rosenberg-Goldenberg, Rosenberg-I’s processor accesses (and thus receives) from memory the “force detent profiles” taught in Goldenberg that are associated with the rate control or scrolling function(s) Rosenberg-I’s device is performing for a particular application. Ward, ¶¶390-391; *supra* §VII.D.2. For example, when adjusting the volume in a videogame or scrolling through a menu list presented on an Internet browser, Rosenberg-I’s processor would receive from memory the Goldenberg “force detent profile” associated with that function. Goldenberg, 2:40-42 (“detent force can be output when the cursor moves from one menu item to a different menu item.”); 16:11-19 (describing “standard detent force effects” associated with scrolling a

menu list); 21:38-34 (“Scrolling List Model”); 22:48-23:13 (describing Slider Model used for volume control and which “output[s]” “detents”); Ward, ¶391.

Goldenberg’s “force detent profile[s]” map the magnitude of a vibrational force to a position of the input device as shown by Goldenberg’s common “force detent profiles” in Figures 4A-4D. Goldenberg, 13:14-34, 14:48-15:55; 16:15-25. When implemented in a touchpad, the position of the input device corresponds to movement of the user’s finger on the touchpad, *e.g.*, moving from point A to point B on the touchpad. Ward, ¶392.

POSAs would have understood the force magnitude and position information included in Goldenberg’s “force *detent profile*” to be “*haptic data associated with a virtual detent*,” as claimed. Ward, ¶393. Therefore, in operation, the “processor” of Rosenberg-Goldenberg “*receiv[es] a detent profile associated with one of the systems*,” as recited in [1B], [10B], [14B], and [15B1], *i.e.*, a Goldenberg “force detent profile” for a scrolling or rate control function associated with a particular program Rosenberg-I’s computer is running such as a videogame or Internet browser. Ward, ¶393; *supra* §VII.C.2.c ([1B]) (explaining that Rosenberg-I uses “profiles” that are associated with different systems); Rosenberg-I at 11:28-29; 12:5-6; 12:27-49; 13:18-20; 15:19-23.

VIII. NO BASIS FOR DISCRETIONARY DENIAL

A. *Fintiv*

Under the Director’s Interim Procedure for Discretionary Denials, the PTAB will not deny institution based on *Fintiv*⁷ if there is compelling evidence of unpatentability, which this Petition provides, thereby concluding the *Fintiv* analysis. *Nokia of Am. Corp. v. TQ Delta*, IPR2022-00471, Paper 11 at 19-21 (Aug. 18, 2022). Regardless, the *Fintiv* factors weigh against discretionary denial.

1. Potential for Stay

Petitioner will seek a pre-institution stay, but without “specific evidence” how the court will rule, this factor is neutral. *Sand Revolution II v. Continental Intermodal Group–Trucking*, IPR2019-01393, Paper 24 at 7 (June 16, 2020) (informative).

2. Timing of Trial

The Board considers the median time to trial which is 27 months for the Western District of Washington. EX1083, 76; *but see* EX1020 (identifying June 2025 trial-ready date). A trial would thus likely occur in late August 2025, *after* a final written decision would be expected. *Cf. Sony Interactive v. Quantum Imaging*,

⁷ *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (Mar. 20, 2020) (precedential).

IPR2023-00954, Paper 11 at 26 (Dec. 11, 2023) (trial four months *before* FWD “weighs *against* discretionary denial”).

Moreover, Petitioner filed this petition with diligence, filing three months after receiving patent owner’s list of asserted claims, and fourth months before the §315(b) deadline. EX1019; EX1084. Factor 2 thus weighs against denial. *Fintiv*, Paper 11 at 11 (“expeditiously” filed petitions “weigh[] against [denial]”).

3. Litigation Investment

Other than initial motion practice and preliminary contentions, the parties have invested little in the litigation, weighing against denial. *Samsung Elecs. v. Netlist, Inc.*, IPR2022-00063, Paper 13 at 8 (May 5, 2022) (granting institution where no “claim construction and merits determinations” had occurred).

4. Issue Overlap

Petitioner challenges all 19 claims of the ’042 patent, whereas patent owner asserts only a subset of those claims in district court. EX1021. That a trial here will address claims the district court will not address weighs against denial. *Markforged Inc. v. Continuous Composites, Inc.*, IPR2022-00679, Paper 7 at 32-33 (Oct. 25, 2022).

5. Litigation Defendants

Petitioner is the defendant in district court, which “is far from an unusual circumstance.” *Sand Revolution II*, Paper 24 at 12-13. This factor is neutral.

B. *Advanced Bionics*

Discretionary denial under *Advanced Bionics v. Med-El*, IPR2019-01469, Paper 6 (Feb. 13, 2020) (precedential) is not warranted.

1. Step 1: The Petition Advances Art and Arguments Not Previously Considered

Levin was cited during prosecution, but was not applied as a basis for rejection. Likewise, the Office did not previously consider Levin’s teachings in light of Ichinose (not cited during prosecution) and the Office did not consider the petition’s grounds that do not rely upon Levin. Step 1 of the *Advanced Bionics* framework is thus not satisfied, and there is no need to proceed to Step 2. *Samsung Elecs.*, IPR2022-00063, Paper 13 at 13.

2. Step 2: The Office Erred Materially

If Step 1 is satisfied because Levin was cited in an IDS, discretionary denial is still unwarranted because the Office erred materially in its prior “evaluation.” Step 2 focuses on *Becton, Dickinson* factors (c) and (e)-(f) (*Advanced Bionics*, 10), which weigh against denial.

a. Factor (c): Levin Was Not Previously Evaluated

The Board has “consistently held that a reference that ‘was neither applied against the claims nor discussed by the examiner,’” like Levin, “does not weigh in favor of exercising our discretion under §325(d).” *Bowtech, Inc. v. MCP IP, LLC*, IPR2019-00382, Paper 12 at 12 (Aug. 6, 2019).

b. Factors (e)-(f): The Office Erred

Where “the Office’s previous consideration of the art is not well developed or silent, then a petitioner may show the Office erred by overlooking something persuasive under factors (e) and (f).” *Advanced Bionics* at 10. Here, the Petition details how Ichinose in view of Levin renders obvious claims 1-19, demonstrating the Office’s error in allowing the claims despite Levin being of record.

IX. CONCLUSION

The Board should institute IPR.

Respectfully submitted,
Valve Corp.

Date: 01-19-2024

By: /Richard Giunta/
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CERTIFICATE OF SERVICE UNDER 37 C.F.R. § 42.6 (E)(4)

I certify that on January 19, 2024, I will cause a copy of the foregoing document, including any exhibits or appendices filed therewith, to be served via Overnight FedEx at the following correspondence address of record for the patent:

Immersion / Kilpatrick Townsend and Stockton
Mailstop: IP Docketing - 22
1100 Peachtree Street
Suite 2800
Atlanta, GA 30309

Date: January 19, 2024

/MacAulay Rush /
MacAulay Rush
Paralegal
WOLF, GREENFIELD & SACKS, P.C.

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24, the undersigned certifies that the foregoing IPR petition contains 13,997 words excluding a table of contents, a table of authorities, Mandatory Notices under § 42.8, a certificate of service or word count, or appendix of exhibits or claim listing. Petitioners have relied on the word count feature of the word processing system used to create this paper in making this certification.

Date: January 19, 2024

/MacAulay Rush /
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X. CLAIM LISTING

The following claim listing assigns element labels (e.g., [1A1], [1A2], etc.) to certain claims for clarity.

Claim 1
[1PRE] A method comprising:
[1A] receiving an input signal comprising information associated with a manipulation of an input device configured to control a plurality of systems, wherein the input device comprises a touch-pad;
[1B] receiving a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent; and
[1C] generating a vibrotactile signal configured to cause an actuator to produce a vibrotactile effect to the input device, the vibrotactile effect comprising the virtual detent.
Claim 2
The method of claim 1, further comprising generating a system signal associated with a system to be manipulated, the system signal based at least in part on the input signal, and wherein generating a system signal and generating the vibrotactile signal occur substantially simultaneously.
Claim 3
The method of claim 1, wherein the vibrotactile signal is based at least in part on the input signal.
Claim 4
The method of claim 1, wherein the vibrotactile signal is further based in part on the status of the input device.
Claim 5
The method of claim 1, further comprising determining whether to generate a vibrotactile signal.
Claim 6
The method of claim 5, wherein determining whether to generate a vibrotactile signal is based at least in part on a status of the system to be manipulated.
Claim 7
The method of claim 1, further comprising determining one of a plurality of virtual detents to generate.

Claim 8
The method of claim 1, wherein the detent profile comprises a first detent profile, and further comprising receiving a second detent profile.
Claim 9
[9PRE] A method comprising:
[9A] detecting a change in position of an input device configured to control one of a plurality of systems, wherein the input device comprises a touch-pad;
[9B] receiving a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent; and
[9C] generating a detent signal based at least in part on the detent profile and the change in position, the detent signal configured to cause an actuator to produce a vibrotactile effect to the input device, the vibrotactile effect comprising the virtual detent, the vibrotactile effect based at least in part on the detent signal.
Claim 10
[10PRE] A non-transitory computer-readable medium on which is encoded program code, the program code comprising:
[10A] program code for receiving an input signal comprising information associated with the manipulation of an input device configured to control one of a plurality of systems, wherein the input device comprises a touch-pad;
[10B] program code for receiving a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent; and
[10C] program code for generating a detent signal configured to cause an actuator to produce a vibrotactile effect to the input device, the vibrotactile effect comprising the virtual detent.
Claim 11
The computer-readable medium of claim 10, further comprising program code for generating a system signal associated with a system to be manipulated, the system signal based at least in part on the input signal.
Claim 12
The computer-readable medium of claim 10, further comprising program code for determining whether to generate a detent signal.
Claim 13
The computer-readable medium of claim 10, further comprising program code for determining a virtual detent to generate.

Claim 14
[14PRE] A non-transitory computer-readable medium on which is encoded program code, the program code comprising:
[14A] program code for detecting a change in position of an input device configured to control one of a plurality of systems, wherein the input device comprises a touch-pad;
[14B] program code for receiving a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent; and
[14C] program code for generating a detent signal based at least in part on the change in position, the detent signal configured to cause an actuator to produce a vibrotactile effect to the input device, the vibrotactile effect comprising the virtual detent, the vibrotactile effect based at least in part on the detent signal.
Claim 15
[15PRE] A system comprising:
[15A] an input device configured to control one of a plurality of systems, wherein the input device comprises a touch-pad;
[15B] a processor in communication with the input device,
[15B1] the processor configured to receive an input signal and a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent,
[15B2] the processor further configured to generate a detent signal; and
[15C] at least one actuator coupled to the input device, the at least one actuator configured to receive the detent signal and produce a vibrotactile effect to the input device, the vibrotactile effect comprising the virtual detent.
Claim 16
The system of claim 15, wherein the processor is further configured to control a system based at least in part on a manipulation of the input device.
Claim 17
The system of claim 15, wherein the processor is further configured to determine whether to generate a detent signal.
Claim 18
The system of claim 15, wherein the at least one actuator is coupled to a housing of the input device.

Claim 19

The system of claim 15, wherein the input device comprises a sensor.