IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reexamination of

U.S. Patent No. 6,344,791

Inventor: Armstrong

Issued: February 5, 2002

Recorded Assignee: Anascape, Ltd.

For: VARIABLE SENSOR WITH TACTILE FEEDBACK

LITIGATION

Atty. Ref.: 723-2108

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January 31, 2007

MAIL STOP INTER PARTIES REEXAMINATION
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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 (claims 1-66) of U.S. Patent 6,344,791 issued February 5, 2002 to Brad A. Armstrong ("Armstrong").[1] This is a new reexamination request . The '791 patent has not been previously reexamined.

As required by 37 C.F.R. § 1.915 (a) and (b), this Request includes the following:

[1] Contemporaneous with this Request, NOA has also filed requests for *inter partes* reexamination of Armstrong's U.S. Patent No. 6,563,415 ("the '415 patent") and U.S. Patent No. 6,351,205 ("the 205 patent"). This Request, however, is limited to the '791 patent.

1. A listing of prior art relied upon to establish a substantial new question of patentability (Section III).[2]

2. A statement pointing out each substantial new question of patentability based on prior patents and printed publications (Section IV);

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 '791 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); 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 D); 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.

[2] Additional prior art, not specifically relied upon, is cited in Section V and copies are provided in Appendix C.

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") filed an Original Complaint for Patent Infringement ("Complaint") in the United States District Court for the Eastern District of Texas, alleging infringement of the '791 patent by NOA. The case 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's First Amended Complaint on December 6, 2006.

I. Introduction

The subject matter of the '791 patent for which reexamination is requested relates generally to the incorporation of analog functionality into an existing dome-cap switch or sensor (Armstrong apparently uses these terms interchangeably) traditionally used simply as a momentary ON/OFF switch.

There is no dispute here with respect to the fact that both momentary ON/OFF dome-cap switches or sensors as well as pressure-sensitive, variable conductance (analog) switches or sensors were well known long prior to the alleged invention described in the '791 patent.

Momentary ON/OFF dome-cap switches, characterized by a snap-through tactile feedback, have been used for several years in devices such as computer keyboards, video game controllers and the like. See, for example, Armstrong's statement in the '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 (emphasis added). According to Armstrong, hundreds of millions of such switches have been made a sold over the twenty years preceding the patent ('791 patent at Col. 2, lines 42-44).

The use of pressure-sensitive variable conductance analog sensors has also long preceded any development work related to the '791 patent. Armstrong acknowledges as much, stating:

> *Pressure-sensitive variable conductance sensors have also been known for decades...*

'791 patent at Col. 2, lines 44,45 (emphasis added).

It 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, for example, Col. 1, line 66 through Col. 2, line 17.

Given the acknowledged state of the art, what is it that Armstrong invented? In the '791 patent, Armstrong claims to have discovered that the active element in the

known prior art dome-cap switch or sensor is (or, in the alternative, can be made) pressure sensitive and variably conductive, and thus the sensor can be used as an analog sensor with appropriate circuitry. See Col. 3, lines 21-26, and Col. 4, lines 10-49.

This Request has been filed because the prior art demonstrates that well before the earliest possible effective filing date of the '791 patent, others had already recognized that dome-cap switches or sensors could be constructed to exhibit analog functionality.

For example, in UK Published Patent Specification No. 1 412 298 published in 1975, Knox describes a keyboard that includes a plastic plate or sheet formed with a plurality of variable resistance dome-like keys for a keyboard. 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. Knox at page 4, lines 30-33.

JP S61-100844 (Kaneko et al), published in 1986, discloses a pressure sensitive dome-cap 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. The reference also discloses that the dome cap returns to its original state upon release. Kaneko et al at page 2, lines 12-15 and page 7, lines 7-11.

JP S61-103836 (Matsumoto et al), also published in 1986, discloses a pressure sensitive dome-cap switch that describes a "click point" substantially identical to Kaneko. See page 2, lines 12-16 and page 8, lines 10-12.

U.S. Patent No. 5,164,697 (Kramer), issued in 1992, describes the application of analog functionality to a conventional rubber dome cap switch in order to allow the user to adjust values in "entertainment electronics" applications.

U.S. Patent No. 3,643,041 (Jackson) discloses a snap-action switch for use with keyboard buttons. The switch includes a dome-shaped resiliently deformable dimple serving as the push button which is arranged to contact an aligned contact. The push button exhibits snap-action tactile feedback upon pressing and upon releasing (see Col. 2, lines 11-42). In one embodiment, capacitance-change sensed circuitry is employed to detect the change in capacitance between the button and the contact (see Col. 2, line 72 through Col. 3, line 7).

Other patents discussed in this Request disclose dome-cap switches with analog functionality that would appear to inherently exhibit snap-through tactile feedback, even though they do not use snap or click terminology. In that regard, the switch constructions disclosed in at least some of these patents are virtually identical to the switch constructions illustrated by Armstrong. See, for example, JP 5-87760 (Furukawa '760) of record in the '791 patent; JP H6-56740 (Furukawa); JP H05-326217 (Furukawa '217); and JP H1-62627 (Yasufumi). If snap-through tactile feedback is not considered an inherent feature of such devices, it would have been obvious to utilize a dome cap that exhibits tactile feedback. See, for example, Patent No. 3,590,195 (Driver) which explains the mechanics of dome-caps and how they provide snap-through tactile feedback.

At least two of the prior patents (see Furukawa '760 and Furukawa '217) disclose utilizing such sensors or switches for controlling characters in computer video games, and another (Kramer) discloses similar switches for remote transmitters in "entertainment electronics".

Accordingly, based on the wealth of evidence contained in the prior art newly cited herein and in certain of the prior patents cited during the prosecution of the '791 patent, it will become apparent from the discussion below that substantial new questions of patentability have been raised as to all of the '791 patent claims.

II. Background

The '791 Patent

The '791 patent issued on February 5, 2002 to Brad A. Armstrong, and is based on application Serial No. 09/599,095, filed June 21, 2000. The application was characterized as a continuation of application Serial No. 09/122,269, filed July 24, 1998 and now U.S. Patent No. 6,135,886. The '791 patent is one of many issued patents and pending applications filed by Armstrong that relate to pressure sensitive, variable conductance switches for use in video game controllers. Note in this regard that Armstrong incorporates by reference the '886 patent as well as two earlier U.S. Patent Nos. 6,102,802 and 6,222,525. This Request is limited to the '791 patent.

The '791 patent is said to relate to sensors utilizing injection-molded, flexible dome caps, typically used as simple momentary ON/OFF switches. Such switches incorporate a well known tactile feel phenomenon (also referred to as a "snap-through"

tactile feedback), whereby the user confirms by feel that the switch has been moved to an ON or OFF position. More specifically, the inventor contends that he discovered that the active (conductive) element utilized in an otherwise conventional dome-cap ON/OFF switch is pressure sensitive and variably conductive (Column 3, lines 21-25), and that the switch can operate as a pressure sensitive, variable conductance sensor (i.e., an analog sensor or switch) by simply modifying the electric circuitry to read at least three (or more) states of the active element of the dome-cap (Column 3, lines 20-25 and Column 4, lines 56-64). In at least the first-described embodiment, no change in the prior art switch construction per se is required to implement the invention and, thus, the known snap-through tactile feedback feature is retained along with the analog functionality.

With reference now to Figure 1 of the drawings, the '791 patent discloses a typical sensor 10 including a one-piece injection molded dome cap 12 provided with an active element 14 that, in an OFF position, is supported above conductive elements 16, 18 on a base 20. The unnumbered flexible legs of the dome cap are designed to collapse in a snap-through-action to the ON position shown in Figure 5 upon application of pressure to the dome cap, such that element 14 engages the conductive elements 16, 18. Upon release, the spring characteristics of the legs return the switch to the OFF position. This construction per se is acknowledged to be well known (see Column 6, lines 17, 18).

An analog sensing circuit for the sensor 10 is shown in Figure 2 and includes a battery 24 and a meter 26 capable of showing varying conductivity across the dome-cap

sensor 10 as pressure is applied to the active element 14. The patent goes on to explain how the sensor operates:

> *The dome-cap sensor 10 is indicated in the circuit as being in what could be considered a first or open state in this example. It should be understood that depressive pressure applied to the dome-cap 12 will move the raised portion of the dome-cap 12 toward base 20 sufficiently to bring the active element 14 into contact with both conductive elements 16, 18, and with sufficient pressure, and varying pressure well within a range readily applied by a human finger, the sensor 10 will be moved to second and third, etc. states with increasing applied pressure, and the different states in this example, because this is an analog circuit, will be indicated by the needle of the meter 26 being positioned left, right or at various states in between on the scale. The scale of meter 26 in this example includes marks which the needle moves through, in this example the needle moving to the right as the resistivity of the active element 4 decreases. It can be appreciated that while the marks are only printed on the scale, each mark represents a position the needle can pass through, and an electrical state of the sensor in which each can have a digital bit assignment associated therewith. In this example, higher pressure to dome-cap 12 and active element 14 would move the needle further to the right indicating lower resistivity, i.e. greater conductivity of active element 14. As those skilled in the art can appreciate and will be further discussed below, digital bit assignments can be made for any level or state of conductivity and at least two bits of digital information are required for identifying more than two readable states.*

'791 Patent at Col. 7, lines 12-39.

In terms of how the invention may be implemented, the patent discloses that:

> *In order to gain the benefits of the present invention, manufacturers using prior art style dome-caps 12 will only need to apply new or modified circuitry on the circuit boards capable of reading any one of at least three readable states of the dome-cap sensor 10 indicative of at least three states of the dome-cap 12 and active element 14. Such readable*

> *states, for example, can be: 1) a first level of electrical resistance being relatively high resistance or open across the proximal conductive elements indicating the dome-cap as raised; 2) a second level of electrical resistance being less than the first level but allowing current flow between the proximal conductive elements and being indicative of the dome-cap being lightly depressed and lightly compressing the active element 14; and 3) a third level of electrical resistance being less than the first and second levels and allowing current flow between the proximal conductive elements 16, 18 and being indicative of the dome-cap being depressed and compressing (applying force) active element 14 more firmly or with greater pressure compared to the second level or state.*

'791 Patent at Col. 9, lines 4-22.

The '791 patent issued with 66 claims, of which claims 1, 34, 44, 56 and 64 are written in independent form.

The prosecution history was brief. After initially refusing to consider prior art submitted by Armstrong on the ground that the submission did not comply with applicable USPTO Rules, the Examiner entered grounds of rejection based only upon the judicially-created doctrine of obviousness-type double patenting, the Examiner citing only Armstrong's parent U.S. Patent No. 6,135,886. Upon cancellation of the original claims and submission of new claims, the application (with a few minor subsequent amendments to certain of the claims) was allowed. There are no substantive comments by the Examiner in the prosecution history of any of the prior art documents relied upon in this Request.

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

It is important to remember Armstrong acknowledges that dome-cap switch constructions per se, including those that exhibit a snap-through tactile feedback feature, were well known long before the effective filing date of the '791 patent. (See, for example, Col. 1, line 26 through Col. 2, line 17.) In fact, Figure 1 of the '791 patent and the text relating thereto is acknowledged prior art (see Col. 6, lines 17,18). In addition, Armstrong explains that dome-cap switches employing analog circuitry provide a less expensive alternative to typical analog sensors employing potentiometers and sliding plate resistors (Col. 3, lines 36-47). Thus, it appears that the variously disclosed and claimed applications for Armstrong's switches are no different than those of typical analog sensors.

Some of the documents relied upon in this Request to establish a substantial new question of patentability were of record in the prosecution of the application which matured into the '791 patent. It is respectfully submitted, however, that the Examiner either did not carefully consider, or did not fully understand the extent of the disclosure in certain of the cited references, most notably U.S. Patent No. 5,164,697 (Kramer) and JP 5-87760 (Furukawa '760), and that many if not all of the claims appearing in the '791 patent would not have been allowed had these references been fully appreciated for what they disclose. This is evidenced by reasons for allowance advanced by the Examiner in the Notice of Allowability dated November 2, 2001:

> *The claimed variable sensor is not disclosed in the prior art of record. Kambic discloses digital sensors. While digital and analog sensors are disclosed in Mitchell, there is no suggestion to employ such sensor [sic] with a snap-through tactile feedback where sensor is employed in digital bi-state/on-off devices in the prior art.*

A thorough review of the prosecution history reveals that there were several references of record more relevant than either Kambic or Mitchell, and some, such as Kramer and Furukawa '760 do, in fact, employ tactile feedback features in pressure sensitive or variable resistance (analog), dome cap switches.

In any event, relevant prior art newly cited in this Request confirms that it was well known to integrate analog functionality into momentary ON/OFF dome-cap switches well before the effective filing date of the '791 patent.

The following prior art patents and published applications , including translations of non-English language documents,[3] are relied upon for establishing a substantial new question of patentability with respect to all claims in the '791 patent. An indication is made in each case whether or not the reference was cited in the prosecution of the application.

A. List of Prior Patents/Publications Relied Upon in this Request

- U.S. Patent No. 3,643,041 (Jackson), issued Feb. 15, 1972 (not cited)
- U.S. Patent No. 5,164,697 (Kramer), issued Nov. 17, 1992 16, 1991 (cited)

[3] All translations have been certified.

- U.S. Patent No. Re. 34,095 (Padula et al) issued October 13, 1992 (not cited) (hereafter, Padula)
- U.S. Patent No. 5,231,386 (Brandenburg et al.), issued July 27, 1993 (not cited here but cited in Armstrong's U.S. Patent No. 5,222,525) (hereafter, Brandenburg)
- Japanese Laid Open Utility Model Application No. JP S61-100844 (Kaneko et al.), published June 27, 1986 (not cited) (hereafter, Kaneko)
- Japanese Laid Open Utility Model Application No. JP S61-103836 (Matsumoto et al.), published July 2, 1986 (not cited) (hereafter Matsumoto)
- Japanese Laid Open Patent Application No. JP H5-304007 (Tanami et al.), published Nov. 16, 1993 (not cited) (hereafter Tanami)
- Japanese Laid Open Utility Model Application No. JP H3-61304 (Kawashima), published June 17, 1991 (not cited)
- Japanese Laid Open Utility Model Application No. JP5-87760 (Furukawa et al.), published Nov. 26, 1993 (cited) (hereafter, Furukawa '760)
- Japanese Laid Open Utility Model Application No. JP H6-56740 (Furukawa et al.), published Aug. 5, 1994 (not cited) (hereafter, Furukawa '740)
- UK Published Patent Application No. 2 156 588 A (Meleard et al.), published Oct. 9, 1985 (not cited) (hereafter, Meleard)

- UK Published Patent Specification No. 1 412 298 (Knox), published Nov. 5, 1975 (not cited)

Each reference is described in greater detail below, in the same order as presented above.

U.S. 3,643,041 (Jackson)

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 column 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 button 30, as shown in Fig. 4. This snap action results in the 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 over center 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.*

Jackson 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, when the dimple 22 is depressed as shown in Figure 5, the capacitance between the button 37 [sic, 36] and the dimple 22 is substantially greater than when the dimple is in its original position. It is disclosed that a circuit connected the contact button 36 and the switch plate 20 incorporates a variable capacitance depending on the position of the dimple 22 with respect to the contact button 36. It is disclosed that conventional capacitance-change-sensed circuitry may be utilized to detect the change capacitance resulting from the depression of the dimple 22, thus providing a keyboard operable through an induced change and capacitance at the selected keys. See Col. 3, lines 3-7.

U.S. 5,164,697 (Kramer)

Kramer discloses a pushbutton switch device for use with an input keyboard for an electronic "appliance" (e.g., a remote control transmitter) in the "entertainment electronics" field. Kramer was cited by the patent applicant during the prosecution of the '791 patent, but the reference was neither applied nor even commented upon by the Examiner. Kramer discusses rubber dome switches (Col. 1, lines 21-35), and notes the desirability of having a switch that not only performs a choosing or setting function, but also a changing value function (Col. 1, lines 36-44), or "adjustment process" (Col. 1, lines 46-51). Kramer thus recognizes that the transition resistance at the bearing surfaces

of the switch contact elements is a linear function of applied pressure, and that the resistance pattern can be monitored and conveyed for evaluation to a control circuit arrangement (Col. 2, lines 31-41), for the purpose of providing an "adjustment" or variable resistance function to the device. Kramer describes at least three embodiments of a switch that can be used to produce not only a setting function, but also an adjustment (analog) function. Of particular significance is the text disclosing 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 the 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 36-51 (emphasis added).

Earlier in the patent specification, Kramer explains that:

> *At positions corresponding to the various pushbuttons of the remote control transmitter, rubber domes are formed in the contact mat to act as spring elements. These rubber domes produce a snap effect upon depression of the pushbutton...*[4]

Kramer at Col. 1, lines 28-33 (emphasis added).

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[4] While Kramer does not explicitly describe the snap effect upon release of the button, Armstrong acknowledges in the '791 patent that most "conventional dome-cap" switches do snap back upon release (see col. 1, line 66 through col. 2, line 17), and it appears that Kramer's would do likewise. See also Driver at Col. 1, lines 5-10 and Jackson, Col. 2, lines 11-42.

Thus, Kramer clearly describes the application of analog functionality to a conventional dome cap switch in order to allow the user to adjust values in "entertainment electronics" applications. This is precisely what Armstrong purports to have invented in the '791 patent.

U.S. Patent No. Re. 34,095 (Padula)

U.S. Patent No. Re. 34,095 to Padula also 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.*
>
> *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)

Thus, Padula is another example of a pressure sensitive analog switch utilizing a "snap-through" feature to provide tactile feedback.

U.S. Patent No. 5,231,386 (Brandenburg)

Brandenburg 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 21downwardly 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 dual-switch configuration. Brandenburg also notes that the

tactile response or feel of the dome cap switch remains the same as in an unmodified dome cap switch. (Brandenburg is relied upon in this Request in only a relatively minor respect. In the course of the pending litigation, Anascape has provided infringement contentions that 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 (as in Brandenburg, for example). NOA does not agree with the claim scope presented in Anascape's infringement contentions. Should Anascape's claim scope arguments prevail, however, Brandenburg would assume greater significance.)

JP S61-100844 (Kaneko)

Kaneko discloses a variable resistance switch 10 that includes an electro-conductive curved plate 3 (a dome cap) adapted to be pressed by a pushbutton 1 so as to engage a pressure sensitive electroconductive rubber sheet 6. With reference to Figure 3, when pressed to the center of the generating line 8 on a concave surface side of the sheet 6, the concave surface is elastically deformed and changes its orientation with a click action to the configuration shown in Figure 4 (see page 5, lines 7-11). According to Kaneko, the purpose of the invention is to resolve problems with prior art variable resistance switches and to provide a variable resistance switch "in which a switch over 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." (See page 2, lines 12-16.)

JP H5-304007 (Tanami)

Tanami discloses a pressure sensitive switch that includes a flexible, conductive dome cap 4 in the form of an "inverted recess". When the key top 5 is depressed, the arc-like pressing surface 5a engages the pressure sensitive conductive dome cap 4 which collapses and comes into contact with at least one of multiple positive electrodes 2 and one or more of the multiple negative electrodes 3. According to Tanami et al.:

> *...the pressure-sensitive conductive rubber is made extremely easy to flex by making the pressure-sensitive conductive rubber in the cross-sectional shape of an inverted recess, and also conforms to a required characteristic of the pressure-sensitive switch that the contact area with the electrodes be increased with pressurizing the pressure-sensitive conductive rubber to lower the resistance value. Accordingly, a larger contact area of the pressure-sensitive conductive rubber for the electrodes may be insured, the resistance value is also suddenly lowered at a very small applied pressure force, eliminating the need to further increase the applied pressure force.*

Tanami at page 5.

It is also noteworthy that on page 6 of the translation, Tanami indicates that upon engagement by the key top 5, the pressure-sensitive conductive dome 4 collapses instantaneously, and it comes into contact with at least one of multiple positive electrodes 2, 2 and one of the multiple negative electrodes 3, 3. Figure 2 of Tanami et al. shows the electrodes to be interdigitated.

JP H3-61304 (Kawashima)

Kawashima discloses a variable resistor for changing the conductive resistance of electrode parts. The variable resistor is a see-saw-type resistor having two electrodes and is constituted from a resistor main body 20 and an operating body or button 30 pivotably secured at 31. The acting body 2 is formed with two hill-like pressure parts 2a, the undersides of which are provided with conical conductive parts 2b that are positioned to engage electrode parts 4a upon depression of either of the hill-like pressure parts 2a by the operating body or button 10. Thus, as shown in Figure 3, when the left side of the button 10 is depressed, the hill-like pressed part 2a directly underlying the left side of the button 10 pushes the conductive part 2b into contact with the electrode part 4a.

JP 5-87760 (Furukawa '760)

Furukawa ' 760 discloses a game controller 10 that incorporates a cross-key 12 positioned on the upper left hand side of the controller and trigger keys 19 and 20 positioned on the right hand side of the controller. Figure 2 illustrates a rubber contact or dome cap 29 in the cross-key 12, but note that Furukawa ' 760 teaches that the dome cap switch construction is not limited to use in the cross-key 12. A dome cap 29 including a "moving part" or push button 30 is disposed at each section of the cross-key 12, and each dome cap includes an elastic leg portion 31 that slopes obliquely downward from the peripheral middle portion of the cap 30, with a bottom surface 31a of the elastic leg portion on the top surface of the substrate 5. A moving contact 32 formed of conductive rubber is disposed on the bottom of each moving part 30, and a conductive portion 33

whose resistance varies with pressure, is attached to the bottom surface of the moving contact 32 by printing or integral molding. When the moving part 30 is not pressed, the conductive portion 33 is positioned above the bottom and surface 31a of a leg portion 31. When depressed, 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 contact 7, 7 of a wiring pattern disposed on the substrate 5. By discontinuing the pressing operation, the moving part 30 is said to be lifted by an "elastic restoring force" of the elastic leg portion 31, thereby releasing the above-described electrical connection (see translation, page 3). The text in Furukawa ' 760 thus apparently describes a "snap-through" tactile feedback similar to that described in the '791 patent.

Furukawa '760 also explains that:

> *By pressing the pressing portion of the cross-key 12 with a fingertip, the character of the video game is moved in a direction corresponding to the pressed portion, and the speed of the character's movement changes according to the magnitude of the pressing force applied by a fingertip. That is, the pressing force applied by the fingertip on each pressing portion of the cross-key 12 changes the electrical resistance through the conductive portion 33, whose resistance changes according to the pressing force, fixed on the bottom surface of the moving part 30 of the rubber contact 29. Thus, the operation of the character of the video game can be freely controlled by the pressing force applied by the finger tip of the operator.*

Furukawa '760 at pages 7, 8.

JP H6-56740 (Furukawa '740)

Furukawa '740 discloses a pressure sensitive device similar to that described in the Furukawa '760 patent described above. In this case, the movable contact 14b supported on the lower surface of the movable contact or button 14 has a circular shape that deforms upon engagement with the two fixed contacts 12 and 13 on the substrate 11 in the manner shown in Figure 3. As in the Furukawa '760 patent, the electric resistance changes relative to pressure and, as the pressure increases, the movable contact increasingly deforms in a flattened-collapsed-like shape, thereby increasing the contact area with the fixed contacts will become. Furukawa '740 explains that the electric resistance value between the two fixed contacts is slowly reduced and the change of the electric resistance value corresponds to the pushing forces obtained by slowly increasing the contact area of the movable contact with the fixed contacts. Furukawa '740 contrasts his analog switch with simple ON/OFF switches, noting that the analog switch permits adjustment of a control input in accordance with the will of an operator, thus improving the performance of the switch. Furukawa '740 further discloses that in order to implement the analog functionality in an ON/OFF switch, the software and hardware must be changed accordingly.

JP S61-103836 (Matsumoto)

Matsumoto discloses a variable resistance switch that is virtually identical to the switch disclosed in Kaneko, but with added figures and related disclosure.

UK 2 156 588A (Meleard)

The '588 patent discloses a switch assembly that includes a stationary membrane switch circuit layer 16, an insulating spacer 28 having at least one opening 30 therein, and a moveable membrane layer switch circuit on the other side of the spacer having at least one "snap-action tactile element" 22 extending upwardly therefrom. The stationary membrane layer has electric conductors 16 thereon arranged in a geometrical pattern and cooperating with the openings 30 and the separator layer 28 to define an array of unique switch and circuit locations. According to Meleard:

> *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....*

Meleard at Page 1, lines 21-27.

UK 1,412,298 (Knox)

Knox describes a keyboard that includes a plastic plate or sheet 4 formed with a plurality of dome keys 3 arranged to push a conductive layer into engagement with contacts 2. Variable resistance is established between the layer 14 and the terminals A-O of the contact track 2. Knox further discloses 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 page 4, lines 30-33.

IV. Statements Identifying Substantial New Questions of Patentability and Detailed Application of Prior Art to the Claims of the '791 Patent

1. Claim 1 is anticipated by Knox under 35 U.S.C. § 102(b).

Application of Knox to claim 1 of the '791 patent is presented in claim chart form below.

CLAIM LANGUAGE OF THE '791 PATENT	KNOX
CLAIM 1	
A variable sensor, said variable sensor comprising: a rigid support board, said board at least in part supporting a sheet, said sheet positioned between said board and a depressible resilient dome cap, said dome cap structured to provide, upon depression of said dome cap, a snap-through threshold tactile feedback to a human user.	Knox discloses a variable sensor (see page 2, lines 4-8; page 3, lines 54-61 and Figs. 4, 5). The sensor comprises a rigid board (base-plate 15) and a sheet (layer of conducting material 14) between the board and a depressible resilient dome cap (cross-members 10 and integral keys 3), (see Fig. 4, and page 3, lines 61-69), that may be structured to provide a "snap-action" and an audible "click" on depressing the key (see Page 4, lines 30-33).

2. Claim 1 is also anticipated by Kaneko under 35 U.S.C. § 102(b) . Application of Kaneko to claim 1 of the '791 patent is presented in claim chart format below.

CLAIM LANGUAGE OF THE '791 PATENT	KANEKO
CLAIM 1	
A variable sensor, said variable sensor comprising: a rigid support board, said board at least in part supporting a sheet, said sheet positioned between said board and a depressible resilient dome cap, said dome cap structured to provide, upon depression of said dome cap, a snap-through threshold tactile feedback to a human user.	Kaneko discloses a variable resistance sensor (page 1, line 4) that comprises a rigid support board (bottom of lower switch case 5, page 4, lines 4,5 and Fig. 1); a sheet between the board and a resilient dome cap (electro-conductive rubber sheet 6 between the board 5 and the dome-cap 3, page 4, lines 4-12); the dome cap exhibits a snap-through tactile feedback ("..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", page 2, lines 12-16). See also page 5, lines 6-11 and page 6, lines 6-13.

3. Claim 1 is anticipated by Matsumoto under 35 U.S.C. § 102(b) . Application of Matsumoto to claim 1 of the '791 patent is presented in claim chart format below.

CLAIM LANGUAGE OF THE '791 PATENT	MATSUMOTO
CLAIM 1	
A variable sensor, said variable sensor comprising: a rigid support board, said board at least in part supporting a sheet, said sheet positioned between said board and a depressible resilient dome cap, said dome cap structured to provide, upon depression of said dome cap, a snap-through threshold tactile feedback to a human user.	Matsumoto discloses a variable resistance sensor (page 1, line 4) that comprises a rigid support board (bottom of lower switch case 2B, page 4, lines 4,5 and Fig. 1); a sheet between the board and a resilient dome cap (electro-conductive rubber sheet 6 between the board 2B and the dome-cap 3, page 4, lines 9-11); the dome cap exhibits a snap-through tactile feedback ("..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", page 2, lines 12-16). See also page 6, lines 2-4 and page 7, lines 4-13.

4. Claim 1 is anticipated by Jackson under 35 U.S.C. § 102(b) .

CLAIM LANGUAGE OF THE '791 PATENT	JACKSON
CLAIM 1	
A variable sensor, said variable sensor comprising: a rigid support board, said board at least in part supporting a sheet, said sheet positioned between said board and a depressible resilient dome cap, said dome cap structured to provide, upon depression of said dome cap, a snap-through threshold tactile feedback to a human user.	Jackson discloses a variable sensor comprising a rigid support board (contact board 28), supporting a sheet (insulating plate 35), and a resilient dome cap (dimple 22) that provides snap-through tactile feedback to the user (see Col. 2, lines 24-42). By sensing variation in capacitance (see Col. 3, lines 3-7), the sensor is properly characterized as a "variable sensor".

5. Claims 1-5, 7, 19, 34-38, 44-46, 56, 61 and 64 are anticipated by Kramer under 35 U.S.C. 102(b) . Application of Kramer to the above claims of the '791 patent is presented in claim chart format below.

CLAIM LANGUAGE OF THE '791 PATENT	KRAMER
CLAIM 1	
A variable sensor, said variable sensor comprising: a rigid support board, said board at least in part supporting a sheet, said sheet positioned between said board and a depressible resilient dome cap, said dome cap structured to provide, upon depression of said dome cap, a snap-through threshold tactile feedback to a human user.	Kramer discloses a variable sensor or switching device 3 including a rigid support board 10, supporting a sheet 17; the sheet positioned between the board 10 and a depressible, resilient dome cap (not shown, but see Col. 5, lines 36-42); providing a snap-through threshold tactile feedback to the human user (see Col. 5, lines 42-48 and Col.1, lines 21-35).
CLAIM 2	
A variable sensor according to claim 1 wherein said board is a circuit board supporting electrical circuit traces, and said variable sensor is combined with means for variably controlling imagery according to variable depressive force applied by the human user.	Kramer's board 10 is a circuit board supporting electrical circuit traces 11.1 and 11.2 (Col. 4, lines 61-65); the means for variably controlling imagery is the control circuit shown in Figure 2, operating on the basis of variable resistance as a function of applied pressure, just as described in the '791 patent. Because Kramer describes the use of his device with "entertainment electronics" (col. 1, lines 8-9) it is considered inherent that the adjustment function described therein embraces "imagery".
CLAIM 3	
A variable sensor according to claim 2 wherein said dome cap has a deformable surface having an apex located to contact said sheet.	Locating spring 20 of Kramer on the ceiling surface of a rubber dome would inherently provide an "apex" (a surface projecting from the dome), located to contact the sheet.
CLAIM 4	
A variable sensor according to claim 3 wherein said sheet supports electrically conductive material.	Sheet 17 of Kramer supports the electrically conductive carbonized foil 14 (Fig. 1).
CLAIM 5	
A variable sensor according to claim 4 wherein said conductive material is located to contact said circuit traces.	Kramer discloses that the carbonized foil 14 is located to contact conductive linings or "circuit traces" 11.1 and 11.2. (Fig. 1)

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CLAIM LANGUAGE OF THE '791 PATENT	KRAMER
CLAIM 7	
A variable sensor according to claim 5 wherein said imagery is an electronic game displayed by a television.	See claim 2 above, and in addition, "entertainment electronics", such as electronic games as of 1998 were played on TV sets. If Kramer is determined not to embrace electronic games, then claim 7 should be rejected as obvious under 35 U.S.C 103 when Kramer is combined with Furukawa '760 which teaches the use of similar pressure sensitive switches in video game controllers.
CLAIM 19	
A variable sensor according to claim 1 wherein electrically conductive material is carried by said dome cap, and said variable sensor is combined with means for variably controlling imagery according to variable depressive force applied by a human finger of the human user.	Spring 20, with applied conductive carbonized foil 14 and conductive layer 17, is carried by the dome cap (Col. 5, lines 39-41), and the switching device 3 acts as a pressure dependent, variable sensor as pressure is applied to pushbutton. Electric circuitry shown in Figure 2 of Kramer controls or adjusts values in the context of electronics entertainment transmitters. To control "imagery" typically found in video games is inherently embraced by Kramer's reference to "entertainment electronics", but see also the discussion above relating to claim 7.
CLAIM 34	
A variable sensor operated by depression of a single button, said single button depressed by a finger of a user, said variable sensor combined with means for controlling game imagery, said variable sensor comprising: sensor means for creating a proportional output, said proportional output representing varying depression applied by the finger of the user, said proportional output at least in part for controlling the game imagery, feedback means at least for providing a snap-through threshold tactile feedback to the user.	Kramer discloses a switching device or variable sensor 3 operated by depression of a button depressed by the finger of a user; the sensor may be used to provide an adjustment function for entertainment electronics (inherently embracing controlling game "imagery"); the sensor and associated circuit operate based on variable resistance as a function of applied pressure (see Col. 2, lines 31-41). A depressible, resilient dome cap (not shown, but see Col. 5, lines 36-42) provides a snap-through threshold tactile feedback to the human user (see Col. 5, lines 42-48). If Kramer is determined not to embrace electronic games, then claim 34 should be rejected as obvious under 35 U.S.C 103 when Kramer is combined with Furukawa '760 which teaches the use of similar pressure sensitive switches in video game controllers.
CLAIM 35	
A variable sensor according to claim 34 wherein said feedback means further comprises means for active tactile feedback.	The feedback described in Kramer is "active" and "tactile" insofar as it involves a "snap effect" (col. 5, line 46).
CLAIM 36	
A variable sensor according to claim 34 wherein said sensor means includes a resilient dome cap depressible by said button.	Kramer discloses that the sensor includes a rubber dome cap. (Col. 5, lines 36-42).

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CLAIM LANGUAGE OF THE '791 PATENT	KRAMER
CLAIM 37	
A variable sensor according to claim 36 wherein said feedback means comprises said dome cap supplying said snap-through threshold tactile feedback through said button to the finger of the user.	The countercontact 16 and spring member 20 attached to the underside of the dome cap supplies snap-through tactile feedback through the button to the user (Col. 5, lines 42-48 and Col. 1, lines 21-35).
CLAIM 38	
A variable sensor according to claim 37 wherein said dome cap comprises rubber material.	The dome cap in Kramer is rubber (Col. 1, lines 21-35 and Col. 5, line 40).
CLAIM 44	
A variable sensor combined with means for variably controlling electronic imagery according to variable depressive force applied to said variable sensor by only a single human finger, said variable sensor comprising: a depressible resilient dome cap, said dome cap structured to provide, upon depression of said dome cap, a snap-through threshold tactile feedback to the human finger.	See the discussion and cites above in connection with claims 1 and 34. Insofar as Kramer relates to remote transmitters in the "electronics entertainment" art, the disclosure inherently embraces adjustment or control of "imagery."
CLAIM 45	
A variable sensor according to claim 44 wherein electrically conductive material is carried by said dome cap.	In the embodiment described in Col. 5, lines 42-48, countercontact 16 (foil 14 and conductive layer 17) are carried by the dome cap.
CLAIM 46	
A variable sensor according to claim 45 wherein said conductive material deforms under said depressive force.	Spring member 20 with carbonized foil 14 and conductive layer 17 deforms under pressure (Col. 4, lines 8-15).

CLAIM LANGUAGE OF THE '791 PATENT	KRAMER
CLAIM 56	
A method of using a variable pressure analog sensor, depressed by a human thumb, to control variable movement of imagery in an electronic game, said method including the steps: a) decreasing pressure on said analog sensor, followed by b) receiving a soft snap tactile feedback, followed by c) increasing pressure on said analog sensor, said increasing pressure-applied according to said imagery and substantially because of said receiving a soft snap tactile feedback.	Kramer relates to entertainment electronics, of which video games are a prime example. Controlling variable movement of "imagery" is typically associated with video games. 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 or repeated action. Dome switches as described in Kramer typically provide tactile feedback in both directions. (See, if necessary, Jackson or Driver) This claim could also be rejected, however, as obvious under 35 USC 103 in further consideration of Furukawa '760 as explained above in the discussion of Claim 7 relating to the imagery limitation.
CLAIM 61	
A method of using a variable sensor depressed by a human finger to variably control movement in an electronic game, said method including the steps: a) depressing said variable sensor with varying pressure; b) receiving a user discernable a snap-through threshold tactile feedback.	See the discussion of claims 1, 34 and 56 above.
CLAIM 64	
A method of variably controlling electronic imagery by using a variable sensor, said method including the steps: a) pressing, with a human finger, a button associated with the variable sensor; b) receiving, through said finger, a snap-through threshold tactile feedback.	See the discussion of claims 1, 34 and 56 above.

Various other of the dependent claims in the '791 patent relate merely to obvious circuit arrangements and/or applications for the analog sensor, mainly in the context of video game controllers, including limitations relating to button type, number, location on a controller, particular game functionality, and the like. Nowhere in the '791 patent is

there any indication that any of these controller configurations are new or unobvious, or that the variously recited button configurations and/or button functions solve any particular stated problem. In fact, there is no discussion whatsoever in the '791 patent of many of the limitations contained in various of the dependent claims. In any event, the subject matter of these claims would have been obvious (35 U.S.C.§103) as of the effective filing date of the '791 patent (application) when Kramer is considered along with one or more other prior art references as explained further herein.

6. Claim 6 is unpatentable under 35 U.S.C. §103 based on Kramer in view of Brandenburg. It would be have been obvious to combine Kramer with Brandenburg because each of the references is directed to the same purpose as the claimed invention. Any improvement resulting from the combination of Kramer with Brandenburg is technology independent requiring no technical insight.

Alternatively, Claim 6 would have been obvious Kramer in view of Tanami. It would have been obvious to combine Kramer with Tanami because each of the references is directed to the same purpose as the claimed invention. Any improvement resulting from the combination of Kramer with Tanami is technology independent requiring no technical insight.

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 6	
A variable sensor according to claim 5 wherein said circuit traces are interdigitated.	"Interdigitated" circuit traces in pressure sensitive switch constructions were well known as taught by Brandenburg et al. (Column 3, line 68 thru Col. 4, line 2) or Tanami et al. (Page 6, Para. 10 and Figure 2). To modify Kramer's contact linings 11.1 and 11.2 to include interdigitated circuit traces would have been an obvious matter of circuit design choice, motivated by design functionality and efficiency.

7. Claims 8-13 are unpatentable under 35 U.S.C. 103 based on Kramer in view of JP'304 (Kawashima). Kramer provides express motivation to a person skilled in the art to combine its teachings with Kawashima by teaching that the Kramer patent can be implemented using a dome cap. Kawashima discloses an example of an implementation of a prior art dome cap.

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 8	
A variable sensor according to claim 2 wherein said variable sensor is positioned at least in part within a hand operated device, said device includes a first pivotally mounted button, said first pivotally mounted button positioned to be operated by a first human finger of the human user.	Kramer discloses variable pressure sensitive sensors/switches in the context of hand-operated input keyboards on remote transmitters (Col. 1, lines 46-51) for electronic appliances in entertainment electronics (Col. 1, lines 52-54); Kawashima discloses variable resistors in an operating body 10 for finger tip actuation (Page 6, lines 3-9). The operating body or button 10 is of the see-saw type (Page 4, lines 24-26), pivotally mounted on a shaft 11 (Page 5, lines 25, 26 and Figures 1,3 and 4). It would have been obvious to modify Kramer to have the switches disclosed therein work with pivotally mounted buttons, since such buttons were well known in entertainment electronics at the time of Armstrong's effective filing date. The motivation would have been provided by the desirability of cross-key switches in hand-operated controllers (see also the rocker switch 12 in Furukawa '760).

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 9	
A variable sensor according to claim 8 wherein said device includes a second pivotally mounted button, said second pivotally mounted button positioned to be operated by a second human finger of the human user.	Incorporating the above discussion of Claim 8, it would have been well within the skill of the art of the ordinarily skilled entertainment electronics engineers (e.g., electronic game controller designers) to add additional buttons wherever deemed necessary and or convenient, motivated by the game functionality and the desire to facilitate use of the controller by the user.
CLAIM 10	
A variable sensor according to claim 9 wherein said device includes means for providing active tactile feedback.	The buttons in Kramer provide active tactile feedback (See, e.g., Col. 5, lines 42-48).
CLAIM 11	
A variable sensor according to claim 10 wherein said first pivotally mounted button is variably depressible to at least in part variably control said imagery.	The buttons in Kramer and Kawashima are variably depressible. The use of variably conductive sensors or switches in the "entertainment electronics" of Kramer would have been understood by those of ordinary skill in the electronics entertainment arts to include control of "imagery".
CLAIM 12	
A variable sensor according to claim 11 wherein said second pivotally mounted button is variably depressible to at least in part variably control said imagery, said imagery displayed by a television.	Incorporating the discussion of Claims 8-11, it was well known as of the effective filing date of the '791 patent that electronic games (electronics entertainment) were played on television sets. To the extent not inherently disclosed in Kramer, the utilization of television sets in the context of claim 12 would have been obvious to the ordinarily skilled artisan at the time the invention was made.
CLAIM 13	
A variable sensor according to claim 12 wherein said variable sensor outputs signals representing On/Off data and proportional data.	Kramer discloses that the pushbuttons "can be used to produce not only a setting process, but also an adjustment (proportional) process" (Col. 1, lines 46-51).

8. Claims 14-18 are unpatentable under 35 U.S.C. 103 based on Kramer in view of JP '760 (Furukawa '760). Kramer provides express motivation to a person skilled in the art to combine its teachings with Furukawa '760 by teaching that the Kramer patent can be implemented using a dome cap. Furukawa '760 discloses an example of such a prior art dome cap.

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 14	
A variable sensor according to claim 2 wherein said variable sensor is positioned at least in part within a hand operated device, said hand operated device includes a right-hand area and a left-hand area, said variable sensor is located in said right-hand area, said imagery is an electronic game displayed by a television.	Furukawa '760 discloses a hand-operated video game controller 10 that includes right and left-hand areas, with cross key or button 12 (left side) and trigger buttons 19,20 (right side) (Fig. 1). It is disclosed that the cross key 12 may incorporate a variable sensor or switch 29 (Fig. 2). That the video game would have been played on a television set is well understood. Moreover, the use of such a device in the context of Kramer's "electronics entertainment" would also have been obvious. In other words, the controller 10 in Furukawa '760 merely exemplifies the entertainment electronics appliances referred to in Kramer. Whether the cross key 12 is located on the left or right side of the controller amounts to no more than an obvious matter of choice for the ordinarily skilled electronic game controller designer.
CLAIM 15	
A variable sensor according to claim 14 wherein said variable sensor is activated by depression of a thumb depressible button, said thumb depressible button located in said right-hand area and positioned to be depressed by a right hand thumb of the user.	Which finger of a user is employed to activate the sensor is of no moment to the sensor construction per se. In any event, controllers of the type shown in Figure 1 of Furukawa '760 are typically gripped in such a way that the right and left hand thumbs are used to activate the right and left hand buttons, respectively. Whether the cross key 12 is located on the left or right side of the controller amounts to no more than an obvious matter of choice for the ordinarily skilled electronic game controller designer.
CLAIM 16	
A variable sensor according to claim 15 wherein said variable sensor outputs signals representing On/off data and proportional data.	Kramer discloses that the pushbuttons "can be used to produce not only a setting process, but also an adjustment (proportional) process" (Col. 1, lines 46-51).
CLAIM 17	
A variable sensor according to claim 16 wherein said hand operated device includes a second variable sensor located in said right-hand area.	Furukawa '760 teaches that his invention is not limited to the use of a pressure-sensitive switch in each of the four sections of the cross key 12 (see page 9), suggesting that depending on the desired functionality of the buttons, the pressure sensitive switch could also be employed with other buttons, at desired locations, e.g., on the right hand side.
CLAIM 18	
A variable sensor according to claim 17 wherein said hand operated device includes a third variable sensor and a fourth variable sensor, the second, third and fourth sensors	Incorporating the discussion of claim 17, it would have been obvious to employ the pressure sensitive switches of Kramer and Furukawa '760 in as few or as many locations on a video game controller as desired, depending on the game system hardware

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
associated with second, third and fourth independent buttons, the buttons located in said right-hand area positioned to be depressed by a right-hand thumb of the user.	and software. By Armstrong's own admission, controllers with multiple rubber dome-type switches were well known (see, for example, Figures 1 and 2 of Armstrong's '802 patent, incorporated by reference into the '791 patent). Based on the teachings of Kramer and Furukawa '760, one of ordinary skill in the art would have found it obvious to use variable sensors in hand-operated controllers wherever analog functionality were desired.

9. Claims 20 and 21 are unpatentable under 35 U.S.C. 103 based on Kramer in view of Brandenburg Furukawa '740. Kramer provides express motivation to a person skilled in the art to combine its teachings with Brandenburg by teaching that the Kramer patent can also be implemented using a dome cap. Brandenburg discloses an example of a prior art dome cap.

Alternatively, Kramer provides express motivation to a person skilled in the art to combine its teachings with Furukawa '740 by teaching that the Kramer patent can be implemented using dome cap. Furukawa '740 discloses an example of a prior art dome cap.

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 20	
A variable sensor according to claim 19 wherein said conductive material has a deformable substantially convexed surface having an apex.	Both Brandenburg and Furukawa '740 teach the use of convex actuator surfaces (conductive material), as shown at 17 in Brandenburg and 14b in Furukawa '740. To modify the spring element 20 in Kramer (in the context of the embodiment described in Col.5, lines 36-51) to have a convex face would have been obvious. Motivation for the modification is also provided in the secondary references which teach that compression of the convex actuator surfaces smoothly distributes the forces (Col. 5, lines 32-39 of Brandenburg) or advantageously increases surface contact with the underlying conductors (see pages 8, 9 of Furukawa '740).

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CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 21	
A variable sensor according to claim 20 wherein said variable sensor is structured in combination with means for providing active tactile feedback.	The buttons in Kramer provide active tactile feedback (See, e.g., Col. 5, lines 42-48). The same is true of Brandenburg (Col. 6, lines 37-42) and would appear to be inherently true of Furukawa '740 as well.

10. Claims 22-24, 27 and 28 are unpatentable under 35 U.S.C. 103 based on Kramer in view of Meleard. Kramer provides express motivation to a person skilled in the art to combine its teachings with Meleard by teaching that the Kramer patent can be implemented using a dome cap. Meleard discloses an example of a prior art dome cap.

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 22	
A variable sensor according to claim 1 wherein said sheet is an electrically non-conductive sheet supporting electrically conductive material, and said variable sensor is combined with means for variably controlling imagery according to variable depressive force applied by a human finger of the human user.	This configuration for a snap-through switch was well known as evidenced by Meleard, see page 2, lines 70-81 in conjunction with Figure 3, where a non-conductive sheet 20, supports conductive material (contact surface 26). The use of variably conductive sensors or switches in the "entertainment electronics" of Kramer would have been understood by those of ordinary skill in the electronics entertainment arts to include control of "imagery".
CLAIM 23	
A variable sensor according to claim 22 wherein said conductive material contacts circuit traces.	Incorporating the discussion of Claim 22, note that the conductive material 26 in Meleard contacts circuit traces 16. (Meleard, Fig. 3; page 2, lines 125-130)
CLAIM 24	
A variable sensor according to claim 23 wherein said circuit traces comprise a first circuit trace and a second circuit trace, said conductive material contacting between said first circuit trace and said second circuit trace.	Kramer discloses conductive material 14 that contacts a first circuit trace 11.1 and a second circuit trace 11.2 (Kramer Fig.1.)
CLAIM 27	
A variable sensor according to claim 24	Kramer discloses a sensor with active tactile feedback (See,

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
wherein said variable sensor is structured in combination with means for providing active tactile feedback.	e.g., Col. 5, lines 42-48).
CLAIM 28	
A variable sensor according to claim 27 wherein said variable sensor outputs signals representing On/off data and proportional data.	Kramer discloses that the pushbuttons "can be used to produce not only a setting, but also an adjustment [proportional] process" (Col. 1, lines 46-51).

11. Claims 25, 26 and 29-33 are unpatentable under 35 U.S.C. 103 based on Kramer in view of Meleard et al. and JP '760 Furukawa. Kramer provides express motivation to a person skilled in the art to combine its teachings with Meleard and Furukawa '760 by teaching that the Kramer patent can also be implemented using a dome cap. Meleard and Furukawa '760 each disclose an example of a prior art dome cap.

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 25	
A variable sensor according to claim 24 wherein a four way rocker is located in said left-hand area of said housing.	Furukawa '760 discloses a four-way rocker switch in the left hand area of the housing (Fig. 1).
CLAIM 26	
A variable sensor according to claim 25 wherein said imagery is an electronic game displayed by a television.	Because Kramer describes the use of his device with "entertainment electronics" it is considered inherent that the adjustment function described therein embraces "imagery". Furukawa '760 teaches the use of similar pressure sensitive switches in video game controllers for controlling a video game machine connected to a television.
CLAIM 29	
A variable sensor according to claim 27 wherein said variable sensor is positioned at least in part within a hand-held housing, and said means for providing active tactile feedback is also at least in part within said housing.	Kramer discloses a tactile feedback variable sensor within a household housing. Furukawa '760 discloses a tactile feedback variable sensor within a household housing (Fig. 1).

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 30	
A variable sensor according to claim 29 wherein said imagery is an electronic game displayed by a television.	See Claim 26.
CLAIM 31	
A variable sensor according to claim 30 wherein a second variable sensor is positioned within said right-hand area of said housing, said second variable sensor actuated by variable depression of a second single individual button.	Furukawa '760 teaches and claims a video game controller with variable sensors unlimited in number and location (claim 1, para. 9 on page 6), for example, teaches that his invention is not limited to the use of a pressure-sensitive switch in the cross key 12, suggesting that depending on the desired functionality of the buttons, the pressure sensitive switch could also be employed in other buttons, at desired locations.
CLAIM 32	
A variable sensor according to claim 31 wherein a four way rocker is located in said left-hand area of said housing.	Furukawa '760 discloses a four-way rocker switch in the left hand area of the housing (switch 12 in Fig. 1).
CLAIM 33	
A variable sensor according to claim 32 wherein a third variable sensor is positioned within said right-hand area of said housing, said third variable sensor actuated by variable depression of a third single individual button, and a fourth variable sensor is positioned within said right-hand area of said housing, said fourth variable sensor actuated by variable depression of a fourth single individual button.	Furukawa '760 teaches and claims a video game controller with variable sensors unlimited in a number and location (claim 1, para. 9 on page 6).

12. Claim 39 is unpatentable under 35 U.S.C. 103 based on Kramer in view of Padula. Kramer provides express motivation to a person skilled in the art to combine its teachings with Padula by teaching that the Kramer patent can also be implemented using a dome cap. Padula is an example of such a prior art dome cap.

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 39	
A variable sensor according to claim 37 wherein said dome cap comprises metallic material.	Incorporating the discussion of claims 34-37 (anticipated by Kramer), the specific material used for the dome cap would have been considered by the ordinarily skilled artisan as an obvious matter of design choice. Padula, for example, teaches using a metal dome 102 in a pressure transducer (Col. 9, lines 12-16, and Figure 12). To apply this teaching to Kramer would have been obvious, with motivation provided by cost and performance criteria typically considered by the person of ordinary skill in the art.

13. Claims 40-43 and 47-55, 57-60, 62, 63, 65 and 66 are unpatentable under 35 U.S.C. 103 based on Kramer in view of Furukawa '760. Kramer provides express motivation to a person skilled in the art to combine its teachings with Furukawa '760 by teaching that the Kramer patent can also be implemented using a dome cap.

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 40	
A variable sensor according to claim 37 wherein said variable sensor is located in a two-hand operated device, and said sensor means includes a first proportional sensor activated by depression of said button, and a second proportional sensor activated by depression of a second button.	Incorporating the discussion of claims 34-37 (anticipated by Kramer), Furukawa '760 discloses a hand-operated video game controller 10 that includes right and left-hand areas, with cross key or button 12 (left side) and trigger buttons 19, 20 (right side). It is disclosed that the cross key 12 may incorporate variable sensors 29 (four such sensors would be included in a cross key). To apply such a cross key in the remote transmitter of Kramer would have been obvious, motivation being provided by the known advantages of cross keys in hand-operated game controllers.
CLAIM 41	
A variable sensor according to claim 40 wherein the buttons and the sensors are located in a right-hand area of said two-hand operated device.	Furukawa '760 teaches and claims a video game controller with variable sensors unlimited in number and location (Claim 1, para. 9). Incorporating the remarks relating to claim 40 above, the location of buttons on a game controller is no more than an obvious matter of design choice, and there is nothing in the disclosure of the '791 patent to indicate otherwise (i.e., there is

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
	no discussion of any kind that the recited location solves any particular problem.
CLAIM 42	
A variable sensor according to claim 41 wherein the buttons are positioned for thumb depression.	Incorporating the discussion of claim 41, the buttons on the controller of Furukawa '760 are in fact positioned for depression by the thumb of a user (Fig. 1).
CLAIM 43	
A variable sensor according to claim 42 wherein said feedback means comprises means for active tactile feedback.	Incorporating the discussion of Claim 42, above, note that Kramer's rubber dome cap switch provides the same active tactile feedback as disclosed in the '791 patent.
CLAIM 47	
A variable sensor according to claim 46 wherein said variable sensor is located in a right-hand area of a housing, and a four way rocker is located in a left-hand area of said housing.	Incorporating the discussion of claim 46 above, the controller 10 of Furukawa '760 includes buttons on the right and a rocker on the left. Furukawa '760 teaches that his invention is not limited to the use of a pressure-sensitive switch in the cross key 12, suggesting that depending on the desired functionality of the buttons, the pressure sensitive switches could also be employed with other buttons, at desired locations.
CLAIM 48	
A variable sensor according to claim 47 wherein said variable sensor is structured in combination with means for providing active tactile feedback.	Incorporating the discussion of Claim 47 above, note that Kramer's rubber dome cap switch provides the same active tactile feedback as disclosed in the '791 patent.
CLAIM 49	
A variable sensor according to claim 47 wherein said variable sensor outputs signals representing On/off data and proportional data.	Incorporating the discussion of Claim 47 above, Kramer discloses that the pushbuttons "can be used to produce not only a setting process, but also an adjustment [proportional] process" (Col. 1, lines 46-51).
CLAIM 50	
A variable sensor according to claim 49 wherein said variable sensor is structured in combination with means for providing active tactile feedback.	Incorporating the discussion of Claim 49 above, note that Kramer's rubber dome cap switch provides active tactile feedback.

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CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 51	
A variable sensor according to claim 50 wherein said variable sensor is activatable by depression of a button, said sensor and said button are positioned in a right-hand area of a housing, and a four way rocker is positioned in a left-hand area of said housing.	Incorporating the discussion of Claim 50 above, the controller 10 of Furukawa '760 includes buttons on the right and a rocker on the left. Furukawa '760 teaches that his invention is not limited to the use of a pressure-sensitive switch in the cross key 12, implying that depending on the desired functionality of the buttons, the pressure sensitive switches could also be employed with other buttons, at desired locations, (claim 1, para. 9 on page 6).
CLAIM 52	
A variable sensor according to claim 51 wherein said electronic imagery is an electronic game displayed by a television.	Incorporating the discussion of Claim 51, the use of variably conductive sensors or switches in the "entertainment electronics" of Kramer or the controller 10 in Furukawa '760 (controlling a game object), would have been understood by those of ordinary skill in the electronics entertainment art to include control of "imagery" displayed by a television.
CLAIM 53	
A variable sensor according to claim 52 wherein said housing is hand-held, and said means for providing active tactile feedback is located within said housing.	Incorporating the discussion of Claim 52, the remote transmitter of Kramer and the controller housing 10 in Furukawa '760 are designed to be hand-held, and active tactile feedback is provided by both Kramer and Furukawa '760.
CLAIM 54	
A variable sensor according to claim 53 wherein a second variable sensor is positioned within said housing, said second variable sensor actuated by variable depression of a second button, said second button located in said right-hand area of said housing.	Furukawa '760 teaches that his invention is not limited to the use of a pressure-sensitive switch in the cross key 12, suggesting that depending on the desired functionality of the buttons, the pressure sensitive switch could also be employed in other buttons, at desired locations.
CLAIM 55	
A variable sensor according to claim 54 wherein a third variable sensor is positioned within said housing, said third variable sensor actuated by variable depression of a third single individual button positioned in said right-hand area of said housing, and a fourth variable sensor is positioned within said housing, said fourth variable sensor actuated by a variable depression of a fourth single individual button positioned in said right-hand area of said housing.	It would have been obvious to employ the pressure sensitive switches of Kramer and Furukawa '760 in as few or as many locations on a video game controller as desired, depending on the game system hardware and software. By Armstrong's own admission, controllers with multiple rubber dome-type switches were well known (see, for example, Figures 1 and 2 of Armstrong's '802 patent, incorporated by reference into the '791 patent). Based on the teachings of Kramer and Furukawa '760, one of ordinary skill in the art would have found it obvious to use pressure sensitive switches wherever analog functionality were desired.

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CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 57	
A method according to claim 56 wherein said variable movement of imagery is movement of a viewpoint through three-dimensional graphics.	Incorporating the discussion of claim 56, to employ Kramer's switch to control imagery in the context of three-dimensional graphics would have been obvious. This is simply one more obvious application of an analog switch as was well known as of the effective filing date of Armstrong. To the extent Kramer's reference to "entertainment electronics" is considered not to embrace movement of a "viewpoint" through three-dimensional graphics, Furukawa '760 teaches the use of similar switches in hand-operated controllers for controlling characters in video games. That such games would include three-dimensional graphics would have been well understood.
CLAIM 58	
A method according to claim 56 wherein said variable movement of imagery is variable movement of a game object.	Incorporating the discussion of Claim 57 above, to variably control a game character using the sensor of Kramer would have been obvious – if not inherently, when consideration is given to Furukawa '760 which discloses variable movement of imaging in the form of a game object (para. 10, on page 7).
CLAIM 59	
A method according to claim 58 wherein said game object is a three-dimensional game object located within a three-dimensional graphics display.	Incorporating the discussion of Claim 58, to control a game object in three dimensions would have been obvious in view of the teaching in Furukawa '760 to use the disclosed switch to control game characters in a video game.
CLAIM 60	
A method according to claim 56 wherein said variable movement of imagery is movement of a game character in three-dimensional graphics.	See the discussion of Claim 59 above.
CLAIM 62	
A method according to claim 61 wherein said depressing includes depressing harder to make a controllable game character, of said electronic imagery, jump higher.	Furukawa '760 discloses controlling the speed of a characters movement according to the magnitude of the pressing force applied to the button. There is nothing in Armstrong to suggest that controlling jump height is anything other than a routine matter of design choice, i.e., using the analog sensor in other obvious analog applications.

CLAIM LANGUAGE OF THE '791 PATENT	PRIOR ART
CLAIM 63	
A method according to claim 61 wherein said depressing includes increasing depressive pressure to make a simulated race car, of said electronic imagery, slow according to the increasing depressive pressure.	The particular application of analog functionality is largely controlled by related software. There is nothing in Armstrong to suggest that having a game character (person or thing) slow down upon increased application of pressure is anything other than a routine matter of design choice. Furukawa '760 discloses that a game character moves at a first speed corresponding to a first depressive pressure, and at a second speed with a second depressive pressure, when second depressive pressure is greater than first depressive pressure and second speed is different from first speed. (see para. 10 on page 7) Control of a simulated race car is a subset of the character disclosed by Furukawa '760.
CLAIM 65	
A method of controlling electronic imagery according to claim 64 wherein said pressing includes pressing harder to make a controllable game character, of said electronic imagery, jump higher.	See the discussions of Claims 62, 63 and 64 above.
CLAIM 66	
A method of controlling electronic imagery according to claim 64 wherein said pressing includes increasing pressure to make a simulated race car, of said electronic imagery, slow according to the increasing pressure.	See the discussions of Claims 62, 63 and 64 above.

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 acknowledged prior art (APA) in the '791 patent (Figure 1 and related text) combined with any of several prior patents discussed herein (e.g., Furukawa '760, Kramer, Kaneko, Tanami 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 integrate analog functionality into conventional dome-cap switches as described in the APA. While these

references do not use the exact terminology used in the '791 patent claims (i.e., "snap-through"), the structure is so similar to the switch illustrated in the '791 patent that the "snap-through" limitation is inherently met by the references. In any event, Armstrong acknowledges in the '791 patent that this is a known feature of "most" dome-caps (col. 1, line 66 through col. 2, line 17).[5]

V. Additional Relevant Prior Art

The following listing of relevant prior art is intended to support the Requestor's position that the invention as described and claimed on the '791 patent was well known as of the effective filing date of the '791 patent.

- U.S. Patent No. 5,278,557 (Stokes et al) issued January 11, 1994

This reference discloses a dual ON/OFF, pressure sensitive switch that incorporates a dome sheet formed with individual resiliently collapsible dome caps.

- U.S. Patent No. 4,508,942 (Inaba), issued April 2, 1985 (not cited)

This reference discloses a keyboard switch with snap-action domes.

[5] Note also that claim 1 is so broad that it could be rejected under 35 U.S.C. 102 as anticipated by the "prior art" Figure 1 of the '791 patent and related text (Col. 2, lines 17-67). The body of the claim describes the sensor shown in Figure 1 to a "T". The only issue is whether the sensor in Figure 1 may be described as a "variable sensor" as recited in the claim preamble. It is respectfully submitted that giving the words in the preamble their plain meaning, the claim as a whole reads directly on Figure 1. In this regard, Armstrong refers to an "analog sensor" in the Abstract; an "analog or variable pressure sensor" in Col. 3, lines 25,26 "pressure-sensitive variable conductance sensor" in Col. 5, lines 9 and 51 and Col. Claim 1 says nothing about any analog functionality or any structure providing such functionality. By choosing to describe the sensor simply as a "variable sensor", no structural distinction is made vis-à-vis the prior art sensor of Figure 1, which, acknowledged by Armstrong, variably senses open and closed (OFF/ON) positions or states. Claim 1 could also be rejected as anticipated by e.g., Furukawa '760.

- U.S. Patent No. 5,440,237 (Brown), issued August 8, 1995 (cited in Armstrong U.S. Patent No. 6,351,205)

This reference disclose a dome-cap switch with tactile response combined with a pressure-sensitive, variable output sensor.

- U.S. Patent No. 3,590,195 (Driver) issued June 29, 1971 (not cited)

This reference discloses dome-cap publications that employ snap-action tactile feedback.

- Italian Patent Application (Industrial Invention) No. MI 91 A 00 3315 (Marcio et al.), Laid Open to the Public June 11, 1993 (not cited)

This reference discloses a pressure sensitive switch with vibrating tactile feedback.

- Japanese Laid Open Utility Model Application No. JP S53-128861 (Amase et al.), published March 23, 1977 (not cited)

This reference discloses a dome-cap pressure sensitive switch with tactile feedback ("click feeling").

- Japanese Laid Open Utility Model Application No. JP HEI1-62627 (Yasufumi), published April 21, 1989 (not cited)

This reference discloses a dome-cap ON/OFF, pressure sensitive switch with apparent snap-through tactile feedback.

- Japanese Laid Open Patent Application No. JP5-326217 (Furukawa et al.), published Dec. 10, 1993

This reference is similar to Furukawa '760 . The pressure sensitive dome-cap switch is used to control, *inter alia*, cursor speed and character reaction speed in computer games.

- Japanese Laid Open Patent Application No. JP8-222070 (Yamamoto et al.), published Aug. 30, 1996.

This reference discloses a rubber dome-type pressure sensitive switch for use in video games.

- Design Specifications for Membrane Keyboards; CSI Keyboards Inc. (1988)

This publication provides detailed technical aspects with respect to the design of membrane and dome switches. Analog output is also discussed in Section 3.5 (page 16).

VI. CONCLUSION

The prior art documents discussed herein clearly establish that the subject matter of all claims of the '791 patent was well known in the art as of the effective filing date of the '791 patent (application).

Accordingly, Requestor respectfully submits that substantial new questions of patentability have been raised herein with respect to all claims of the '791 patent.

Respectfully submitted,

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