

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reexamination of

LITIGATION

U.S. Patent No. 6,563,415

Atty. Ref.: 723-2110

Inventor: Armstrong

Issued: May 13, 2003

Recorded Assignee: Anascape, Ltd.

For: ANALOG SENSOR(S) WITH SNAP-THROUGH TACTILE FEEDBACK

* * * * *

January 31, 2007

MAIL STOP *INTER PARTES* REEXAMINATION
COMMISSIONER FOR PATENTS
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Sir:

REQUEST FOR *INTER PARTES* REEXAMINATION

Nintendo Company of America ("NOA," also the "Requestor") requests reexamination under 35 U.S.C. § 311 of all claims of U.S. Patent 6,563,415 ("the '415 patent") issued May 13, 2003 to Brad A. Armstrong ("Armstrong").¹

1. A listing of prior art relied upon to establish a substantial new question of patentability (Section III).
2. A statement pointing out each substantial new question of patentability based on prior patents and printed publications (Section IV);

¹ Contemporaneous with this Request, NOA has also filed requests for *inter partes* reexamination of Armstrong's U.S. Patent No. 6,344,791 ("the '791 patent") and U.S. Patent No. 6,351,205 ("the '205 patent"). This Request, however, is limited to the '415 patent.

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3. An identification of every claim for which Reexamination is requested, and a detailed explanation of the pertinency and manner of applying the cited art to every claim for which Reexamination is requested (Section IV);

4. A copy of the entire '415 patent including Terminal Disclaimers (Appendix A);

5. A copy of every patent or printed publication relied upon for establishing a substantial new question of patentability, including English language translations of all non-English patents or publications (Appendix B);² and patents or printed publications cited as background prior art (Appendix C)

6. A certification that a copy of the Request has been served in its entirety on the patent owner at the name and address provided for in §1.33(c) (Appendix E); and,

7. A credit card authorization form PTO-2038 for the fee of \$8,800.00 required by 37 C.F.R. § 1.20(c)(2) is submitted herewith. The Commissioner is hereby authorized to charge any additional fees that may be due, or credit any overpayment to Deposit Account 14-1140.

8. Requestor certifies that this a new reexamination request, and that therefore the estoppel provisions of 37 C.F.R. §1.907 do not prohibit this Request.

9. The Requestor and real party in interest for this Request in Nintendo Company of America.

Notice of Pending Litigation

On July 31, 2006, Anascape, Ltd. ("Anascape") (purported assignee of the '415 patent) filed an Original Complaint for Patent Infringement ("Complaint") in the United States District Court for the Eastern District of Texas, alleging infringement of the '415 patent by NOA and

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Microsoft Corporation. The case is styled *Anascape, Ltd. v. Microsoft Corporation and Nintendo of America, Inc.* and has been assigned Case No. 9:06-CV-00158-RC. Anascape filed a First Amended Complaint for Patent Infringement (“Amended Complaint”) on November 21, 2006. NOA filed its Answer and Counterclaims to Anascape, Ltd.’s First Amended Complaint on December 6, 2006.

I. **INTRODUCTION**

The subject matter of the ‘415 patent for which reexamination is requested relates generally to the combination of snap-through tactile feedback and a variable conductance switch, and it was on that combination of features that the Examiner based his decision to allow the claims of the ‘415 patent. Indeed, the ‘415 patent states that:

[W]hile the present invention can be viewed as an improved pressure-sensitive variable-conductance sensor improved by way of integrating a tactile feedback dome-cap therein, the invention can also be viewed as an improved momentary-On snap switch improved by way of integrating pressure-sensitive variable-conductance material electrically into a current flow path between the first and second conductive elements.

‘415 patent at col. 7, lines 5-16.³ In addition, the Examiner concluded that “it would appear that using a snap type device would interfere with smooth analog-type sensing, or at the least, there is no reason or suggestion to combine the two types of action.” July 12, 2002 Office Action at 4-6.

There is no dispute here that both snap-through switches or sensors – as well as pressure-sensitive, variable conductance switches or sensors – were well known long prior to the sensor

² Additional prior art, not specifically relied upon, is discussed herein and/or cited in Section V below. Copies of the additional prior art are included in Appendix C. In addition, copies of the ‘791 and ‘205 patents and documents from the prosecution history of the ‘415 patent are included in Appendix D.

³ By describing his invention in this manner, Armstrong appears to identify snap-through tactile feedback as a feature common to momentary-on switches.

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described in the '415 patent.⁴ For example, dome-cap switches, characterized by a snap-through tactile feedback, have been used for several years in devices such as computer keyboards, television remote controls, calculators, game controllers and the like. Further, the '415 patent characterizes the dome-cap switch as "a very common prior art switch," '415 patent at col. 1, lines 39-46, and Armstrong recognizes in his '791 patent that:

Elastomeric or flexible injection-molded dome-cap momentary-On switches (sensors) are well known and widely used in the prior art as switches incorporated in such common host devices as remote controls for television and stereos, and in electronic game control devices

'791 Patent at col. 1, lines 28-31.

The use of variable conductance analog switches has also long preceded any development work related to the '415 patent. Armstrong acknowledges as much, stating that "pressure-sensitive variable conductance sensors have also been known for decades." '415 patent at col. 2, lines 41-43.

It is significant that Armstrong also acknowledges that most elastomeric injection molded dome-cap switches produce the well known snap-through tactile feedback phenomenon that makes such switches attractive in devices such as those mentioned above. *See* '791 patent at col. 1, line 66 to col. 2, line 17. Indeed, UK Published Patent Application No. 2156588 A to Meleard et al. (published in 1985), notes that:

It is often considered desirable to provide for tactile feedback so that, when the keys are pressed by the finger of a person operating the keyboard, the keys 'snap' and force discontinuity is transmitted to the finger of the user indicating that the key has been actuated and an electrical signal thus generated in the circuit associated with the key.

⁴ The '415 patent uses "switch" and "sensor" interchangeably. '415 patent at col. 1, line 33.

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Meleard at 1, lines 21-29. Further, in discussing other prior art variable-resistance switches, JP S61-100844 to Kaneko et al. (published June 27, 1986) and JP S61-103836 to Matsumoto et al. (published July 2, 1986) both observe that, “when the push button is pressed while the switch is off, there is no switchover point (click action) to indicate when it is turned on in the course of operation to activate the variable resistance function from the off-state.” Kaneko (translation) at 2; Matsumoto (translation) at 2.⁵ This is precisely the reason Armstrong sought to incorporate snap-through tactile feedback in his switches:

A benefit provided by a sensor in accordance with the present invention is a reduction of confusion or potential confusion on the part of the user as to when the analog sensor is actuated and de-actuated.

‘415 patent at col. 3, lines 23-30. Ultimately, Armstrong purportedly solved his problem in the same way Kaneko and Matsumoto solved theirs more than a decade earlier: by combining snap-through tactile feedback with a variable-conductance sensor. *See* Kaneko at 2; Matsumoto at 2-3, 11.

As for the source of the snap-through tactile feedback, it was well known to use dome-caps. For example, Meleard describes domes as “tactile snap-action elements.” In particular, Meleard discloses that a typical membrane type keyboard having snap-through tactile feedback is comprised of “an active member switch circuit layer ... [that] is often comprised of a plurality of tactile snap-action elements such as domes.” Meleard at 1, lines 30-42 (emphasis added). U.S. Patent No. 3,590,195 to Driver explains the mechanics as to why a dome-cap provides snap-through tactile feedback:

The principle of the invention is based upon that of the conventional oilcan in which, to eject a quantity of oil from the can, each of the sides, or the base, depending upon the type of can, is depressed and snaps inward into a deformed

⁵ Please note that all references to non-English documents cite the translations for those documents.

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condition, which however is unstable, so that when pressure is released each side or the base, as the case may be, snaps back into its previous undistorted condition. In applying this principle, a plate of springy material, such for example as nickel silver, is provided, by means of a stamping or press operation, with one or more dome-shaped projections such as shown at 2 in FIGS. 1 and 4. This domed projection provides a pushbutton. In analogy with the oilcan, when finger pressure is applied to the dome it becomes distorted and clicks inward as depicted in FIG. 3. When pressure is released the deformed material clocks out again into its original shape.

Driver at col. 1, line 70 to col. 2, line 9.

CSI Keyboards, Inc.'s 1988 "Design Specifications for Membrane Keyboards" ("CSI") further illustrates the association of snap-through tactile feedback with dome switches. For example, CSI states that, among other things, a tactile membrane keyboard consists of "a domed upper circuit layer." CSI at 3. CSI defines "tactile feel" as "[t]he snap action feel of domed keyboards with graphics or keytops, and the full stroke of full travel membrane keyboard." *Id.* at 60. "Pressure applied to the raised key location causes the protrusion in the upper circuit to flex through the spacer opening. This action results in a momentary switch closure and simultaneous tactile feedback." *Id.* at 3; *see also id.* at 4 ("[p]ressure applied to the dome allows it [sic, to] travel through the dome spacer layer and make contact to the lower circuit creating a momentary switch closure. This action also produces a tactile response."), 5-7, 10, 11, 14, 26. Furthermore, section 3.5 on page 16 addresses the issue of analog output.

Thus, both the prior art and Armstrong's '415 patent make clear that dome-caps are readily associated with snap-through tactile feedback. In addition, the '415 patent appears to identify snap-through tactile feedback as a feature common to momentary-on switches, which often take the form of dome-caps.

Armstrong nevertheless has criticized certain prior art, such as JP5-87760 to Furukawa et al. ("Furukawa '760"), for not explicitly stating that the disclosed structure provides snap-

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through tactile feedback, despite striking similarities between the prior art and structure that Armstrong discloses as having such feedback. *Compare, e.g.,* Furukawa '760 at Fig. 2 *with* '791 patent at Fig. 1. However, if as Armstrong recognizes, dome-caps are often used as momentary-on switches and momentary-on switches provide snap-through tactile feedback, it should not be surprising that the prior art may not explicitly call out that feature in every instance. This is especially so, given Armstrong's acknowledgement during prosecution of the '415 patent that Furukawa '760 has a "resilient return or restoring structure," May 16, 2002 Response at 3, a hallmark of momentary-on switches. *See, e.g.,* '415 patent at col. 2, lines 14-17 ("The dome-cap being of resilient design, returns to a raised position off of the second conductive element when the actuator is no longer depressed, and thus the switch or sensor is a momentary-On type."); *id.* at col. 7, lines 5-12.

This Request has been filed because the prior art demonstrates that well before the effective filing date of the '415 patent, others had recognized that variable-conductance switches or sensors could be constructed to provide snap-through tactile feedback. As discussed above, Matsumoto and Kaneko disclose such sensors. Additional examples, such as GB Patent Specification 1 412 298 to Knox (published in 1975) and U.S. Patent No. 5,164,697 to Kramer, are described below. Further, JP H5-304007 to Tanami et al. discloses a pressure-sensitive switch with tactile feedback. For example, Tanami provides the following disclosures:

Since the pressure-sensitive conductive rubber 4 has the cross-sectional shape of an inverted recess and becomes cavity-like in the non-pressure state, a moderate feeling in the switching is obtained by the collapse deformation of the pressure-sensitive conductive rubber 4.

* * *

[T]he pressure-sensing conductive rubber is formed in the cross-sectional shape of an inverted recess when accomplishing switching due to a resistance change

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accompanied by the applied pressure of the pressure-sensitive conductive rubber with the pressure-sensitive conductive rubber as a movable contact, therefore the pressure-sensitive conductive rubber is easily collapsed and deformed, ensuring a large contact area in the collapse deformation, and a large drop of resistance value is instantaneously obtained by applying only a very small applied pressure, and once the resistance value starts to lower, additional pressure force need not be applied, greatly improving the sensitivity or responsiveness as a pressure sensitive switch.

* * *

Since a moderate feeling accompanied by the collapse deformation of the pressure-sensitive conductive rubber itself is also obtained when the pressure-sensitive conductive rubber is pressurized, the pressure sensitive switch also operates satisfactorily.

Tanami at 7.

Other prior art discussed in this Request, such as Furukawa '760, disclose dome-cap switches with analog capability that would appear to inherently exhibit snap-through tactile feedback, even though they do not use the exact terminology "snap-through." Such feedback in that prior art is especially evident in view of the '415 patent's descriptions of dome-cap momentary-on switches. In addition, certain of the prior art references (see especially Furukawa '760) disclose the use of such sensors or switches in controllers for video games. *See also* Japanese Laid Open Patent Application No. JP5-326217 (Furukawa et al.), published Dec. 10, 1993 ("Furukawa '217").

Furthermore, in the course of the pending litigation, Anascape has provided infringement contentions requiring a claim scope that would read on other prior art. For example, Anascape's infringement contentions rely on a claim scope in which the variable conductance feature is provided by an element other than the element providing snap-through tactile feedback. NOA does not agree with the claim scope presented in Anascape's infringement contentions.

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However, out of an abundance of caution, NOA identifies prior art that would fall within the scope of those contentions.

For example, U.S. Patent No. 5,231,386 to Brandenburg et al. discloses an integrated keyswitch/pointing assembly on a keyboard. The keyboard is of the elastomeric type, including a baseplate or printed circuit board 30 having a plurality of switch contacts 32, and a rubber dome sheet 20 formed with a plurality of dome springs, one shown at 21, aligned over a respective contact 32. The underside of the dome cap is said to be provided with a conductive pad. A conventional key cap 10 is coupled to a plunger 12 that is arranged for sliding movement through a plunger guide 14, enabling the plunger to engage the top surface of the dome spring 21. When the key cap 10 is depressed, the plunger 12 will push the dome cap 21 downwardly into engagement with the contact 32 such that the conductive pad on the underside of the dome cap engages the contact 32 to thereby close the switch and actuate, for example, a typing key stroke. Note that surface 11 of the key cap 10 will bottom on the upper surface 18 of the guide 14. The guide 14 is also provided with four actuator surfaces 17 arranged to contact respective force-sensing resistor elements 24 of a force-sensing array 22 arranged between the base plate 30 and the rubber dome sheet 20. Thus, after surfaces 11 and 18 are engaged, further pressure applied to the key cap 10 will cause actuator surfaces 17 to engage the force-sensing array 22 in a pointing modality to, for example, control cursor speed. Thus, Brandenburg integrates digital ON/OFF and analog force-sensitive modalities in a single dome cap switch. Brandenburg also notes that “[t]he tactile response or ‘feel’ of the keyswitch is the same as an unmodified keyswitch, in that it is determined by the usual dome spring 21 on the rubber dome sheet 20.” Brandenburg at col. 6, lines 39-42.

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In addition, U.S. Patent No. 5,692,956 to Rifkin discloses a combination computer mouse and game play control in the context of computer mouse configured to resemble a miniature automobile. The control includes "an analog switch 57 which is coupled in tandem to click switch 55." Rifkin at col. 4, lines 44-47, Fig. 3. Rifkin also discloses the use of an electric motor 60 and eccentric weight 61 to provide engine vibration simulation. *Id.* at col. 4, lines 38-42. In describing the control's functionality, Rifkin states:

During game play operation, movements to the left in the direction of arrow 24 or to the right in the direction of arrow 25 of game play control 30 are communicated by the trackball unit on the underside of game play control 30 (seen in FIG. 3) to cause display scrolling in the directions indicated by arrows 26 and 27 upon display screen 12. This facilitates game play in which the user "steers" the simulated vehicle viewed on display 12 by moving game play control unit 30 to the left and to the right. In addition, depressing right push button 32 communicates game play information to processor 16 corresponding to depressing the accelerator in a vehicle. In response and by means set forth below in greater detail, game play control 30 is caused to vibrate simulating engine vibration and communicates to processor 16 the acceleration which in turn produces output sounds played through speakers 13 and 14 corresponding to engine noise. In addition, a pair of simulated gages 28 and 29 which represent a tachometer and speedometer of the simulated vehicle respectively also respond to the pressure exerted upon right push button 32. Thus, the combined effect observed by the game player in depressing right button 32 is the increase in vehicle speed, the increase in engine RPM, an increase in tactile vibration felt in the game play control and a rise in the engine noise pitch produced through the sound system of computer system 10.

In addition, as the user depresses push button 33 of game play control 30, a braking action is simulated and the image upon display 12 responds accordingly to depict a slower speed with reduced scrolling in the forward direction. In addition, the pressing of button 33 communicates to processor 16 an appropriate command which causes processor 16 to cause sounds representative of brake screeching to be outputted through the computer sound system. Thus, as the game player releases button 32 and presses button 33, the front to back scrolling of the image upon display 12 slows and the sound of brake screeching is heard.

* * *

In accordance with the present invention, the user places a hand upon the upper portion of body 31 in the manner shown in dashed-line representation such that

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the user's thumb extends downwardly along the left side and the user's fingers extend downwardly to right button 32 and left button 33. When so gripped, the user is able to move game play control 30 from side to side to provide the above-described directional command input or to press either of buttons 32 or 33 to manipulate the above-described game play of acceleration and braking respectively. Thus, as the user forces button 32 downwardly in the direction of arrow 40, an increasingly greater acceleration command is communicated to processor 16 via cable 20. Correspondingly, when the user presses left button 33 downwardly in the direction of arrow 41, the above described braking action commands are coupled to processor unit 16.

Id. at col. 3, lines 31-67, col. 4, lines 13-28.

Accordingly, based on the wealth of evidence contained in the prior art cited herein, it is apparent that Armstrong was not entitled to the claims as issued in the '415 patent.

II. BACKGROUND

The '415 Patent

The '415 patent issued on May 13, 2003 to Brad A. Armstrong, from application Serial No. 09/955,838, filed September 18, 2001. The application was characterized as a division of application Serial No. 09/455,521, filed December 7, 1999 (now abandoned), which is characterized as a continuation of application Serial No. 09/106,825, filed June 29, 1998 (now U.S. Patent No. 5,999,084), and which is in turn characterized as a continuation-in-part of application Serial No. 08/677,378 filed July 5, 1996 (now U.S. Patent No. 6,222,525).⁶

The invention is said to relate to electrical sensors of the type useful for controlling electrical flow through a circuit and is said to specifically involve the use of a tactile feedback dome-cap in conjunction with pressure-sensitive variable-conductance material to provide momentary-on pressure-dependant variable electrical output. The tactile feedback is user-

⁶ This Request does not comment on the extent to which the '415 patent may be entitled to an effective date earlier than September 18, 2001, or the extent to which the claimed subject matter of the '415 patent

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discernable for indicating actuation and deactuation of the sensor. '415 patent at col. 1, lines 20-27. According to Armstrong, his invention lay in the combination of well-known features, namely snap-through tactile feedback and a variable conductance switch. '415 patent at col. 7, lines 5-15.

As illustrated by a comparison of the figures of the '415 patent, the basic difference between the acknowledged prior art (Figure 3) and Armstrong's sensor (*e.g.*, Figures 4-6) is the addition of variable conductive material 30: "FIG. 4 shows a median cross section view of a flat mount sensor in accordance with the present invention and structured the same as the FIG. 3 [prior art] sensor with the exception of the installation of a pressure-sensitive variable-conductance material 30 shown contacting and adhered in place on second conductive element 14 within housing 10." '415 patent at col. 6, lines 46-53 (emphasis added). Accordingly, the housing 10, first conductive elements 12, second conductive elements 14, conductive dome-cap 16, depressible actuator 18, flange 20, housing plate 22, hole 24 and plastics studs 26 – as well as their functional attributes – of the Armstrong sensor were all features of the prior art. '415 patent at Figs. 3, 4. Indeed, the patent states that "the present invention can be viewed as an improved pressure-sensitive variable-conductance sensor improved by way of integrating a tactile feedback dome-cap therein, [and that] the invention can also be viewed as an improved momentary-On snap switch improved by way of integrating pressure-sensitive variable-conductance material electrically into a current flow path between the first and second conductive elements." '415 patent at col. 7, lines 5-15.

In describing the prior art, the '415 patent notes that:

was disclosed in the original application for that patent. However, Anascape has asserted in the pending litigation that the '415 patent is entitled to a priority date of July 5, 1996.

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Sufficient depression of the actuator causes the actuator to apply force to the dome-cap, causing the dome-cap to bow (snap-through) downward, causing a center portion of the dome-cap to contact a more centrally positioned end of the second conductive element and resulting in a conductive bridging or closing between the first and second conductive elements with the current flow path being through the conductive dome-cap. The dome-cap when pressed against sufficiently to bow toward the second conductive element has resistance to moving which begins low and increases toward a snap-through threshold wherein at the threshold the dome-cap snaps creating a snap or click which is user discernable in the form of a tactile sensation. The dome-cap then moves further toward the second conductive element. The dome-cap being of resilient design, returns to a raised position off of the second conductive element when the actuator is no longer depressed, and thus the switch or sensor is a momentary-On type. A tactile sensation is also produced by the dome-cap upon returning to the normally raised position and in doing so moving back through the snap-through threshold.

'415 patent at col. 1, line 67 to col. 2, line 20 (emphasis added). Thus, the '415 patent teaches that snap-through tactile feedback occurs when a convex structure is elastically deformed to become concave (or vice versa).⁷ The patent also appears to identify snap-through tactile feedback as a feature common to momentary-on switches and cites dome-caps as an example of momentary-on switches. '415 patent at col. 2, lines 14-17; col. 7, lines 5-12.

In addition, the '415 patent demonstrates that a structure having snap-through tactile feedback upon actuation will also have snap-through tactile feedback upon deactuation. *See, e.g.,* '415 patent at col. 2, lines 14-20, col. 6, lines 9-16. U.S. Patent No. Re. 34,095 to Padula further demonstrates this feature of momentary-on snap-through structures. Padula at col. 9, lines 25-32 ("The snap action during collapse of the dome can be sensed by the stylus user, providing a definite tactile feedback indicating to the user that the digitizing apparatus has switched from the disabled state to the enabled state. When pressure is removed from the stylus

⁷ That teaching is consistent with the teachings of the prior art. *See, e.g.,* JP S53-128861 to Amase at 4-5; *see also* JP H5-304007 to Tanami at 7; Kramer at col. 5, lines 36-48.

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tip, the dome snaps back to its original undeformed state, ready for the next operation.”); *see also* Kaneko at 5-7; Matsumoto at 7-8; JP S53-128861 to Amase at 4-5.

With reference now to Figures 1 and 2 of the application drawings, the ‘415 patent discloses the exterior of a sensor having, *inter alia*, a housing 10, a first conductive element 12, a second conductive element 14, and an actuator 18. Figure 3 discloses a cross-section view of a prior art switch additionally showing conductive dome-cap 16. Figure 4 shows a cross-section view of the “present invention” and, as noted above, differs from the prior art switch of Figure 3 only in the addition of pressure-sensitive variable-conductance material 30 to the surface of second conductive element 14. Convex conductive dome-cap 16 is designed to collapse in a snap-through action upon application of pressure to the actuator 18 (and therethrough to the dome cap), such that conductive dome-cap 16 (which is already engaging first conductive element 12) engages pressure-sensitive variable-conductance material 30 (which is already engaging second conductive element 14). Upon release, the spring characteristic of conductive dome-cap 16 returns the switch to the OFF position. Figures 5-13 show various iterations of the same basic principle. In particular, Figure 5 shows a cross-section view of an alternative embodiment of the “present invention,” in which pressure-sensitive variable-conductance material 30 has been added to the underside of conductive dome-cap 16. According to the patent, both Figures 4 and 5 (as well as others) depict snap-through switches, in which the travel space for the dome-cap has been narrowed from that in the prior art snap-through switch (Figure 3).

The issue of snap-through tactile feedback played a prominent role in the prosecution history of the ‘415 patent. Specifically, claims 1-2, 4-5, 7-9, 11, 13-15, 17-18, 20-21 and 23-24, all of which required snap-through tactile feedback, were rejected as being anticipated by

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Furukawa '760.⁸ May 3, 2002 Office Action at 4. Published November 26, 1993, Furukawa '760 discloses a pressure-sensing switch to enable an operator to freely control, for example, the operation of a character of a video game. The controller disclosed in Furukawa '760 is configured to be held by both hands with depressible buttons on the left hand and the right hand sides of the controller. The button on the left hand of the controller is identified as cross key 12, which is positioned to be operated by a user's left thumb. Fig. 1. Cross key 12 comprises rubber contact (or dome-cap) 29, which is disclosed as a dome cap formed of an elastic rubber material. Disposed at each section of cross key 12 is a moving part (or pushbutton) 30, from which elastic leg 31 slopes to meet substrate 5. Furukawa '760 at 6-7, Figs. 1, 2. Disposed at the bottom end of each pushbutton 30 is a moving contact 32 formed of conductive rubber. A conductive portion 33, whose resistance changes with the pressure exerted on cross key 12, is fixed on the bottom surface of the pushbutton 30.

When cross key 12 is pressed, pushbutton 30 comes into electrical contact with fixed contacts 7, 7 of a wiring pattern on the substrate 5. As a result of the pressure-sensitive characteristics of conductive part 33, varying the pressing force on cross key 12 will vary the electrical resistance through conductive part 33 between fixed contacts 7, 7, thereby generating a variable electrical output in response to varying physical pressure on the video game button. Furukawa '760 at 6-7, Figs. 1, 2. The variable output based on variable pressure applied to a button on a video game controller can be used, for example, to change the speed of a character's movement according to the amount of pressure applied to the button. Furukawa '760 at 6-8.⁹

⁸ The only claims not rejected as being anticipated by Furukawa '760 were those claims additionally requiring a metallic dome-cap (*i.e.*, claims 3, 6, 10, 12, 16, 19 and 22).

⁹ Furukawa '760 notes that the invention is not limited to variable control on a cross key button. Furukawa '760 at 6.

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Consistent with the '415 patent's teaching regarding momentary-on switches and snap-through, the Examiner noted, among other things, that "Furukawa discloses the claimed invention at Fig. 2 where the snap-through action is due to the restoring of 30, and 33 provides the analog sensor that is pressure sensitive." May 3, 2002 Office Action at 4. In response, Armstrong distinguished Furukawa '760 solely on the basis of snap-through tactile feedback. Armstrong did not dispute that Furukawa discloses all other features of claims 1-2, 4-5, 7-9, 11, 13-15 and original claims 17-24.¹⁰

In particular, Armstrong addressed Furukawa '760 by arguing that "there is not the slightest hint in the Furukawa disclosure of the dome cap or sensor having a snap-through or threshold tactile feedback" and that "a threshold snap-through tactile feedback is not an inherent feature of a dome cap or sensor." May 16, 2002 Response at 3, 5. Contrary to what he said in the '415 patent, Armstrong asserted that the "resilient return or restoring structure" of Furukawa '760 is not tantamount to snap-through tactile feedback. *Compare* May 16, 2002 Response at 3-4 *with* '415 patent at col. 2, lines 14-17, col. 7, lines 5-12.

Armstrong also argued that Furukawa '760 teaches away "from structuring which would provide threshold snap-through tactile feedback" because "element '33' in Fig. 2 narrows the spacing between the dome cap carried pill '33' and the conductors 7, the narrowing of the spacing being the opposite structural arrangement which would normally be applied if one desired the dome cap to be able to be depressed to a point of crossing a threshold snap-through before the depressive stroke has bottomed-out." '415 patent, May 16, 2002 Response at 5. In

¹⁰ Claims 17, 18, 20 and 21 were amended to require snap-through tactile feedback specifically on actuation and/or deactuation. Claim 20 was also amended to specify that the claimed "electrical output" is variable. Aug. 27, 2002 Response at 4-5.

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the end, the Examiner concluded that Furukawa '760 does not disclose "a snap-through device" and reasoned that:

[I]t would appear that using a snap type device would interfere with smooth analog-type sensing, or at the least, there is no reason or suggestion to combine the two types of action. While applicant admits at page 2 of his application a common prior art switch has a metal dome-cap, there is no suggestion to combine that with an analog device such as that of Furukawa for reasons noted.

July 12, 2002 Office Action at 4-5.

Contrary to the Examiner's reasoning, however, the prior art does disclose the use of snap-through tactile feedback with analog-type sensing, as well as the use of metal dome-caps with analog switches. *See, e.g.*, Kramer at col. 5, lines 36-48; Padula at col. 7, line 54 to col. 9, line 55; Matsumoto at 1-3, 6-11; Kaneko at 1-3, 5-7.

In addition, the '415 patent itself demonstrates the problem with Armstrong's distinction of Furukawa '760. To begin, the '415 patent defines "snap-through" as "causing the dome-cap to bow ... downward." '415 patent at col. 2, lines 1-2.¹¹ That is, snap-through occurs as a convex dome-cap is elastically deformed to become concave (and vice versa).¹² The patent also teaches that resilient return is characteristic of momentary-on switches and that Armstrong considered momentary-on switches to provide snap-through tactile feedback. '415 patent at col. 2, lines 14-17, col. 7, lines 5-12.

¹¹ *See also* '415 patent at col. 2 lines 7-12 ("The dome-cap when pressed against sufficiently to bow toward the second conductive element has resistance to moving which begins low and increases toward a snap-through threshold wherein at the threshold the dome-cap snaps creating a snap or click which is user discernable in the form of a tactile sensation.").

¹² Indeed, Armstrong notes in his '791 patent that "most, but not all elastomeric injection molded dome-caps when depressed produce a soft snap which is a user discernable tactile feedback." '791 patent at col. 1, line 66 to col. 2, line 2.

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It is clear from the disclosure of Furukawa '760 that pressing on pushbutton 30 will cause the dome-cap to bow downward to establish contact between conductive portion 33 and fixed contacts 7, 7. Furukawa '760 at 7 ("By performing the pressing operation, the moving part 30 is lowered while being resisted by an elastic urging force of the elastic leg portion 31 so that it is electrically connected to the fixed contacts, 7, 7 of a wiring pattern disposed on the substrate 5."), Fig. 2; *compare* '415 patent at col. 2, lines 7-12 ("The dome-cap when pressed against sufficiently to bow toward the second conductive element has resistance to moving which begins low and increases toward a snap-through threshold wherein at the threshold the dome-cap snaps creating a snap or click which is user discernable in the form of a tactile sensation." (emphasis added)). Thus, the convex dome-cap of Furukawa '760 is elastically deformed to become concave. Furthermore, even Armstrong acknowledged the resilient return/momentary-on characteristics of the Furukawa '760 dome-cap. May 16, 2002 Response at 3.

The inherent snap-through feature of the Furukawa '760 structure is demonstrated elsewhere in the prior art.¹³ For example, JP S53-128861 to Amase discloses a "pressure sensitive switch mechanism by which a person operating the switch may perceive whether the switch become the ON state or the OFF state, i.e. whether the switch reliably operates or not by a click feeling" JP S53-128861 at 3; *id.* at 4, 5. In particular, the "click feeling" – *i.e.*, snap-through tactile feedback – results from the inversion of a convex spring 12, which inversion occurs both as pressure is applied and as pressure is released. JP S53-128861 at 4-5; *see also* U.S. Patent No. 3,643,041 to Jackson at col. 2, lines 23-42; Padula at col. 9, lines 25-32 ("The

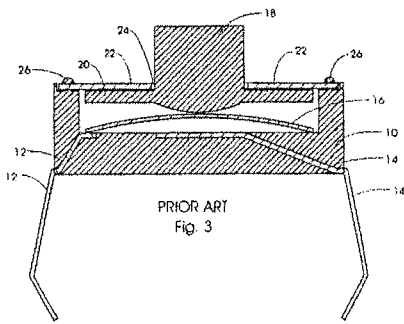
¹³ *See, e.g., Continental Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991) ("To serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence.").

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snap action during collapse of the dome can be sensed by the stylus user, providing a definite tactile feedback indicating to the user that the digitizing apparatus has switched from the disabled state to the enabled state. When pressure is removed from the stylus tip, the dome snaps back to its original undeformed state, ready for the next operation.”); Tanami et al. at 7 (“Since the pressure-sensitive conductive rubber 4 has the cross-sectional shape of an inverted recess and becomes cavity-like in the non-pressure state, a moderate feeling in the switching is obtained by the collapse deformation of the pressure-sensitive conductive rubber 4.”); Kaneko at 2, 6-7; Matsumoto at 2-3, 7-8; Kramer at col. 1, lines 28-35, col. 5, lines 36-48, Fig. 1; Driver at col. 1, line 70 to col. 2, line 9.

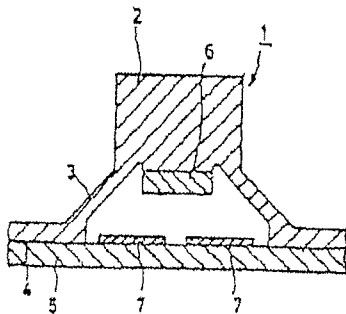
In any event, a comparison of Figures 3 and 5 of the ‘415 patent most tellingly shows the problem with Armstrong’s distinction of Furukawa ‘760. Figure 3 of the ‘415 patent depicts a prior art switch. Figure 5 depicts the same structure as Figure 3, the sole exception being the addition of variable conductance material 30 on the underside of conductive dome-cap 16. Thus, as in Furukawa ‘760, the difference between the prior art and the variable conductance sensor is the addition of variable conductance material to the underside of the dome-cap, resulting in a “narrowing [of] the spacing between the dome cap ... and the conductors” May 16, 2002 Response at 5. Compare the figures below.

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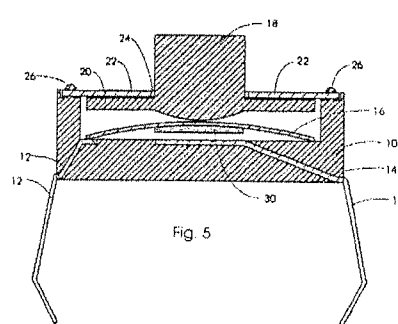
'415 Patent Prior Art

[圖 3]



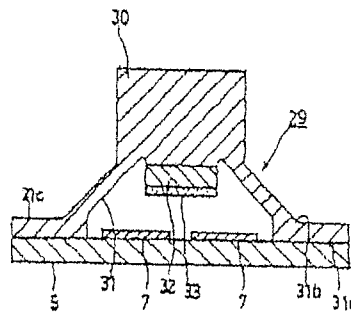
Furukawa '760 Prior Art

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'415 Patent

[圖 2]



Furukawa '760

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Armstrong does not identify – and the figures do not exhibit – that any “[c]areful designing or engineering in elastic legs and dome structures and other associated parts” occurred in order to carry over the snap-through tactile feedback feature from the prior art structure to the Figure 5 structure. *See id.* at 5.

With respect to Furukawa '760, Armstrong argues that such structure teaches away from snap-through tactile feedback. With respect to the embodiment of “the present invention” shown in Figure 5 of the '415 patent, however, Armstrong states that such structure embodies snap-through tactile feedback. '415 patent at col. 8, line 61 to col. 9, line 4, col. 9, lines 35-40. If, as Armstrong told the Examiner, “the narrowing of the spacing [is] the opposite structural

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arrangement which would normally be applied if one desired the dome cap to be able to be depressed to a point of crossing a threshold snap-through before the depressive stroke has bottomed-out,” then his assertion in the ‘415 patent that the structure of Figure 5 shows snap-through tactile feedback is simply wrong. The same error would apply to at least the embodiments of Figures 4, 6, 9 10, 11 and 13, as well. May 16, 2002 Response at 5; *see* ‘415 patent at col. 6, lines 58-60; col. 8, lines 61-63; col. 9, lines 50-52; col. 10, lines 62-64; col. 11, lines 23-27, 49-67. The more reasonable conclusion, especially in view of the teachings of the ‘415 patent, is that simply narrowing the spacing within a dome-cap does not indicate an absence of snap-through tactile feedback, and Armstrong has not shown any concrete reason to believe that the momentary-on dome-cap switch of Furukawa ‘760 does not provide such feedback.

**III. Prior Art Relied Upon by Requestor That Establishes
A Substantial New Question Of Patentability**

A. List of Prior Art Patents/Publications

The following is a list of patents and publications attached in support of this Request. For convenience, the prior art is categorized as “cited” or “not cited” during the prosecution of the ‘415 patent.¹⁴

- UK Published Patent Application No. 2 156 588 A (Meleard et al.), published Oct. 9, 1985 (not cited);
- U.S. Patent No. 3,590,195 (Driver), issued June 29, 1971;
- Japanese Laid Open Utility Model Application No. JP S61-103836 (Matsumoto et al.), published July 2, 1986 (not cited);
- Japanese Laid Open Utility Model Application No. JP S61-100844 (Kaneko et al.), published June 27, 1986 (not cited);

¹⁴ All translations have been certified.

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- UK Published Patent Specification No. 1 412 298 (Knox), published Nov. 5, 1975 (not cited);
- U.S. Patent No. 5,164,697 (Kramer), issued Nov. 17, 1992 (cited);
- U.S. Patent No. Re. 34,095 (Padula et al.), issued October 13, 1992 (original patent issued Nov. 22, 1988) (not cited);
- Japanese Laid Open Utility Model Application No. JP5-87760 (Furukawa et al.), published Nov. 26, 1993 (cited);
- Japanese Laid Open Patent Application No. JP5-326217 (Furukawa et al.), published Dec. 10, 1993 (not cited);
- JP S53-128861 (Amase), published 1978 (not cited);
- U.S. Patent No. 3,643,041 (Jackson), issued Feb. 15, 1972 (not cited);
- U.S. Patent No. 5,046,739 (Reichow), issued Sept. 10, 1991 (not cited).

B. Summary of Prior Art

As explained further in the claim charts below, Matsumoto and Kaneko each anticipate the subject matter of at least claims 1, 2, 7-10 and 17-19 of the '415 patent. Knox anticipates the subject matter of at least claims 9, 10, 13-15 and 17-19. Kramer anticipates (35 U.S.C. 102) the subject matter of at least claims 1, 2, 4, 5, 7-9, 11, 13-15, 17, 18, 20, 21, 23 and 24. Further, Furukawa anticipates (35 U.S.C. 102) the subject matter of at least claims 1, 4, 5, 7, 9, 11, 13-15, 17, 18, 20, 21, 23 and 24. Each of these references independently establishes a substantial new question of patentability with respect to these claims. In addition, other prior art references, discussed in greater detail below, render the additional features of the remaining claims obvious and establish a substantial new question of patentability with respect to those claims.

Certain of the prior art references discussed herein were cited during prosecution of the '415 patent application. However, it is clear from the prosecution history that the full teachings of those references were not appreciated.

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According to Armstrong, his invention lay in the combination of well-known features, namely snap-through tactile feedback and a variable conductance switch. '415 patent at col. 7, lines 5-15. However, as discussed above, the general desirability for snap-through tactile feedback has long been recognized, and the use of such feedback with a variable output sensor certainly is not new.

For example, as discussed above, Meleard explains the desirability of snap-through tactile feedback, identifying domes as "tactile snap-action elements," Meleard at 1, lines 21-42, and Driver explains the mechanics as to why a dome-cap provides snap-through tactile feedback. Driver at col. 1, line 70 to col. 2, line 9.

Further, Knox describes a keyboard that includes a plastic plate or sheet 4 formed with a plurality of dome-like keys 3, arranged to push a conductive layer 14 into engagement with contacts 2. Variable resistance is established between the layer 14 and the terminals A-O of the track 2. Knox discloses further that each key can be arranged to act against a metal spring so that a "snap-action" and an audible "click" is obtained when the key is depressed. *See* Knox at 4, lines 30-33.

Similarly, Kramer discloses a pushbutton switch device (switching device 3) for use with an input keyboard for an electronic "appliance" (*e.g.*, a remote control transmitter) in entertainment electronics.¹⁵ Kramer discusses ON/OFF type rubber dome switches, and notes the desirability of having a switch that not only performs choosing or setting functions (*i.e.*, ON/OFF functions), but also a changing value function, or "adjustment process." Kramer at col.

¹⁵ Kramer was cited during prosecution of the '415 patent as providing the basis for an alternative obviousness rejection of claims 1, 2, 7 and 8. May 3, 2002 Office Action at 5.

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1, lines 21-51. Kramer also discloses that its sensor is of the pressure-sensitive, variable conductance type:

The pressure-dependent contact resistance between the contact surface 18 of the carbonized plastic foil and the contact surfaces 15.1 and 15.2 of the contact linings 11.1 and 11.2 of the conductor strips 12.1 and 12.2 of the printed circuit board 10 is schematically indicated in FIG. 2 by means of the resistances $R_k(P)$ controlled by a pressure P . These resistances diminish linearly as the contact pressure increases, the linear relationship being preserved over a range of two to three powers of ten. This contact pressure is constituted by the operating pressure P acting on the pushbutton 22, since the spring element 20 transfers this pressure to the contact surface 18 of the carbonized plastic foil 14.

Kramer at col. 4, line 63 to col. 5, line 8.

Kramer describes at least three embodiments of a switch that can be used to produce not only a switching process but also an adjustment process. Of particular significance is the text in column 5, lines 36-51, which discloses that:

In another advantageous embodiment of such an input keyboard that is not illustrated in the drawing attached hereto, the spring element 20 is attached to the ceiling surface of a rubber dome of a contact mat that is arranged between the bottom 27 of a pushbutton 22 and the said spring element 20. Like the thin insulating plate in the previous embodiment, the rubber dome bears against the printed circuit board 10 and, upon the depression of the appropriate pushbutton 22, will first actuate a switching process with a snap effect and subsequently permit pressure-dependent adjustment of a function variable. In this way it becomes possible to combine switching devices with and without an additional pressure-dependent adjustment function in one and the same contact mat.

Kramer at col. 5, lines 36-50 (emphasis added);

Another example is U.S. Patent No. Re. 34,095 to Padula et al., which discloses a pressure sensitive dome-cap switch having snap-through tactile feedback. For example, Padula, directed to a digitizer stylus switch, provides the following disclosures:

As the pressure on the stylus tip is increased, the resistance of the FSR [force-sensitive resistant] transducer 26 decreases, whereby the dc level of the analog signal increases.

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* * *

FIG. 12 indicates another embodiment of a pressure transducer in which a layer 100 of flexible material, for example, a thin sheet of silver or other metal, formed with a dome 102 is positioned between, for example, the refill interface plug 12 and the plunger 20. The dome 102 is surrounded by a planar annular portion 106 which is seated on the radial end face of refill interface plug 12. When a predetermined pressing force is applied to the dome by refill interface plug 12 and plunger 20, the dome undergoes reversible collapse. The metal dome is designed so that the collapse of the bubble takes place at a pressure which is substantially equal to the pressure at which the processing of data from the stylus is enabled, as previously described. The snap action during collapse of the dome can be sensed by the stylus user, providing a definite tactile feedback indicating to the user that the digitizing apparatus has switched from the disabled state to the enabled state. When pressure is removed from the stylus tip, the dome snaps back to its original undeformed state, ready for the next operation.

Padula at col. 8, lines 23-26; col. 9, lines 12-32 (emphasis added).

Jackson discloses a push button diaphragm switch for a keyboard formed of a plurality of openings 18. A metal switch 20 underlies a metal keyboard base plate 16 and is formed with a plurality of dome-shaped resiliently deformable dimples 22 that project into corresponding openings 18 and serve as keyboard push buttons. See Jackson at col. 1, lines 64-73. The dimples 22 are adapted to engage contact buttons 30 secured to a contact board 28 as best seen in Figure

3. According to the reference:

Downward pressure on the dimple will be resisted until a certain predetermined force is exerted, whereupon the dimple "collapses" with a snap action, resulting in the convex portion of the dimple becoming concave and the dimple contacting the button 30, as shown in FIG. 4. This snap action results in a mechanical sensory feedback signal through the fingertip of the operator. The sensation received by the operator is a snap sensation similar to that received when operating a toy clicker device which emits an audible clicking sound when depressed. The action of the dimple while collapsing is a modified overcenter action wherein a force on the convex portion of the dimple beyond a predetermined portion results in the collapse of the dimple but does not cause the dimple to permanently assume a convex shape; rather, immediately upon releasing the dimple, it will snap into its original shape. This snap action provides the operator with a desirable mechanical sensory feedback signal which enables him to determine that the key has properly been depressed.

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Id. at col. 2, lines 25-42.

In a second embodiment illustrated in Figure 5, a continuous flat insulating sheet 35 without openings or holes insulates the dimple 22 from the contact button 36. According to the patent document, “[w]hen the dimple 22 is depressed as shown in FIG. 5, the capacitance existing between the button 37 [sic, 36] and the dimple 22 is substantially greater than when the dimple is in its original position.” *Id.* at col. 3, lines 72-75. It is disclosed that “a circuit connected between the contact button 36 and the switchplate 20 will incorporate a variable capacitance depending on the position of the dimple 22 with respect to the contact button 36. Conventional capacitance change sensed circuitry may be utilized to detect this change in capacitance resulting from the depression of the dimple 22, thus providing a keyboard operable through an induced change in capacitance at the selected keys. *See id.* at col. 2, line 75 to col. 3, line 7.

Other references disclose variable-conductance sensors but do not explicitly state that the sensors provide snap-through tactile feedback. Nevertheless, the disclosure of snap-through tactile feedback is inherent in those references. For example, as discussed above with respect to the ‘415 patent’s prosecution history, Furukawa ‘760 inherently discloses snap-through tactile feedback in a variable conductance switch.

Similarly, Furukawa ‘217 discloses a pressure-sensitive variable resistor switch –whose structure is very similar to the rubber contact of Furukawa ‘760 – to control, *inter alia*, “character reaction speed in computer games” played using a computer keyboard. Furukawa ‘217 at 1, 5, Figs. 3-5. In particular:

When the rubber key top 6 is pressed down, the pressure-sensitive variable resistor 1 makes contact with two secure contact points 9 and 10 on a circuit board 8 as shown in Fig. 5, establishing a circuit between the two secure contact

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points 9 and 10 via anisotropic electro-conductive paths a and b of the pressure-sensitive variable resistor 1 and the electro-conductive layer 7 above it. When the contact pressure is low, the pressure-sensitive variable resistor 1 has high resistance. The resistance is reduced as the rubber key top 6 is further pressed down and the contact pressure is increased.

Furukawa '217 at 4-5, Figs. 3-5 (emphasis added). It is worth noting that computer keyboards usually provide snap-through tactile feedback. *See, e.g.*, CSI.

As noted above, Amase discloses a pressure sensitive dome-cap switch, by which a person may perceive "whether the switch reliably operates or not by a click feeling" that results from inversion of dome spring 12. Amase at 3; *id.* at 4, 5. That inversion occurs both as pressure is applied and as pressure is released. *Id.* at 5. Thus, snap-through feedback is provided on both application and release of pressure.

With respect to other claimed features of the '415 patent, U.S. Patent No. 5,046,739 to Reichow ("Reichow") discloses that housings for game controllers were "commonly made of metal or rigid plastic." Reichow at col. 1, lines 23-24.

IV. DETAILED APPLICATION OF PRIOR ART TO THE CLAIMS OF THE '415 PATENT

As explained further in the claim charts below, Matsumoto and Kaneko each anticipate the subject matter of at least claims 1, 2, 7-10 and 17-19 of the '415 patent. Knox anticipates the subject matter of at least claims 9, 10, 13-15 and 17-19. Kramer anticipates (35 U.S.C. 102) the subject matter of at least claims 1, 2, 4, 5, 7-9, 11, 13-15, 17, 18, 20, 21, 23 and 24. Further, Furukawa anticipates (35 U.S.C. 102) the subject matter of at least claims 1, 4, 5, 7, 9, 11, 13-15, 17, 18, 20, 21, 23 and 24. Each of these references independently and respectively establishes a substantial new question of patentability with respect to these claims. In addition, several prior

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patents, discussed in greater detail below, render the additional features of the remaining claims obvious and establish a substantial new question of patentability with respect to those claims.

1. Anticipation

a. Matsumoto Anticipates at Least Claims 1, 2, 7-10 and 17-19 Under 35 U.S.C. § 102

CLAIM LANGUAGE OF THE '415 PATENT	MATSUMOTO
CLAIM 1	
A pressure-sensitive variable-conductance analog sensor with tactile feedback actuatable by a single human finger, comprising;	Matsumoto discloses a pressure-sensitive variable-conductance analog sensor with tactile feedback actuatable by a single human finger. Matsumoto at 1 ("The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how much the push button of the switch is pressed."); <i>id.</i> at 4, Figs. 3-9; <i>id.</i> at 2-3 ("The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation, and the resistance between two terminals is changed when the push button is further pressed."); <i>see also id.</i> at 4-9.
a housing;	Upper switch case 2A, lower switch case 2B
electrically highly conductive elements at least in-part within said housing;	Electrodes 4A, 4B, 5A, 5B, electro-conductive layer 7B
a depressible actuator retained by said housing and in-part exposed external to said housing for depression by a single human finger;	Push button 1
a resilient snap-through dome-cap positioned within said housing and depressible with force from said actuator applied to said dome-cap to cause said dome-cap to snap-through and create a snap-through tactile feedback detectable by the finger depressing the actuator; and	Curved plate 3
pressure-sensitive variable-conductance material positioned within said housing, said pressure-sensitive	Pressure-sensitive electro-conductive rubber 6

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CLAIM LANGUAGE OF THE '415 PATENT	MATSUMOTO
variable-conductance material electrically positioned as a variably conductive element between said highly conductive elements, said pressure-sensitive variable-conductance material further positioned for receiving force applied to said dome-cap.	
CLAIM 2	
A pressure-sensitive variable-conductance analog sensor with tactile feedback in accordance with claim 1 wherein said pressure-sensitive variable-conductance material is variable in terms of electrical resistivity, the electrical resistivity lowering with increasing force applied to said depressible actuator.	See discussion of claim 1 with respect to Matsumoto. "With the push button 1 being further pressed, the pressure-sensitive electro-conductive rubber 6 is compressed and has reduced resistance, gradually reducing the resistance between the terminals 5C and 5D." Matsumoto at 8.
CLAIM 7	
An improved momentary-On snap-through switch of the type having a housing; a resilient snap-through tactile feedback dome-cap positioned within said housing; a depressible actuator retained by said housing and in-part exposed external to said housing for being depressed by a single human finger; wherein the improvement comprises:	This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art. Furthermore, Matsumoto discloses a momentary-on snap-through switch having a housing (upper switch case 2A, lower switch case 2B), a resilient snap-through tactile feedback dome-cap (curved plate 3) positioned within said housing; a depressible actuator (push button 1) retained by said housing and in-part exposed external to said housing for being depressed by a single human finger. Matsumoto at 1 ("The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how much the push button of the switch is pressed."); <i>id.</i> at 4, Figs. 3-9; <i>id.</i> at 2-3 ("The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the

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CLAIM LANGUAGE OF THE '415 PATENT	MATSUMOTO
	<p>pressing operation, and the resistance between two terminals is changed when the push button is further pressed.”); <i>see also id.</i> at 6-9.</p> <p>The switch disclosed in Matsumoto is a momentary-on switch, because the switch is turned on as pressure is applied to push button 1, and the switch is turned off as pressure is removed from push button 1. Matsumoto at 7-8 (“On the other hand, with the pressure on the push button 1 being released, the pressure-sensitive electro-conductive rubber 6 tends to return to its original state due to elasticity and the resistance is increased. When the pressing is discontinued, first, the pressure-sensitive electro-conductive rubber 6 returns to its no-load state due to elasticity; then, the resistance through the thickness reaches an infinite value, nullifying [sic] the conductivity between the terminals 5C and 5D. Then, the restoration of the elastic electro-conductive curved plate 3 pushes up the push button 1 and the elastic electro-conductive curved plate 3 returns to its no-load state so that it is no longer in contact with the electrode 4B, nullifying the conductivity between the terminals 4C and 4D.”).</p>
<p>analog structuring within said housing for creating a variable electrical output representational of variable depression of said actuator.</p>	<p>Pressure-sensitive electro-conductive rubber 6</p> <p>“The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation, and the resistance between two terminals is changed when the push button is further pressed.” Matsumoto at 2-3; Figs. 3, 4, 7-9.</p> <p>“With the push button 1 being further pressed, the pressure-sensitive electro-conductive rubber 6 is compressed and has reduced resistance, gradually</p>

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CLAIM LANGUAGE OF THE '415 PATENT	MATSUMOTO
	<p>reducing the resistance between the terminals 7A and 7B.” Matsumoto at 8.</p> <p>“On the other hand, with the pressure on the push button 1 being released, the pressure-sensitive electro-conductive rubber 6 tends to return to its original state due elasticity and the resistance is increased.” Matsumoto at 8.</p> <p>“When the pressing is discontinued, first, the pressure-sensitive electro-conductive rubber 6 returns to its no-load state due to elasticity; then, the resistance through the thickness reaches an infinite value, nullifying [sic] the conductivity between the terminals 5C and 5D. Then, the restoration of the elastic electro-conductive curved plate 3 returns to its no-load state so that it is no longer in contact with the electrode 4B, nullifying the conductivity between the terminals 4C and 4D.” Matsumoto at 8.</p>
CLAIM 8	
<p>An improved momentary-on snap-through switch in accordance with claim 7 wherein said electrical output is variable in terms of electrical resistivity, the electrical resistivity lowering with increasing depression of said actuator.</p>	<p>See discussion of claim 7 with respect to Matsumoto.</p> <p>“With the push button 1 being further pressed, the pressure-sensitive electro-conductive rubber 6 is compressed and has reduced resistance, gradually reducing the resistance between the terminals 5C and 5D.” Matsumoto at 8.</p>
CLAIM 9	
<p>An improved analog sensor of the type having at least two highly conductive electrical elements operationally connected to pressure-sensitive analog structure; a depressible actuator in-part exposed to be depressible toward said pressure-sensitive analog structure for supplying an analog electrical output according to depression of said actuator;</p> <p>wherein the improvement comprises:</p>	<p>This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art.</p> <p>Furthermore, Matsumoto discloses an analog sensor having at least two highly conductive electrical elements (electrodes 4A, 4B, 5A, 5B, electro-conductive layer 7B) operationally connected to pressure-sensitive analog structure (pressure-sensitive electro-conductive rubber 6); a depressible actuator (push button 1) in-part exposed to be depressible toward said pressure-</p>

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CLAIM LANGUAGE OF THE '415 PATENT	MATSUMOTO
	<p>sensitive analog structure for supplying an analog electrical output according to depression of said actuator.</p> <p>Matsumoto at 1 (“The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how much the push button of the switch is pressed.”); <i>id.</i> at 4, Figs. 3-9; <i>id.</i> at 2-3 (“The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation, and the resistance between two terminals is changed when the push button is further pressed.”); <i>see also id.</i> at 6-9, 11.</p>
<p>a resilient snap-through dome-cap positioned to provide tactile feedback through said actuator to a human user’s thumb depressing said actuator.</p>	<p>Curved plate 3</p> <p>Matsumoto at 1 (“The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how much the push button of the switch is pressed.”); <i>id.</i> at 4, Figs. 3-9; <i>id.</i> at 2-3 (“The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation, and the resistance between two terminals is changed when the push button is further pressed.”); <i>see also id.</i> at 6-9, 11.</p> <p>The sensor of Matsumoto is disclosed in the</p>

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CLAIM LANGUAGE OF THE '415 PATENT	MATSUMOTO
	context of being actuated by a fingertip, which may include the tip of a human thumb.
CLAIM 10	
An improved analog sensor in accordance with claim 9 wherein said snap-through dome-cap is metallic.	Curved plate 3 is made of a phosphor bronze. Matsumoto at 6.
CLAIM 17	
An analog sensor, comprising:	Matsumoto discloses an analog sensor.
an actuator moveable by only a single human finger; responsive to movement of said actuator is	Push button 1. Matsumoto at 1 ("The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how much the push button of the switch is pressed.").
first means for varying electrical resistance and providing a varying electrical output of said sensor; and responsive to movement of said actuator is	Pressure-sensitive electro-conductive rubber 6.
second means for providing a snap-through threshold tactile feedback detectable upon deactivation of said first means, said snap-through tactile feedback detectable by the single human finger.	Curved plate 3. Matsumoto at 1 ("The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how much the push button of the switch is pressed."); <i>id.</i> at 4, Figs. 3-9; <i>id.</i> at 2-3 ("The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation, and the resistance between two terminals is changed when the push button is further pressed."); <i>see also id.</i> at 6-9, 11. Matsumoto provides snap-through threshold tactile feedback upon activation. Momentary-on dome switches as described in Matsumoto inherently provide tactile feedback in both

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CLAIM LANGUAGE OF THE '415 PATENT	MATSUMOTO
	<p>directions. <i>See, e.g.</i>, '415 patent at col. 2, lines 14-20; Padula at col. 9, lines 26-32; Driver at col. 1, line 70 to col. 2, line 9; <i>cf.</i> Matsumoto. at 8 (describing restoration of curved plate 3 to the no-load state). Thus, it is inherent that the same structure will provide the claimed snap-through threshold tactile feedback upon deactivation, just as in the '415 patent. <i>See, e.g.</i>, '415 patent at col. 2, lines 14-20; Padula at col. 9, lines 26-32; Driver at col. 1, line 70 to col. 2, line 9.</p>
CLAIM 18	
<p>An analog sensor according to claim 17 wherein said second means comprises a dome-cap structure, and another snap-through threshold tactile feedback is discernable upon activation of said first means.</p>	<p>See discussion of claim 17 with respect to Matsumoto.</p> <p>Curved plate 3.</p> <p>Matsumoto provides snap-through threshold tactile feedback upon activation. Utilizing the dome-type sensor in Matsumoto as intended would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent use. Momentary-on dome switches as described in Matsumoto provide tactile feedback in both directions. <i>See, e.g.</i>, '415 patent at col. 2, lines 14-20; Padula at col. 9, lines 26-32; Jackson at col. 2, lines 23-24; Driver at col. 1, line 70 to col. 2, line 9; <i>cf.</i> Matsumoto at 8 describing restoration of curved plate 3 to the no-load state). Thus, it is inherent that the same structure will provide the claimed snap-through threshold tactile feedback upon deactivation, just as in the '415 patent. <i>See, e.g.</i>, '415 patent at col. 2, lines 14-20; Padula at col. 9, lines 26-32; Jackson at col. 2, lines 23-24; Driver at col. 1, line 70 to col. 2, line 9.</p> <p>Matsumoto at 1 ("The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how much the push button of the</p>

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CLAIM LANGUAGE OF THE '415 PATENT	MATSUMOTO
	switch is pressed.”); <i>id.</i> at 4, Figs. 3-9; <i>id.</i> at 2-3 (“The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation, and the resistance between two terminals is changed when the push button is further pressed.”); <i>see also id.</i> at 6-9, 11.
CLAIM 19	
An analog sensor according to claim 18 wherein said dome-cap is metallic.	See discussion of claim 18 with respect to Matsumoto. Curved plate 3 is made of a phosphor bronze. Matsumoto at 6.

b. Kaneko Anticipates at Least Claims 1, 2, 7-10 and 17-19 Under 35 U.S.C. § 102

CLAIM LANGUAGE OF THE '415 PATENT	KANEKO
CLAIM 1	
A pressure-sensitive variable-conductance analog sensor with tactile feedback actuatable by a single human finger, comprising;	Kaneko discloses a pressure-sensitive variable-conductance analog sensor with tactile feedback actuatable by a single human finger. Kaneko at 1 (“The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how far the push button of the switch is pressed.”); <i>id.</i> at 4, Figs. 1-4; <i>id.</i> at 2 (“The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation.”); <i>see also id.</i> at 5-7.
a housing;	Upper switch case 2A, lower switch case 2B

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CLAIM LANGUAGE OF THE '415 PATENT	KANEKO
electrically highly conductive elements at least in-part within said housing;	Electrodes 4A, 4B.
a depressible actuator retained by said housing and in-part exposed external to said housing for depression by a single human finger;	Push button 1
a resilient snap-through dome-cap positioned within said housing and depressible with force from said actuator applied to said dome-cap to cause said dome-cap to snap-through and create a snap-through tactile feedback detectable by the finger depressing the actuator; and	Curved plate 3
pressure-sensitive variable-conductance material positioned within said housing, said pressure-sensitive variable-conductance material electrically positioned as a variably conductive element between said highly conductive elements, said pressure-sensitive variable-conductance material further positioned for receiving force applied to said dome-cap.	Pressure-sensitive electro-conductive rubber 6
CLAIM 2	
A pressure-sensitive variable-conductance analog sensor with tactile feedback in accordance with claim 1 wherein said pressure-sensitive variable-conductance material is variable in terms of electrical resistivity, the electrical resistivity lowering with increasing force applied to said depressible actuator.	See discussion of claim 1 with respect to Kaneko. "With the push button 1 being further pressed, the pressure-sensitive electro-conductive rubber 6 is compressed and has reduced resistance, which gradually reduces the resistance between the terminals 7A and 7B." Kaneko at 7.
CLAIM 7	
An improved momentary-On snap-through switch of the type having a housing; a resilient snap-through tactile feedback dome-cap positioned within said housing; a depressible actuator retained by said housing and in-part exposed external to said housing for being depressed by a single human finger; wherein the improvement comprises:	This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art. Furthermore, Kaneko discloses a momentary-on snap-through switch having a housing (upper switch case 2A, lower switch case 2B), a resilient snap-through tactile feedback dome-cap (curved plate 3) positioned within said housing; a depressible actuator (push button 1) retained by said housing and in-part exposed external to said housing for being depressed by a single human finger. Kaneko at 1 ("The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through

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CLAIM LANGUAGE OF THE '415 PATENT	KANEKO
	<p>the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how far the push button of the switch is pressed.”); <i>id.</i> at 4, Figs. 1-4; <i>id.</i> at 2 (“The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation.”); <i>see also id.</i> at 5-7.</p> <p>The switch disclosed in Kaneko is a momentary-on switch, because the switch is turned on as pressure is applied to push button 1, and the switch is turned off as pressure is removed from push button 1. Kaneko at 5-7 (“With the push button 1 being further pressed, the pressure-sensitive electro-conductive rubber 6 is compressed and has reduced resistance, which gradually reduces the resistance between the terminals 7A and 7B. When pressing is discontinued, the restoration of the elastic electro-conductive curved plate 3 pushes up the push button 1 and the elastic electro-conductive curved plate 3 returns to the no-load state so that it is no longer in contact with the pressure-sensitive electro-conductive rubber 6, with the resistance between terminals 7A and 7B reaching an infinite value.”).</p>
<p>analog structuring within said housing for creating a variable electrical output representational of variable depression of said actuator.</p>	<p>Pressure-sensitive electro-conductive rubber 6</p> <p>“The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation.” Kaneko at 2.</p>

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CLAIM LANGUAGE OF THE '415 PATENT	KANEKO
	<p>“With the push button 1 being further pressed, the pressure-sensitive electro-conductive rubber 6 is compressed and has reduced resistance, which gradually reduces the resistance between the terminals 7A and 7B.” Kaneko at 7.</p> <p>“When pressing is discontinued, the restoration of the elastic electro-conductive curved plate 3 pushes up the push button 1 and the elastic electro-conductive curved plate 3 returns to the no-load state so that it is no longer in contact with the pressure-sensitive electro-conductive rubber 6, with the resistance between terminals 7A and 7B reaching an infinite value.” Kaneko at 7.</p>
CLAIM 8	
<p>An improved momentary-on snap-through switch in accordance with claim 7 wherein said electrical output is variable in terms of electrical resistivity, the electrical resistivity lowering with increasing depression of said actuator.</p>	<p>See discussion of claim 7 with respect to Kaneko.</p> <p>“With the push button 1 being further pressed, the pressure-sensitive electro-conductive rubber 6 is compressed and has reduced resistance, which gradually reduces the resistance between the terminals 7A and 7B.” Kaneko at 7.</p>
CLAIM 9	
<p>An improved analog sensor of the type having at least two highly conductive electrical elements operationally connected to pressure-sensitive analog structure; a depressible actuator in-part exposed to be depressible toward said pressure-sensitive analog structure for supplying an analog electrical output according to depression of said actuator;</p> <p>wherein the improvement comprises:</p>	<p>This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art.</p> <p>Furthermore, Kaneko discloses an analog sensor having two highly conductive electrical elements (Electrodes 4A, 4B) operationally connected to pressure-sensitive analog structure (pressure-sensitive electro-conductive rubber 6); a depressible actuator (push button 1) in-part exposed to be depressible toward said pressure-sensitive analog structure for supplying an analog electrical output according to depression of said actuator.</p> <p>Kaneko at 1 (“The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the</p>

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CLAIM LANGUAGE OF THE '415 PATENT	KANEKO
	<p>resistance between two terminals can be changed depending on how far the push button of the switch is pressed.”); <i>id.</i> at 4, Figs. 1-4; <i>id.</i> at 2 (“The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation.”); <i>see also id.</i> at 5-8.</p>
<p>a resilient snap-through dome-cap positioned to provide tactile feedback through said actuator to a human user’s thumb depressing said actuator.</p>	<p>Curved plate 3.</p> <p>Kaneko at 1 (“The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how far the push button of the switch is pressed.”); <i>id.</i> at 4, Figs. 1-4; <i>id.</i> at 2 (“The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation.”); <i>see also id.</i> at 5-9.</p> <p>The sensor of Kaneko is disclosed in the context of being actuated by a fingertip, which may include the tip of a human thumb.</p>
<p>CLAIM 10</p>	
<p>An improved analog sensor in accordance with claim 9 wherein said snap-through dome-cap is metallic.</p>	<p>See discussion of claim 10 with respect to Kaneko.</p> <p>Curved plate 3 is made of a phosphor bronze. Kaneko at 5.</p>

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CLAIM LANGUAGE OF THE '415 PATENT	KANEKO
CLAIM 17	
An analog sensor, comprising:	Kaneko discloses an analog sensor.
an actuator moveable by only a single human finger; responsive to movement of said actuator is	Push button 1. Kaneko at 1 ("The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how far the push button of the switch is pressed.").
first means for varying electrical resistance and providing a varying electrical output of said sensor; and responsive to movement of said actuator is	Pressure-sensitive electro-conductive rubber 6.
second means for providing a snap-through threshold tactile feedback detectable upon deactivation of said first means, said snap-through tactile feedback detectable by the single human finger.	<p>Curved plate 3. Kaneko at 1 ("The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how far the push button of the switch is pressed."); <i>id.</i> at 4, Figs. 1-4; <i>id.</i> at 2 ("The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation."); <i>see also id.</i> at 5-8.</p> <p>Kaneko provides snap-through threshold tactile feedback upon activation. Utilizing the dome-type sensor in Kaneko as intended would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent use. Momentary-on dome switches as described in Kaneko provide tactile feedback in both directions. <i>See, e.g.,</i> '415 patent at col. 2, lines 14-20; Padula at col. 9, lines 26-32; Jackson at col. 2, lines 23-24; Driver at col. 1, line 70 to col. 2, line 9; <i>cf.</i> Kaneko at 7 (describing restoration of curved plate 3 to the no-load state). Thus, it is</p>

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CLAIM LANGUAGE OF THE '415 PATENT	KANEKO
	<p>inherent that the same structure will provide the claimed snap-through threshold tactile feedback upon deactivation, just as in the '415 patent. <i>See, e.g.,</i> '415 patent at col. 2, lines 14-20; Padula at col. 9, lines 26-32; Jackson at col. 2, lines 23-24; Driver at col. 1, line 70 to col. 2, line 9.</p>
<p>CLAIM 18</p>	
<p>An analog sensor according to claim 17 wherein said second means comprises a dome-cap structure, and another snap-through threshold tactile feedback is discernable upon activation of said first means.</p>	<p>See discussion of claim 17 with respect to Kaneko.</p> <p>Curved plate 3.</p> <p>Kaneko provides snap-through threshold tactile feedback upon activation. Utilizing the dome-type sensor in Kaneko as intended would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent use. Momentary-on dome switches as described in Kaneko provide tactile feedback in both directions. <i>See, e.g.,</i> '415 patent at col. 2, lines 14-20; Padula at col. 9, lines 26-32; Jackson at col. 2, lines 23-24; Driver at col. 1, line 70 to col. 2, line 9; <i>cf.</i> Kaneko at 7 (describing restoration of curved plate 3 to the no-load state). Thus, it is inherent that the same structure will provide the claimed snap-through threshold tactile feedback upon deactivation, just as in the '415 patent. <i>See, e.g.,</i> '415 patent at col. 2, lines 14-20; Padula at col. 9, lines 26-32; Jackson at col. 2, lines 23-24; Driver at col. 1, line 70 to col. 2, line 9.</p> <p>Kaneko at 1 (“The present invention relates to a variable resistance switch of which the on/off switching can be easily recognized through the feeling of pressure on a fingertip and the resistance between two terminals can be changed depending on how far the push button of the switch is pressed.”); <i>id.</i> at 4, Figs. 1-4; <i>id.</i> at 2 (“The purpose of the present invention is to resolve the above problems with the prior art variable resistance switch and to provide an excellent variable resistance switch in which a</p>

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CLAIM LANGUAGE OF THE '415 PATENT	KANEKO
	switchover point (click point) is provided in the middle of the stroke of the push button so that the operator clearly recognizes the switching from the off-state to the on-state in the course of the pressing operation.”); <i>see also id.</i> at 5-8.
CLAIM 19	
An analog sensor according to claim 18 wherein said dome-cap is metallic.	See discussion of claim 18 with respect to Kaneko. Curved plate 3 is made of a phosphor bronze. Kaneko at 5.

c. **Knox Anticipates at Least Claims 9, 10, 13-15 and 17-19 Under 35 U.S.C. § 102**

CLAIM LANGUAGE OF THE '415 PATENT	KNOX
CLAIM 9	
An improved analog sensor of the type having at least two highly conductive electrical elements operationally connected to pressure-sensitive analog structure; a depressible actuator in-part exposed to be depressible toward said pressure-sensitive analog structure for supplying an analog electrical output according to depression of said actuator; wherein the improvement comprises:	This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art. Furthermore, Knox discloses an analog sensor having at least two highly conductive electrical elements (tracks 2) operationally connected to pressure-sensitive analog structure (conducting material 14); a depressible actuator (cap 8 of key 3) in-part exposed to be depressible toward the pressure-sensitive analog structure for supplying an analog electrical output according to depression of cap 8. Knox at 3, lines 86-128, Fig. 5.
a resilient snap-through dome-cap positioned to provide tactile feedback through said actuator to a human user's thumb depressing said actuator.	Dome-like key 3, cross-members 10, metal spring; <i>see also</i> Knox at 4, lines 30-33 (“If desired, each key can be arranged to act against a metal spring so that a snap-action and an audible ‘click’ is obtained on depressing the key.”). Because the sensor of Knox is disclosed in the context of an input keyboard it is inherent that cap 8 of key 3 may be depressed by any finger of the human user, including the thumb.

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CLAIM LANGUAGE OF THE '415 PATENT	KNOX
CLAIM 10	
An improved analog sensor in accordance with claim 9 wherein said snap-through dome-cap is metallic.	See discussion of claim 9 with respect to Knox. Knox at 4, lines 30-33 ("If desired, each key can be arranged to act against a metal spring so that a snap-action and an audible 'click' is obtained on depressing the key.").
CLAIM 13	
An analog sensor, comprising:	Knox discloses an analog sensor. Knox at 3, lines 86-128.
means for varying electrical resistance for providing a varying output representational of varying depressive input by a single human finger; and	Conducting material 14; <i>see also</i> Knox at 3, lines 86-128. Because the sensor of Knox is disclosed in the context of an input keyboard it is inherent that cap 8 of key 3 may be depressed by any single finger of the human user.
a depressible resilient snap-through tactile element, when depressed said tactile element creating a tactile feedback detectable by the single finger.	Dome-like key 3, cross-members 10, metal spring; <i>see also</i> Knox at 4, lines 30-33 ("If desired, each key can be arranged to act against a metal spring so that a snap-action and an audible 'click' is obtained on depressing the key.").
CLAIM 14	
An analog sensor according to claim 13 wherein said analog sensor is a pressure-sensitive analog sensor.	See discussion of claim 13 with respect to Knox. Knox at 3, lines 86-128 ("The resistance on contact decreases with increased pressure on the key ...").
CLAIM 15	
An analog sensor according to claim 14 further including an actuator positioned between the single human finger and said tactile element, and said tactile element is a dome-cap.	See discussion of claim 14 with respect to Knox. Cap 8 of key 3; Dome-like key 3, cross-members 10, metal spring.
CLAIM 17	
An analog sensor, comprising:	Knox discloses an analog sensor. Knox at 3, lines 86-128.
an actuator moveable by only a single human finger; responsive to movement of said actuator is	Because the sensor of Knox is disclosed in the context of an input keyboard it is inherent that cap

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CLAIM LANGUAGE OF THE '415 PATENT	KNOX
	8 of key 3 may be depressed by any single finger of the human user.
first means for varying electrical resistance and providing a varying electrical output of said sensor; and responsive to movement of said actuator is	Conducting material 14; <i>see also</i> Knox at 3, lines 86-128.
second means for providing a snap-through threshold tactile feedback detectable upon deactivation of said first means, said snap-through tactile feedback detectable by the single human finger.	<p>Dome-like key 3, cross-members 10, metal spring; <i>see also</i> Knox at 4, lines 30-33 (“If desired, each key can be arranged to act against a metal spring so that a snap-action and an audible ‘click’ is obtained on depressing the key.”).</p> <p>Utilizing the dome-type sensor in Knox as intended would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent action. Dome switches as described in Knox are typically of the momentary-on type and provide tactile feedback in both directions. Thus, it is inherent that the same structure. <i>See, e.g.</i>, ‘415 patent at col. 2, lines 14-20; Padula at col. 9, lines 26-32; Driver at col. 1, line 70 to col. 2, line 9.</p>
CLAIM 18	
An analog sensor according to claim 17 wherein said second means comprises a dome-cap structure, and another snap-through threshold tactile feedback is discernable upon activation of said first means.	<p>See discussion of claim 17 with respect to Knox.</p> <p>Dome-like key 3, cross-members 10, metal spring; <i>see also</i> Knox at 4, lines 30-33 (“If desired, each key can be arranged to act against a metal spring so that a snap-action and an audible ‘click’ is obtained on depressing the key.”).</p> <p>Utilizing the dome-type sensor in Knox as intended would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent action. That is, Knox is directed to a sensor that is inherently intended for repeated use, and Knox therefore discloses the “another snap-through threshold tactile feedback is discernable upon activation of said first means” requirement.</p>

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CLAIM LANGUAGE OF THE '415 PATENT	KNOX
CLAIM 19	
An analog sensor according to claim 18 wherein said dome-cap is metallic.	See discussion of claim 18 with respect to Knox. Knox at 4, lines 30-33 ("If desired, each key can be arranged to act against a metal spring so that a snap-action and an audible 'click' is obtained on depressing the key.").

d. **Kramer Anticipates at Least Claims 1, 2, 4, 5, 7-9, 11, 13-15, 17, 18, 20, 21, 23 and 24 Under 35 U.S.C. § 102**

CLAIM LANGUAGE OF THE '415 PATENT	KRAMER
CLAIM 1	
A pressure-sensitive variable-conductance analog sensor with tactile feedback actuatable by a single human finger, comprising;	Switching device 3 Because the sensor of Kramer is disclosed in the context of an input keyboard it is inherent that the sensor is actuatable by any finger of the human user.
a housing;	Keyboard cover plate 23
electrically highly conductive elements at least in-part within said housing;	Conducting layer 17; contact linings 11.1 and 11.2; conductor strips 12.1 and 12.2
a depressible actuator retained by said housing and in-part exposed external to said housing for depression by a single human finger;	Pushbutton 22 Because the sensor of Kramer is disclosed in the context of an input keyboard it is inherent that pushbutton 22 may be depressed by any finger of the human user.
a resilient snap-through dome-cap positioned within said housing and depressible with force from said actuator applied to said dome-cap to cause said dome-cap to snap-through and create a snap-through tactile feedback detectable by the finger depressing the actuator; and	Kramer at col. 5, lines 36-48 ("In another advantageous embodiment of such an input keyboard that is not illustrated in the drawing attached hereto, the spring element 20 is attached to the ceiling surface of a rubber dome of a contact mat that is arranged between the bottom 27 of a pushbutton 22 and the said spring element 20. Like the thin insulating plate in the previous embodiment, the rubber dome bears against the printed circuit board 10 and, upon the depression of the appropriate pushbutton 22, will first actuate a switching process with a snap effect and subsequently permit pressure-dependent

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CLAIM LANGUAGE OF THE '415 PATENT	KRAMER
<p>pressure-sensitive variable-conductance material positioned within said housing, said pressure-sensitive variable-conductance material electrically positioned as a variably conductive element between said highly conductive elements, said pressure-sensitive variable-conductance material further positioned for receiving force applied to said dome-cap.</p>	<p>adjustment of a function variable.”). Countercontact 16. Kramer at col. 4, line 8 to col. 5, line 8; col. 5, lines 36-48.</p>
<p>CLAIM 2</p>	
<p>A pressure-sensitive variable-conductance analog sensor with tactile feedback in accordance with claim 1 wherein said pressure-sensitive variable-conductance material is variable in terms of electrical resistivity, the electrical resistivity lowering with increasing force applied to said depressible actuator.</p>	<p>See discussion of claim 1 with respect to Kramer. “The pressure-dependent contact resistance between the contact surface 18 of the carbonized plastic foil and the contact surfaces 15.1 and 15.2 of the contact linings 11.1 and 11.2 of the conductor strips 12.1 and 12.2 of the printed circuit board 10 is schematically indicated in FIG. 2 by means of the resistances $R_k(P)$ controlled by a pressure P. These resistances diminish linearly as the contact pressure increases, the linear relationship being preserved over a range of two to three powers of ten. This contact pressure is constituted by the operating pressure P acting on the pushbutton 22, since the spring element 20 transfers this pressure to the contact surface 18 of the carbonized plastic foil 14.” Kramer at col. 4, line 63 to col. 5, line 8.</p>
<p>CLAIM 4</p>	
<p>An improved analog sensor actuated by a single human finger, the sensor providing a variable output used for controlling an electronic game; wherein the improvement comprises:</p>	<p>This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art. Furthermore, Kramer discloses an analog sensor (switching device 3) providing a variable output used for controlling “entertainment electronics,” of which electronic games are a prime example. Kramer at col. 5, lines 36-48. Controlling an electronic game is typically associated with video games.¹⁶</p>

¹⁶ Furukawa '760 discloses the use of an analog sensor for controlling a video game. Thus, it alternatively would have been obvious (under 35 U.S.C. 103) in view of Furukawa '760 to use the

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CLAIM LANGUAGE OF THE '415 PATENT	KRAMER
	<p>Because the sensor of Kramer is disclosed in the context of an input keyboard it is inherent that pushbutton 22 may be depressed by any single finger of the human user.</p>
<p>snap-through structuring for providing a snap-through tactile feedback to the finger.</p>	<p>Kramer discloses that, “[i]n another advantageous embodiment of such an input keyboard that is not illustrated in the drawing attached hereto, the spring element 20 is attached to the ceiling surface of a rubber dome of a contact mat that is arranged between the bottom 27 of a pushbutton 22 and the said spring element 20. Like the thin insulating plate in the previous embodiment, the rubber dome bears against the printed circuit board 10 and, upon the depression of the appropriate pushbutton 22, will first actuate a switching process with a snap effect and subsequently permit pressure-dependent adjustment of a function variable.” Kramer at col. 5, lines 36-48; <i>see also id.</i> at col. 1, lines 28-35 (describing rubber dome switches).</p>
<p>CLAIM 5</p>	
<p>An improved analog sensor in accordance with claim 4 wherein said analog sensor is a pressure-sensitive analog sensor and said single human finger is a single human thumb.</p>	<p>See discussion of claim 4 with respect to Kramer.</p> <p>“The pressure-dependent contact resistance between the contact surface 18 of the carbonized plastic foil and the contact surfaces 15.1 and 15.2 of the contact linings 11.1 and 11.2 of the conductor strips 12.1 and 12.2 of the printed circuit board 10 is schematically indicated in FIG. 2 by means of the resistances $R_k(P)$ controlled by a pressure P. These resistances diminish linearly as the contact pressure increases, the linear relationship being preserved over a range of two to three powers of ten. This contact pressure is constituted by the operating pressure P acting on the pushbutton 22, since the spring element 20 transfers this pressure to the contact surface 18 of the carbonized plastic foil 14.” Kramer at col. 4, line 63 to col. 5, line 8.</p>

Kramer sensor to control an electronic game, particularly since Kramer’s remote transmitter is intended for use in “entertainment electronics.”

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CLAIM LANGUAGE OF THE '415 PATENT	KRAMER
	<p>Because the sensor of Kramer is disclosed in the context of an input keyboard it is inherent that pushbutton 22 may be depressed by any single finger of the human user, including a thumb.</p>
CLAIM 7	
<p>An improved momentary-On snap-through switch of the type having a housing; a resilient snap-through tactile feedback dome-cap positioned within said housing; a depressible actuator retained by said housing and in-part exposed external to said housing for being depressed by a single human finger;</p> <p>wherein the improvement comprises:</p>	<p>This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art.</p> <p>Furthermore, dome switches as described in Kramer are typically of the momentary-on type. <i>See, e.g.</i>, '415 patent at col. 2, lines 14-20, col. 7, lines 5-12; Jackson at col. 2, lines 23-24; Driver at col. 1, line 70 to col. 2, line 9. Kramer discloses keyboard cover plate 23, pushbutton 22. In addition, Kramer discloses that, "[i]n another advantageous embodiment of such an input keyboard that is not illustrated in the drawing attached hereto, the spring element 20 is attached to the ceiling surface of a rubber dome of a contact mat that is arranged between the bottom 27 of a pushbutton 22 and the said spring element 20. Like the thin insulating plate in the previous embodiment, the rubber dome bears against the printed circuit board 10 and, upon the depression of the appropriate pushbutton 22, will first actuate a switching process with a snap effect and subsequently permit pressure-dependent adjustment of a function variable." Kramer at col. 5, lines 36-48.</p>
<p>analog structuring within said housing for creating a variable electrical output representational of variable depression of said actuator.</p>	<p>"The pressure-dependent contact resistance between the contact surface 18 of the carbonized plastic foil and the contact surfaces 15.1 and 15.2 of the contact linings 11.1 and 11.2 of the conductor strips 12.1 and 12.2 of the printed circuit board 10 is schematically indicated in FIG. 2 by means of the resistances $R_k(P)$ controlled by a pressure P. These resistances diminish linearly as the contact pressure increases, the linear relationship being preserved over a range of two to three powers of ten. This contact pressure is constituted by the operating pressure P acting on</p>

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CLAIM LANGUAGE OF THE '415 PATENT	KRAMER
	the pushbutton 22, since the spring element 20 transfers this pressure to the contact surface 18 of the carbonized plastic foil 14." Kramer at col. 4, line 63 to col. 5, line 8.
CLAIM 8	
<p>An improved momentary-on snap-through switch in accordance with claim 7 wherein said electrical output is variable in terms of electrical resistivity, the electrical resistivity lowering with increasing depression of said actuator.</p>	<p>See discussion of claim 7 with respect to Kramer.</p> <p>"The pressure-dependent contact resistance between the contact surface 18 of the carbonized plastic foil and the contact surfaces 15.1 and 15.2 of the contact linings 11.1 and 11.2 of the conductor strips 12.1 and 12.2 of the printed circuit board 10 is schematically indicated in FIG. 2 by means of the resistances $R_k(P)$ controlled by a pressure P. These resistances diminish linearly as the contact pressure increases, the linear relationship being preserved over a range of two to three powers of ten. This contact pressure is constituted by the operating pressure P acting on the pushbutton 22, since the spring element 20 transfers this pressure to the contact surface 18 of the carbonized plastic foil 14." Kramer at col. 4, line 63 to col. 5, line 8.</p>
CLAIM 9	
<p>An improved analog sensor of the type having at least two highly conductive electrical elements operationally connected to pressure-sensitive analog structure; a depressible actuator in-part exposed to be depressible toward said pressure-sensitive analog structure for supplying an analog electrical output according to depression of said actuator;</p> <p>wherein the improvement comprises:</p>	<p>This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art.</p> <p>Furthermore, Kramer discloses an analog sensor (switching device 3) having at least conducting layer 17 and contact linings 11.1 and 11.2 operationally connected to carbonized plastic foil 14. In addition, pushbutton 22 is depressible in the same direction as countercontact 16 and moves closer to the surface of carbonized plastic foil 14 as carbonized plastic foil 14 is compressed for supplying an analog electrical output according to depression of said actuator. Kramer at col. 4, line 63 to col. 5, line 8.</p>
<p>a resilient snap-through dome-cap positioned to provide tactile feedback through said actuator to a human user's thumb depressing said actuator.</p>	<p>Kramer discloses that, "[i]n another advantageous embodiment of such an input keyboard that is not illustrated in the drawing attached hereto, the</p>

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	<p>spring element 20 is attached to the ceiling surface of a rubber dome of a contact mat that is arranged between the bottom 27 of a pushbutton 22 and the said spring element 20. Like the thin insulating plate in the previous embodiment, the rubber dome bears against the printed circuit board 10 and, upon the depression of the appropriate pushbutton 22, will first actuate a switching process with a snap effect and subsequently permit pressure-dependent adjustment of a function variable.” Kramer at col. 5, lines 36-48.</p> <p>Because the sensor of Kramer is disclosed in the context of an input keyboard it is inherent that pushbutton 22 may be depressed by any single finger of the human user, including a thumb.</p>
<p>CLAIM 11</p> <p>An improved pressure-sensitive analog sensor providing an electrically varying output, said varying output used for controlling an electronic game, the varying output representational of varying depressive input by a single human thumb,</p> <p>wherein the improvement comprises:</p>	<p>This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art.</p> <p>Furthermore, Kramer discloses a pressure-sensitive analog sensor (switching device 3) providing a variable output used for controlling “entertainment electronics,” of which electronic games are a prime example. Controlling an electronic game is typically associated with video games.¹⁷ The varying output is representational of varying depressive input. Kramer at col. 4, line 63 to col. 5, line 48.</p> <p>Because the sensor of Kramer is disclosed in the context of an input keyboard it is inherent that pushbutton 22 may be depressed by any single finger of the human user, including a thumb.</p>
<p>a depressible resilient snap-through tactile element, upon depression said tactile element creates a tactile feedback detectable by the single thumb.</p>	<p>Kramer discloses that, “[i]n another advantageous embodiment of such an input keyboard that is not illustrated in the drawing attached hereto, the</p>

¹⁷ Furukawa ‘760 discloses the use of an analog sensor for controlling a video game. Thus, it alternatively would have been obvious (under 35 U.S.C. 103) in view of Furukawa ‘760 to use the Kramer sensor to control an electronic game, particularly since Kramer’s remote transmitter is intended for use in “entertainment electronics.”

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	<p>spring element 20 is attached to the ceiling surface of a rubber dome of a contact mat that is arranged between the bottom 27 of a pushbutton 22 and the said spring element 20. Like the thin insulating plate in the previous embodiment, the rubber dome bears against the printed circuit board 10 and, upon the depression of the appropriate pushbutton 22, will first actuate a switching process with a snap effect and subsequently permit pressure-dependent adjustment of a function variable.” Kramer at col. 5, lines 36-48.</p>
CLAIM 13	
<p>An analog sensor, comprising: means for varying electrical resistance for providing a varying output representational of varying depressive input by a single human finger; and</p>	<p>Switching device 13</p> <p>Carbonized plastic foil 14. “The pressure-dependent contact resistance between the contact surface 18 of the carbonized plastic foil and the contact surfaces 15.1 and 15.2 of the contact linings 11.1 and 11.2 of the conductor strips 12.1 and 12.2 of the printed circuit board 10 is schematically indicated in FIG. 2 by means of the resistances $R_k(P)$ controlled by a pressure P. These resistances diminish linearly as the contact pressure increases, the linear relationship being preserved over a range of two to three powers of ten. This contact pressure is constituted by the operating pressure P acting on the pushbutton 22, since the spring element 20 transfers this pressure to the contact surface 18 of the carbonized plastic foil 14.” Kramer at col. 4, line 63 to col. 5, line 8. Kramer thus varies electrical resistance for providing a varying output in the same way as disclosed in the '415 patent.</p> <p>Because the sensor of Kramer is disclosed in the context of an input keyboard it is inherent that pushbutton 22 may be depressed by any single finger of the human user.</p>
<p>a depressible resilient snap-through tactile element, when depressed said tactile element creating a tactile feedback detectable by the single finger.</p>	<p>Rubber dome.</p> <p>Kramer discloses that, “[i]n another advantageous embodiment of such an input keyboard that is not illustrated in the drawing attached hereto, the</p>

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	<p>spring element 20 is attached to the ceiling surface of a rubber dome of a contact mat that is arranged between the bottom 27 of a pushbutton 22 and the said spring element 20. Like the thin insulating plate in the previous embodiment, the rubber dome bears against the printed circuit board 10 and, upon the depression of the appropriate pushbutton 22, will first actuate a switching process with a snap effect and subsequently permit pressure-dependent adjustment of a function variable.” Kramer at col. 5, lines 36-48.</p>
CLAIM 14	
<p>An analog sensor according to claim 13 wherein said analog sensor is a pressure-sensitive analog sensor.</p>	<p>See discussion of claim 13 with respect to Kramer.</p> <p>“The pressure-dependent contact resistance between the contact surface 18 of the carbonized plastic foil and the contact surfaces 15.1 and 15.2 of the contact linings 11.1 and 11.2 of the conductor strips 12.1 and 12.2 of the printed circuit board 10 is schematically indicated in FIG. 2 by means of the resistances $R_k(P)$ controlled by a pressure P. These resistances diminish linearly as the contact pressure increases, the linear relationship being preserved over a range of two to three powers of ten. This contact pressure is constituted by the operating pressure P acting on the pushbutton 22, since the spring element 20 transfers this pressure to the contact surface 18 of the carbonized plastic foil 14.” Kramer at col. 4, line 63 to col. 5, line 8.</p>
CLAIM 15	
<p>An analog sensor according to claim 14 further including an actuator positioned between the single human finger and said tactile element, and said tactile element is a dome-cap.</p>	<p>See discussion of claim 14 with respect to Kramer.</p> <p>Pushbutton 22 is positioned between the single human finger and said tactile element.</p> <p>Kramer discloses that, “[i]n another advantageous embodiment of such an input keyboard that is not illustrated in the drawing attached hereto, the</p>

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	<p>spring element 20 is attached to the ceiling surface of a rubber dome of a contact mat that is arranged between the bottom 27 of a pushbutton 22 and the said spring element 20. Like the thin insulating plate in the previous embodiment, the rubber dome bears against the printed circuit board 10 and, upon the depression of the appropriate pushbutton 22, will first actuate a switching process with a snap effect and subsequently permit pressure-dependent adjustment of a function variable.” Kramer at col. 5, lines 36-48.</p>
CLAIM 17	
An analog sensor, comprising:	Switching device 3
an actuator moveable by only a single human finger; responsive to movement of said actuator is	<p>Pushbutton 22</p> <p>Because the sensor of Kramer is disclosed in the context of an input keyboard it is inherent that pushbutton 22 may be depressed by any single finger of the human user.</p>
first means for varying electrical resistance and providing a varying electrical output of said sensor; and responsive to movement of said actuator is	Carbonized plastic foil 14
second means for providing a snap-through threshold tactile feedback detectable upon deactivation of said first means, said snap-through tactile feedback detectable by the single human finger.	<p>Rubber dome, spring element 20; Kramer at col. 5, lines 36-48.</p> <p>Kramer provides snap-through threshold tactile feedback upon activation of carbonized plastic foil 14. Utilizing the dome-type sensor in Kramer as intended (for adjusting values in remote transmitters associated with “entertainment electronics”) would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent action. Dome switches as described in Kramer are typically of the momentary-on type and provide tactile feedback in both directions.. <i>See, e.g.,</i> ‘415 patent at col. 2, lines 14-20, col. 7, lines 5-12; Jackson at col. 2, lines 23-24; Driver at col. 1, line 70 to col. 2, line 9.</p>

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CLAIM LANGUAGE OF THE '415 PATENT	KRAMER
CLAIM 18	
<p>An analog sensor according to claim 17 wherein said second means comprises a dome-cap structure, and another snap-through threshold tactile feedback is discernable upon activation of said first means.</p>	<p>See discussion of claim 17 with respect to Kramer.</p> <p>Rubber dome.</p> <p>Utilizing the dome-type sensor in Kramer as intended (for adjusting values in remote transmitters associated with "entertainment electronics") would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent action. Dome switches as described in Kramer are typically of the momentary-on type and provide tactile feedback in both directions.. <i>See, e.g., '415 patent at col. 2, lines 14-20, col. 7, lines 5-12; Jackson at col. 2, lines 23-24; Driver at col. 1, line 70 to col. 2, line 9.</i> That is, Kramer is directed to a sensor that is inherently intended for repeated use.</p> <p>Kramer discloses that, "[i]n another advantageous embodiment of such an input keyboard that is not illustrated in the drawing attached hereto, the spring element 20 is attached to the ceiling surface of a rubber dome of a contact mat that is arranged between the bottom 27 of a pushbutton 22 and the said spring element 20. Like the thin insulating plate in the previous embodiment, the rubber dome bears against the printed circuit board 10 and, upon the depression of the appropriate pushbutton 22, will first actuate a switching process with a snap effect and subsequently permit pressure-dependent adjustment of a function variable." Kramer at col. 5, lines 36-48.</p> <p>Thus, Kramer inherently discloses the requirement for "another snap-through threshold tactile feedback."</p>
CLAIM 20	
<p>An improved analog sensor of a type actuated by a single human finger, the sensor providing an analog variable electrical output used for controlling an electronic game;</p>	<p>This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art.</p>

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<p>wherein the improvement comprises:</p>	<p>Furthermore, Kramer discloses an analog sensor (switching device 3) providing an analog variable electrical output used for controlling "entertainment electronics," of which electronic games are a prime example. Kramer at col. 4, line 63 to col. 5, line 48. Controlling an electronic game is typically associated with video games.¹⁸</p> <p>Because the sensor of Kramer is disclosed in the context of an input keyboard it is inherent that pushbutton 22 may be depressed by any single finger of the human user.</p>
<p>means for providing a user discernable snap-through threshold tactile feedback to the finger, said user discernable snap-through threshold tactile feedback is provided on deactuation of the variable electrical output used for controlling the electronic game.</p>	<p>Rubber dome, spring element 20; Kramer at col. 5, lines 36-48.</p> <p>Kramer provides snap-through threshold tactile feedback upon actuation of the variable electrical output. Utilizing the dome-type sensor in Kramer as intended (for adjusting values in remote transmitters associated with "entertainment electronics") would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent action. Dome switches as described in Kramer are typically of the momentary-on type and provide tactile feedback in both directions.. <i>See, e.g.,</i> '415 patent at col. 2, lines 14-20, col. 7, lines 5-12; Jackson at col. 2, lines 23-24; Driver at col. 1, line 70 to col. 2, line 9.</p>
<p>CLAIM 21</p>	
<p>An improved analog sensor in accordance with claim 20 wherein another user discernable snap-through threshold tactile feedback is provided on actuation of the variable electrical output used for controlling the electronic game.</p>	<p>See discussion of claim 20 with respect to Kramer.</p> <p>Utilizing the dome-type sensor in Kramer as intended (for adjusting values in remote transmitters associated with "entertainment</p>

¹⁸ Furukawa '760 discloses the use of an analog sensor for controlling a video game. Thus, it alternatively would have been obvious (under 35 U.S.C. 103) in view of Furukawa '760 to use the Kramer sensor to control an electronic game, particularly since Kramer's remote transmitter is intended for use in "entertainment electronics."

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	<p>electronics”) would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent action. Dome switches as described in Kramer are typically of the momentary-on type and provide tactile feedback in both directions.. See, e.g., ‘415 patent at col. 2, lines 14-20, col. 7, lines 5-12; Jackson at col. 2, lines 23-24; Driver at col. 1, line 70 to col. 2, line 9. That is, Kramer is directed to a sensor that is inherently intended for repeated use.</p> <p>Kramer discloses that, “[i]n another advantageous embodiment of such an input keyboard that is not illustrated in the drawing attached hereto, the spring element 20 is attached to the ceiling surface of a rubber dome of a contact mat that is arranged between the bottom 27 of a pushbutton 22 and the said spring element 20. Like the thin insulating plate in the previous embodiment, the rubber dome bears against the printed circuit board 10 and, upon the depression of the appropriate pushbutton 22, will first actuate a switching process with a snap effect and subsequently permit pressure-dependent adjustment of a function variable.” Kramer at col. 5, lines 36-48.</p> <p>Thus, Kramer inherently discloses the requirement for “another user discernable snap-through threshold tactile feedback.”</p>
CLAIM 23	
<p>An improved analog sensor in accordance with claim 21 wherein said analog sensor is a pressure-sensitive analog sensor, and the single human finger is a single human thumb.</p>	<p>See discussion of claim 21 with respect to Kramer.</p> <p>“The pressure-dependent contact resistance between the contact surface 18 of the carbonized plastic foil and the contact surfaces 15.1 and 15.2 of the contact linings 11.1 and 11.2 of the conductor strips 12.1 and 12.2 of the printed circuit board 10 is schematically indicated in FIG. 2 by means of the resistances $R_k(P)$ controlled by a pressure P. These resistances diminish linearly</p>

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	<p>as the contact pressure increases, the linear relationship being preserved over a range of two to three powers of ten. This contact pressure is constituted by the operating pressure P acting on the pushbutton 22, since the spring element 20 transfers this pressure to the contact surface 18 of the carbonized plastic foil 14.” Kramer at col. 4, line 63 to col. 5, line 8.</p> <p>Because the sensor of Kramer is disclosed in the context of an input keyboard it is inherent that pushbutton 22 may be depressed by any single finger of the human user, including a thumb.</p>
CLAIM 24	
An improved analog sensor in accordance with claim 23 wherein said means includes a non-metallic dome-cap.	<p>See discussion of claim 23.</p> <p>Rubber dome. Kramer at col. 5, lines 36-48</p>

e. **Furukawa '760 Anticipates at Least Claims 1, 4, 5, 7, 9, 11, 13-15, 17, 18, 20, 21, 23 and 24 Under 35 U.S.C. § 102**

CLAIM LANGUAGE OF THE '415 PATENT	FURUKAWA '760
CLAIM 1	
A pressure-sensitive variable-conductance analog sensor with tactile feedback actuatable by a single human finger, comprising;	<p>Rubber dome-cap 29</p> <p>Furukawa '760 discloses that, “when using the switch of the present invention as, for example, a controller of a video game, when the operator presses the moving part of the switch, the electrical resistance of the conductive portion fixed on the bottom surface of the moving contact changes according to the degree of the pressing force, thereby changing a signal from the controller.” Furukawa '760 at 5; <i>see also id.</i> at 6-9.</p> <p>Fig. 1 of Furukawa shows a controller 10 with cross key 12 positioned such that cross key 12 may be pressed by a single human finger to actuate rubber dome-cap 29.</p>
a housing;	Furukawa discloses a housing for the sensor. Fig. 1.
electrically highly conductive elements at least in-part	Moving contact 32 and fixed contacts 7, 7

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within said housing;	
a depressible actuator retained by said housing and in-part exposed external to said housing for depression by a single human finger;	Cross key 12. Furukawa '760 at 6.
a resilient snap-through dome-cap positioned within said housing and depressible with force from said actuator applied to said dome-cap to cause said dome-cap to snap-through and create a snap-through tactile feedback detectable by the finger depressing the actuator; and	<p>Rubber dome-cap 29 (pushbutton 30, elastic leg portion 31, moving contact 32, conductive portion 33)</p> <p>Furukawa inherently discloses the claimed feature of snap-through tactile feedback. Fig. 2 shows rubber dome-cap 29 constructed such that, when pressed to make contact between conductive portion 33 and fixed contacts 7, the convex structure of rubber dome-cap 29 is elastically deformed to become concave, and pressing cross key 12 provides a snap-through tactile feedback to the finger. <i>See also</i> '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2, line 9; Meleard at 1, lines 21-42.</p>
pressure-sensitive variable-conductance material positioned within said housing, said pressure-sensitive variable-conductance material electrically positioned as a variably conductive element between said highly conductive elements, said pressure-sensitive variable-conductance material further positioned for receiving force applied to said dome-cap.	Conductive portion 33
CLAIM 4	
<p>An improved analog sensor actuated by a single human finger, the sensor providing a variable output used for controlling an electronic game;</p> <p>wherein the improvement comprises:</p>	<p>This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art.</p> <p>Furthermore, Furukawa '760 discloses rubber dome-cap 29 and that, "when using the switch of the present invention as, for example, a controller of a video game, when the operator presses the moving part of the switch, the electrical resistance of the conductive portion fixed on the bottom surface of the moving contact changes according to the degree of the pressing force, thereby changing a signal from the controller." Furukawa '760 at 5; <i>see also id.</i> at 6-9.</p>

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CLAIM LANGUAGE OF THE '415 PATENT	FURUKAWA '760
	Fig. 1 of Furukawa shows a controller 10 with cross key 12 positioned such that cross key 12 may be pressed by a single human finger.
snap-through structuring for providing a snap-through tactile feedback to the finger.	Furukawa inherently discloses the claimed feature of snap-through tactile feedback. Fig. 2 shows rubber dome-cap 29 constructed such that, when pressed to make contact between conductive portion 33 and fixed contacts 7, the convex structure of rubber dome-cap 29 is elastically deformed to become concave, and pressing cross key 12 provides a snap-through tactile feedback to the finger. See also '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2, line 9; Meleard at 1, lines 21-42.
CLAIM 5	
An improved analog sensor in accordance with claim 4 wherein said analog sensor is a pressure-sensitive analog sensor and said single human finger is a single human thumb.	<p>See discussion of claim 4 with respect to Furukawa '760.</p> <p>The analog sensor of Furukawa is pressure-sensitive. Furukawa '760 at 5 ("Accordingly, when using the switch of the present invention as, for example, a controller of a video game, when the operator presses the moving part of the switch, the electrical resistance of the conductive portion fixed on the bottom surface of the moving contact changes according to the degree of the pressing force, thereby changing a signal from the controller."); <i>see also id.</i> at 6-9.</p> <p>Fig. 1 of Furukawa shows a controller 10 with cross key 12 positioned such that cross key 12 may be pressed by a single human thumb.</p>
CLAIM 7	
<p>An improved momentary-On snap-through switch of the type having a housing; a resilient snap-through tactile feedback dome-cap positioned within said housing; a depressible actuator retained by said housing and in-part exposed external to said housing for being depressed by a single human finger;</p> <p>wherein the improvement comprises:</p>	<p>This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art.</p> <p>Furthermore, Furukawa '760 inherently discloses a momentary-on snap-through switch of the type having a housing (Fig. 1); a resilient snap-through tactile feedback dome-cap (rubber dome-cap 29)</p>

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	<p>positioned within said housing; a depressible actuator (cross key 12) retained by said housing and in-part exposed external to said housing for being depressed by a single human finger.</p> <p>The Furukawa switch is a momentary-on switch, because the switch is turned on by applying pressure and, when pressure is removed from the switch it returns to a state in which the switch is off. Furukawa '760 at 7 ("By discontinuing the pressing operation, the moving part 30 is lifted by an elastic restoring force of the elastic leg portion 31, thereby releasing the above-described electrical connection.").</p> <p>Furukawa inherently discloses the claimed feature of snap-through tactile feedback. Fig. 2 shows rubber dome-cap 29 constructed such that, when pressed to make contact between conductive portion 33 and fixed contacts 7, the convex structure of rubber dome-cap 29 is elastically deformed to become concave, and pressing cross key 12 provides a snap-through tactile feedback to the finger. <i>See also</i> '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2, line 9; Meleard at 1, lines 21-42.</p> <p>Fig. 1 of Furukawa shows a controller 10 with cross key 12 positioned such that cross key 12 may be pressed by a single human finger.</p>
<p>analog structuring within said housing for creating a variable electrical output representational of variable depression of said actuator.</p>	<p>Furukawa '760 at 5 ("Accordingly, when using the switch of the present invention as, for example, a controller of a video game, when the operator presses the moving part of the switch, the electrical resistance of the conductive portion fixed on the bottom surface of the moving contact changes according to the degree of the pressing force, thereby changing a signal from the controller."); <i>see also id.</i> at 6-9.</p>
<p>CLAIM 9</p>	
<p>An improved analog sensor of the type having at least two highly conductive electrical elements operationally</p>	<p>This portion of the claim is written in Jepson format, and the recited subject matter is therefore</p>

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<p>connected to pressure-sensitive analog structure; a depressible actuator in-part exposed to be depressible toward said pressure-sensitive analog structure for supplying an analog electrical output according to depression of said actuator;</p> <p>wherein the improvement comprises:</p>	<p>admitted prior art.</p> <p>Furthermore, Furukawa '760 discloses an analog sensor of the type having at least two highly conductive electrical elements (moving contact 32 and fixed contacts 7, 7) operationally connected to pressure-sensitive analog structure (conductive portion 33); a depressible actuator (cross key 12) in-part exposed to be depressible toward said pressure-sensitive analog structure for supplying an analog electrical output according to depression of said actuator. For example, cross key 12 is depressible in the same direction as conductive portion 33 and moves closer to the surface of conductive portion 33 as conductive portion 33 is compressed. Furukawa '760 at Fig. 2.</p>
<p>a resilient snap-through dome-cap positioned to provide tactile feedback through said actuator to a human user's thumb depressing said actuator.</p>	<p>Furukawa inherently discloses the claimed feature of snap-through tactile feedback. Fig. 2 shows rubber dome-cap 29 constructed such that, when pressed to make contact between conductive portion 33 and fixed contacts 7, the convex structure of rubber dome-cap 29 is elastically deformed to become concave, and pressing cross key 12 provides a snap-through tactile feedback to the thumb. <i>See also</i> '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2, line 9; Meleard at 1, lines 21-42.</p> <p>Fig. 1 of Furukawa shows a controller 10 with cross key 12 positioned such that cross key 12 may be pressed by a single human thumb.</p>
<p>CLAIM II</p>	
<p>An improved pressure-sensitive analog sensor providing an electrically varying output, said varying output used for controlling an electronic game, the varying output representational of varying depressive input by a single human thumb,</p> <p>wherein the improvement comprises:</p>	<p>This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art.</p> <p>Furukawa discloses an improved pressure-sensitive analog sensor providing an electrically varying output, said varying output used for controlling an electronic game, the varying output representational of varying depressive input by a</p>

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	<p>single human thumb. Furukawa '760 at 5 (“Accordingly, when using the switch of the present invention as, for example, a controller of a video game, when the operator presses the moving part of the switch, the electrical resistance of the conductive portion fixed on the bottom surface of the moving contact changes according to the degree of the pressing force, thereby changing a signal from the controller.”); <i>see also id.</i> at 6-9.</p> <p>Fig. 1 of Furukawa shows a controller 10 with cross key 12 positioned such that cross key 12 may be pressed by a single human thumb.</p>
<p>a depressible resilient snap-through tactile element, upon depression said tactile element creates a tactile feedback detectable by the single thumb.</p>	<p>Furukawa inherently discloses the claimed feature of snap-through tactile feedback. Fig. 2 shows rubber dome-cap 29 constructed such that, when pressed to make contact between conductive portion 33 and fixed contacts 7, the convex structure of rubber dome-cap 29 is elastically deformed to become concave, and pressing cross key 12 provides a snap-through tactile feedback to the thumb. <i>See also</i> '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2, line 9; Meleard at 1, lines 21-42.</p>
<p>CLAIM 13</p>	
<p>An analog sensor, comprising: means for varying electrical resistance for providing a varying output representational of varying depressive input by a single human finger; and</p>	<p>Rubber dome-cap 29</p> <p>Furukawa '760 at 5 (“Accordingly, when using the switch of the present invention as, for example, a controller of a video game, when the operator presses the moving part of the switch, the electrical resistance of the conductive portion fixed on the bottom surface of the moving contact changes according to the degree of the pressing force, thereby changing a signal from the controller.”); <i>see also id.</i> at 6-9; Fig. 1.</p> <p>Fig. 1 of Furukawa shows a controller 10 with cross key 12 positioned such that cross key 12 may be pressed by a single human finger.</p>
<p>a depressible resilient snap-through tactile element, when depressed said tactile element creating a tactile feedback</p>	<p>Furukawa inherently discloses the claimed resilient snap-through tactile feedback element.</p>

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detectable by the single finger.	Fig. 2 shows rubber dome-cap 29 constructed such that, when pressed to make contact between conductive portion 33 and fixed contacts 7, the convex structure of rubber dome-cap 29 is elastically deformed to become concave, and pressing cross key 12 provides a snap-through tactile feedback to the finger. <i>See also</i> '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2, line 9; Meleard at 1, lines 21-42.
CLAIM 14	
An analog sensor according to claim 13 wherein said analog sensor is a pressure-sensitive analog sensor.	See discussion of claim 13 with respect to Furukawa '760. The analog sensor of Furukawa is pressure-sensitive. Furukawa '760 at 5 ("Accordingly, when using the switch of the present invention as, for example, a controller of a video game, when the operator presses the moving part of the switch, the electrical resistance of the conductive portion fixed on the bottom surface of the moving contact changes according to the degree of the pressing force, thereby changing a signal from the controller."); <i>see also id.</i> at 6-9.
CLAIM 15	
An analog sensor according to claim 14 further including an actuator positioned between the single human finger and said tactile element, and said tactile element is a dome-cap.	See discussion of claim 14 with respect to Furukawa '760. Cross key 12 (actuator), rubber dome-cap 29 (dome-cap tactile element). Furukawa '760 at Figs. 1, 2; <i>see also</i> May 16, 2002 Response at 6 (acknowledging Furukawa '760's dome cap).
CLAIM 17	
An analog sensor, comprising: an actuator moveable by only a single human finger; responsive to movement of said actuator is	Rubber dome-cap 29 Cross key 12. Fig. 1 of Furukawa shows a controller 10 with cross key 12 positioned such that cross key 12 may be pressed by a single human thumb.

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CLAIM LANGUAGE OF THE '415 PATENT	FURUKAWA '760
first means for varying electrical resistance and providing a varying electrical output of said sensor; and responsive to movement of said actuator is	Conductive portion 33
second means for providing a snap-through threshold tactile feedback detectable upon deactivation of said first means, said snap-through tactile feedback detectable by the single human finger.	<p>Pushbutton 30, elastic leg portion 31 of rubber dome-cap 29</p> <p>Furukawa inherently discloses the claimed feature of snap-through tactile feedback. Fig. 2 shows rubber dome-cap 29 constructed such that, when pressed to make contact between conductive portion 33 and fixed contacts 7, the convex structure of rubber dome-cap 29 is elastically deformed to become concave, and pressing cross key 12 provides a snap-through tactile feedback to the thumb. <i>See also</i> '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2, line 9; Meleard at 1, lines 21-42.</p> <p>Utilizing the dome-type sensor in Furukawa as intended (for varying output associated with a video game) would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent action. Momentary-on dome switches as described in Furukawa provide tactile feedback in both directions. Thus, it is inherent that the same structure will provide the claimed snap-through threshold tactile feedback upon deactivation of the conductive portion 33, just as in the '415 patent. <i>See, e.g.,</i> '415 patent at col. 2, lines 14-20; Padula at col. 9, lines 26-32; Driver at col. 1, line 70 to col. 2, line 9; Meleard at 1, lines 21-42.</p> <p>Fig. 1 of Furukawa shows a controller 10 with cross key 12 positioned such that cross key 12 may be pressed by a single human finger.</p>
CLAIM 18	
An analog sensor according to claim 17 wherein said second means comprises a dome-cap structure, and another snap-through threshold tactile feedback is discernable upon activation of said first means.	<p>See discussion of claim 17 with respect to Furukawa '760.</p> <p>A dome-cap structure (rubber dome-cap 29) is</p>

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CLAIM LANGUAGE OF THE '415 PATENT	FURUKAWA '760
	<p>formed in Furukawa '760 by pushbutton 30, elastic leg portion 31, moving contact 32 and conductive portion 33. Furukawa '760 at Fig. 2.</p> <p>Furukawa inherently discloses the claimed feature of snap-through tactile feedback. Fig. 2 shows rubber dome-cap 29 constructed such that, when pressed to make contact between conductive portion 33 and fixed contacts 7, the convex structure of rubber dome-cap 29 is elastically deformed to become concave, and pressing cross key 12 provides a snap-through tactile feedback to the finger. <i>See also</i> '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2 line 9; Meleard at 1, lines 21-42.</p> <p>Furthermore, utilizing the dome-type sensor in Furukawa '760 as intended (for varying output associated with a video game) would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent action. Momentary-on dome switches as described in Furukawa '760 provide tactile feedback in both directions. <i>See also</i> '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2 line 9; Meleard at 1, lines 21-42. That is, Furukawa discloses a game controller, the cross key 12 of which is inherently intended for repeated use. Thus, it is inherent that Furukawa discloses the claimed "another snap-through threshold tactile feedback."</p>
CLAIM 20	
<p>An improved analog sensor of a type actuated by a single human finger, the sensor providing an analog variable electrical output used for controlling an electronic game;</p> <p>wherein the improvement comprises:</p>	<p>This portion of the claim is written in Jepson format, and the recited subject matter is therefore admitted prior art.</p> <p>Furthermore, Furukawa discloses an analog sensor of a type actuated by a single human finger, the sensor providing an analog variable electrical output used for controlling an electronic game. Furukawa '760 at 5 ("when using the</p>

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CLAIM LANGUAGE OF THE '415 PATENT	FURUKAWA '760
	<p>switch of the present invention as, for example, a controller of a video game, when the operator presses the moving part of the switch, the electrical resistance of the conductive portion fixed on the bottom surface of the moving contact changes according to the degree of the pressing force, thereby changing a signal from the controller.”); <i>see also id.</i> at 6-9.</p> <p>Fig. 1 of Furukawa shows a controller 10 with cross key 12 positioned such that cross key 12 may be pressed by a single human finger.</p>
<p>means for providing a user discernable snap-through threshold tactile feedback to the finger, said user discernable snap-through threshold tactile feedback is provided on deactuation of the variable electrical output used for controlling the electronic game.</p>	<p>Pushbutton 30, elastic leg portion 31 of rubber dome-cap 29</p> <p>Furukawa inherently discloses the claimed feature of snap-through tactile feedback. Fig. 2 shows rubber dome-cap 29 constructed such that, when pressed to make contact between conductive portion 33 and fixed contacts 7, the convex structure of rubber dome-cap 29 is elastically deformed to become concave, and pressing cross key 12 provides a snap-through tactile feedback to the finger. <i>See also</i> '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2, line 9; Meleard at 1, lines 21-42.</p> <p>Furthermore, utilizing the dome-type sensor in Furukawa '760 as intended (for varying output associated with a video game) would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent action. Momentary-on dome switches as described in Furukawa '760 provide tactile feedback in both directions. <i>See also</i> '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2 line 9; Meleard at 1, lines 21-42. That is, Furukawa discloses a game controller, the cross key 12 of which is inherently intended for repeated use. Thus, it is inherent that Furukawa discloses the claimed “snap-through threshold tactile feedback ... provided on</p>

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CLAIM LANGUAGE OF THE '415 PATENT	FURUKAWA '760
	deactuation of the variable electrical output used for controlling the electronic game.”
CLAIM 21	
<p>An improved analog sensor in accordance with claim 20 wherein another user discernable snap-through threshold tactile feedback is provided on actuation of the variable electrical output used for controlling the electronic game.</p>	<p>See discussion of claim 20 with respect to Furukawa '760.</p> <p>Furukawa inherently discloses the claimed feature of snap-through tactile feedback. Fig. 2 shows rubber dome-cap 29 constructed such that, when pressed to make contact between conductive portion 33 and fixed contacts 7, the convex structure of rubber dome-cap 29 is elastically deformed to become concave, and pressing cross key 12 provides a snap-through tactile feedback to the thumb. <i>See also</i> '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2, line 9; Meleard at 1, lines 21-42.</p> <p>Furthermore, utilizing the dome-type sensor in Furukawa '760 as intended (for varying output associated with a video game) would inherently involve releasing pressure after depressing the button, and subsequently increasing pressure in a subsequent action. Momentary-on dome switches as described in Furukawa '760 provide tactile feedback in both directions. <i>See also</i> '415 patent at col. 1, line 67 to col. 2, line 12; JP S53-128861 at 4-5; Kramer at col. 5, lines 36-48; Driver at col. 1, line 70 to col. 2 line 9; Meleard at 1, lines 21-42. That is, Furukawa discloses a game controller, the cross key 12 of which is inherently intended for repeated use. Thus, it is inherent that Furukawa discloses the claimed “another snap-through threshold tactile feedback.”</p>
CLAIM 23	
<p>An improved analog sensor in accordance with claim 21 wherein said analog sensor is a pressure-sensitive analog sensor, and the single human finger is a single human thumb.</p>	<p>See discussion of claim 21 with respect to Furukawa '760.</p> <p>The analog sensor of Furukawa is pressure-sensitive. Furukawa '760 at 5 (“Accordingly, when using the switch of the present invention as,</p>

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CLAIM LANGUAGE OF THE '415 PATENT	FURUKAWA '760
	<p>for example, a controller of a video game, when the operator presses the moving part of the switch, the electrical resistance of the conductive portion fixed on the bottom surface of the moving contact changes according to the degree of the pressing force, thereby changing a signal from the controller.”); <i>see also id.</i> at 6-9.</p> <p>Fig. 1 of Furukawa shows a controller 10 with cross key 12 positioned such that cross key 12 may be pressed by a single human thumb.</p>
CLAIM 24	
<p>An improved analog sensor in accordance with claim 23 wherein said means includes a non-metallic dome-cap.</p>	<p>See discussion of claim 23 with respect to Furukawa '760.</p> <p>Furukawa discloses a rubber dome-cap. Furukawa '760 at 6, Fig. 2.</p>

2. Obviousness

Dependent claims 3, 6, 10, 12, 16, 19 and 22 of the '415 patent relate merely to the use of a plastic housing and/or a metallic dome-cap for the analog sensor. Nowhere in the '415 patent is there any indication that any of these features are new or unobvious. To the contrary, the '415 patent expressly acknowledges that the use of plastic housings and metallic dome-caps were used in “[a] very common prior art switch.” '415 patent at col. 1, lines 39-46. Indeed, the prior art even discloses that housings for game controllers were “commonly made of metal or rigid plastic,” as well as the use of a metallic dome-cap with a variable conductance switch. *See Reichow* at col. 1, lines 23-24; *Padula* at col. 9, lines 22-32. The use of these claimed features was nothing more than an obvious design choice. Accordingly, substantial new questions of patentability are raised with respect to dependent claims 3, 6, 10, 12, 16, 19 and 22 by the combined teachings set forth below.

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a. **At Least Claim 3 is Obvious Under 35 U.S.C. § 103
Over Kramer in View of Padula and Reichow**

CLAIM LANGUAGE OF THE '415 PATENT	PRIOR ART
CLAIM 3	
A pressure-sensitive variable-conductance analog sensor with tactile feedback in accordance with claim 2 wherein said housing is formed of plastic and said dome-cap is metallic.	<p>See discussion of claim 2 with respect to Kramer.</p> <p>Reichow discloses that housings for game controllers were “commonly made of metal or rigid plastic.” Reichow at col. 1, lines 23-24. In addition, Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32.</p> <p>Thus, it would have been an obvious design choice to use plastic for the housing of Kramer and to use metal for the dome-cap of Kramer because both were recognized as useful for these purposes in the prior art. <i>See</i> MPEP § 2144.07 (“Art Recognized Suitability for an Intended Purpose” as a rationale for obviousness rejections).</p>

b. **At Least Claims 6, 10, 12, 16, 19 and 22 are Obvious
Under 35 U.S.C. § 103 Over Kramer in view of Padula**

CLAIM LANGUAGE OF THE '415 PATENT	PRIOR ART
CLAIM 6	
An improved analog sensor in accordance with claim 5 wherein said snap-through structuring includes a metallic dome-cap.	<p>See discussion of claim 5 with respect to Kramer.</p> <p>Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32. Thus, it would have been a mere design choice to employ a metallic dome-cap with the analog sensor of Kramer. <i>See</i> MPEP § 2144.07 (“Art Recognized Suitability for an Intended Purpose” as a rationale for obviousness rejections).</p>
CLAIM 10	
An improved analog sensor in accordance with claim 9 wherein said snap-through dome-cap is metallic.	<p>See discussion of claim 9 with respect to Kramer.</p> <p>Padula discloses the use of a metallic dome-cap</p>

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CLAIM LANGUAGE OF THE '415 PATENT	PRIOR ART
	<p>with a variable-conductance analog sensor. Padula at col. 9, lines 12-32.</p> <p>Thus, it would have been an obvious design choice to use metal for the dome-cap of Kramer. See MPEP § 2144.07 ("Art Recognized Suitability for an Intended Purpose" as a rationale for obviousness rejections).</p>
CLAIM 12	
<p>An improved pressure-sensitive analog sensor according to claim 11 wherein said snap-through tactile element is metallic.</p>	<p>See discussion of claim 11 with respect to Kramer.</p> <p>Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32. Thus, it would have been a mere design choice to employ a metallic dome-cap with the variable-conductance sensor of Kramer.</p>
CLAIM 16	
<p>An analog sensor according to claim 15 wherein said dome-cap is metallic.</p>	<p>See discussion of claim 15 with respect to Kramer.</p> <p>Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32.</p> <p>Thus, it would have been an obvious design choice to use metal for the dome-cap of Kramer. See MPEP § 2144.07 ("Art Recognized Suitability for an Intended Purpose" as a rationale for obviousness rejections).</p>
CLAIM 19	
<p>An analog sensor according to claim 18 wherein said dome-cap is metallic.</p>	<p>See discussion of claim 18 with respect to Kramer.</p> <p>Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32.</p> <p>Thus, it would have been an obvious design choice to use metal for the dome-cap of Kramer. See MPEP § 2144.07 ("Art Recognized</p>

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CLAIM LANGUAGE OF THE '415 PATENT	PRIOR ART
	Suitability for an Intended Purpose” as a rationale for obviousness rejections).
CLAIM 22	
An improved analog sensor in accordance with claim 21 wherein said means includes a metallic dome-cap.	<p>See discussion of claim 21 with respect to Kramer.</p> <p>Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32.</p> <p>Thus, it would have been a mere design choice to employ a metallic dome-cap with the variable-conductance sensor of Kramer. See MPEP § 2144.07 (“Art Recognized Suitability for an Intended Purpose” as a rationale for obviousness rejections).</p>

c. At Least Claims 2 and 8 are Obvious Under 35 U.S.C. § 103 Over Furukawa '760 in view of Furukawa '217

CLAIM LANGUAGE OF THE '415 PATENT	PRIOR ART
CLAIM 2	
A pressure-sensitive variable-conductance analog sensor with tactile feedback in accordance with claim 1 wherein said pressure-sensitive variable-conductance material is variable in terms of electrical resistivity, the electrical resistivity lowering with increasing force applied to said depressible actuator.	<p>See discussion of claim 1 with respect to Furukawa '760.</p> <p>Furukawa '760 discloses that the pressure-sensitive variable-conductance material of its sensor is variable in terms of electrical resistivity: “[W]hen using the switch of the present invention as, for example, a controller of a video game, when the operator presses the moving part of the switch, the electrical resistance of the conductive portion fixed on the bottom surface of the moving contact changes according to the degree of the pressing force, thereby changing a signal from the controller.” Furukawa '760 at 5; see also <i>id.</i> at 6-9.</p> <p>Furukawa '217, like other prior art references, discloses that, “[w]hen the contact pressure is low, the pressure-sensitive variable resistor 1 has high resistance. The resistance is reduced as the</p>

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CLAIM LANGUAGE OF THE '415 PATENT	PRIOR ART
	<p>rubber key top 6 is further pressed down and the contact pressure is increased." Furukawa '217 at 4-5. Thus, Furukawa '217 taught that this decreasing resistance was useful to provide a variable signal in a dome cap sensor.</p> <p>Thus, in view of Furukawa '217, it would have been obvious to one of ordinary skill in the art that the electrical resistivity in the conductive portion 33 of Furukawa '760 would lower with increasing depression of cross key 12. <i>See</i> MPEP § 2144.07 ("Art Recognized Suitability for an Intended Purpose" as a rationale for obviousness rejections).</p>
<p>CLAIM 8</p>	
<p>An improved momentary-on snap-through switch in accordance with claim 7 wherein said electrical output is variable in terms of electrical resistivity, the electrical resistivity lowering with increasing depression of said actuator.</p>	<p>See discussion of claim 7 with respect to Furukawa '760.</p> <p>Furukawa '760 discloses that electrical output of its switch is variable in terms of electrical resistivity: "[W]hen using the switch of the present invention as, for example, a controller of a video game, when the operator presses the moving part of the switch, the electrical resistance of the conductive portion fixed on the bottom surface of the moving contact changes according to the degree of the pressing force, thereby changing a signal from the controller." Furukawa '760 at 5; <i>see also id.</i> at 6-9.</p> <p>Furukawa '217, like other prior art references, discloses that, "[w]hen the contact pressure is low, the pressure-sensitive variable resistor 1 has high resistance. The resistance is reduced as the rubber key top 6 is further pressed down and the contact pressure is increased." Furukawa '217 at 4-5. Thus, Furukawa '217 taught that this decreasing resistance was useful to provide a variable signal in a dome cap sensor.</p> <p>Thus, in view of Furukawa '217, it would have been obvious to one of ordinary skill in the art</p>

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CLAIM LANGUAGE OF THE '415 PATENT	PRIOR ART
	that the electrical resistivity in the conductive portion 33 of Furukawa '760 would lower with increasing depression of cross key 12. <i>See</i> MPEP § 2144.07 ("Art Recognized Suitability for an Intended Purpose" as a rationale for obviousness rejections).

d. **At Least Claim 3 is Obvious Under 35 U.S.C. § 103 Over Furukawa '760 Further in View of Reichow and Padula**

CLAIM LANGUAGE OF THE '415 PATENT	PRIOR ART
<p>CLAIM 3</p> <p>A pressure-sensitive variable-conductance analog sensor with tactile feedback in accordance with claim 2 wherein said housing is formed of plastic and said dome-cap is metallic.</p>	<p>See claim 2 with respect to Furukawa '760.</p> <p>Reichow discloses that housings for game controllers were "commonly made of metal or rigid plastic." Reichow at col. 1, lines 23-24. In addition, Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32.</p> <p>Thus, it would have been merely an obvious design choice to employ a plastic housing and metallic dome-cap with the variable-conductance analog sensor of Furukawa. <i>See</i> MPEP § 2144.07 ("Art Recognized Suitability for an Intended Purpose" as a rationale for obviousness rejections).</p>

e. **At Least Claims 6, 10, 12, 16, 19 and 22 are Obvious Under 35 U.S.C. § 103 Over Furukawa '760 in view of Padula**

CLAIM LANGUAGE OF THE '415 PATENT	PRIOR ART
<p>CLAIM 6</p> <p>An improved analog sensor in accordance with claim 5 wherein said snap-through structuring includes a metallic dome-cap.</p>	<p>See discussion of claim 5 with respect to Furukawa '760.</p> <p>Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32.</p> <p>Thus, it would have been merely an obvious</p>

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CLAIM LANGUAGE OF THE '415 PATENT	PRIOR ART
	design choice to employ a metallic dome-cap with the analog sensor of Furukawa. <i>See</i> MPEP § 2144.07 (“Art Recognized Suitability for an Intended Purpose” as a rationale for obviousness rejections).
CLAIM 10	
An improved analog sensor in accordance with claim 9 wherein said snap-through dome-cap is metallic.	<p>See discussion of claim 9 with respect to Furukawa '760.</p> <p>Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32.</p> <p>Thus, it would have been merely an obvious design choice to employ a metallic snap-through dome cap with the analog sensor of Furukawa. <i>See</i> MPEP § 2144.07 (“Art Recognized Suitability for an Intended Purpose” as a rationale for obviousness rejections).</p>
CLAIM 12	
An improved pressure-sensitive analog sensor according to claim 11 wherein said snap-through tactile element is metallic.	<p>See discussion of claim 11 with respect to Furukawa '760.</p> <p>Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32.</p> <p>Thus, it would have been merely an obvious design choice to employ a metallic snap-through tactile element with the pressure-sensitive analog sensor of Furukawa. <i>See</i> MPEP § 2144.07 (“Art Recognized Suitability for an Intended Purpose” as a rationale for obviousness rejections).</p>
CLAIM 16	
An analog sensor according to claim 15 wherein said dome-cap is metallic.	<p>See discussion of claim 15 with respect to Furukawa '760.</p> <p>Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32.</p>

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CLAIM LANGUAGE OF THE '415 PATENT	PRIOR ART
	<p>Thus, it would have been merely an obvious design choice to employ a metallic dome-cap with the analog sensor of Furukawa. <i>See</i> MPEP § 2144.07 (“Art Recognized Suitability for an Intended Purpose” as a rationale for obviousness rejections).</p>
CLAIM 19	
<p>An analog sensor according to claim 18 wherein said dome-cap is metallic.</p>	<p>See discussion of claim 18 with respect to Furukawa '760.</p> <p>Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32.</p> <p>Thus, it would have been merely an obvious design choice to employ a metallic dome-cap with the analog sensor of Furukawa. <i>See</i> MPEP § 2144.07 (“Art Recognized Suitability for an Intended Purpose” as a rationale for obviousness rejections).</p>
CLAIM 22	
<p>An improved analog sensor in accordance with claim 21 wherein said means includes a metallic dome-cap.</p>	<p>See discussion of claim 21 with respect to Furukawa '760.</p> <p>Padula discloses the use of a metallic dome-cap with a variable-conductance analog sensor. Padula at col. 9, lines 12-32.</p> <p>Thus, it would have been merely an obvious design choice to employ a metallic dome-cap with the variable-conductance sensor of Furukawa. <i>See</i> MPEP § 2144.07 (“Art Recognized Suitability for an Intended Purpose” as a rationale for obviousness rejections).</p>

The proposed rejections set forth herein are merely representative of several bases for rejection that could be made based on the disclosures and suggestions in the cited prior art documents. For example, Section 103 obviousness rejections can be made using the

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acknowledged prior art (APA) in the '415 patent combined with any of several prior patents discussed herein on the grounds that it would have been obvious to one of ordinary skill in the art in view of the teachings in the various secondary references to combine snap-through tactile feedback with a variable-conductance switch or sensor.

V. ADDITIONAL RELEVANT PRIOR ART

Further to the prior art references discussed in detail above, the following prior art references are relevant to an understanding of the knowledge of one of ordinary skill in the art at the time of the alleged invention of the subject matter claimed in the '415 patent:

- U.S. Patent No. 4,508,942 (Inaba), issued April 2, 1985 (not cited) (keyboard switch with snap action domes);
- Japanese Laid Open Utility Model Application No. JP HEI1-62627 (Yasufumi), published April 21, 1989 (dome-cap ON/OFF and pressure-sensitive/variable resistance switch with apparent snap-through tactile feedback);
- Japanese Laid Open Utility Model Application No. JP H3-61304 (Kawashima), published June 17, 1991 (not cited) (see-saw-type variable resistor);
- Italian Patent Application (Industrial Invention) No. MI 91 A 00 3315 (Marcio et al.), Laid Open to the Public June 11, 1993 (not cited) (pressure-sensitive switch with vibrating tactile feedback);
- Japanese Laid Open Patent Application No. JP5-190051 (Tanami et al.), published July 30, 1993 (not cited) (rubber dome-cap-type pressure-sensitive switch);
- Japanese Laid Open Patent Application No. JP8-222070 (Yamamoto et al.), published Aug. 30, 1996 (not cited) (rubber dome-cap-type pressure-sensitive switch used for video game);
- U.S. Patent No. 5,440,237 (Brown et al.), issued Aug. 8, 1995 (cited) (dome-cap switch with tactile response combined with pressure-sensitive, variable-output sensor);

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- Japanese Laid Open Patent Application No. JP H5-304007 (Tanami et al.), published Nov. 16, 1993 (not cited) (pressure-sensitive switch with tactile feedback);
- Japanese Laid Open Utility Model Application No. JP H6-56740 (Furukawa et al.), published Aug. 5, 1994 (not cited) (pressure sensitive device dome-cap switch similar to that described in Furukawa '760);
- U.S. Patent No. 5,231,386 (Brandenburg et al.), issued July 27, 1993 (cited during prosecution of Armstrong's U.S. Patent No. 5,222,525) (dome-cap switch with tactile response combined with pressure-sensitive, variable-output sensor);
- U.S. Patent No. 5,692,956 (Rifkin), issued Dec. 2, 1997, Filed Feb. 9, 1996 (not cited) (combination computer mouse and game play control including an analog switch coupled in tandem to a click switch, and including structure for providing engine vibration simulation);
- "Design Specifications for Membrane Keyboards" (CSI Keyboards, Inc.) (1988) (not cited) (describing membrane keyboards and dome switches);
- U.S. Patent No. 5,278,557 (Stokes et al), issued Jan. 11, 1994 (dual ON/OFF, pressure sensitive switch that incorporates a dome sheet formed with individual resiliently collapsible dome caps).

VI. CONCLUSION

The above comparisons clearly establishes that the subject matter of all claims of the '415 patent was well known in the art as of the effective filing date of the '415 patent.


Accordingly, Requestor respectfully submits that substantial new questions of patentability have been raised herein with respect to all claims of the '415 patent.

On this basis, granting of this Request is solicited.

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Respectfully submitted,

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