EXHIBIT A

Exhibit A

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A. Agreed-upon Constructions

Claim Term[1]	Joint Proposed Construction
"range" '907 Patent, claims 1, 2, 5, 8, 9, 12, 15, 16, 18	"a sequence, series, or scale between limits"
"primary range" '907 Patent, claims 1, 2, 8, 9, 15, 16	"range" as construed above, but otherwise plain and ordinary meaning
"secondary range" '907 Patent, claims 1, 2, 5, 8, 9, 12, 15, 16, 18	"range" as construed above, but otherwise plain and ordinary meaning
"boundary range" '907 Patent, claims 1, 2, 5, 8, 9, 12, 15, 16, 18	"range" as construed above, but otherwise plain and ordinary meaning
"a haptic output signal based at least in part on the first and second sensor signals" '738 Patent, claims 1, 15, 19	"a haptic output signal based at least in part on both the first sensor signal and the second sensor signal"

[1] References to claims in the claim term column include only asserted claims in which the claim term appears. The claim term may also appear in other unasserted claims.

B. Disputed Constructions

Claim Term	Plaintiff's Proposed Construction and Evidence in Support[2]	Defendant's Proposed Construction and Evidence in Support[3]
"computer-readable medium having instructions" '260 Patent, claim 1	Proposed Construction: Plain and ordinary meaning Dictionary/Treatise Definitions: The IEEE Standard Dictionary of Electrical and Electronics Terms (6th ed.) (1999): definition of "machine-readable:" *pertaining to a medium that can record information and convey it to a machine or sensing device; pertaining to information that can be read and processed by a machine*. IMMRVLV-0010777. The IEEE Standard Dictionary of Electrical and Electronics Terms (6th ed.) (1999): definition of "medium:" *the material, or configuration thereof, on which data are recorded; for example, paper tape, cards, magnetic tape*. IMMRVLV-0010778.	Proposed Construction: "a storage or transmission device that stores, transmits, or carries instructions" Dictionary/Treatise Definitions: IEEE 100 The Authoritative Dictionary of IEEE Standards Terms (7th ed.) (2000): definition of "channel" Intrinsic Evidence: Claims 2-9 (referring to a "computer-readable medium … further comprising stored instructions") '260 Patent 5:5-22 ("On embodiments of a suitable computer-readable medium includes an electronic, optical, magnetic, or other storage or transmission device capable of providing a processor, such as the

[2] Immersion reserves the right to rely on any intrinsic evidence of the patents-in-suit not cited here, to the extent that Valve proffers statements that are inconsistent with its positions in that intrinsic evidence, including but not limited to positions taken by Valve in the IPRs. Immersion likewise reserves the right to address any intrinsic or extrinsic evidence identified by Valve.

[3] Valve reserves the right to rely on any intrinsic evidence of the patents-in-suit not cited here, to the extent that Immersion proffers statements that are inconsistent with its positions in that intrinsic evidence, including but not limited to positions taken by Immersion in the prosecution history or IPRs of the patents-in-suit. Valve likewise reserves the right to address any intrinsic or extrinsic evidence identified by Immersion. Valve also reserves the right to rely on any extrinsic evidence disclosed by Immersion, including without limitation the Declaration of Dr. Robert Akl. In addition, Valve expects certain expert depositions to occur before the close of claim construction discovery under PAT 133 on April 26, 2024, and Valve reserves the right to cite any testimony from those depositions.

Claim Term	Plaintiff's Proposed Construction and Evidence in Support[2]	Defendant's Proposed Construction and Evidence in Support[3]
	The New Oxford American Dictionary (2001): definition of "instruction set:" *the complete set of all the instructions in machine code that can be recognized and executed by a central processing unit.* IMMRVLV-0010789. Modern Dictionary of Electronics (7th ed.) (1999): definition of "instruction:" *in a computer, a single order within a program. This order will be fetched from memory, decoded, and executed by the CPU.* IMMRVLV-0010785. <u>Intrinsic Evidence</u>: '260 Patent 4:63-5:37 ("The controller 9 is located in a suitable location according to the needs of the device in which the apparatus 1 is placed. In one embodiment, the controller 9 is attached to the PCB 4 as shown in FIG. 1. Suitable controllers, include, for example, digital logical processors capable of processing to created the desired tactile sensations in the input device in response to the inputs received from that input device. Such controllers may include a microprocessor, an Application Specific Integrated Circuit (ASIC), and state machines. Such controllers include, or may be in communication with, media, for example computer readable media, which stores instructions that, when executed by the controller, cause the controller to perform the steps described herein as carried out, or assisted, by a controller. On embodiments of a Suitable	processor in a web server, with computer-readable instructions. Other examples of suitable media include, but are not limited to, a floppy disk, CD-ROM, magnetic disk, memory chip, ROM, RAM, ASIC, configured processor, all optical media, all magnetic tape or other magnetic media, or any other medium from which a computer processor can read. Also, various other forms of computer-readable media may transmit or carry instructions to a computer, including a router, private or public network, or other transmission device or channel.") '507 Patent 4:24-37 (containing nearly identical language to '260 Patent 5:5-22); '507 Patent claim 9 ("non-transitory computer-readable medium") '507 Patent File History, 07-19-2012 Non-final Rejection at 2-4 ("1. Claims 10-15 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. As claim 10, the claim limitation recites 'A computer-readable medium comprising program code'. However, the usage of the phrase 'computer-readable medium' is broad enough to include both 'non-transitory' and 'transitory' (moving electrons, etc) media. The specification does not clearly limit the utilization of a non-transitory computer readable medium and, thus does not constitute functional descriptive material. Therefore, when the broadest reasonable interpretation of a claim covers a signal per se, the claim must be rejected under 35 U.S.C. § 101 as covering non-

Claim Term	Plaintiff's Proposed Construction and Evidence in Support[2]	Defendant's Proposed Construction and Evidence in Support[3]
	computer-readable medium includes an electronic, optical, magnetic, or other storage or transmission device capable of providing a processor, such as the processor in a web server, with computer-readable instructions. Other examples of Suitable media include, but are not limited to, a floppy disk, CD-ROM, magnetic disk, memory chip, ROM, RAM, ASIC, configured processor, all optical media, all magnetic tape or other magnetic media, or any other medium from which a computer processor can read. Also, various other forms of computer-readable media may transmit or carry instructions to a computer, including a router, private or public network, or other transmission device or channel. In one embodiment, the apparatus 1 includes a dedicated controller 9 for use specifically with the apparatus 1. This embodiment is particularly well suited for applications where the apparatus 1 is retro-fitted into an existing electrical or electronic device. In another embodiment, the con troller 9 is the microprocessor or Central Processing Unit (CPU) of the electronic device in which the apparatus 1 is disposed. The apparatus 1 can also include additional circuitry Such as the drive circuitry (not shown) necessary to create the tactile sensations in the actuator 6 in response to input from the controller 9 and a memory medium for storing data to be accessed by the controller 9 for example a correlation between the tactile sensations to be produced in the actuator 6 and the input information or input signal received from the input device 2.")	statutory subject matter. See In re Nuijten, 500 F.3d 1346, 1356-57 (Fed. Cir. 2007) (transitory embodiments are not directed to statutory subject matter). …"); 11-19-2012 Response After Final Action; 11-19-2012 Amendments to the Claims at 3-4 (amending claims 10-15 to refer to "non-transitory computer-readable medium"), and Applicant Arguments/Remarks Made in an Amendment at 6-7 (arguing the addition of the "non-transitory" limitation obviates the reason for the Examiner's rejection of claims 10-15 under 35 U.S.C. § 101) '042 Patent 5:31-42 (containing nearly identical language to '260 Patent 5:5-22); '042 Patent File History, 02-28-2012 Non-final Rejection ("Claims 10-14 are rejected under 35 U.S.C. 101 because the claims recite 'a computer-readable medium'. The specification (paragraph [0039]) defines the computer readable medium to include signal or carrier wave."); 04-27-2012 Response After Final Action, Amendments to Claims (amending claim 10 and 14 to refer to "non-transitory computer-readable medium"), and Applicant Arguments/Remarks Made in an Amendment at 7-8 (arguing the addition of the "non-transitory" limitation obviates the reason for the Examiner's rejection of claims 10-15 under 35 U.S.C. § 101) '546 Patent 2:60-3:7 (referring to "data in a modulated data signal such as a carrier wave or other transport mechanism" as examples of "computer-readable

Claim Term	Plaintiff's Proposed Construction and Evidence in Support[2]	Defendant's Proposed Construction and Evidence in Support[3]
	'260 Patent 7:57-64 ("In the embodiment shown in FIG. 1, the input signals that are transmitted by the input devices are transmitted to a controller 9. In the embodiment shown, the controller is in communication with storage memory (not shown). Examples of such memory includes Read Only Memory (ROM). The storage memory includes a table in which input signals are associated with various haptic feedback signals. This is explained more fully in relation to FIGS. 9-10.") Extrinsic Evidence:[4] Declaration of Dr. Robert Akl	medium"); '546 Patent, claims 1-4, 13-20 (referring to a "non-transitory computer-readable medium"); '546 Patent File History, 11-13-2014 Non-Final Rejection at 2-4 (rejecting claims under 35 U.S.C. § 101 because the claims recite "a computer readable medium" and because "the usage of the phrase 'computer readable medium' is broad enough to include both 'non-transitory' and 'transitory' (moving electrons, etc.) media. …"); 02-13-2015 Response After Final Action, Amendments to Claims (amending claims to refer to "non-transitory computer-readable medium"), and Applicant Arguments/Remarks Made in an Amendment at 13 (arguing the addition of the "non-transitory" limitation obviates the reason for the Examiner's rejection of claims disclosing "computer-readable medium" under 35 U.S.C. § 101) '907 Patent, claims 8-14 (referring to a "non-transitory computer-readable medium"); '907 Patent 3:40-50 (describing "non-transitory memory") '067 Patent 3:19-30 (describing "tangible (and non-transitory) computer-readable medium"), claim 21 (referring to a "non-transitory computer-readable medium")

[4] Immersion reserves the right to rely on any extrinsic evidence disclosed by Valve, including without limitation the Opening Expert Report of Jeremy Cooperstock. In addition, Immersion expects certain expert depositions to occur before the close of claim construction discovery under PAT 133 on April 26, 2024, and Immersion reserves the right to cite any testimony from those depositions.

Claim Term	Plaintiff's Proposed Construction and Evidence in Support[2]	Defendant's Proposed Construction and Evidence in Support[3]
		'738 Patent claim 19 (referring to a "computer-readable non-transitory medium")

Claim Term	Plaintiff's Proposed Construction and Evidence in Support	Defendant's Proposed Construction and Evidence in Support
"determining . . . a change in pressure" / "change in pressure threshold" '507 Patent, claims 1	Proposed Construction: Plain and ordinary meaning Dictionary/Treatise Definitions: Modern Dictionary of Electronics (7th ed.) (1999): definition of "threshold:" *the point at which an effect is first produced, observed, or otherwise indicated.* IMMRVLV-0010768. The New Oxford American Dictionary (2001): definition of "pressure:" *the continuous physical force exerted on or against an object by something in contact with it.* IMMRVLV-0010771. The New Oxford American Dictionary (2001): definition of "threshold:" *the magnitude or intensity that must be exceeded for a certain reaction, phenomenon, result, or condition to occur or be manifested.* IMMRVLV-0010773. Intrinsic Evidence:	Proposed Construction: "computing the difference between the current pressure and a prior pressure" / "a threshold for the difference between the current pressure and a prior pressure" Intrinsic Evidence: '507 Patent 1:53-55 ("Changes in position on the touchpad and in the pressure exerted on the surface of the touchpad must be used to determine the user's intent."). '507 Patent 1:58-63 ("Variables affecting the ability of a program to determine what a user is attempting to do include the following: [...] the variance in pressure between different users and between the same user."). '507 Patent 5:11-14 ("Thresholds for pressure, pseudo pressure, pseudo-pressure change, velocity, and other measures may be stored in a computer-readable medium when the device is manufactured.").

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	'507 patent 7:29-32 ("Also, in the embodiment shown in FIG. 3, the change in pseudo pressure is digitally filtered to reduce the effects of unwanted noise, which results from extraneous contact with the touchpad (102), such as sliding of a finger.") '507 patent 9:4-6 ("Such a filter computes a rolling average using a weighting function emphasizing more recent samples.") '507 patent 9:21-24 ("However, various types of filters, utilizing a variety of waveforms, a combination of filters, and other processing means may be used as part of a process for determining a users intent.") '507 patent 9:32-35 ("In another embodiment, the threshold is based on the standard deviation of the pseudo-pressure change. In yet another embodiment, more Sophisticated filtering techniques are utilized.") <u>Extrinsic Evidence</u>: Declaration of Dr. Robert Akl	'507 Patent 5:27-30 ("A processor executing the process shown compares the pseudo pressure against a minimum threshold value and compares changes in pseudo pressure against additional minimum thresholds."). '507 Patent 5:63-6:47 ("The processor (106) determines that the finger is on the touchpad (102) by evaluating the pseudo-pressure (Z) parameter. If the Z parameter is greater than zero, the user's finger is touching. If not, the algorithm repeats step 204 until a finger is detected. [...] If the first tick count has not elapsed, the threshold is set to the first threshold for the key 220. The threshold value is then compared to the change in pseudo pressure 222. If the change in pseudo pressure does not exceed the threshold set in steps 218 and 220, the process repeats beginning at Step 204. If the change in pseudo pressure exceeds the threshold value, the pseudo pressure, i.e., the current value of Z, is compared to an absolute threshold 224. If the pseudo pressure does not exceed the absolute threshold, the process repeats beginning at step 204. If the pseudo pressure exceeds the absolute threshold, then the processor (106) determines that the user is pressing the key 226."); *see also* Fig. 2. '507 Patent 7:9-33 ("Similar to the embodiment shown in FIG. 2, in the process shown in FIG. 3, a processor (106) compares the pseudo pressure against a minimum threshold value and compares the change in pseudo pressure against a minimum threshold

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		value. […] In the embodiment shown in FIG. 2, the processor (106) compares the pseudo pressure against both lower and upper thresholds to determine whether the finger is touching. If the finger was not previously touching the touchpad (102), the processor (106) requires that the pseudo pressure exceed the upper threshold before the processor (106) can conclude that the finger is currently touching the touchpad (102). […] Also, in the embodiment shown in FIG. 3, the change in pseudo pressure is digitally filtered to reduce the effects of unwanted noise, which results from extraneous contact with the touchpad (102), such as sliding of a finger."); *see also* Fig. 3. '507 Patent 8:6-9:20 ("In the embodiment shown in FIG. 3, a processor (106) executing program code first compares the pseudo pressure to an upper threshold value 302. [...] If the speed is less than the speed threshold, the change in pseudo pressure is compared to a threshold value 322. If the change in pseudo pressure is less than or equal to the threshold, the processor (106) returns to step 302 in the process. If the change in pseudo pressure is greater than the threshold, the processor (106) determines whether the first interval has elapsed 324. […] In one such embodiment, three variables are filtered: (1) the speed at which the finger moves across the surface of the touchpad (102), (2) the pseudo-pressure (Z), and (3) the change in pseudo-pressure (ΔZ). The filtering of each of the above quantities may be performed using the same type of filter or different types of filters. For

Claim Term	Plaintiff's Proposed Construction and Evidence in Support	Defendant's Proposed Construction and Evidence in Support
		example, in one embodiment, [...]"); *see also* Fig. 3 '507 Patent 9:25-33 ("In one embodiment, the change in pseudo pressure is computed by subtracting the filtered (average) pseudo pressure from the current pseudo pressure. In another embodiment, the previous filtered pseudo pressure is subtracted from the current filtered pseudo pressure. In one embodiment, the user adjusts the threshold values for each key to attain maximum accuracy in intent determination. In another embodiment, the threshold is based on the standard deviation of the pseudo-pressure change.") '507 Patent File History, 05-13-2013 Applicant's Amendment/Remarks at 8 ("Because Fujita does not disclose '... determining a pressure and a change in pressure ... and ... a change in pressure threshold...' as recited in claim 1, claim 1 is patentable over Fujita. As the Board of Appeals noted in the parent application of the present application, Fujita does not disclose or suggest 'comparing a change in pressure to a change in pressure threshold.' See U.S. Patent App. No. 10/723,778, Decision on Appeal mailed December 14, 2011, p.6 (reversing rejection based on Fujita in combination with other references for the same reasons as the independent claims). Such functionality is recited in amended claim 1, and thus claim 1 is patentable over Fujita."), 9-11 (similar) '507 Patent File History, 06-25-2013 Non-Final Rejection at 5 ("Fig. 19 of Gillespie teaches

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		determining ... a change in pressure threshold (Zpushdown, col. 48, line 65 to col. 49, lines 12 for example). ")

Claim Term	Plaintiff's Proposed Construction and Evidence in Support	Defendant's Proposed Construction and Evidence in Support
"actual pressure" / "pseudo pressure" '507 Patent, claims 2, 3	Proposed Construction: Plain and ordinary meaning Dictionary/Treatise Definitions: The New Oxford American Dictionary (2001): definition of "pressure:" *the continuous physical force exerted on or against an object by something in contact with it.* IMMRVLV-0010771. Intrinsic Evidence: '507 patent 2:7-15 ("An embodiment of the present invention provides systems and methods for adaptive interpretation of input received from a touch-sensitive input device by receiving a pressure signal indicating a pressure from the input device, comparing the pseudo pressure signal to an adaptive pressure threshold value, and outputting a signal if the pseudo pressure signal is greater than the adaptive pressure threshold value. Further details and advantages of embodiments of the present invention are set forth below.") '507 patent 2:53-63 ("The touchpad 102 shown does not sense an actual pressure. Instead, the pressure reading from the touchpad 102 is a pseudo pressure. Touchpads work by utilizing resistance, capacitance, or membrane Switches. The touchpad 102 shown in FIG. 1 utilizes capacitance, however, an embodiment of the present invention may be implemented in conjunction	Proposed Construction: "a direct measure of pressure" / "an indirect measure of pressure"; the claims fail to provide a person with ordinary skill in the art ("POSITA") with reasonable certainty about the limits to the full scope of the term "pseudo pressure" Intrinsic Evidence: '507 Patent 2:53-3:50 ("The touchpad 102 shown does not sense an actual pressure. Instead, the pressure reading from the touchpad 102 is a pseudo pressure. Touchpads work by utilizing resistance, capacitance, or membrane switches. The touchpad 102 shown in FIG. 1 utilizes capacitance, however, an embodiment of the present invention may be implemented in conjunction with any touch-sensitive input device, including resistive and membrane-switch touchpads. In other embodiments, actual pressure may be sensed. For example, in one embodiment, a touch screen with an attached explicit pressure sensor is utilized. […] The touchpad 102 also provides a pseudo pressure, Z. The pseudo pressure is based on the amount of capacitance resulting from the conductor touching the touchpad 102. Accordingly, the amount of capacitance is not a direct measure of pressure but rather a pseudo pressure. In other words, the pseudo pressure or Z parameter provided by the touchpad 102 is not a measure of the actual vertical displacement by a conductor at a single point on the touchpad 102, but

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	with any touch-sensitive input device, including resistive and membrane-switch touchpads. In other embodiments, actual pressure may be sensed. For example, in one embodiment, a touch screen with an attached explicit pressure sensor is utilized.") '507 patent 3:10-39 ("The touchpad 102 also provides a pseudo pressure, Z. The pseudo pressure is based on the amount of capacitance result ing from the conductor touching the touchpad 102. Accordingly, the amount of capacitance is not a direct measure of pressure but rather a pseudo pressure. In other words, the pseudo pressure or Z parameter provided by the touchpad 102 is not a measure of the actual Vertical displacement by a conductor at a single point on the touchpad 102, but rather an estimation of the vertical displacement based on the size of the capacitance change. The pseudo pressure may not accurately represent the amount of pressure actually exerted on the touchpad 102. For example, the larger the Surface of the conductor used on the touchpad 102, e.g., a user's finger, the larger the change in capacitance per amount of pressure exerted. As would be expected, if a user presses heavily against the touchpad 102 with a fleshy part of the finger, the amount of touchpad 102 area covered by the finger is greater than then when the same part of the finger is touching lightly. However, what is less obvious is that the area covered, and the corresponding pseudo pressure, is also greater than when the user presses heavily with a bony part of a finger. Additionally, the	rather an estimation of the vertical displacement based on the size of the capacitance change. The pseudo pressure may not accurately represent the amount of pressure actually exerted on the touchpad 102. […]The difficulty in determining a user's intent by evaluating the data provided by the touchpad 102 is compounded by the different ways in which a conductor may be utilized. For example, the pressure exerted across the surface of the touchpad may vary as the user's finger moves in relation to the hand. The user's finger covers a larger area of the touchpad when the finger is extended horizontally away from the hand on the touchpad 102 than when the finger is close to the hand. Similarly, a pointing device held vertical in relation to the touchpad 102 may cover a smaller surface area than one held at an angle to the touchpad 102.") '507 Patent 4:66-5:5 ("In one embodiment of the present invention, a processor receives a pressure signal indicating a pressure from the input device, compares the pressure signal to an adaptive pressure threshold value, and outputs a signal if the pressure signal is greater than the adaptive pressure threshold value. The pressure may be a pseudo pressure or an explicit pressure. Also, the pressure may be filtered.

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	difference in the features of different conductors, for instance the size or makeup of different users fingers, affects the capacitance change for any given change in pressure. For example, if a first user with a large finger applies the same pressure as a second user with a small finger, the pseudo pressure signal output by the touchpad 102 is greater for the first person than for the second person for the same amount of applied pressure.") '507 patent 5:11-20 ("Thresholds for pressure, pseudo pressure, pseudo-pressure change, Velocity, and other measures may be stored in a computer-readable medium when the device is manufactured. Alternatively, Software executed by a processor may provide settings for the thresholds. Thresholds set by software may be static or adaptive. Adaptive thresholds may rely on various parameters, including, for example, the length of time the input device has been active, the placement of the conductor on the Surface of the input device, and the current user of the device.") '507 patent 5:48-57 ("In one embodiment in which an adaptive threshold is based on a specific user, the processor (106) executing the Software is able to identify the user. A user identifier is stored in a computer-readable medium, and retrieved based on input received from a user. Such as a user name, password, or other user identifier. Multiple user identifiers and threshold sets may be stored. The threshold may also depend on the orientation of the	

Claim Term	Plaintiff's Proposed Construction and Evidence in Support	Defendant's Proposed Construction and Evidence in Support
	user's grip on a device used for pointing. For example, a stylus may incorporate a sensor to sense a user's grip orientation on the stylus.") '507 patent 8:42-50 ("If the speed is less than the speed threshold, the change in pseudo pressure is compared to a threshold value 322. If the change in pseudo pressure is less than or equal to the threshold, the processor (106) returns to step 302 in the process. If the change in pseudo pressure is greater than the threshold, the processor (106) determines whether the first interval has elapsed 324. If so, the processor (106) concludes that the user is pressing 326 and the processor (106) returns to step 302 in the process.") '507 patent 9:20-29 ("Ramp type filters work very well in filtering out unwanted noise. However, various types of filters, utilizing a variety of waveforms, a combination of filters, and other processing means may be used as part of a process for determining a users intent. In one embodiment, the change in pseudo pressure is computed by Subtracting the filtered (average) pseudo pressure from the current pseudo pressure. In another embodiment, the previous filtered pseudo pressure is subtracted from the current filtered pseudo pressure.") Serial No. 10/723,778 Attorney Docket IMMl 74 ("The specification does not disclose in step 322 that the change in pseudo pressure is compared to a first pressure threshold value and a second pressure threshold value, and outputting the signal if the pressure	

Claim Term	Plaintiff's Proposed Construction and Evidence in Support	Defendant's Proposed Construction and Evidence in Support
	signal is greater than both first pressure threshold value and the second pressure threshold value. See Office Action, p. 3.However, regardless of whether the Examiner's statement is true, the specification does provide written description for comparing a pressure value against two threshold values as recited in claims 6 and 20. For example, paragraph 41 recites that "[i]n the embodiment shown in FIG. 2, the processor (106) compares the pseudo pressure against both lower and upper thresholds to determine whether the finger is touching." Further, in paragraph 46, the specification recites "[i]n the embodiment shown in FIG. 3, a processor(106) executing program code first compares the pseudo pressure to an upper threshold value 302. If the pseudo pressure exceeds the upper threshold value, the process continues at step 314. If not, the processor (106) determines whether the user was previously touching, for example by checking the value of a stored flag 304. If so, the processor (106) compares the pseudo pressure to a lower threshold value 306." As such, with regards to both of figures 2 and 3, the specification describes comparing a pressure value to a first and second threshold value. Further, Applicant would like to note that in the rejection, the Examiner stated that "the change in pseudo pressure is compared to a first pressure threshold value and a second pressure threshold value." This is not accurate based on the claim language. The claim language of claims 6 and 20 recites that a "pressure signal," not a "change in pressure," is compared against first and second thresholds. In view of the foregoing, Applicant	

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	respectfully requests the Examiner withdraw the rejections of claims 6 and 20.") <u>Extrinsic Evidence</u>: Declaration of Dr. Robert Akl	

Claim Term	Plaintiff's Proposed Construction and Evidence in Support	Defendant's Proposed Construction and Evidence in Support
"detent" / "virtual detent" '042 Patent, claims 1, 7-10, 13-15	Proposed Construction: Plain and ordinary meaning Dictionary/Treatise Definitions: Modern Dictionary of Electronics (7th ed.) (1999): definition of "detent:" *a stop or other holding device, such as a pin, lever, etc., on a ratchet wheel.* IMMRVLV-0010767. Merriam Webster's Collegiate Dictionary (11th ed.) (2003): definition of "detent:" *device (as a catch, dog, or spring-operated ball) for positioning and holding one mechanical part in relation to another in a manner such that the device can be released by force applied to one of the parts.* IMMRVLV-0010753. The New Oxford American Dictionary (2001): definition of "virtual:" *computing not physically existing as such but made by software to appear to do so.* IMMRVLV-0010774. Intrinsic Evidence: '042 Patent 1:38-43 ("A detent, such as a mechanical detent, can refer to the resistance of rotation of a wheel or shaft. A detent can be used to divide a rotation into discrete increments, or may be used to arrest rotation in a direction. For instance, a mechanical detent can be	Proposed Construction: "a sense of mechanical resistance that divides movement of a control device into discrete increments, or that arrests movement in a direction" / "vibrotactile feedback that simulates a mechanical detent" Dictionary/Treatise Definitions: *Collins English Dictionary* (7th ed.) (2005): definition of "detent" ("the locking piece of a mechanism, often spring-loaded to check the movement of a wheel in one direction only.") *Dictionary of Mechanical Engineering* (4th ed.) (1996): definition of "detent" ("A catch or checking device, the removal of which allows machinery to work such as the detent which regulates the striking of a clock.") Intrinsic Evidence: '042 Patent 1:32-43 ("without click-stops or 'detents,' or otherwise a sense of mechanical resistance, it may be difficult to obtain a similar experience from an electronic substitute for a traditional mechanical control device or even effectively and efficiently operate such a device. A detent, such as a mechanical detent, can refer to the resistance of rotation of a wheel or shaft. A detent can be used to divide a

	constructed from a notched wheel and a small gravity or spring-actuated lever.") '042 patent 1:30-43 ("With many traditionally mechanical functions being replaced by electronics, operation of electronic controls has been made less intuitive to users. For example, without click-stops or "detents," or otherwise a sense of mechanical resistance, it may be difficult to obtain a similar experience from an electronic substitute for a traditional mechanical control device or even effectively and efficiently operate such a device.") '042 patent 3:6-14 ("Such simulated mechanical detents, or virtual detents, may provide useful feedback to a user.") '042 patent 5:54-6:31 ("Specifically, in some embodiments the actuator 108 may be configured to provide the perception of a detent (i.e. a virtual detent) without the traditional means necessary for a mechanical detent") '042 patent 7:66–8:4 ("Once the processor 206 receives an input signal, the processor 206 can determine whether to generate a detent signal and/or a system signal. For example, if the input signal indicates a rotation of a knob in more than 5 degrees of motion, the processor 206 may generate a system signal and a detent signal.") '042 patent 8:38-46 ("The processor 206 can be configured to determine a specific detent signal to generate. The detent signal may be based at least in part	rotation into discrete increments, or may be used to arrest rotation in a direction. For instance, a mechanical detent can be constructed from a notched wheel and a small gravity or spring-actuated lever.") '042 Patent 3:6-14 ("Such an illustrative embodiment may be advantageously employed to simulate mechanical detents through vibrotactile feedback. Such simulated mechanical detents, or virtual detents, may provide useful feedback to a user. For example, a virtual detent may indicate the successful change in volume of a sound system. As another example, the absence of a virtual detent may indicate that a climate system is not turned on, or that it has reached the highest threshold of operation.") '042 Patent 4:30-34 ("In one embodiment, the processor 106 may process software code running as an application on the processor and utilize the input signal in the context of the software code to generate signals configured to cause virtual detents.") '042 Patent 5:66-6:20 ("The actuator 108 may be configured to simulate mechanical feedback through vibrotactile feedback. Specifically, in some embodiments the actuator 108 may be configured to provide the perception of a detent (i.e. a virtual detent) without the traditional means necessary for a mechanical detent. For example, the actuator 108 may be used in place of various mechanical components which traditionally provided tactile feedback, such as springs, brakes or cams. In some embodiments, the vibrotactile feedback may comprise a click effect replicating a mechanical click. In other embodiments,

	on the system which is actively being controlled. For example, if the video system 210a is being controlled, the processor 206 may generate one type of detent signal. Such as a click effect. Alternatively, if the stereo system 210b is being controlled, the processor 206 may generate a second type of detent signal. Such as a hard stop virtual detent.") '042 patent 9:33-38 ("An actuator (not shown in FIG. 3) is coupled to the touch pad. As a user manipulates the circular touch pad 306, vibrotactile feedback in the form of virtual detents are provided to the user when the actuator vibrates the touch pad. The actuator generates virtual detents through vibrotactile feedback, to simulate mechanical feedback.") '042 patent 9:59-10:49 ("In one embodiment the frequency and strength of the vibrotactile feedback notifies the user of various levels of control. A stronger virtual detent can indicate a bigger decision in comparison to a weaker virtual detent indicative of a smaller decision. High and low strengths of vibrotactile feedback can indicate divisions in a list (i.e. separate words by letter, or numbers at every multiple of 10). A high or low strength of vibrotactile feedback can also indicate one or more points in a range, for example, the center position of a balance control. The frequency of the vibrotactile feedback may represent the speed of navigation of the user's finger across the touch active surface or across the number of elements in a list. In one embodiment, each system that is controlled by the input device may be associated with a type or profile of vibrotactile feedback. For example, the actuator vibrates the input device at a constant intensity when an audio system is being controlled by the input device,	the vibrotactile feedback may not comprise a click effect, but some other effect, such as a spring effect or a barrier effect. … In one embodiment, the virtual detent may comprise a simulated click generated through a single pulse. In a second embodiment, the virtual detent may comprise a click-and-release effect generated by a double pulse. FIG. 9 provides illustrations of various virtual detent profiles."); *see also* Fig. 9 (showing examples of detent profiles) '042 Patent 8:10-12 ("the vibrotactile effect comprising a simulated mechanical detent");*see also* 11:21-22; 11:41-42, 12:16-17 '042 Patent 8:38-67 ("The processor 206 can be configured to determine a specific detent signal to generate. …A default library of vibrotactile effects, such as virtual detents, may be stored in the memory 216. For example, the processor 106 may store each virtual detent profile illustrated in FIG. 9 in the memory 216. This profile may take the form of computer code. In one embodiment, the processor may be programmed with various types of vibrotactile effects not previously stored in memory 216. For example, each user of the system may author individual vibrotactile effects to store in memory 216. In a second embodiment, the processor 106 may only store vibrotactile effects programmed by a manufacturer. In one embodiment, characteristics of the actuator may be stored in memory 216. For example, the frequency response of a system's actuator may be stored in memory 216.")

	and vibrates the input device at a periodic intensity when a temperature system is being controlled. In one embodiment, a combination of vibrotactile effects is linked as a vibrotactile theme. A vibrotactile theme can correspond with an individual function or system. One theme can comprise a combination of single clicks and double clicks to represent simulated mechanical feedback for a system being changed or a threshold being reached. Another theme can comprise a combination of a constant, low intensity vibration with a hard stop virtual detent effect. While the first theme can be assigned to one system, such as a climate system the second theme can be assigned to a second system, such as a stereo system. FIG. 4 is an illustration of a second device for providing virtual detents through vibrotactile feedback in one embodiment of the present invention. The device in FIG. 4 comprises a mechanical device, specifically a rotary knob 400. While the embodiment shown in FIG. 4 comprises a rotary knob 400, other embodiments may comprise other input devices. In some other embodiments, the input device may comprise a linear or rotary encoder, a potentiometer, or a fader. Alternatively, other embodiments may comprise non mechanical input devices, such as a touch-sensitive pad or a touch-sensitive screen. The rotary knob 400 is configured to rotate in a rotary degree of freedom about an axis extending through the knob. In some embodiments, the rotary knob may also be configured to move in a plane perpendicular to or along the rotary axis. The rotary knob 400 is coupled to a mounting surface 402. The mounting Surface may be a surface on a control panel, dashboard, car console, mouse, joystick, industrial	’042 Patent 9:37-38 (“The actuator generates virtual detents through vibrotactile feedback, to simulate mechanical feedback.” ’042 Patent 10:12-11:9 (“In one embodiment, a combination of vibrotactile effects is linked as a vibrotactile theme. A vibrotactile theme can correspond with an individual function or system. One theme can comprise a combination of single clicks and double clicks to represent simulated mechanical feedback for a system being changed or a threshold being reached. Another theme can comprise a combination of a constant, low intensity vibration with a hard stop virtual detent effect. While the first theme can be assigned to one system, such as a climate system the second theme can be assigned to a second system, such as a stereo system. …”)

	equipment, medical equipment, or any consumer electronics device. A user interacts with the rotary knob 400 by rotating the knob in a clockwise or counter-clockwise direction. One or more actuators 406 can be coupled to the rotary knob 400 to generate vibrotactile feedback. As the knob is rotated, vibrotactile feedback may be generated in the form of virtual detents. For example, as the knob is rotated, an effect such as a hard stop may be generated by vibrating the knob.") '042 patent 11:55-63 ("In one embodiment, the signal is based on a system reaching a maximum or minimum threshold. For example, if a stereo system has reached the highest Volume level, than the signal is configured to produce a hard stop virtual detent. Alternatively, if the system to be controlled has reached a threshold no signal is generated. In another example, if the Stereo system has not reached the highest or lowest Volume level, a signal configured to produce a click effect virtual detent is generated.") '042 patent12:33-38 ("A processor 106 can generate the detent signal. The detent signal may be based at least in part on the manipulation or change in position of the input device. For example, a first detent signal may correspond to a small change in position of the input device, whereas a second detent signal may correspond to a larger change in position of the input device.") '042 patent 12:45-55 ("In step 704, the processor 106 determines whether to generate a detent signal. The processor 106 may determine whether to generate a	

	detent signal based at least in part on a status of a system to be manipulated 110. For example, the processor 106 may generate a detent signal if the system to be manipulated is turned on. As another example, the processor 106 may not generate a detent signal if the system to be manipulated is turned off. In step 706, the processor 106 generates a detent signal. The processor 106 can generate the detent signal as a digital signal sent to the actuator 108.") '042 patent 13:35-14:57 ("Examples of Virtual Detents FIGS. 9A, 9B, 9C, 9D, 9E, 9F, 9G, and 9H are eight illustrations of virtual detent profiles in various embodiments of the present invention. In FIGS. 9A-9H, the rotary knob 202 is shown on the right along with a representation of the virtual detent profile on the left corresponding with the rotary knob. The virtual detent profiles illustrated in FIGS. 9A-9H are exemplary embodiments of the invention. Other embodiments may be apparent to those skilled in the art. In Some embodiments, various types of detents may be combined to produce a combination vibrotactile effect. FIG. 9A depicts a programmable virtual detent profile. Virtual detents are shown at A, B, C, D, and E. For example, as a rotary knob is rotated through each point A-E, the rotary knob may be vibrated to generate the feeling of a real detent. The magnitude and width of the vibrotactile feedback applied to the input device at each virtual detent may simulate the magnitude and width of a mechanical detent. FIG.9B depicts a hard stop virtual detent profile. A hard stop, or barrier virtual detent, may simulate a mechanical hard stop or barrier. For example, a virtual hard stop may indicate that a system	

	can no longer be manipulated. As an illustration, as a user turns a rotary knob, Virtual detents may indicate each increasing fan level selected by a user. When the fan level reaches its maximum, the processor 106 may send a detent signal to the actuator 108 comprising a barrier detent instruction. FIG.9C depicts a hill virtual detent profile. A hill effect may simulate the approach to the end of a menu system, or a maximum or minimum threshold of a system. For example, as the user approaches the last item in a menu, the Vibrotactile effect may gradually increase. As another example, when the user is approaching the end of a wrap around menu structure, the intensity of the vibrotactile feedback may increase until the user reaches the beginning item, which may be accompanied by vibrotactile feedback with lower intensity. FIG. 9D depicts a compound virtual detent profile. In Some embodiments, the magnitude and/or width of the vibrotactile feedback may be varied at each point. In such embodiments, a compound effect may include two or more effects such as barriers or detents. A compound effect may be related to the operational characteristics of a system. For example, a compound effect used in conjunction with a menu system may generate light intensity vibrotactile feed back while a menu is traversed within a Subcategory, but generate heavier intensity vibrotactile feedback when larger categories of the menu are traversed. In one embodiment, a hill effect may be used as a user traverses contact names beginning with the same letter. When a new letter is reached, a hard stop effect may be used to indicate the new letter. FIG. 9E depicts a spring virtual detent profile. A spring virtual detent may indicate a preferred	

	position of an input device. For example, as a user manipulates a rotary knob away from a home position, a spring effect virtual detent may increase in intensity as the knobs distance from the home position increases. FIG. 9F depicts a damper virtual detent profile. In a damper virtual detent, the vibrotactile force may increase or decrease based on the speed of the manipulation of an input device. For example, a light vibrotactile effect may accompany slow rotation of a rotary knob, while a heavier vibrotactile effect may accompany faster rotation of the rotary knob. FIG. 9G depicts a constant virtual detent profile. A constant force effect may be a continuous force independent of the position or manipulation of the input device. For example, as a rotary knob is rotated, the force of the Vibrotactile effect may remain constant. A constant virtual detent profile may be used in combination with a null force profile, such that vibrotactile effects are generated at a constant intensity during part of a manipulation of an input device, and not generated at all at a later time. For example, a constant vibrotactile force may be produced on a rotary knob until a threshold is reached, upon which no vibrotactile force is generated in response to manipulation of the rotary knob. In another example, a constant vibrotactile force may be output while a user has selected one item in a menu system, but not generated when a user selects a different item in a menu system. FIG. 9H depicts a periodic virtual detent profile. The periodic force effect profile may comprise a sine wave, square wave, or triangular wave profile. In one example of a triangular virtual detent, the intensity of a virtual detent may	

	increase and decrease linearly over time. A periodic virtual detent may last for a set period of time.") '042 patent Abstract ("Systems and methods for virtual detents through vibrotactile feedback are described. One described method includes receiving an input signal comprising information associated with the manipulation of an input device and generating a signal configured to cause an actuator to provide a vibrotactile effect to the input device, the vibrotactile effect comprising a virtual detent.") Application/Control Number: 11/965,046 Art Unit: 2629; '042 Page 7; 02/01/2016 Patent Board Decision at 4 ("As explained by Appellant, a detent provides a sense of mechanical resistance while operating a virtual control for a virtual device (Spec. 4; see Figures 9A-9H)."). <u>Extrinsic Evidence</u>: Declaration of Dr. Robert Akl	

Claim Term	Plaintiff's Proposed Construction and Evidence in Support	Defendant's Proposed Construction and Evidence in Support
"detent profile" '042 Patent, claims 1, 8-10, 14, 15	Proposed Construction: Plain and ordinary meaning Dictionary/Treatise Definitions: Modern Dictionary of Electronics (7th ed.) (1999): definition of "detent:" *a stop or other holding device, such as a pin, lever, etc., on a ratchet wheel.* IMMRVLV-0010767. Merriam Webster's Collegiate Dictionary (11th ed.) (2003): definition of "detent:" *device (as a catch, dog, or spring-operated ball) for positioning and holding one mechanical part in relation to another in a manner such that the device can be released by force applied to one of the parts.* IMMRVLV-0010753. The New Oxford American Dictionary (2001): definition of "virtual:" *computing not physically existing as such but made by software to appear to do so.* IMMRVLV-0010774. Intrinsic Evidence: '042 patent 4:50-60 ("The processor 106 may generate a signal by accessing a detent profile stored in a memory (not shown in FIG. 1). In one embodiment, the processor 106 may access a specific detent profile based at least in part on the input signal. In certain embodiments, the processor 106 may determine which	Proposed Construction: "computer code or actuator characteristics that represent a virtual detent" Intrinsic Evidence: *See above* as to "detent" '042 Patent 4:30-34 ("In one embodiment, the processor 106 may process software code running as an application on the processor and utilize the input signal in the context of the Software code to generate signals configured to cause virtual detents.") '042 Patent 4:25-60 (The processor 106 can also generate one or more signals. For example, a processor may generate a signal when a valid input signal is received. In the embodiment shown in FIG. 1, as the input device 102 is manipulated, the processor 106 may generate a signal at the same time or immediately after the manipulation. … Further, the processor 106 may then access the hard stop virtual detent profile in a memory, and generate a detent signal based on the hard stop virtual detent profile….") '042 Patent 5:66-6:30 ("The actuator 108 may be configured to simulate mechanical feedback through vibrotactile feedback. Specifically, in some embodiments the actuator 108 may be configured to

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	of a plurality of simulated mechanical detents to generate. For example, the processor 106 may analyze the input signal and determine that a hard stop is appropriate. Further, the processor 106 may then access the hard stop virtual detent profile in a memory, and generate a detent signal based on the hard stop virtual detent profile.") '042 patent 8:47-67 ("As shown in FIG. 2, the processor 206 comprises memory 216. The memory 216 can be a high-speed cache memory, and configured to store vibrotactile feedback effects, such as virtual detent profiles. In one embodiment, the processor can access an effect profile stored in memory 216 after the processor 206 has determined what type of vibrotactile effect to generate. A default library of vibrotactile effects, such as virtual detents, may be stored in the memory 216. For example, the processor 106 may store each virtual detent profile illustrated in FIG. 9 in the memory 216. This profile may take the form of computer code. In one embodiment, the processor may be programmed with various types of vibrotactile effects not previously stored in memory 216. For example, each user of the system may author individual vibrotactile effects to store in memory 216. In a second embodiment, the processor 106 may only store vibrotactile effects programmed by a manufacturer. In one embodiment, characteristics of the actuator may be stored in memory 216. For example, the frequency response of a system's actuator may be stored in memory 216.")	provide the perception of a detent (i.e. a virtual detent) without the traditional means necessary for a mechanical detent. … The actuator 108 may be configured to generate various types of vibrotactile feedback. For example, the actuator 108 may be configured to produce different virtual detents. The vibrotactile feedback may be generated in various directions. For example, the actuator 108 may vibrate the input device orthogonal to the motion of the input device.") '042 Patent 8:38-67 ("The processor 206 can be configured to determine a specific detent signal to generate. …A default library of vibrotactile effects, such as virtual detents, may be stored in the memory 216. For example, the processor 106 may store each virtual detent profile illustrated in FIG. 9 in the memory 216. This profile may take the form of computer code. In one embodiment, the processor may be programmed with various types of vibrotactile effects not previously stored in memory 216. For example, each user of the system may author individual vibrotactile effects to store in memory 216. In a second embodiment, the processor 106 may only store vibrotactile effects programmed by a manufacturer. In one embodiment, characteristics of the actuator may be stored in memory 216. For example, the frequency response of a system's actuator may be stored in memory 216.") '042 Patent 9:33-44 ("An actuator (not shown in FIG. 3) is coupled to the touch pad. As a user manipulates

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	'042 patent 13:35-14:57 ("Examples of Virtual Detents FIGS. 9A, 9B, 9C, 9D, 9E, 9F, 9G, and 9H are eight illustrations of virtual detent profiles in various embodiments of the present invention. In FIGS. 9A-9H, the rotary knob 202 is shown on the right along with a representation of the virtual detent profile on the left corresponding with the rotary knob. The virtual detent profiles illustrated in FIGS. 9A-9H are exemplary embodiments of the invention. Other embodiments may be apparent to those skilled in the art. In Some embodiments, various types of detents may be combined to produce a combination vibrotactile effect. FIG. 9A depicts a programmable virtual detent profile. Virtual detents are shown at A, B, C, D, and E. For example, as a rotary knob is rotated through each point A-E, the rotary knob may be vibrated to generate the feeling of a real detent. The magnitude and width of the vibrotactile feedback applied to the input device at each virtual detent may simulate the magnitude and width of a mechanical detent. FIG.9B depicts a hard stop virtual detent profile. A hard stop, or barrier virtual detent, may simulate a mechanical hard stop or barrier. For example, a virtual hard stop may indicate that a system can no longer be manipulated. As an illustration, as a user turns a rotary knob, Virtual detents may indicate each increasing fan level selected by a user. When the fan level reaches its maximum, the processor 106 may send a detent signal to the actuator 108 comprising a barrier detent instruction. FIG.9C depicts a hill virtual	the circular touch pad 306, vibrotactile feedback in the form of virtual detents are provided to the user when the actuator vibrates the touch pad. The actuator generates virtual detents through vibrotactile feedback, to simulate mechanical feedback. Since the vibrotactile feedback may be programmable and variable, providing different types of vibrotactile feedback on the same input device will provide an enhanced interface. Vibrotactile feedback may aid in the selection of menus, control of levels (such as volume, bass, treble, balance, etc.), and navigation of lists.") '042 Patent 10:5-22 ("In one embodiment, each system that is controlled by the input device may be associated with a type or profile of vibrotactile feedback. For example, the actuator vibrates the input device at a constant intensity when an audio system is being controlled by the input device, and vibrates the input device at a periodic intensity when a temperature system is being controlled….") '042 Patent 11:14-24 ("FIG. 5 is a flow diagram illustrating a first method for providing virtual detents through vibrotactile feedback in one embodiment of the present invention. In step 502, the sensor generates an input signal based at least in part on a manipulation of an input device. In step 502, the processor 106 receives an input signal comprising information associated with the manipulation of an input device 102. In step 504, the processor 106 generates a signal configured to cause an actuator to produce a

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	detent profile. A hill effect may simulate the approach to the end of a menu system, or a maximum or minimum threshold of a system. For example, as the user approaches the last item in a menu, the Vibrotactile effect may gradually increase. As another example, when the user is approaching the end of a wrap around menu structure, the intensity of the vibrotactile feedback may increase until the user reaches the beginning item, which may be accompanied by vibrotactile feedback with lower intensity. FIG. 9D depicts a compound virtual detent profile. In Some embodiments, the magnitude and/or width of the vibrotactile feedback may be varied at each point. In such embodiments, a compound effect may include two or more effects such as barriers or detents. A compound effect may be related to the operational characteristics of a system. For example, a compound effect used in conjunction with a menu system may generate light intensity vibrotactile feed back while a menu is traversed within a Subcategory, but generate heavier intensity vibrotactile feedback when larger categories of the menu are traversed. In one embodiment, a hill effect may be used as a user traverses contact names beginning with the same letter. When a new letter is reached, a hard stop effect may be used to indicate the new letter. FIG. 9E depicts a spring virtual detent profile. A spring virtual detent may indicate a preferred position of an input device. For example, as a user manipulates a rotary knob away from a home position, a spring effect virtual detent may increase in intensity as the knobs distance from the home position increases.	vibrotactile effect to the input device 102, the vibrotactile effect comprising a simulated mechanical detent.") '042 Patent File History, 02-28-2012 Non-final Rejection at 3-4 ("Grant does not specifically teach receiving a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent; the vibrotactile effect comprising the virtual detent."); *see also* 08-21-2012 Final Rejection (similar)

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	FIG. 9F depicts a damper virtual detent profile. In a damper virtual detent, the vibrotactile force may increase or decrease based on the speed of the manipulation of an input device. For example, a light vibrotactile effect may accompany slow rotation of a rotary knob, while a heavier vibrotactile effect may accompany faster rotation of the rotary knob. FIG. 9G depicts a constant virtual detent profile. A constant force effect may be a continuous force independent of the position or manipulation of the input device. For example, as a rotary knob is rotated, the force of the Vibrotactile effect may remain constant. A constant virtual detent profile may be used in combination with a null force profile, such that vibrotactile effects are generated at a constant intensity during part of a manipulation of an input device, and not generated at all at a later time. For example, a constant vibrotactile force may be produced on a rotary knob until a threshold is reached, upon which no vibrotactile force is generated in response to manipulation of the rotary knob. In another example, a constant vibrotactile force may be output while a user has selected one item in a menu system, but not generated when a user selects a different item in a menu system. FIG. 9H depicts a periodic virtual detent profile. The periodic force effect profile may comprise a sine wave, square wave, or triangular wave profile. In one example of a triangular virtual detent, the intensity of a virtual detent may increase and decrease linearly over time. A periodic virtual detent may last for a set period of time.")	

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	Extrinsic Evidence: Declaration of Dr. Robert Akl	

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"extra-sensory information" '546 Patent, claims 1, 5	Proposed Construction: Plain and ordinary meaning Intrinsic Evidence: '546 patent 2:13-28 ("One embodiment is a haptic representation system that can produce a haptic effect that represents input that is generated by a sensor and received by the haptic representation system. In certain embodiments, the received input includes extra sensory information, where extra-sensory information is information that cannot normally be perceived by a human being. Such as an electromagnetic field, infra-red light, ultraviolet light, radiation, or subtle changes in temperature. In Some embodiments, the haptic effect is a deformation haptic effect produced by a deformation actuator, where a deformation haptic effect includes an alteration of a shape and/or size of a component operably coupled to the deformation actuator. In certain embodiments, the deformation haptic effect that is produced by the deformation actuator is generated based on the extra-sensory information included in the received input generated by the sensor.") '546 patent 4:23-28 ("The sensor can be configured to detect sensory information and extra-sensory information, where sensory information is information that can normally be perceived by a human being, and	Proposed Construction: "information that cannot normally be perceived by a human being, such as an electromagnetic field, infra-red light, ultra-violet light, radiation, or subtle changes in temperature"; the claims fail to provide a POSITA with reasonable certainty about the limits to the full scope of the term "extra-sensory information" Intrinsic Evidence: '546 patent 2:13-20 ("One embodiment is a haptic representation system that can produce a haptic effect that represents input that is generated by a senor and received by the haptic representation system. In certain embodiments, the received input includes extra-sensory information, where extra-sensory information is information that cannot normally be perceived by a human being, such as an electromagnetic field, infra-red light, ultra-violet light, radiation, or subtle changes in temperature.") '546 patent 4:14-30 (discussing Fig. 2 ("example of a device 200 with sensor input and haptic output, according to one embodiment of the invention") and noting: "The sensor can be configured to detect sensory information and extra-sensory information, where sensory information is information that can normally be perceived by a human being. The sensor

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	where extra-sensory information is information that can not normally be perceived by a human being.") '546 patent 6:40-7:30 ("In certain embodiments, sensor 400 can be a sensor configured to detect extra-sensory information, where extra sensory information is information that cannot normally be perceived by a human being. For example, in one embodiment, sensor 400 can be a magnetometer configured to detect electromagnetic fields. In another embodiment, sensor 400 can be a light sensor configured to detect light frequencies that are out of range of the human eye. Such as an infra-red light frequency. In another embodiment, sensor 400 can be a temperature sensor configured to detect a change in temperature, even when the temperature change could not normally be detected by a human being. Based on the detected extra sensory information, the sensor can generate sensor input, where the sensor input represents the detected extra-sensory information. In other embodiments, sensor 400 can be a sensor configured to detect sensory information, where sensory information is information that can normally be perceived by a human being. FIG. 4 also illustrates representation module 410. When executed by a processor (not illustrated in FIG. 4), representation module 410 can receive the sensor input from sensor 400, map the sensor input to an output signal, and send the output signal to output device 420. According to the embodiment, representation module 410 can include an algorithm that maps the sensor input to an output signal, where the output signal is	can be further configured to produce sensor input based on the detected information.") '546 patent 6:34-57 (discussing Fig. 4 ("diagram of an example mapping sensor input to an output signal that, when played at an output device, produces an output effect") and noting: "In certain embodiments, sensor 400 can be a sensor configured to detect extra-sensory information, where extra-sensory information is information that cannot normally be perceived by a human being. For example, in one embodiment, sensor 400 can be a magnetometer configured to detect electromagnetic fields. In another embodiment, sensor 400 can be a light sensor configured to detect light frequencies that are out of range of the human eye, such as an infra-red light frequency. In another embodiment, sensor 400 can be a temperature sensor configured to detect a change in temperature, when the temperature change could not normally be detected by a human being. Based on the detected extra-sensory information, the sensor can generate sensor input, were the sensor input represents the detected extra-sensory information. In other embodiments, sensor 400 can be a sensor configured to detect sensory information, where sensory information is information that can normally be perceived by a human being.") '546 patent 6:58-7:29 ("According to the embodiment, representation module 410 can include an algorithm that maps the sensor input to an output signal, where the output signal is configured to produce an output effect when played at output device 420. Thus, in

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	configured to produce an output effect when played at output device 420. Thus, in certain embodiments, representation module 410 can represent the extra-sensory information detected by sensor 400 (and which cannot normally be perceived by a human being) as an output effect that can be played at output device 420 (and thus, can be perceived by a human being). In this manner, representation module 410 can allow a human being to perceive extra-sensory information detected by sensor 400, which normally could not be perceived. In other embodiments, representation module 410 can also represent the sensory information detected by sensor 400 as an output effect that can be played at output device 420. In this manner, representation module 410 can augment a human being's normal perception of the sensory information detected by sensor 400. In certain embodiments, representation module 410 can be a haptic representation module, such as haptic representation module 16 of FIG. 1. In these embodiments, when executed by a processor, representation module 410 can receive the sensor input from sensor 400, map the sensor input to a haptic signal, and send the haptic signal to output device 420, where output device 420 is an actuator, such as actuator 26 of FIG. 1. According to the embodiment, representation module 410 can include an algorithm that maps the sensor input to a haptic signal, where the haptic signal is configured to produce a haptic effect when played at output device 420. Thus, representation module 410 can represent the extra-sensory information detected by sensor 400 (and which cannot	certain embodiments, representation module 410 can represent the extra-sensory information detected by sensor 400 (and which cannot normally be perceived by a human being) as an output effect that can be played at output device 420 (and thus, can be perceived by a human being) as an output effect that can be played at output device 420 (and thus, can be perceived by a human being). In this manner, representation module 410 can allow a human being to perceive extra-sensory information detected by sensor 400, which normally could not be perceived. … Thus, representation module 410 can represent extra-sensory information detected by sensor 400 (and which cannot normally be perceived by a human being) as a haptic effect that can be played at an output device 420 (and thus can be perceived by a human being).") '546 patent 8:60-63 ("Thus, according to certain embodiments, a user's senses can be augmented, as the user can perceive attributes of an environment that would normally be difficult or impossible to perceive.") '546 patent 9:12-26 (discussing flow diagram depicted in Fig. 5: "The flow beings and proceeds to 510. At 510, input is received from a sensor. The input can include extra-sensory information, where extra-sensory information is information that cannot normally be perceived by a human being. In certain embodiments, the input can include one or more interaction parameters, where each interaction parameter can include a value. In certain

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	normally be perceived by a human being) as a haptic effect that can be played at output device 420 (and thus, can be perceived by a human being).") '546 patent 9:12-27 ("The flow begins and proceeds to 510. At 510, input is received from a sensor. The input can include extra-sensory information, where extra-sensory information is information that cannot normally be perceived by a human being. In certain embodiments, the input can include one or more interaction parameters, where each interaction parameter can include a value. In certain embodiments, the sensor can be a magnetometer configured to generate the input based on an electro-magnetic field that the magnetometer detects. In other embodiments, the sensor can be a light sensor configured to generate the input based on energy that the light sensor detects. The energy can include ultraviolet light. Alternately, the energy can include infra-red light. In other embodiments, the sensor can be a radiation sensor configured to generate the input based on radiation that the radiation sensor detector. The flow proceeds to 520.") '546 patent 9:62-11:6 ("FIG. 6 illustrates a block diagram of a device 600 capable of producing a haptic effect to augment sensory perception, according to one embodiment of the invention. Device 600 can include sensor 610. Sensor 610 can be identical to sensor 28 of FIG.1. Sensor 610 can be a sensor configured to detect information. Based on the detected information, the	embodiments, the sensor can be a magnetometer configured to generate the input based on an electro-magnetic field that the magnetometer detects. In other embodiments, the sensor can be a light sensor configured to generate the input based on energy that the light sensor detects. The energy can include ultraviolet light. Alternatively, the energy can include infra-red light. In other embodiments, the sensor can be a radiation sensor configured to generate the input based on radiation that the radiation sensor detector [sic].") '546 patent 10:2-5 (discussing block diagram depicted in Fig. 6: "In certain embodiments, sensor 610 can be a sensor configured to detect extra-sensory information, where extra-sensory information is information that cannot normally be perceived by a human being.") '546 patent 10-29-11:6 (discussing example embodiments of sensors that can detect extra-sensory information, including: "barometric pressure"; "electromagnetic field"; "radiation"; "signal sent by a global positioning system"; and "electrical conductance of the skin of a user."); *see also id.* at 7:30-45 (similarly describing embodiments with a "magnetometer", a "light sensor", and a "radiation sensor"); *id.* at 8:24-31 (similarly describing embodiments with sensors that can detect various information, such as "the electromagnetic field", "infra-red light (or ultraviolet light"))

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	sensor can generate sensor input, where the sensor input represents the detected information. In certain embodiments, sensor 610 can be a sensor configured to detect extra-sensory information, where extra-sensory information is information that can not normally be perceived by a human being. Device 600 can further include a housing 620. Housing 620, also identified as an outer enclosure of device 600, can be operatively coupled to an actuator 630. Housing 620 can also include a haptic Surface which overlays at least a portion of housing 620. In certain embodiments, the haptic Surface can be configured to apply a force in response to a force haptic effect produced by actuator 630. In these embodiments, actuator 630 can be a force actuator that can be configured to produce a force haptic effect. In other certain embodiments, the haptic Surface can be configured to macroscopically alter its physical shape in response to a deformation haptic effect produced by actuator 630. In these embodiments, actuator 630 can be a deformation actuator that can be configured to produce a deformation haptic effect. In other certain embodiments, the haptic Surface can be configured to produce a mechanical impedance in response to an impedance haptic effect produced by actuator 630. In these embodiments, actuator 630 can be an impedance actuator that can be con figured to produce an impedance haptic effect. Thus, in certain embodiments, actuator 630 can cause housing 620 of device 600 to reflect the information detected by sensor 610, including the extra-sensory information detected by sensor 610. In one embodiment, sensor 610 can be a	'546 patent 11:14-18 (discussing block diagram depicted in Fig. 7: "In certain embodiments, sensor 710 can be a sensor configured to detect extra-sensory information, where extra-sensory information is information that cannot normally be perceived by a human being.") '546 patent 11:35-40 ("In one embodiment, sensor 710 can be a light sensor configured to detect light frequencies, including light frequencies that are within a range of the human eye, and also including light frequencies that are out of range of the human eye, ...") '546 patent 11:56-60 (discussing diagram depicted in Fig. 8: "Sensor 800 can be a sensor configured to detect information. In certain embodiments, sensor 800 can be a sensor configured to detect extra-sensory information, where extra-sensory information is information that cannot normally be perceived by a human being."); *see also id.* at 12:63-67 (same re Fig. 9) '546 patent 15:16-19 (discussing flow diagram depicted in Fig. 11: "The input can include extra-sensory information, where extra-sensory information is information that cannot normally be perceived by a human being.") '546 patent 16:16-43 (describing embodiments configured to detect various information and stating "In embodiments where the sensor is a light sensor

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	sensor configured to detect a barometric pressure, and actuator 630 can cause housing 620 to apply a force, to deform, or to produce a mechanical impedance based on the detected barometric pressure. Thus, in this embodiment, device 600 can indicate possible imminent changes in weather patterns due to an increase or decrease in detected barometric pressure. In another embodiment, sensor 610 can be a magnetometer con figured to detect an electromagnetic field, and actuator 630 can cause housing 620 to apply a force, to deform, or to produce a mechanical impedance based on one or more properties of the detected electromagnetic field, such as the presence of the electromagnetic field, the intensity of the electromagnetic field, or the periodicity of the electromagnetic field. For example, a user could hold device 600 near an electrical cord to determine whether the electrical cord is connected to a power source in response to housing 620 of device 600 applying a force, applying a deformation, or producing a mechanical impedance in the presence of an alternating electromagnetic field Surrounding the cord. In another embodiment, sensor 610 can be a radiation sensor configured to detect radiation, and actuator 630 can cause housing 620 to apply a force, to deform, or to produce a mechanical impedance based on the detected radiation. For example, device 600 can detect a level of ambient radiation within an environment using sensor 610, and actuator 630 can cause housing 620 to apply a force, to deform, or to produce a mechanical impedance based on the detected level of ambient radiation. In	configured to detect light frequencies, including light frequencies that are within a range of the human eye, and also including light frequencies that are out of range of the human eye, the haptic effect that is generated by the actuator can cause a display of the device to deform based on the detected light frequencies that are out of range of the human eye. The flow then ends.") <u>Extrinsic Evidence:</u> Opening Expert Report of Jeremy Cooperstock

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	another embodiments, sensor 610 can be a sensor configured to detect a signal sent by a global positioning system ("GPS), where the signal can represent a position of device 600, and actuator 630 can cause housing 620 to apply a force, to deform, or to produce a mechanical impedance based on the detected signal (i.e., the detected position of device 600). Thus, device 600 can create a geofence (i.e., a virtual perimeter for a real-world geographical area). In another embodiment, sensor 610 can be a galvanic skin response sensor configured to detect an electrical conductance of the skin of a user, and actuator 630 can cause housing 620 to apply a force, to deform, or to produce a mechanical impedance based on characteristics of the user identified from the detected electrical conductance of the skin of the user, Such as mood, ambient awareness, and bio feedback. Thus, device 600 can apply a force, deform, or produce a mechanical impedance in order to mirror an identified state of the user.") <u>Extrinsic Evidence</u>: Declaration of Dr. Robert Akl	

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"proxy object" '067 Patent, claims 1, 3, 5, 11, 15, 17, 21	Proposed Construction: Plain and ordinary meaning Dictionary/Treatise Definitions: Merriam Webster's Collegiate Dictionary (11th ed.) (2003): definition of "proxy:" *the agency, function, or office of a deputy who acts as a substitute for another.* IMMRVLV-0010756. Merriam Webster's Dictionary and Thesaurus (rev. ed.) (2014) and The Merriam-Webster Dictionary (rev. ed.) (2022): definition of "proxy:" *the authority or power to act for another*. IMMRVLV-0010764; IMMRVLV-0010782. Merriam Webster's Dictionary and Thesaurus (rev. ed.) (2014) and The Merriam-Webster Dictionary (rev. ed.) (2022): definition of "object:" *something that may be seen or felt*. IMMRVLV-0010762; IMMRVLV-0010781. Intrinsic Evidence: '067 patent 2:30-3:9 ("Embodiments provide for haptic feedback on virtual objects in AR space. Such embodiments may allow a user to see and feel a texture on a real world object using a haptics overlay on that object. Alternatively, such an embodiment may seamlessly incorporate a wearable peripheral device	Proposed Construction: "a physical object in real space" Intrinsic Evidence: '067 patent Abstract ("Systems and methods for integrating haptics overlay in augmented reality are disclosed. One illustrative system described herein includes a haptic output device. The system also includes a display configured to output a visual effect. The system also includes a sensor for tracking a position of a proxy object. The system also includes a processor configured to: determine a modified visual effect based in part on data received from the sensor, determine a haptic effect based in part on data received from the sensor, transmit a display signal associated with the modified visual effect to the display, transmit a haptic signal associated with the haptic effect to the haptic output device; and output the haptic effect using the haptic output device.") '067 patent at 1:5-9 Field of the Invention ("The present application relates to the field of user interface devices. More specifically, the present application relates to integrating haptics overlay in augmented reality.") '067 patent at 1:3-23 ("Virtual and Augmented Reality ("VR" and "AR") applications have become increasingly popular. VR applications typically

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	that is also capable of providing haptic feedback. In other embodiments, just the wearable peripheral device may be used to provide haptic feedback. In some embodiments, AR space comprises VR space. In one illustrative embodiment, a user is wearing an AR headset and is looking at a proxy object, e.g., a shoe, in real space. The user may choose a material from a library of materials (e.g., materials such as one or more of leather, plastic, rubber, metal, burlap, suede, denim, wood, cloth, ceramic, foamed material, or glass). This material will then be displayed on the proxy object via the AR headset by saying a voice command out loud (e.g., apply leather mate rial) or inputting instructions via a visual menu in a VR or AR headset, a hand controller, a wearable device, or gesture recognition. The illustrative AR display of the AR headset is modified based on the command so that the appearance of the proxy object is modified through the AR display to show the proxy object made of the selected material. In one illustrative embodiment, a haptic effect associated with the proxy object is output by a haptic output device, e.g., an actuator, that outputs a haptic effect (e.g., a vibration or ESF effect) simulating a texture of the material selected from the library. In still other illustrative embodiments, a haptic effect is produced by a wearable peripheral device, such as a glove. The user interacting with the proxy object feels the haptic effect, and the haptic effect simulates different textures on the surface of the proxy object (e.g., the haptic effect may simulate the texture of one or more of leather, plastic, rubber, metal, burlap, suede,	incorporate a dedicated controller to allow the user to feel a touch sensation of the virtual object. For example, a VR user may experience a gun shooting in his hand in the VR application and may simultaneously feel a haptic effect simulating that shooting through the dedicated controller. In AR space, it is difficult to provide a haptic effect to the user. Accordingly, systems and methods for integrating haptics overlay in augmented reality are needed.") '067 patent 1:27-50 ("Embodiments of the present disclosure comprise systems and methods for integrating haptics overlay in augmented reality. In one embodiment, a system comprises a haptic output device. The system also comprises a display configured to output a visual effect. The system also comprises a sensor for tracking a position of a proxy object. In another embodiment, a method for integrating haptics overlay in augmented reality comprises determining a modified visual effect based in part on data received from a sensor, determining a haptic effect based in part on data received from the sensor, transmitting a display signal associated with the modified visual effect to a display, transmitting a haptic signal associated with the haptic effect to a haptic output device; and outputting the haptic effect using the haptic output device. '067 patent 2:1-11 (describing Figures 1-5)

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	denim, wood, cloth, ceramic, foamed material, or glass). In one illustrative embodiment, information from a sensor s) is passed to a processor that is also processing and outputting haptic signals associated with haptic effects associated with a texture. The modified image of the proxy object through the AR display, and the texture output by the haptic output device, can then be modified in real - time to reflect any movement of the proxy object. In addition, or alternatively, the processor can use information from a sensor (tell when a wearable peripheral device comes into " contact with an AR object. These sensors may further detect movement of the user associated with the proxy object and modify visual and haptic effects based on the user's movement.") '067 patent 5:23-6:29 ("FIG. 2 shows another illustrative system for integrating haptics overlay in augmented reality. In the embodiment shown in FIG. 2, a user 206 is wearing a wearable AR device 204 and interacting with a proxy object 202. Though this embodiment shows the user wearing a wearable AR device 204, any type of AR display system may be used. The illustrative system of FIG. 2 may incorporate the system illustrated in FIG. 1 for sensing conditions of proxy object 202 as well as for determining, generating and outputting haptic effects. The wearable AR device 204 may include visual display as well as headphones or speakers. In some embodiments, proxy object 202 may take the form of any object, including, but not limited to, a shoe, bag, an article of clothing, an	'067 patent 2:27-3:9 "Illustrative Example of Integrating Haptics Overlay in Augmented Reality" ("Embodiments provide for haptic feedback on virtual objects in AR space. Such embodiments may allow a user to see and feel a texture on a real world object using a haptics overlay on that object. Alternatively, such an embodiment may seamlessly incorporate a wearable peripheral device that is also capable of providing haptic feedback. In other embodiments, just the wearable peripheral device may be used to provide haptic feedback. In some embodiments, AR space comprises VR space. In one illustrative embodiment, a user is wearing an AR headset and is looking at a proxy object, e.g., a shoe in real space. The user may choose a material from a library of materials (e.g., materials such as one or more of leather, plastic, rubber, metal, burlap, suede, denim, wood, cloth, ceramic, foamed material, or glass). This material will then be displayed on the proxy object via the AR headset by saying a voice command out loud (e.g., apply leather material) or inputting instructions via a visual menu in a VR or AR headset, a hand controller, a wearable device, or gesture recognition. The illustrative AR display of the AR headset is modified based on the command so that the appearance of the proxy object is modified through the AR display to show the proxy object made of the selected material….") '067 patent 4:54-62 ("Haptic effect determination module 126 represents a program component that

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	electronic device, a display, or interface object. In other embodiments, proxy object 202 may comprise neutral physical characteristics, like color and texture, e.g. a proxy object made of white color with smooth surface material. In still other embodiments, proxy object 202 may comprise a high fidelity visual prototype g., a high fidelity visual shoe prototype with photorealistic graphic stenciling, so a visual overlay using wearable AR device 204 is unnecessary. The user 206 may choose any texture from a given library of textures, e.g., leather, plastic, rubber, metal, burlap, suede denim, wood, cloth, ceramic, foamed material, or glass, and augmented reality visual effect will modify the appearance of the proxy object through the wearable AR device 204. In some embodiments, the user will choose the texture using an input capture device such as an audio capture device, a touchscreen, a keyboard, a mouse, a joystick, or an augmented reality control board. Processor 102 will receive input signal from the input capture device and determine the haptic effect and visual effect modification that must be transmitted via a haptic signal and display signal, respectively. In some embodiments, once the display signal is trans mitted, the visual effect will be output through wearable AR device 204. So, the user 206 will be able to view the proxy object with the chosen texture through the wearable AR device 204. For example, if the user 206 chooses a red leather, then the user 206 will see the proxy object 202 made of that same red leather through the wearable AR device 204. As the AR visual effect is changed through the choice of texture, a haptic signal	analyzes data regarding audio and video characteristics to select a haptic effect to generate. Particularly, module 126 comprises code that determines, based on the characteristics of haptic output device 118 and AR environment, one or multiple effects to generate and output by the haptic output device 118.") '067 patent 5:17-6:5 ("For example, a vibration may be utilized to convey a specific texture to the user while, simultaneously, a kinesthetic effect is output to indicate the stiffness of an object, such as the stiffness of a shoe upper's material. Such a configuration is merely illustrative and not the sole way in which such a system may be constructed. FIG. 2 shows another illustrative system for integrating haptics overlay in augmented reality. In the embodiment shown in FIG. 2, a user 206 is wearing a wearable AR device 204 and interacting with a proxy object 202. Though this embodiment shows the user wearing a wearable AR device 204, any type of AR display system may be used. The illustrative system of FIG. 2 may incorporate the system illustrated in FIG. 1 for sensing conditions of proxy object 202 as well as for determining, generating and outputting haptic effects. The wearable AR device 204 may include a visual display as well as headphones or speakers. In some embodiments, proxy object 202 may take the form of any object, including, but not limited to, a shoe, a bag, an article of clothing, an electronic device, a display, or an interface object. In other embodiments, proxy

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	is transmitted to the haptic output device (s) 118 contained in proxy object 202. These haptic output devices output a haptic effect associated with the selected texture, which enables user 206 to feel the chosen texture through the haptic effect produced in proxy object 202 as the user touches proxy object 202. In some embodiments, sensors 108 track proxy object 202 so the texture produced by the haptic effect in proxy object 202 and the AR visual effect may be felt and seen, respectively, regardless of any movement or rotation of proxy object 202 by user 206. In other embodiments, the speakers or headphones of wearable AR device 204 may emit audio feedback to convey the sounds user 206 would hear if an actual textured object were being touched. In still other embodiments, no audio feedback is emitted. FIG. 3 shows another illustrative system for integrating haptics overlay in augmented reality. In the embodiment shown in FIG. 3, a user is wearing a wearable AR device 306 and a wearable peripheral device 304 and interacting with a proxy object 302. In some embodiments, proxy object 302 may comprise any of the same features as proxy object 202. Wearable peripheral device 304 may comprise a glove that covers the user's whole hand, a glove that covers only some of the user's hand and fingers, e.g., only the user's thumb and index finger, pieces that only cover the user's fingertips, a shoe, a shirt, a pair of pants, or any other article of clothing. Wearable peripheral device 304 and proxy object 302 comprise one or more haptic output device (s) 118, e.g.,	object 202 may comprise neutral physical characteristics, like color and texture, e.g. a proxy object made of white color with a smooth surface material. In still other embodiments, proxy object 202 may comprise a high fidelity visual prototype, e.g., a high fidelity visual shoe prototype with photorealistic graphic stenciling, so a visual overlay using wearable AR device 204 is unnecessary. … These haptic output devices output a haptic effect associated with the selected texture, which enables user 206 to feel the chosen texture through the haptic effect produced in proxy object 202 as the user touches proxy object 202.") Fig. 2 (depicting user's visual interaction with proxy object 202 (5:24-26)) Fig. 3 (depicting user's interaction with proxy object 302 via "wearable peripheral device" (e.g., a glove) that outputs haptic effect providing textural change (6:15-29)) '067 patent 6:15-37 (discussing Fig. 3 and distinguishing "proxy object" from "visual effect": "…In some embodiments, the user will not interact with proxy object 302. Instead, a chosen object will be displayed as a visual effect through the AR display of the wearable AR device 306. The user may again choose a texture and that texture will be displayed through the AR display. For example, the user may choose a red leather show and a red leather shoe may

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	actuators, capable of outputting a haptic effect to the user.") '067 patent 6:52-7:32 ("In other embodiments, a user will use both a proxy object 302 and a wearable peripheral device 304. The chosen texture is displayed through the AR display of wearable AR device 306 so proxy object 302 appears to have the chosen texture. In some embodiments, proxy object 302 and wear able peripheral device 304 comprise at least one haptic output device 118 configured to output a haptic effect. One or more sensors 108 track characteristics of both proxy object 302 and wearable peripheral device 304. Through the use of proxy object 302 and wearable peripheral device 304, a high - fidelity touch sensation may be achieved. FIG. 4 shows another illustrative system for integrating haptics overlay in augmented reality. In the embodiment shown in FIG. 4, a user is wearing a wearable AR device 406 and a wearable peripheral device 404 and interacting with a system of proxy objects 402, which comprises at least one proxy object. In some embodiments, the proxy objects that make the system of proxy objects 402 may comprise any of the same features as proxy object 202. The system of proxy objects 402 may be arranged to resemble any number of areas, including the interior of a car, the cockpit of a plane, the desk of an office, etc. A user may select a variety of textures to be output throughout the system of proxy objects 402. For example, the user might select a black leather texture for the steering wheel of a car with a cherry walnut	be displayed through the AR display of the wearable AR device 306.") '067 patent file history, 10-07-2019 Response to Non-Final Office Action at 7-9 (arguing that prior art described by Examiner does not disclose or make obvious "a proxy object" in part because the prior art references are "intended to interact with the virtual objects displayed via the head mounted display. The virtual objects are not overlaid on the glove 502 because the glove 502 is to interact with the virtual objects….") '067 patent file history, 01-22-2020 Response to Final Office Action at 2-4, 7-9 (amending claims to include "a haptic output device *within* the proxy object" in response to rejection based on 35 U.S.C. § 103 following Examiner's statement that "A proxy object is a virtual object as disclosed and described in Applicants' Specification."); *see* 11-22-2019 Final Rejection at 33. '067 patent file history, 02-10-2020 Advisory Action (Examiner finding applicant's proposed amendments "raise new issues that would require further consideration and/or search" because "[p]lacing the haptic output device within the proxy object which is argued as a physical object changes the scope of the claims and presents new issues that require additional search and consideration.")

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	wooden center console. In the embodiment of FIG. 4, a haptic effect may be output via only a system of proxy objects 402 or via a combination of a system of proxy objects 402 and wearable peripheral device 404. For example, a vehicle dealership may have a system of proxy objects 402 set up to simulate a certain style of vehicle in a show room. Potential buyers may interact with the system by choosing different materials to be output in different areas of the simulated vehicle. The system of proxy objects 402 may be able to accurately output haptic effects simulating the texture of the different materials without the potential buyers wearing a wearable peripheral device 404. In other embodiments, combining a system of proxy objects 402 with a wearable peripheral device 404. For example, in a gaming environment, a system of proxy objects 402 may be used to simulate a recurring environment throughout the game (e.g., in a racing game, the system of proxy objects 402 may simulate the interior of a vehicle). Further incorporating a wearable peripheral device 404 could allow the use to explore gaming environments outside of the system of proxy objects 402 as well as enhance the user experience when interacting with a system of proxy objects 402.") '067 patent 8:16-33 ("At step 506 the processor 102 transmits a display signal associated with the modified visual effect to the augmented reality display, e.g., wearable AR device 204. For example, when viewed through the wearable AR device 204, the shoe will appear to be made of blue leather material. The	'067 patent file history, 02-24-2020 Response to Final Office Action with Request for Continued Examination (amending claims to disclose "a proxy object comprising one or more haptic output devices" and raising similar arguments to those raised in 01-22-2020 Response to Final Office Action)

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	augmented reality display may comprise at least one of a wearable device or a mobile device. In some embodiments, the modified visual effect modifies the appearance of the proxy object 202 through the augmented reality display. At step 508 the processor 102 transmits a haptic signal associated with the haptic effect to the haptic output device. For example, the haptic output device(s) in the shoe may output a haptic effect that simulates the texture of blue leather on the shoe. In some embodiments, the proxy object 202 may comprise one or more haptic output devices 118. The proxy object 202 may be one or more of a shoe, an article of clothing, an electronic device, a display, an interface object, or an interior of a vehicle.") 10/07/2019 Applicant Arguments or Remarks Made in an Amendment at 8 ("So any ***virtual objects*** or visible alterations to the vehicle ***are not overlaid on the AR glove 196*** because the purpose of the AR glove 196 is to interact with the virtual objects as if they were real. And the purpose of the AR system is "to provide new of [sic] different vehicle functionality to a vehicle" and overlaying a visual effect on the AR glove would not provide a new or different vehicle functionality to the vehicle.") <u>Extrinsic Evidence</u>: Declaration of Dr. Robert Akl	

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"output a visual effect onto a surface of the proxy object" / "modified visual effect to be displayed on the proxy object" / "the modified visual effect being displayed on a surface of a proxy object" '067 Patent, claims 1, 11, 21	Proposed Construction: Plain and ordinary meaning Dictionary/Treatise Definitions: Merriam Webster's Collegiate Dictionary (11th ed.) (2003): definition of "proxy:" *the agency, function, or office of a deputy who acts as a substitute for another.* IMMRVLV-0010756. Merriam Webster's Dictionary and Thesaurus (rev. ed.) (2014) and The Merriam-Webster Dictionary (rev. ed.) (2022): definition of "proxy:" *the authority or power to act for another*. IMMRVLV-0010764; IMMRVLV-0010782. Merriam Webster's Dictionary and Thesaurus (rev. ed.) (2014) and The Merriam-Webster Dictionary (rev. ed.) (2022): definition of "object:" *something that may be seen or felt*. IMMRVLV-0010762; IMMRVLV-0010781. Intrinsic Evidence: '067 patent 2:30-3:9 ("Embodiments provide for haptic feedback on virtual objects in AR space. Such embodiments may allow a user to see and feel a texture on a real world object using a haptics overlay on that object. Alternatively, such an embodiment may seamlessly incorporate a wearable peripheral device	Proposed Construction: "proxy object" as construed above, but otherwise plain and ordinary meaning Intrinsic Evidence: See above as to "proxy object". *See also* '067 patent Fig. 5 ("flow chart of method steps for one example embodiment for integrating haptics overlay in augmented reality") and description of same at 7:37-8:24, in pertinent part: "In the embodiment shown, a process 500 begins at step 502 when a processor, such as processor 102, determines a modified visual effect. The processor 102 receives sensor signals from one or more sensors 108. Using the sensor signals, the processor 102 analyzes the environment to identify characteristics of proxy object 202. Based on these characteristics, processor 102 may determine a modified visual effect. For example, processor 102 may determine that [sic] a blue leather material to display on a proxy object 202, in this case a shoe. Based on data from sensors 108, processor 102 may analyze any movement of the shoe by the user and determine the appropriate modified visual effect to display the blue leather material on the shoe. . . . At step 506 the processor 102 transmits a display signal associated with the modified visual effect to the augmented reality display, e.g., wearable AR device 204. For example, when viewed through the wearable

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	that is also capable of providing haptic feedback. In other embodiments, just the wearable peripheral device may be used to provide haptic feedback. In some embodiments, AR space comprises VR space. In one illustrative embodiment, a user is wearing an AR headset and is looking at a proxy object, e.g., a shoe, in real space. The user may choose a material from a library of materials (e.g., materials such as one or more of leather, plastic, rubber, metal, burlap, suede, denim, wood, cloth, ceramic, foamed material, or glass). This material will then be displayed on the proxy object via the AR headset by saying a voice command out loud (e.g., apply leather mate rial) or inputting instructions via a visual menu in a VR or AR headset, a hand controller, a wearable device, or gesture recognition. The illustrative AR display of the AR headset is modified based on the command so that the appearance of the proxy object is modified through the AR display to show the proxy object made of the selected material. In one illustrative embodiment, a haptic effect associated with the proxy object is output by a haptic output device, e.g., an actuator, that outputs a haptic effect (e.g., a vibration or ESF effect) simulating a texture of the material selected from the library. In still other illustrative embodiments, a haptic effect is produced by a wearable peripheral device, such as a glove. The user interacting with the proxy object feels the haptic effect, and the haptic effect simulates different textures on the surface of the proxy object (e.g., the haptic effect may simulate the texture of one or more of leather, plastic, rubber, metal,	AR device 204, the shoe will appear to be made of blue leather material. The augmented reality display may comprise at least one of a wearable device or a mobile device. In some embodiments, the modified visual effect modifies the appearance of the proxy object through the augmented reality display.") '067 patent file history, 10-07-2019 Response to Non-Final Office Action (amending claims to disclose "a display configured to output a virtual effect <u>onto a surface of the proxy object</u>" to overcome non-final rejection based on 35 U.S.C. § 103)(emphasis in original); *see also* 07-05-2019 Non-Final Rejection '067 patent file history, 02-24-2020 Response to Final Office Action with Request for Continued Examination (amending claims to disclose "modified visual effect to be displayed on the proxy object" to overcome section 103 rejection); *see also* 01-22-2020 Response to Final Office Action

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	burlap, suede, denim, wood, cloth, ceramic, foamed material, or glass). In one illustrative embodiment, information from a sensor s) is passed to a processor that is also processing and outputting haptic signals associated with haptic effects associated with a texture. The modified image of the proxy object through the AR display, and the texture output by the haptic output device, can then be modified in real - time to reflect any movement of the proxy object. In addition, or alternatively, the processor can use information from a sensor (tell when a wearable peripheral device comes into " contact with an AR object. These sensors may further detect movement of the user associated with the proxy object and modify visual and haptic effects based on the user's movement.") '067 patent 5:23-6:29 ("FIG. 2 shows another illustrative system for integrating haptics overlay in augmented reality. In the embodiment shown in FIG. 2, a user 206 is wearing a wearable AR device 204 and interacting with a proxy object 202. Though this embodiment shows the user wearing a wearable AR device 204, any type of AR display system may be used. The illustrative system of FIG. 2 may incorporate the system illustrated in FIG. 1 for sensing conditions of proxy object 202 as well as for determining, generating and outputting haptic effects. The wearable AR device 204 may include visual display as well as headphones or speakers. In some embodiments, proxy object 202 may take the form of	

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	any object, including, but not limited to, a shoe, bag, an article of clothing, an electronic device, a display, or interface object. In other embodiments, proxy object 202 may comprise neutral physical characteristics, like color and texture, e.g. a proxy object made of white color with smooth surface material. In still other embodiments, proxy object 202 may comprise a high fidelity visual prototype g., a high fidelity visual shoe prototype with photorealistic graphic stenciling, so a visual overlay using wearable AR device 204 is unnecessary. The user 206 may choose any texture from a given library of textures, e.g., leather, plastic, rubber, metal, burlap, suede denim, wood, cloth, ceramic, foamed material, or glass, and augmented reality visual effect will modify the appearance of the proxy object through the wearable AR device 204. In some embodiments, the user will choose the texture using an input capture device such as an audio capture device, a touchscreen, a keyboard, a mouse, a joystick, or an augmented reality control board. Processor 102 will receive input signal from the input capture device and determine the haptic effect and visual effect modification that must be transmitted via a haptic signal and display signal, respectively. In some embodiments, once the display signal is trans mitted, the visual effect will be output through wearable AR device 204. So, the user 206 will be able to view the proxy object with the chosen texture through the wearable AR device 204. For example, if the user 206 chooses a red leather, then the user 206 will see the proxy object 202 made of that	

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	same red leather through the wearable AR device 204. As the AR visual effect is changed through the choice of texture, a haptic signal is transmitted to the haptic output device (s) 118 contained in proxy object 202. These haptic output devices output a haptic effect associated with the selected texture, which enables user 206 to feel the chosen texture through the haptic effect produced in proxy object 202 as the user touches proxy object 202. In some embodiments, sensors 108 track proxy object 202 so the texture produced by the haptic effect in proxy object 202 and the AR visual effect may be felt and seen, respectively, regardless of any movement or rotation of proxy object 202 by user 206. In other embodiments, the speakers or headphones of wearable AR device 204 may emit audio feedback to convey the sounds user 206 would hear if an actual textured object were being touched. In still other embodiments, no audio feedback is emitted. FIG. 3 shows another illustrative system for integrating haptics overlay in augmented reality. In the embodiment shown in FIG. 3, a user is wearing a wearable AR device 306 and a wearable peripheral device 304 and interacting with a proxy object 302. In some embodiments, proxy object 302 may comprise any of the same features as proxy object 202. Wearable peripheral device 304 may comprise a glove that covers the user's whole hand, a glove that covers only some of the user's hand and fingers, e.g., only the user's thumb and index finger, pieces that only cover the user's fingertips, a shoe, a shirt, a pair of pants, or any other article of clothing.	

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	Wearable peripheral device 304 and proxy object 302 comprise one or more haptic output device (s) 118, e.g., actuators, capable of outputting a haptic effect to the user.") '067 patent 6:52-7:32 ("In other embodiments, a user will use both a proxy object 302 and a wearable peripheral device 304. The chosen texture is displayed through the AR display of wearable AR device 306 so proxy object 302 appears to have the chosen texture. In some embodiments, proxy object 302 and wear able peripheral device 304 comprise at least one haptic output device 118 configured to output a haptic effect. One or more sensors 108 track characteristics of both proxy object 302 and wearable peripheral device 304. Through the use of proxy object 302 and wearable peripheral device 304, a high - fidelity touch sensation may be achieved. FIG. 4 shows another illustrative system for integrating haptics overlay in augmented reality. In the embodiment shown in FIG. 4, a user is wearing a wearable AR device 406 and a wearable peripheral device 404 and interacting with a system of proxy objects 402, which comprises at least one proxy object. In some embodiments, the proxy objects that make the system of proxy objects 402 may comprise any of the same features as proxy object 202. The system of proxy objects 402 may be arranged to resemble any number of areas, including the interior of a car, the cockpit of a plane, the desk of an office, etc. A user may select a variety of textures to be output throughout the system of proxy objects 402.	

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	For example, the user might select a black leather texture for the steering wheel of a car with a cherry walnut wooden center console. In the embodiment of FIG. 4, a haptic effect may be output via only a system of proxy objects 402 or via a combination of a system of proxy objects 402 and wearable peripheral device 404. For example, a vehicle dealership may have a system of proxy objects 402 set up to simulate a certain style of vehicle in a show room. Potential buyers may interact with the system by choosing different materials to be output in different areas of the simulated vehicle. The system of proxy objects 402 may be able to accurately output haptic effects simulating the texture of the different materials without the potential buyers wearing a wearable peripheral device 404. In other embodiments, combining a system of proxy objects 402 with a wearable peripheral device 404. For example, in a gaming environment, a system of proxy objects 402 may be used to simulate a recurring environment throughout the game (e.g., in a racing game, the system of proxy objects 402 may simulate the interior of a vehicle). Further incorporating a wearable peripheral device 404 could allow the use to explore gaming environments outside of the system of proxy objects 402 as well as enhance the user experience when interacting with a system of proxy objects 402.") '067 patent 8:16-33 ("At step 506 the processor 102 transmits a display signal associated with the modified visual effect to the augmented reality display, e.g.,	

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	wearable AR device 204. For example, when viewed through the wearable AR device 204, the shoe will appear to be made of blue leather material. The augmented reality display may comprise at least one of a wearable device or a mobile device. In some embodiments, the modified visual effect modifies the appearance of the proxy object 202 through the augmented reality display. At step 508 the processor 102 transmits a haptic signal associated with the haptic effect to the haptic output device. For example, the haptic output device(s) in the shoe may output a haptic effect that simulates the texture of blue leather on the shoe. In some embodiments, the proxy object 202 may comprise one or more haptic output devices 118. The proxy object 202 may be one or more of a shoe, an article of clothing, an electronic device, a display, an interface object, or an interior of a vehicle.") 10/07/2019 Applicant Arguments or Remarks Made in an Amendment at 8 ("So any ***virtual objects*** or visible alterations to the vehicle ***are not overlaid on the AR glove 196*** because the purpose of the AR glove 196 is to interact with the virtual objects as if they were real. And the purpose of the AR system is "to provide new of [sic] different vehicle functionality to a vehicle" and overlaying a visual effect on the AR glove would not provide a new or different vehicle functionality to the vehicle.") <u>Extrinsic Evidence</u>:	

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