

**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION**

**ANDREW KATRINECZ and
DAVID BYRD,
Plaintiffs,**

v.

**MOTOROLA MOBILITY, INC.
Defendant.**

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CASE NO. 1:12-CV-00235-LY

PLAINTIFFS' FIRST AMENDED COMPLAINT AND JURY DEMAND

TO THE HONORABLE JUDGE YEAKEL:

1. Plaintiffs Andrew Katrinecz and David Byrd (hereinafter "Plaintiffs") file this action to remedy the illegal actions of Motorola Mobility, LLC (hereinafter "Defendant"), including its willful and malicious infringement and misappropriation of Plaintiffs' intellectual property. Accordingly, Plaintiffs seek permanent injunctive relief and damages to redress the injuries they have suffered.

I. PARTIES

2. Plaintiffs David Byrd and Andrew Katrinecz are individuals residing in Round Rock, Texas, and Shalimar, Florida, respectively.

3. Defendant Motorola Mobility LLC is a Delaware for-profit corporation having its principal place of business at 600 N. U.S. Highway 45, Libertyville IL, 60048.

4. Motorola Mobility LLC was formed in 2012.

5. Until 2012 before Motorola Mobility LLC existed, its predecessor, Motorola, Inc., and specifically the Mobile Devices business unit of Motorola, Inc., used, made, sold, imported, and offered for sale the products accused of infringement.

6. Motorola Mobility LLC is a successor-in-interest to Motorola Inc.

7. Motorola Mobility LLC has assumed all potential liability for Plaintiffs' claims based upon acts by Motorola, Inc.

8. All assets and liabilities pertaining to the products at issue in this case remain with Motorola Mobility LLC.

II. JURISDICTION AND VENUE

9. This is an action for patent infringement arising under the laws of the United States. *See, e.g.*, 35 U.S.C. §§ 1, *et seq.*

10. This Court has subject-matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338 (a).

11. This Court has personal jurisdiction over Defendant because, *inter alia*, it regularly does business in this judicial district, has established minimum contacts with the forum, and the exercise of jurisdiction over Defendant will not offend traditional notions of fair play and substantial justice. On information and belief, Defendant designs, manufactures, and places products that infringe on Plaintiffs' patent into the stream of commerce with the reasonable expectation and/or knowledge that the actual or potential ultimate purchasers and users are located throughout the United States, including within this judicial district. On information and belief, Defendant has voluntarily conducted sales or solicited customers in the state of Texas, including in this judicial district. On information and belief, Defendant sells, advertises, markets, and distributes infringing products throughout this judicial district. Defendant has committed and continues to commit acts of patent infringement in this judicial district.

12. Venue is proper in this judicial district under 28 U.S.C. §§ 1391(b) and (c) and 1400(b) because Defendant is subject to personal jurisdiction in the Western District as discussed in the preceding paragraph.

III. CONDITIONS PRECEDENT

13. All conditions precedent to Plaintiffs' right to recovery have been performed, occurred, or been waived.

IV. FACTS

14. United States Patent No. 7,284,872 ("’872"), entitled "Low power, low cost illuminated keyboards and keypads," was duly and legally issued by the United States Patent and Trademark Office to Plaintiffs on October 23, 2007. A copy of the ’872 patent is attached hereto as Exhibit A.

15. The ’872 patent is valid and enforceable.

16. Plaintiffs David Byrd and Andrew Katrinecz invented the subject matter claimed in the ’872 patent.

17. Together Plaintiffs own all right, title, and interest in the ’872 patent.

18. The inventions claimed in the ’872 patent relate to illumination of keyboards, keypads, and other data entry devices such as keyboards on cellular handsets.

19. Infringing products generally include illuminated keys manufactured from a material that transmits light through the material; an upper enclosure of the keyboard that transmits light through the enclosure (labeled as the "top plate" in the figure below); at least one flexible electroluminescent sheet underlying the keys; and may also feature different keys tinted with different colors.

20. Certain of Defendant's cellular handsets include each and every claimed element of the asserted claims of the ’872 patent.

21. Defendant performed each and every step of the asserted method claim by making, having made, assembling, having assembled, and/or using certain of Defendant's cellular handsets.

22. Examples of Defendant's products that include each and every claimed element of the asserted claims of the '872 patent include the following products sold, offered for sale, made, imported, and used by Defendant: RAZR V3i, RAZR V3c, RAZR maxx Ve, RAZR V3t, RAZR V3m, RAZR V3x, RAZR V3, KRZR K1, RAZR2 V8, RAZR V8, RAZR V3xx, ROKR U9, ROKR W5, RIZR Z3, PEBL U6, KRZR K3, KRZR K3m, RAZR V3a, RAZR V3r, RAZR maxx V6, RIZR Z8, ROKR Z6, RIZR Z9, RIZR Z10, ROKR E1, ROKR E2, ROKR E6, ROKR E8, AURA, FONE 3, ZINE ZN5, RAZR V3r, KRZR K1m, KRZR K1, W490, W510, Moto Q, Moto Q9h, Q9c, Cliq, Droid/Milestone, Droid 3/Milestone 3, Charm, Z6w, Z6m, Hint QA30, QA1, Devour A555, Cliq 2, Droid 2, Z6c, RAZR2 v9m, RAZR 26tv, RAZR2 V9, and RAZR V3s (collectively, the "Infringing Products"). Infringing Products include similar cellular handsets and products not specifically listed here that Defendant or its predecessor-in-interest Motorola, Inc. sold, made, offered for sale, imported, or used in the United States during the relevant time period.¹

23. Defendant has known about the '872 patent and Plaintiffs' technology for years before this suit was filed.

24. Defendant cited the parent application to the '872 patent as prior art during its own prosecution of patent applications relating to one or more of the Infringing Products.

¹ Plaintiffs have attempted to identify with specificity by model number the accused products. Variations in model designation and product iterations may be revealed during discovery. Plaintiffs' identification is intended to be as comprehensive as possible at this stage. Discovery is ongoing.

25. Defendant cited Plaintiffs' United States Patent No. 6,199,996 ("the '996 patent") as prior art during prosecution of the application that issued as United States Patent No. 7,360,957 ("the '957 Patent"). *See* Exhibit B and Exhibit C, respectively.

26. The '996 patent is the parent of the '872 patent; the '872 patent claims priority through the application that issued as the '996 patent.

27. Defendant's '957 patent relates to and describes keypad assemblies and components for its RAZR cell phone product.

28. Defendant cited Plaintiffs' foreign patent application WO 00/12931 as prior art to Motorola's '957 patent. *See* Exhibit D, KATRINECZ-MMLLC 001322-001338 (Katrinecz PCT Application) and Exhibit H, KATRINECZ-MMLLC 001405-1411 (Motorola's Information Disclosure listing Katrinecz as prior art).

29. During prosecution of the application that issued as the '957 patent, Defendant became aware of commercially available products licensed by Plaintiffs.

30. Defendant's '957 patent file wrapper includes an advertisement for the Auravision "Eluminex Illuminated Keyboard," which is a backlit keyboard "using ElectroLuminescent technology." *See* Exhibit E, KATRINECZ-MMLLC 001271.

31. Auravision was a licensee of Plaintiffs' patent rights.

32. The Auravision advertisement that appears in the file wrapper of Defendant's '957 patent identifies "US Patent Number 6,199,996 B1," the parent to patent-in-suit. *See* Exhibit E, KATRINECZ-MMLLC 001271

33. The '957 patent file wrapper also contains an online review of the Auravision Eluminex keyboard. *See* Exhibit F, KATRINECZ-MMLLC 001150-001151.

34. In or about 2009, several years before this suit, patent broker IPotential contacted Defendant regarding the possible sale of Plaintiffs' patents, including the '872 patent, on behalf of Plaintiffs.

35. Defendant has had actual knowledge of the '872 patent for years prior to the filing of this action.

36. After becoming aware of the '872 patent, and since this action was filed, Defendant has and continues to encourage, aid, and direct customers and end-users of Infringing Products how to use the keyboard backlight and how to configure settings controlling the keyboard backlight.

37. Defendant has no license under the '872 patent.

38. Defendant has received no authorization to practice any claim of the '872 patent.

V. CAUSES OF ACTION

A. Count 1 — Infringement of '872 Patent

39. Defendant has infringed and is still infringing (literally and/or under the Doctrine of Equivalents) one or more claims of the '872 patent in at least this state and district by making, using, offering to sell, selling, and/or importing Infringing Products that infringe claims 5-9 of the '872 patent.

40. For the claims at issue, Defendant's RAZR V3t is representative of Defendant's Infringing Products.

41. Demonstrating infringement, the RAZR V3t "representative infringing cell phone" meets each and every element of each asserted claim literally or under the Doctrine of Equivalents.

42. For example, claim 5 of the '872 Patent recites: A data entry apparatus with illuminated keys comprising: keys of an optically transmissive material; one or more flexible luminescent

sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus; and an optically transmissive keyboard top plate.

43. As shown in picture nos. 3, 4, and 7 in Exhibit G, Defendant's representative infringing cell phone allows the user to input data into the cell phone using the keys of the cell phone. The representative infringing cell phone shown in Exhibit G is a device for entering data into a machine. As shown in picture no. 4 in Exhibit G, the keys of the representative infringing device illuminate.

44. As shown in picture nos. 4, 7, and 8 in Exhibit G, the keys of the representative infringing cell phone are an optically transmissive material. In other words, the keys are manufactured of a transmissive material, which allows light from the luminescent sheet under the keys to transmit through the keys and be visible to the user.

45. As shown in picture nos. 4 and 6 in Exhibit G, the luminescent sheet is flexible (*i.e.*, it can be bent or rolled), provides light or illumination through the keys (which are optically transmissive as described above), and the user of the cell phone can see the keys in the dark because of this illumination.

46. As shown in picture nos. 4 and 7 in Exhibit G, the representative infringing cell phone has an area that sets forth an optically transmissive keyboard top plate. The shown optically transmissive keyboard top plate is the upper enclosure of the keyboard. This is an area that is distinct from the keys and allows light from the luminescent sheet to transmit through the enclosure and be visible to the user.

47. Each of the Infringing Products infringes claim 5 of the '872 Patent in the same manner as demonstrated above for the representative infringing cell phone.

48. Claim 6 of the '872 Patent is: A data entry apparatus with illuminated keys comprising: keys of an optically transmissive material; one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus; and an optically transmissive keyboard top plate, wherein said top plate emits light of a desired color.

49. As shown in picture nos. 3, 4, and 7 in Exhibit G, Defendant's representative infringing cell phone allows the user to input data into the cell phone using the keys of the cell phone. The representative infringing cell phone shown in Exhibit G is a device for entering data into a machine. As shown in picture no. 4 in Exhibit G, the keys of the representative infringing device illuminate.

50. As shown in picture nos. 4, 7, and 8 in Exhibit G, the keys of the representative infringing cell phone are an optically transmissive material. In other words, the keys are manufactured of a transmissive material, which allows light from the luminescent sheet under the keys to transmit through the keys and be visible to the user.

51. As shown in picture nos. 4 and 6 in Exhibit G, the luminescent sheet is flexible (*i.e.*, it can be bent or rolled), provides light or illumination through the keys (which are optically transmissive as described above), and the user of the cell phone can see the keys in the dark because of this illumination.

52. As shown in picture nos. 4 and 7 in Exhibit G, the representative infringing cell phone has an area that sets forth an optically transmissive keyboard top plate. The shown optically transmissive keyboard top plate is the upper enclosure of the keyboard. This is an area that is distinct from the keys and allows light from the luminescent sheet to transmit through the enclosure and be visible to the user.

53. As shown in picture nos. 7 and 8 in Exhibit G, the back of the plate of the representative infringing cell phone has blue transmissive material so that the light from the luminescent sheet will be the desired color.

54. Each of the Infringing Products infringes claim 6 of the '872 Patent in the same manner as demonstrated above for the representative infringing cell phone.

55. Claim 7 of the '872 Patent recites: A data entry apparatus with illuminated keys comprising: keys of an optically transmissive material; one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus; an optically transmissive keyboard top plate, wherein said top plate emits light of a desired color; and one or more luminescent sheets underlying said top plate to provide illumination of said top plate visual to said user.

56. As shown in picture nos. 3, 4, and 7 in Exhibit G, Defendant's representative infringing cell phone allows the user to input data into the cell phone using the keys of the cell phone. The representative infringing cell phone shown in Exhibit G is a device for entering data into a machine. As shown in picture no. 4 in ExhibitG, the keys of the representative infringing device illuminate.

57. As shown in picture nos. 4, 7, and 8 in Exhibit G, the keys of the representative infringing cell phone are an optically transmissive material. In other words, the keys are manufactured of a transmissive material, which allows light from the luminescent sheet under the keys to transmit through the keys and be visible to the user.

58. As shown in picture nos. 4 and 6 in Exhibit G, the luminescent sheet is flexible (*i.e.*, it can be bent or rolled), provides light or illumination through the keys (which are optically

transmissive as described above), and the user of the cell phone can see the keys in the dark because of this illumination.

59. As shown in picture nos. 4 and 7 in Exhibit G, the representative infringing cell phone has an area that sets forth an optically transmissive keyboard top plate. The shown optically transmissive keyboard top plate is the upper enclosure of the keyboard. This is an area that is distinct from the keys and allows light from the luminescent sheet to transmit through the enclosure and be visible to the user.

60. As shown in picture nos. 7 and 8 in Exhibit G, the back of the plate of the representative infringing cell phone has blue transmissive material so that the light from the luminescent sheet will be the desired color.

61. As shown in picture nos. 4 and 6 in this Exhibit, the luminescent sheet provides light or illumination to the top plate so that the user can see the light or illumination.

62. Each of the Infringing Products infringes claim 7 of the '872 Patent in the same manner as demonstrated above for the representative infringing cell phone.

63. Claim 8 of the '872 Patent recites: A method for illuminating the keys of a data entry apparatus comprising the steps of: making said keys of an optically transmissive material; and providing one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus, wherein different keys or groups of keys are tinted with different colors to provide illuminated keys or groups of keys that emit light of different colors.

64. As shown in picture nos. 3, 4, and 7 in Exhibit G, Defendant's representative infringing cell phone allows the user to input data into the cell phone using the keys of the cell phone. The representative infringing cell phone shown in Exhibit G is a device for entering data into a

machine. As shown in picture no. 4 in Exhibit G, the keys of the representative infringing device illuminate.

65. As shown in picture nos. 4, 7, and 8 in Exhibit G, the keys of the representative infringing cell phone are an optically transmissive material. In other words, the keys are manufactured of a transmissive material, which allows light from the luminescent sheet under the keys to transmit through the keys and be visible to the user.

66. As shown in picture nos. 5 and 6 in Exhibit G, there is a luminescent sheet under the keys. The luminescent sheet is flexible. The luminescent sheet is not rigid and can easily be bent or even rolled.

67. As shown in picture nos. 4 and 6 in Exhibit G, the luminescent sheet provides light or illumination through the keys (which are optically transmissive as described above), and the user of the cell phone can see the keys in the dark because of this illumination.

68. As shown in picture nos. 3, 4, 7 and 8 in Exhibit G, the representative infringing cell phone has numerous keys (*e.g.*, number keys for inputting numbers and alphanumeric data, a send key, an end key, internet access key, e-mail key, etc.). As shown in picture nos. 3, 4, 7 and 8 in Exhibit G, the send key is tinted green, the end key is tinted red, and the mail and internet keys are tinted blue.

69. As shown in picture nos. 3, 4, 7 and 8 in Exhibit G, the cell phone has keys that illuminate in the colors of blue, red, and green. The keys illuminate in color because the light from the luminescent sheet shines through the colored material below the keys. Thus, there is at least one key or one group of keys that has color added to be a different color than other keys.

70. Each of the Infringing Products infringes claim 8 of the '872 Patent in the same manner as demonstrated above for the representative infringing cell phone.

71. Claim 9 of the '872 Patent is: A data entry apparatus with illuminated keys comprising: keys of an optically transmissive material; one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus, wherein different keys or groups of keys emit light of different colors.

72. As shown in picture nos. 3, 4, and 7 in Exhibit G, Defendant's representative infringing cell phone allows the user to input data into the cell phone using the keys of the cell phone. The representative infringing cell phone shown in Exhibit G is a device for entering data into a machine. As shown in picture no. 4 in Exhibit G, the keys of the representative infringing device illuminate.

73. As shown in picture nos. 4, 7, and 8 in Exhibit G, the keys of the representative infringing cell phone are an optically transmissive material. In other words, the keys are manufactured of a transmissive material, which allows light from the luminescent sheet under the keys to transmit through the keys and be visible to the user.

74. As shown in picture nos. 5 and 6 in this Exhibit, there is a luminescent sheet under the keys. The luminescent sheet is flexible. The luminescent sheet is not rigid and can easily be bent or even rolled.

75. As shown in picture nos. 4 and 6 in Exhibit G, the luminescent sheet provides light or illumination through the keys (which are optically transmissive as described above), and the user of the cell phone can see the keys in the dark because of this illumination.

76. As shown in picture nos. 3, 4, 7 and 8 in Exhibit G, the cell phone has keys that illuminate in the colors of blue, red, and green. The keys illuminate in color because the light from the luminescent sheet shines through the colored material below the keys. Thus, there is at least one key or one group of keys that has color added to be a different color than other keys.

77. Each of the Infringing Products infringes claim 9 of the '872 Patent in the same manner as demonstrated above for the representative infringing cell phone.

78. Thus, each of the Infringing Products infringes the asserted claims of the '872 Patent.

79. Defendant has also contributed to and/or induced, and continues to contribute to and/or induce, the infringement of one or more claims of the '872 patent, in at least this state and district for the same reasons described above.

80. Customers and end-users, including mobile network operators and their customers, use the Infringing Products and keyboard backlight as instructed, directed, and encouraged by Defendant. Direction and instruction is delivered in the form of tutorials, user manuals, and instructional materials published by Defendant and provided to end-users with Infringing Products as sold and delivered by Defendant, Defendant's customers, and/or mobile network operators.

81. Defendant's and third parties' infringement of one or more claims of the '872 patent has taken place with Defendant's full knowledge of the '872 patent.

82. Despite having notice of and actual knowledge of Plaintiffs' '872 patent before and during its performance of acts of infringement and before and during performance of infringing acts by third parties it encouraged, aided, directed, and instructed, Defendant has proceeded willfully, and with reckless disregard of Plaintiffs' patent rights.

83. With actual knowledge of the '872 patent and specific intent to infringe and perform or have performed acts constituting infringement of the '872 patent, Defendant intentionally induced infringement of the '872 patent by having mobile network operators, contract manufacturers, keyboard component and assembly providers, customers, and end-users infringe

directly the '872 patent by making, importing, selling, offering to sell, and importing Infringing Products in the United States.

84. With actual knowledge of the '872 patent, Defendant contributorily infringed and infringes by providing Infringing Products having no other substantial use than to provide keyboard illumination as described and claimed in the '872 patent (and detailed above). Defendant contributed and contributes to direct infringement by mobile network operator customers, Defendant's customers, end-users, testers, and users of the Infringing Products.

85. With actual knowledge of the '872 patent, Defendant contributorily infringed and infringes by providing Infringing Products and components thereof having no substantial user than to provide keyboard illumination as described and claimed in the '872 patent (and detailed above). Defendant contributed and contributes to direct infringement by product testers and certifiers and/or keyboard component supplier Dooco Electronics.

86. With actual knowledge of the '872 patent, Defendant contributes to and induces infringement by others by providing Infringing Products and components thereof having no substantial user than to provide keyboard illumination as described and claimed in the '872 patent (and detailed above). Defendant has provided and continues to provide to distributors, direct and indirect customers, mobile network operators, and end-users detailed oversight, specifications and/or instructions regarding the manufacture, testing, assembly, use, configuration, and performance of the Infringing Products. Defendant provides the Infringing Products to direct infringers with the knowledge and intent that its customers would infringe '872 patent by using, selling, offering to sell, and importing Infringing Products in the United States at a time when Defendant knew that such actions either separately or in combination would infringe the '872 patent.

87. Defendant's infringement has been, and continues to be, willful, deliberate, and intentional. Defendant's direct infringement, as well as induced and contributory infringement, has taken place with the full knowledge by Defendant of the '872 Patent.

88. Defendant's infringement of one or more claims of the '872 Patent has injured Plaintiffs, and Plaintiffs are entitled to recover damages adequate to compensate them for Defendant's infringement, which in no event shall be less than a reasonable royalty.

89. Plaintiffs have complied with 35 U.S.C. § 287 by marking, or requiring their licensees to mark, products with the patent asserted herein. Plaintiffs have required their licensees to place a notice of the Letters Patent asserted herein on all products made or sold and monitored them for compliance.

90. Defendant has caused Plaintiffs substantial damage and irreparable injury by their infringement of one or more claims of the '872 patent, and Plaintiffs will continue to suffer damage and irreparable injury unless and until Defendant's infringement is enjoined by this Court.

VI. NOTICE OF REQUIREMENT OF LITIGATION HOLD

91. Defendant is hereby notified that it is legally obligated to locate, preserve, and maintain all records, notes, drawings, documents, data, communications, materials, electronic recordings, audio/video/photographic recordings, and digital files, including edited and unedited or "raw" source material, and other information and tangible things that Defendant knows, or reasonably should know, may be relevant to actual or potential claims, counterclaims, defenses, and/or damages by any party or potential party in this lawsuit, whether created or residing in hard copy form or in the form of electronically stored information (hereafter collectively referred to as "Potential Evidence").

92. As used above, the phrase “electronically stored information” includes without limitation: computer files (and file fragments), e-mail (both sent and received, whether internally or externally), information concerning e-mail (including but not limited to logs of e-mail history and usage, header information, and deleted but recoverable e-mails), text files (including drafts, revisions, and active or deleted word processing documents), instant messages, audio recordings and files, video footage and files, audio files, photographic footage and files, spreadsheets, databases, calendars, telephone logs, contact manager information, internet usage files, and all other information created, received, or maintained on any and all electronic and/or digital forms, sources and media, including, without limitation, any and all hard disks, removable media, peripheral computer or electronic storage devices, laptop computers, mobile phones, personal data assistant devices, Blackberry devices, iPhones, video cameras and still cameras, and any and all other locations where electronic data is stored. These sources may also include any personal electronic, digital, and storage devices of any and all of Defendant’s agents or employees if Defendant’s electronically stored information resides there.

93. Defendant is hereby further notified and forewarned that any alteration, destruction, negligent loss, or unavailability, by act or omission, of any Potential Evidence may result in damages or a legal presumption by the Court and/or jury that the Potential Evidence is not favorable to Defendant’s claims and/or defenses. To avoid such a result, Defendant’s preservation duties include, but are not limited to, the requirement that Defendant immediately notify its agents and employees to halt and/or supervise the auto-delete functions of Defendant’s electronic systems and refrain from deleting Potential Evidence, either manually or through a policy of periodic deletion.

VII. JURY DEMAND

94. Plaintiffs hereby demand a trial by jury on all claims, issues and damages so triable.

VIII. PRAYER

95. WHEREFORE, Plaintiffs pray for the following relief:

- (a) that Defendant be summoned to appear and answer;
- (b) that the Court enter an order declaring that
 - i. Defendant has infringed, contributorily infringed, and/or induced the infringement of the '872 patent;
 - ii. Defendant's infringement of the '872 patent has been willful, intentional, and deliberate; and
 - iii. that this is an exceptional case under 35 U.S.C. § 285;
- (c) that the Court permanently enjoin Defendant and its officers, directors, servants, consultants, managers, employees, agents, attorneys, successors, assigns, affiliates, subsidiaries, and all persons or entities acting in concert or participation with any of them from infringing, contributorily infringing, and/or inducing the infringement of the '872 patent, including the making, using, offering to sell, selling, or importing any products that infringe, literally or under the Doctrine of Equivalents, the '872 patent;
- (d) that the Court grant Plaintiffs judgment against Defendant for
 - i. all actual, consequential, special, punitive, exemplary, increased, and/or statutory damages, including treble damages pursuant to 35 U.S.C. 284;
 - ii. if necessary, an accounting of all damages;
 - iii. pre and post-judgment interest as allowed by law; and
 - iv. reasonable attorney's fees, costs, and expenses incurred in this action; and
- (e) such further relief to which Plaintiffs may show themselves justly entitled.

Dated: June 9, 2014

Respectfully submitted,

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that all counsel of record who are deemed to have consented to electronic service are being served with a copy of this document via the Court's CM/ECF system per Local Rule CV-5(a)(1) this 9th day of June, 2014.

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US007284872B2

(12) **United States Patent**
Katrinecz et al.

(10) **Patent No.:** **US 7,284,872 B2**
(45) **Date of Patent:** ***Oct. 23, 2007**

(54) **LOW POWER, LOW COST ILLUMINATED KEYBOARDS AND KEYPADS**

(76) Inventors: **Andrew Katrinecz**, 8730 Mapleview Dr., Indianapolis, IN (US) 46217;
David C. Byrd, 5104 Rock Creek Rd., Round Rock, TX (US) 78681

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 126 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **10/867,272**

(22) Filed: **Jun. 14, 2004**

(65) **Prior Publication Data**

US 2004/0223318 A1 Nov. 11, 2004

Related U.S. Application Data

(62) Division of application No. 09/755,775, filed on Jan. 4, 2001, now Pat. No. 6,773,128, which is a division of application No. 09/139,927, filed on Aug. 26, 1998, now Pat. No. 6,199,996.

(51) **Int. Cl.**
F21V 33/00 (2006.01)

(52) **U.S. Cl.** **362/85**; 362/84; 362/109; 200/314; 200/317

(58) **Field of Classification Search** 362/24, 362/84, 85, 109; 200/314, 317; 345/170
See application file for complete search history.

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U.S. PATENT DOCUMENTS

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Primary Examiner—Stephen F Husar

(57) **ABSTRACT**

Methods are provided for adapting existing manufacturing processes for non-illuminated data-entry devices and mice to the manufacture of illuminated data-entry devices. Luminescent sheets of one or more colors underlying optically transmissive device components provide illumination of the components visual to a user of the device. The optically transmissive components may be doped with phosphors or tinted to provide components that emit light of different colors. The intensity of illumination of the luminescent sheet may be controlled by the user and may vary in response to the background light of the environment.

15 Claims, 5 Drawing Sheets

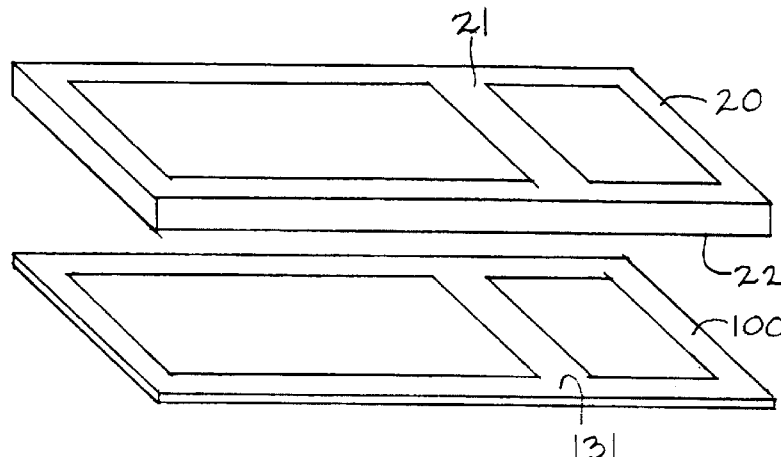


EXHIBIT A

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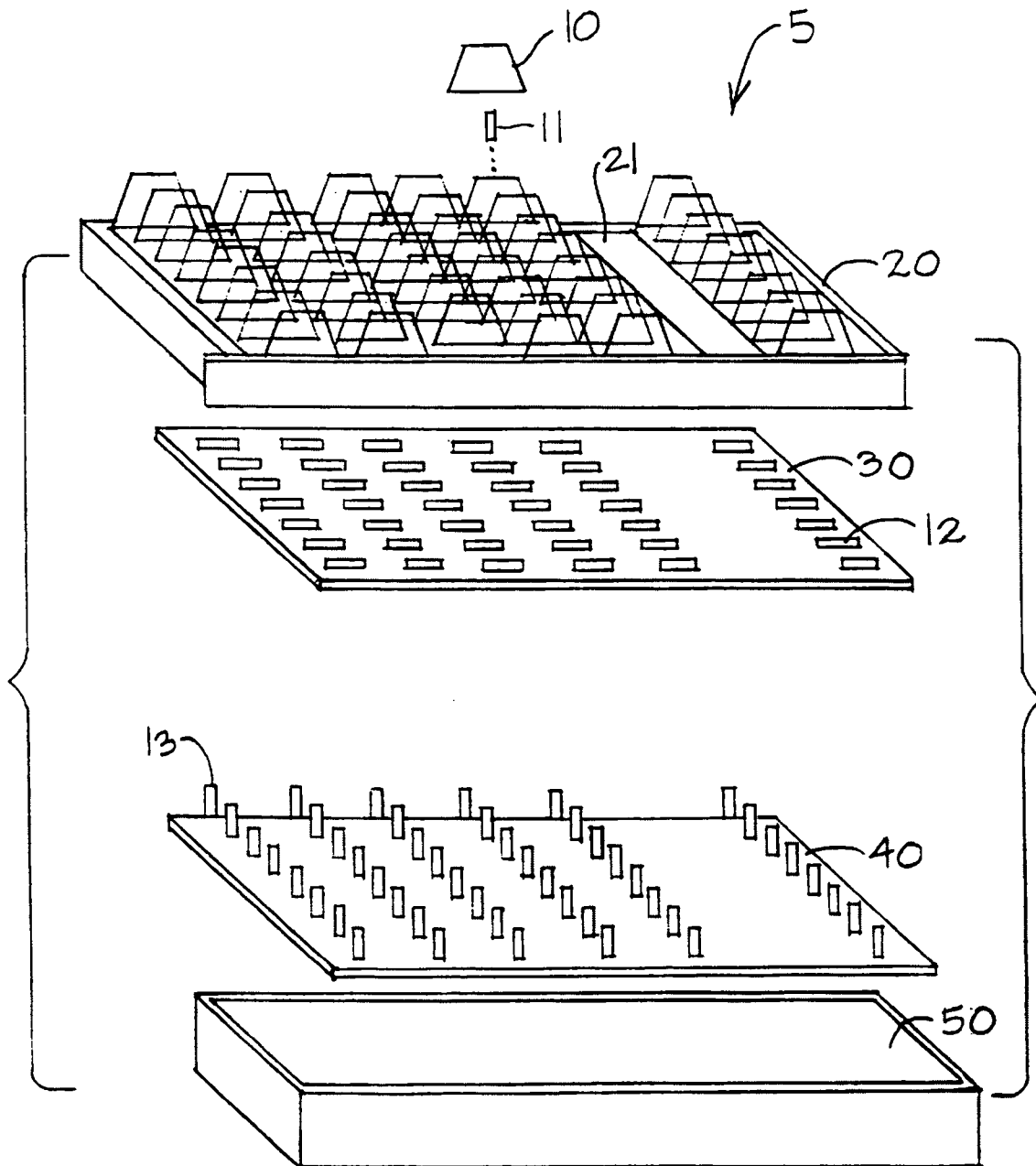


FIG. 1

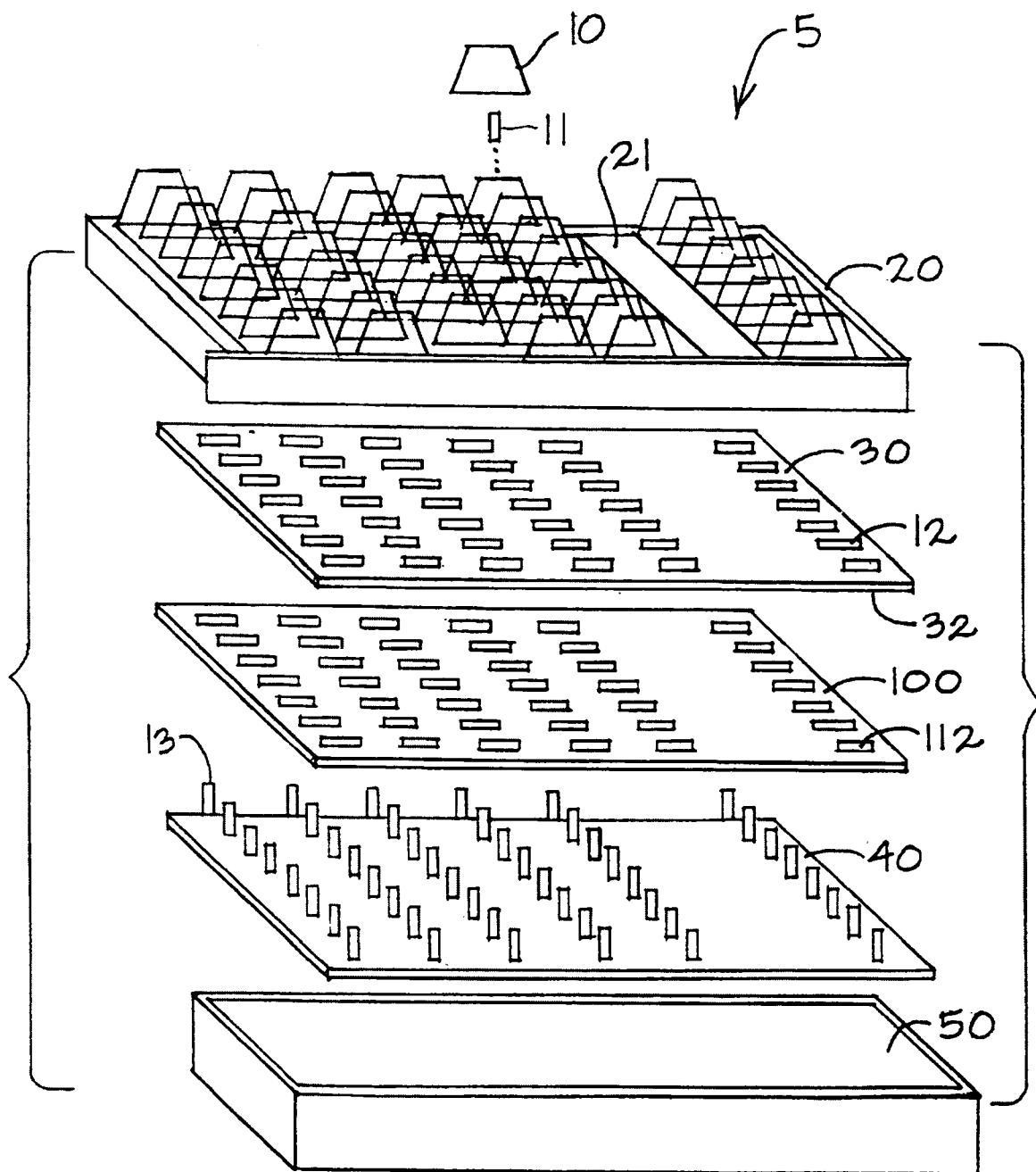


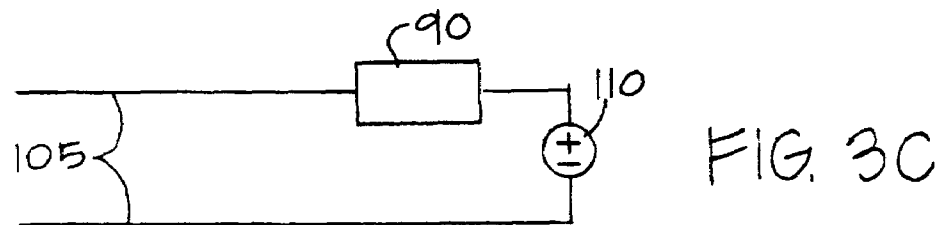
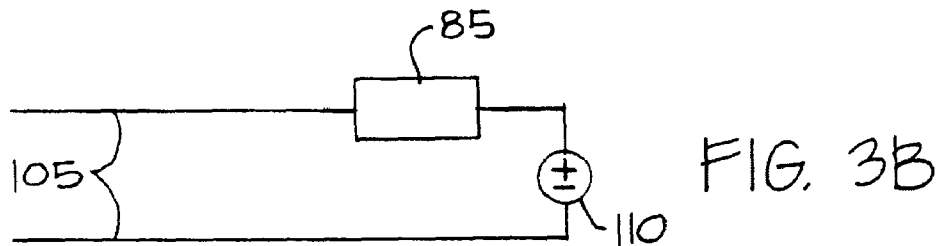
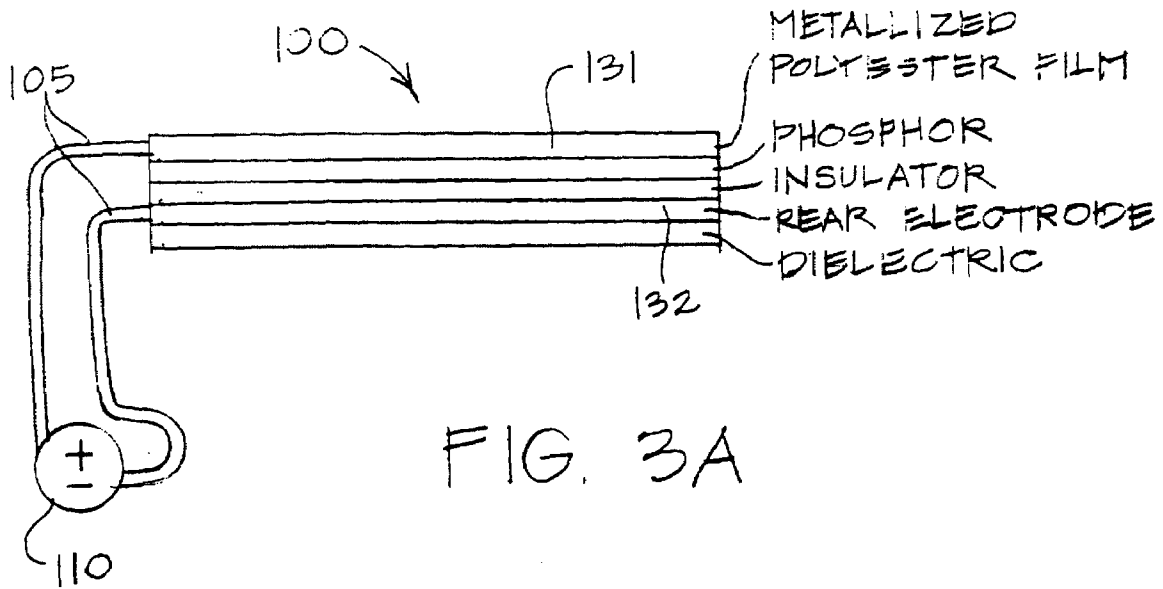
FIG. 2

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Oct. 23, 2007

Sheet 3 of 5

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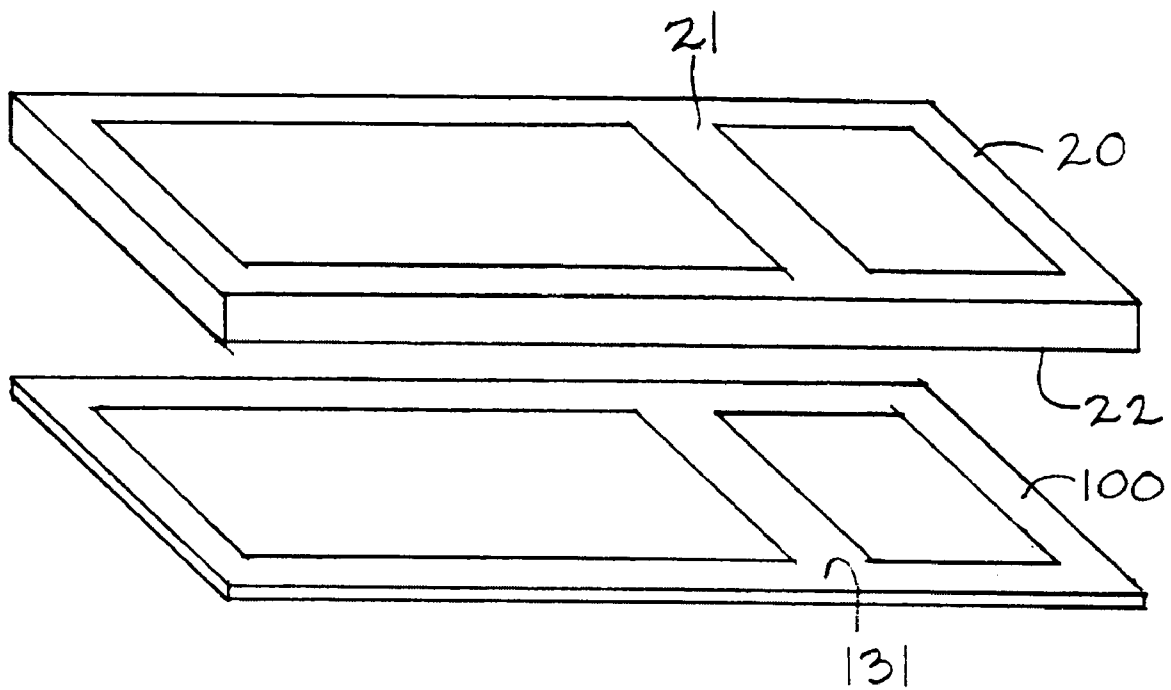


FIG. 4

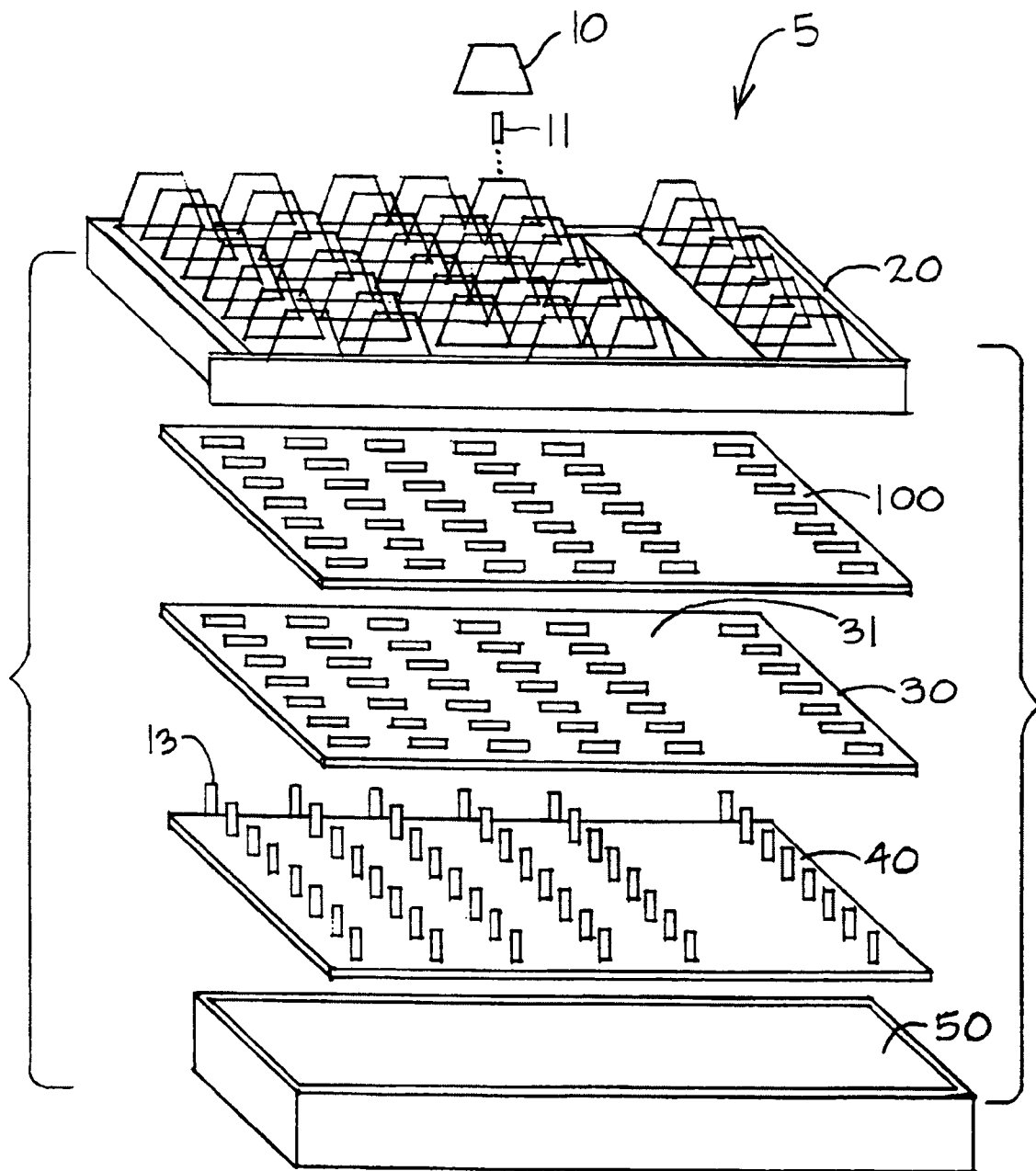


FIG. 5

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**LOW POWER, LOW COST ILLUMINATED
KEYBOARDS AND KEYPADS**

This application is a divisional application and claims priority from U.S. patent application Ser. No. 09/755,775, filed on Jan. 4, 2001 now U.S. Pat. No. 6,773,128, which is a divisional application of U.S. patent application Ser. No. 09/139,927, filed Aug. 26, 1998 (now U.S. Pat. No. 6,199,996), which are incorporated herein by reference.

TECHNICAL FIELD OF THE INVENTION

The present invention relates to illumination of keyboards, keypads, and other data entry devices.

BACKGROUND OF THE INVENTION

Keyboards, keypads, mice, and other data entry devices (hereinafter referred to generally as keyboards) are used in a variety of applications for entry of alphanumeric and other types of data into a machine such as a calculator or computer. Keyboards have been developed that are light weight, low in cost, and relatively easy to manufacture. However, difficulty has been encountered in the development of illuminated keyboards that are light weight, low in cost and easy to manufacture. For example, methods have been developed which require placement of a light source below and in proximity of each key of the keyboard, and each of these light sources must be connected to a power supply, rendering the manufacture of such a keyboard difficult and expensive. Another method for illuminating a keyboard requires a single light source that provides light to each key by means of optical light paths. The optical light paths are difficult to construct in order to illuminate the keys uniformly and efficiently. These methods have the disadvantage of requiring considerable power for illumination, an important consideration for laptop computers and calculators operating under battery power. Moreover, all of these methods are unsuitable for many of the new keyboards that have been developed which are not flat, such as ergonomic keyboards that arc upward and outward from a horizontal surface. More generally, none of the methods of the prior art are readily adaptable to existing keyboard manufacturing processes. Thus, the manufacturing process for manufacturing ordinary non-illuminated keyboards cannot readily and easily be adapted to the manufacture of illuminated keyboards.

SUMMARY OF THE INVENTION

An object of the present invention is to provide methods for manufacture of illuminated keyboards that can easily be adapted and incorporated into the manufacture processes that exist for non-illuminated keyboards.

Another object of the present invention is to provide methods for manufacture of illuminated keyboards that may be applied to keyboards of any shape, including ergonomic keyboards.

Another object of the present invention is to provide uniform illumination of the keys in a manner that does not require implementation of complex optical pathways or separate light sources for each key, and further provides illumination that consumes very low power.

Yet another object of the present invention is to provide illumination that possesses controllable visual functionality as well as aesthetic attributes.

According to one aspect of the present invention a flexible, thin, low power, inexpensive, luminescent sheet is

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adhered to the surface of the key board well plate of a keyboard. The key board well plate is manufactured in any manner and shape as required by the manufacturing process typically used and as required by the shape of the keyboard to be produced. The luminescent sheet may be adhered to the upper surface of the keyboard well plate. Alternatively, the luminescent sheet may be placed between the keyboard well plate and the circuit board of the keyboard. In this configuration the keyboard well plate is made from any optically transmissive material possessing sufficient rigidity to function as a key board well plate. Such materials, such as plexi-glass and other moldable plastics are well known in the art. The keys are also manufactured as required by the manufacturing process ordinarily used, except that the keys are made from an optically transmissive material, and may further contain phosphorescent material that glows residually during and after illumination. The luminescent sheet may be easily connected to a battery or any available power source, including the source that provides power to the keyboard itself. Further, the luminescent sheet may be connected to a device such as a rheostat to allow the user to vary the intensity of illumination. Also, a photo cell may be connected to the source of power of the luminescent sheet to cause the intensity of light from the sheet to automatically vary in response to the darkness of the environment in which the keyboard is used.

According to the present invention, luminescent sheets of different colors can be placed under different sections of keys to improve visual differentiation of key groups. Also, the optically transmissive keys can be tinted so that the same luminescent sheets will cause keys tinted by different colors to appear in different colors. Similarly, the top plate of the keyboard which is normally opaque can also be manufactured from an optically transmissive material so that the entire upper surface of the keyboard will be illuminated. The top plate may be tinted to provide visual contrast. Also, one luminescent sheet of one color can be applied to illuminate the top plate with a color that is different from the color of the luminescent sheet that illuminates the keys. All of these features may be combined to provide an illuminated keyboard that possesses controllable visual functionality and aesthetic attributes. Further, the methods of the present invention disclosed herein can be implemented by persons of ordinary skill in the art to convert existing keyboards into illuminated keyboards.

These and other features, aspects and advantages of the present invention will become apparent and better understood with reference to the following written description, attached drawings, and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, and the advantages thereof, the following description is made with reference to the accompanying drawings, in which:

FIG. 1 illustrates a construction of a typical keyboard.

FIG. 2 illustrates placement of a luminescent sheet below a well plate.

FIGS. 3a, 3b and 3c illustrate construction and electrical connection of a typical luminescent sheet.

FIG. 4 illustrates an embodiment for illumination of a top plate.

FIG. 5 illustrates placement of a luminescent sheet above a well plate.

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DETAILED DESCRIPTION OF THE
PREFERRED EMBODIMENTS

A functional diagram of the construction of a typical keyboard is shown in FIG. 1. Typically, a keyboard 5 is comprised of keypads 10, keystems 11, a keyboard top plate 20, a keyboard well plate 30, a circuit board 40 with key spring switches 13 and a key board bottom plate 50. Typically all of these components are manufactured of opaque materials. Keystems 11 are inserted through holes 12 in keyboard well plate 30. Holes 12 in keyboard well plate 30 are aligned with key spring switches 13 of circuit board 40. Circuit board 40 is secured to key board bottom plate 50. Key board top plate 20 fits over or otherwise attaches to key board bottom plate 50, and thereby provides enclosure for the keyboard. Typically, keys are grouped in a keyboard according to function. For example, on a typical keyboard for typing words and data into a word processor, a set of alphabet keys, number keys, and other certain symbol keys are grouped together in a traditional typewriter key layout, herein referred to as the typewriter keys. Another separately grouped set of keys are the arrow keys which allow control of a cursor displayed on a video monitor. Function keys are separately grouped in a single line across the upper portion of the key board. Etc. These separately grouped sets of keys will be referred to as key groups. Top plate 20 is designed so that when placed in position, the keypads 10 extend through top plate 20 while the areas between key groups are covered by surface 21 of top plate 20.

A preferred embodiment of the present invention is illustrated in FIG. 2. A flexible luminescent sheet 100 is adhered to the lower surface 32 of key board well plate 30 that faces the surface of circuit board 40. Any suitable substance known in the art that is optically transmissive may be used to adhere luminescent sheet 100 to lower surface 32. Alternatively, flexible luminescent sheet 100 may be placed between keyboard well plate 30 and circuit board 40 without the use of an adhering substance, if luminescent sheet 100 will be sufficiently compressed between keyboard well plate 30 and circuit board 40 to remain in place. Holes 112 are made in flexible luminescent sheet 100 to align with holes 12 in keyboard well plate 30.

Luminescent sheet 100 is comprised of a commercially available electroluminescent (E-L) lamp. E-L lamps are solid state devices constructed of thin phosphor-coated plastic sheets with conductive surfaces. When a power source is applied to the conductive surfaces the phosphors illuminate and light is emitted from the entire surface. E-L lamps are thin, flexible and can be twisted, bent or formed into any shape. These lamps draw very little power and produce very little heat. A typical construction of luminescent sheet 100 is illustrated in FIG. 3A. Each conductive surface, metallized polyester film 131 and rear electrode 132, is connected at an edge of sheet 100 by electric leads 105. The upper conductive surface, metallized polyester film 131, is an optically transmissive conductor. When leads 105 are connected to a power source 110, the entire sheet illuminates with an intensity that is substantially uniform across the entire surface of sheet 100. Luminescent sheets are commercially available in a variety of colors such as white, yellow, blue and green. They may be cut to order by the manufacturer, who will provide electrical tabs connected to the conductive surfaces for connection to an electrical power source. For example, flexible luminescent sheets may be obtained from SEG Corporation. SEG may be contacted through their Internet address: www.flashseg.com.

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Flexible luminescent sheet 100 is connected through leads 105 to any convenient power source 110, which may be a battery or the power source of keyboard 5. The intensity of light from luminescent sheet 100 can be varied using an intensity control device 85 such as a rheostat in series with power source 110, as illustrated in FIG. 3B. In addition, or in the alternative as shown in FIG. 3B, intensity may be controlled by providing a photosensitive device 90, such as a photo-cell, and associated circuitry to control the intensity of luminescent sheet 100 in response to the intensity of light in the environment in which keyboard 5 is used. A variety of methods, devices, and circuitry for controlling the intensity of luminescent sheet 100 will readily be recognized by persons of ordinary skill in the art.

In this embodiment, keyboard well plate 30 is manufactured from an optically transmissive material. Any optically transmissive material that is sufficiently rigid to achieve the ordinary purposes of a keyboard well plate will suffice. Even a partially opaque optically transmissive material may be used as long as light of sufficient intensity is transmitted through keyboard well plate 30 to provide illumination visual to the user. Examples of materials that can be used for this purpose are plexiglass and other optically transmissive plastics. Other suitable materials will be known to persons of ordinary skill in the art. Similarly, keypads 10 and key stems 11 will be manufactured from an optically transmissive material, that is, materials that are at most only partially opaque and transmit sufficient light intensity to render the keys visual to the user. In addition, keypads 10 may comprise phosphors that will illuminate in response to the light received from luminescent sheet 100. Thus, in this embodiment, luminescent sheet 100 transmits light through keyboard well plate 30 and through keypads 10 to provide visual illumination of keyboard 5.

It may be desirable in some applications to provide a keyboard in which different keys, key groups and keyboard areas appear in different colors of illumination. A variety of methods can be implemented to achieve this according to the methods of the present invention. One method is to provide a plurality of luminescent sheets 100 of different colors under different portions of keyboard well plate 30 to cause different keys, keygroups and keyboard areas to be illuminated by different colors. Another method for providing keys of different colors is to tint the optically transmissive material from which the keys are made, so that when the keys are illuminated by a luminescent sheet 100, the key color will be a composite of the light from the luminescent sheet and the tint of the keys. Also, the optically transmissive keys from which the keys are made may be mixed with phosphors of different colors when illuminated by luminescent sheet 100.

A further variation of the method of illuminating a keyboard as described above is to manufacture top plate 20 of an optically transmissive material so that light from luminescent sheet 100 will transmit through the top plate to provide illumination of the top plate surface areas as well as the keys. Top plate 20 can be illuminated with a separate luminescent sheet 100 of a desired color by placing the separate luminescent sheet 100 under the surface area 22 of top plate 20, such that the upper surface are 131 of luminescent sheet 100 is aligned with surface area 22 of top plate 20, as illustrated in FIG. 4. Top plate 20 can also be made of an optically transmissive material that is tinted with a desired color and, or, mixed with phosphors to provide luminescence in response to light received from luminescent sheet 100.

In an alternative embodiment, luminescent sheet 100 can be adhered to the upper surface 31 of key board well plate

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30, as illustrated in FIG. 5. In this configuration, keyboard well plate 40 can be made of any opaque material as is usually used, because light from luminescent sheet 100 illuminates the keys more directly without the necessity of transmission through key board well plate 30. Also, the substance used to adhere luminescent sheet 100 to upper surface 31 of keyboard well plate 30 need not be an optically transmissive material in this configuration. In this configuration the keypads 10 are made of optically transmissive material, and top plate 20 can also be illuminated as described above.

An advantage of using a flexible luminescent sheet is the ability to provide illumination for non-traditional keyboards, such as ergonomic keyboards that are arcuate in shape in one or more spatial directions. Moreover, the methods of keyboard illumination disclosed herein can readily be adapted to any keyboard manufacturing process. This would enable a manufacturer of non-illuminated keyboards to quickly and inexpensively become a manufacturer of illuminated keyboards without developing an entirely new manufacturing process to accommodate specialized configurations. Further, the methods of the present invention disclosed herein can be implemented by any person of ordinary skill in the art to convert existing keyboards into illuminated keyboards. Moreover, the methods of the present invention disclosed herein can be applied to the manufacture of an illuminated mouse, by making the mouse buttons and exterior enclosure of an optically transmissive material and underlying these components with one or more luminescent sheets connected to a suitable power source.

While this invention has been described with reference to the foregoing preferred embodiments, the scope of the present invention is not limited by the foregoing written description. Rather, the scope of the present invention is defined by the following claims and equivalents thereof.

We claim:

1. A method for illuminating the keys of a data entry apparatus comprising the steps of:

making said keys of an optically transmissive material; providing one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus; and providing an optically transmissive top plate with a surface and an area through which said keys extend.

2. The method of claim 1, wherein said top plate comprises phosphors to emit light of a desired color.

3. The method of claim 1, wherein said top plate is tinted to emit light of a desired color.

4. The method of claim 1 further comprising the step of: providing one or more luminescent sheets underlying said top plate to provide illumination of said top plate visual to said user.

5. A data entry apparatus with illuminated keys comprising:

keys of an optically transmissive material; one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus; and an optically transmissive keyboard top plate.

6. A data entry apparatus with illuminated keys comprising:

keys of an optically transmissive material; one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus; and an optically transmissive keyboard top plate, wherein said top plate emits light of a desired color.

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7. A data entry apparatus with illuminated keys comprising:

keys of an optically transmissive material; one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus; an optically transmissive keyboard top plate, wherein said top plate emits light of a desired color; and one or more luminescent sheets underlying said top plate to provide illumination of said top plate visual to said user.

8. A method for illuminating the keys of a data entry apparatus comprising the steps of:

making said keys of an optically transmissive material; and providing one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus, wherein different keys or groups of keys are tinted with different colors to provide illuminated keys or groups of keys that emit light of different colors.

9. A data entry apparatus with illuminated keys comprising:

keys of an optically transmissive material; one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus, wherein different keys or groups of keys emit light of different colors.

10. A method for illuminating one or more components of a data-entry computer keyboard apparatus comprising the steps of:

making said one or more key cap components of optically transmissive material; and providing a flexible luminescent sheet underlying said one or more components to provide an intensity of illumination to said components visual to a user of the apparatus; and providing the luminescent sheet with a hole for each of the one or more key caps in order to couple the key cap to an underlying circuit board.

11. A method for illuminating the keys of a data-entry computer keyboard apparatus comprising the steps of:

making said keys of an optically transmissive material; providing one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus; and providing the one or more flexible luminescent sheet with a hole for each of the one or more key caps in order to couple the key cap to an underlying circuit board.

12. A data-entry computer keyboard apparatus with one or more illuminated components comprising:

one or more key cap components comprising an optically transmissive material; and a flexible luminescent sheet underlying said one or more components to provide an intensity of illumination to said components visual to a user of the apparatus, wherein the luminescent sheet includes a plurality of holes corresponding to the one or more key caps to allow the key caps to be coupled to an underlying circuit board.

13. The keyboard of claim 12, which allows the user to control the intensity of illumination from an off state to a maximum intensity on state.

14. The keyboard as stated in claim 13, wherein the illumination intensity can be controlled in a minimum of two settings including on or off.

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15. A data entry computer keyboard apparatus with illuminated keys comprising:
keys of an optically transmissive material;
one or more flexible luminescent sheets underlying said
keys to provide an intensity of illumination to said keys 5
visual to a user of the apparatus, wherein the one or

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more luminescent sheets include a plurality of holes
corresponding to the one or more key caps to allow the
key caps to be coupled to an underlying circuit board.

* * * * *



(12) **United States Patent**
Katrinecz, Jr. et al.

(10) **Patent No.:** **US 6,199,996 B1**
(45) **Date of Patent:** **Mar. 13, 2001**

(54) **LOW POWER, LOW COST ILLUMINATED KEYBOARDS AND KEYPADS**

(75) Inventors: **Andrew J. Katrinecz, Jr.**, Shalimar, FL (US); **David C. Byrd**, Bellingham, MA (US)

(73) Assignee: **Twenty-First Century Technology, Inc.**, Bellingham, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/139,927**

(22) Filed: **Aug. 26, 1998**

(51) **Int. Cl.⁷** **F21V 33/00**

(52) **U.S. Cl.** **362/85; 362/84; 362/276; 200/314**

(58) **Field of Search** 200/317, 314; 362/84, 24, 87, 34, 85, 276, 295

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Primary Examiner—Stephen Husar
(74) *Attorney, Agent, or Firm*—Fulbright & Jaworski

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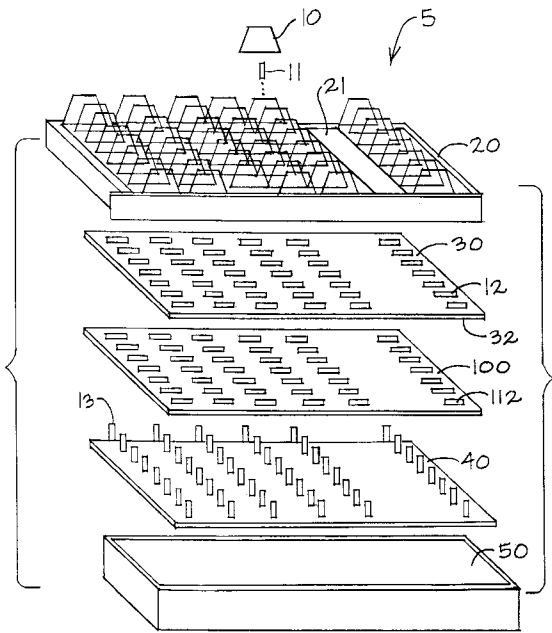
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(57) **ABSTRACT**

Methods are provided for adapting existing manufacturing processes for non-illuminated data-entry devices and mouses to the manufacture of illuminated data-entry devices. Luminescent sheets of one or more colors underlying optically transmissive device components provide illumination of the components visual to a user of the device. The optically transmissive components may be doped with phosphors or tinted to provide components that emit light of different colors. The intensity of illumination of the luminescent sheet may be controlled by the user and may vary in response to the background light of the environment.

16 Claims, 5 Drawing Sheets



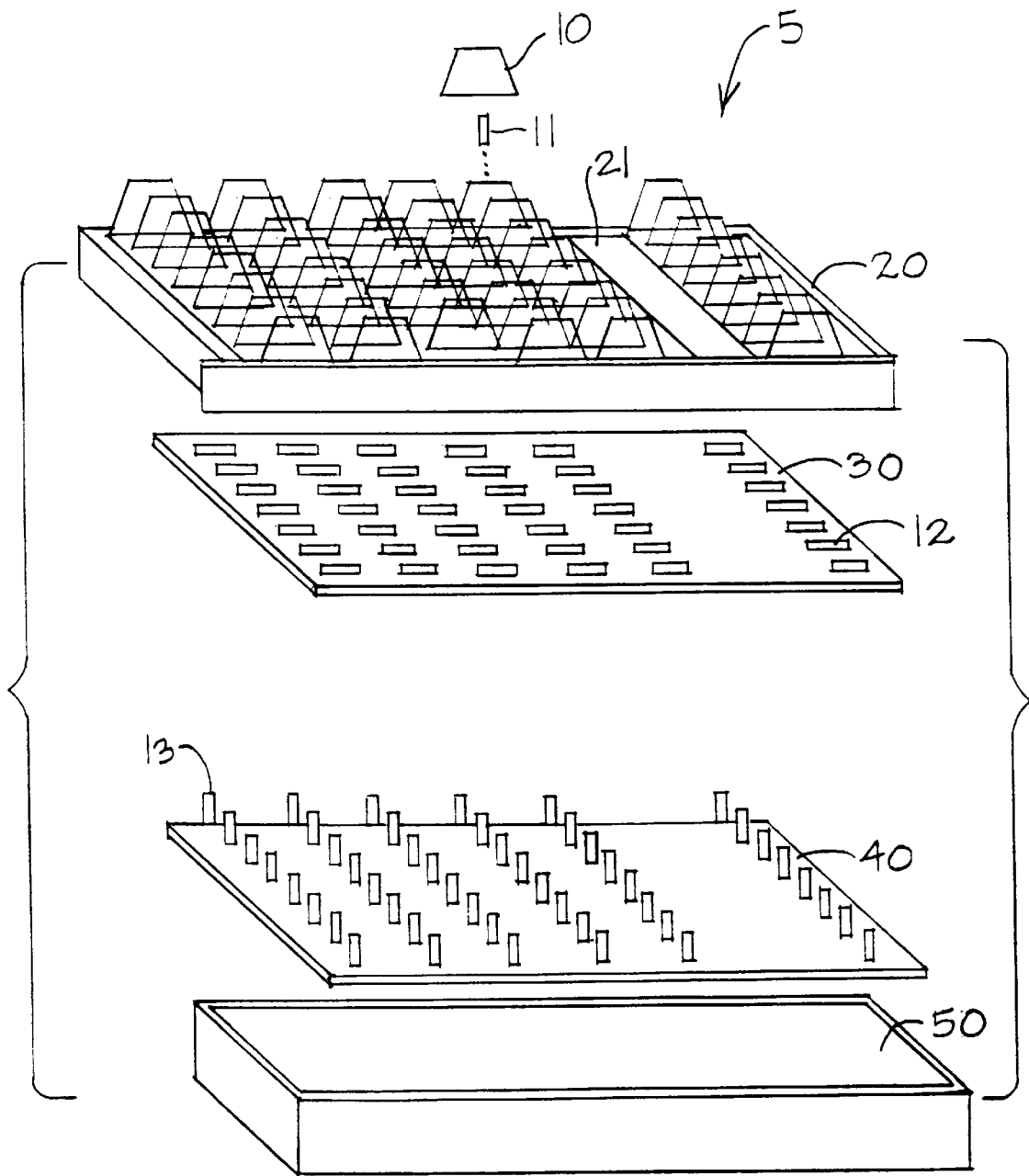


FIG. 1

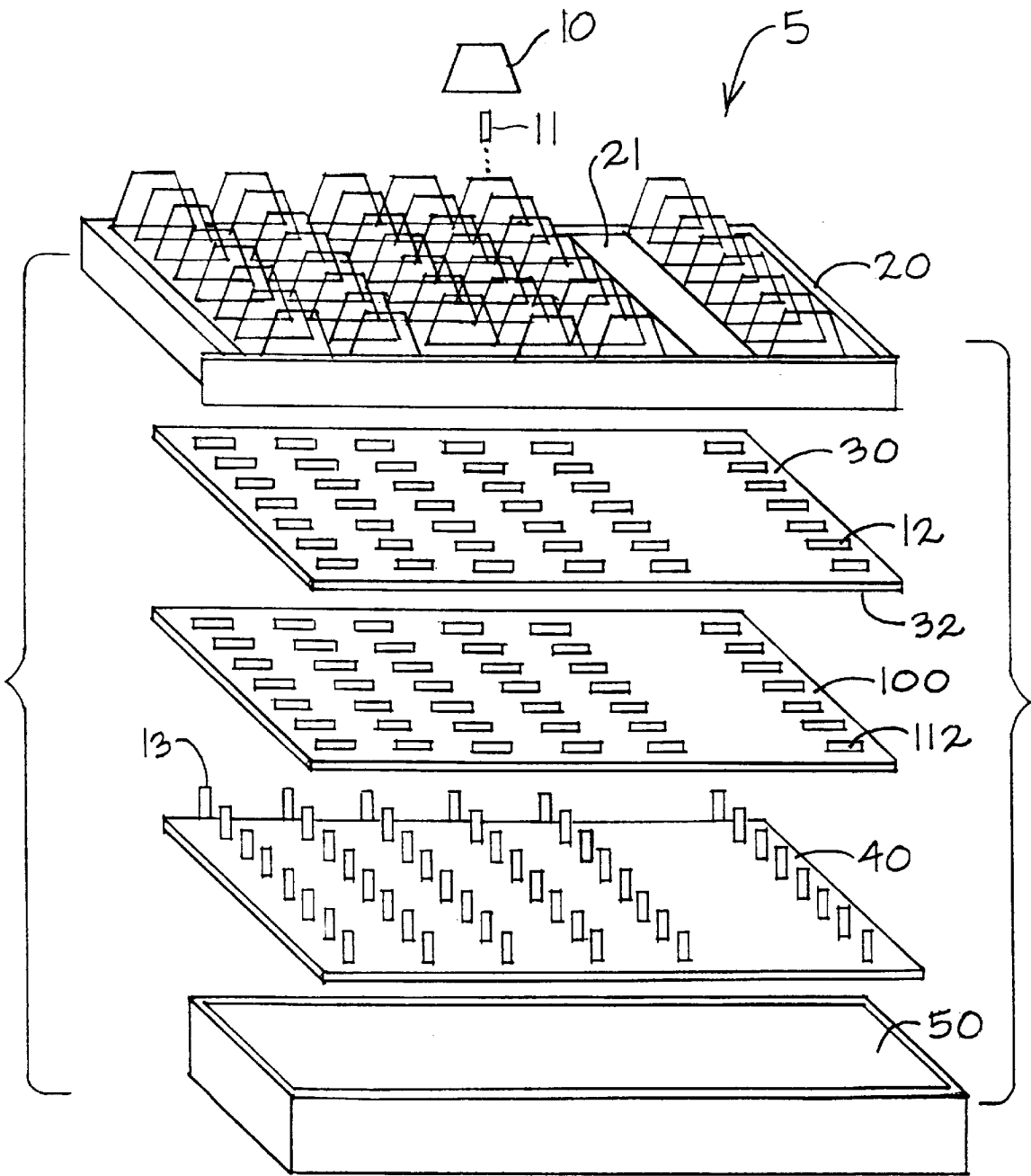
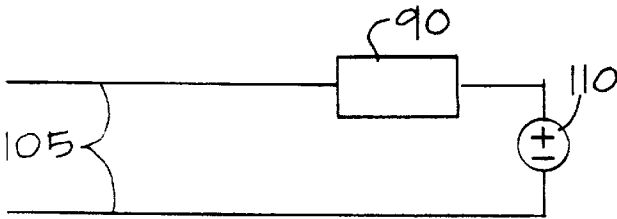
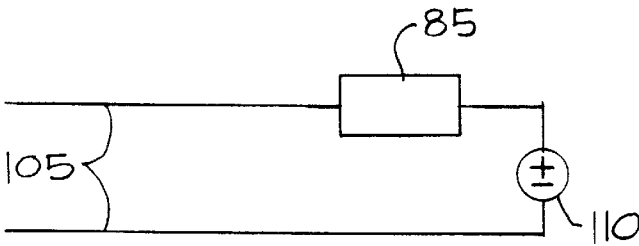
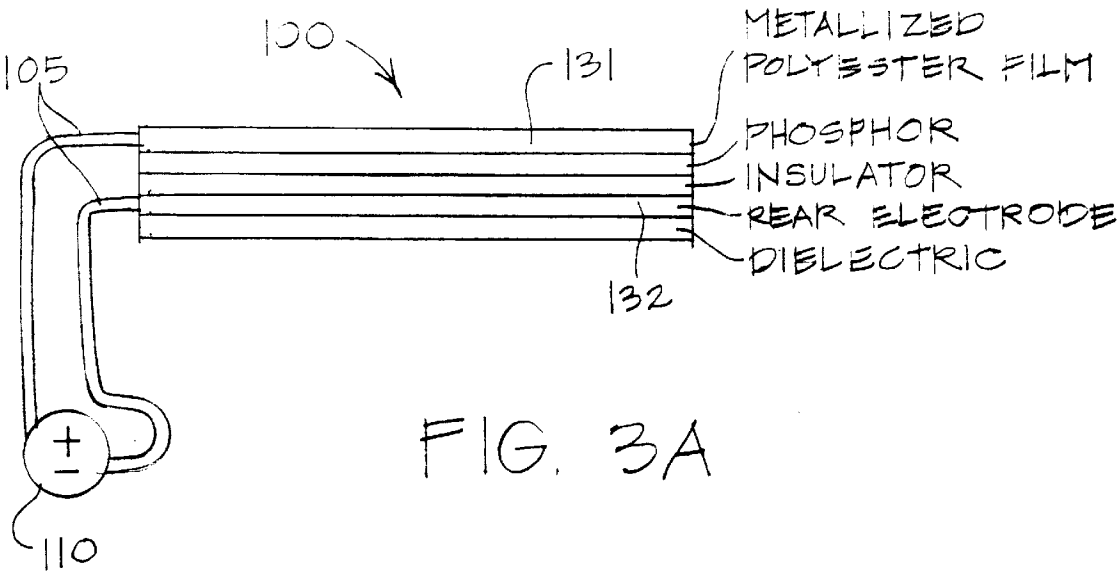


FIG. 2



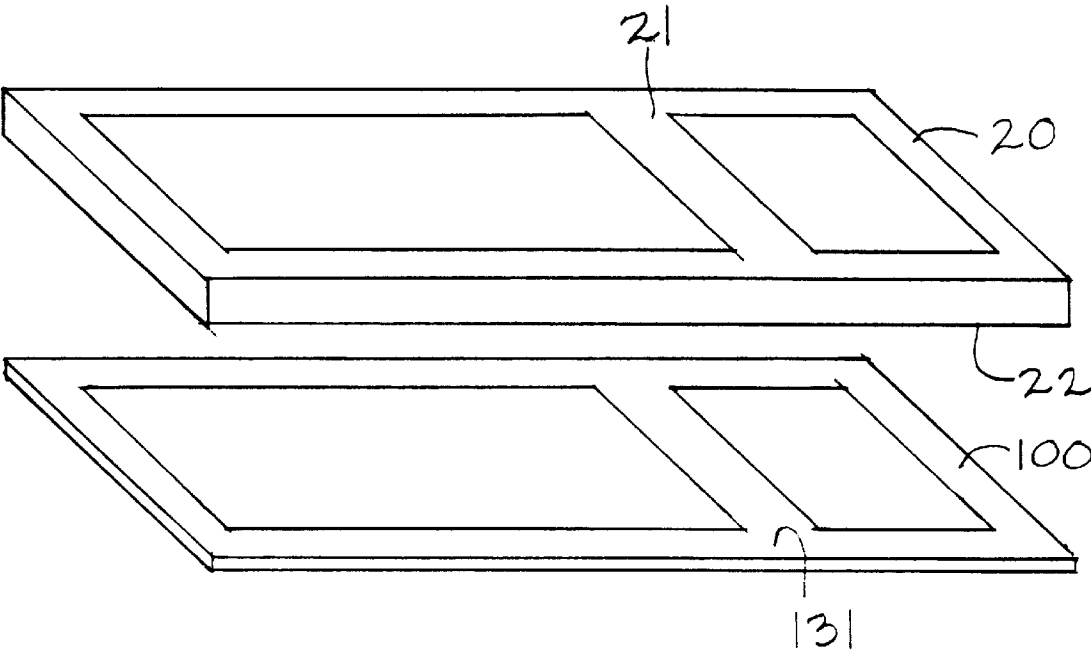


FIG. 4

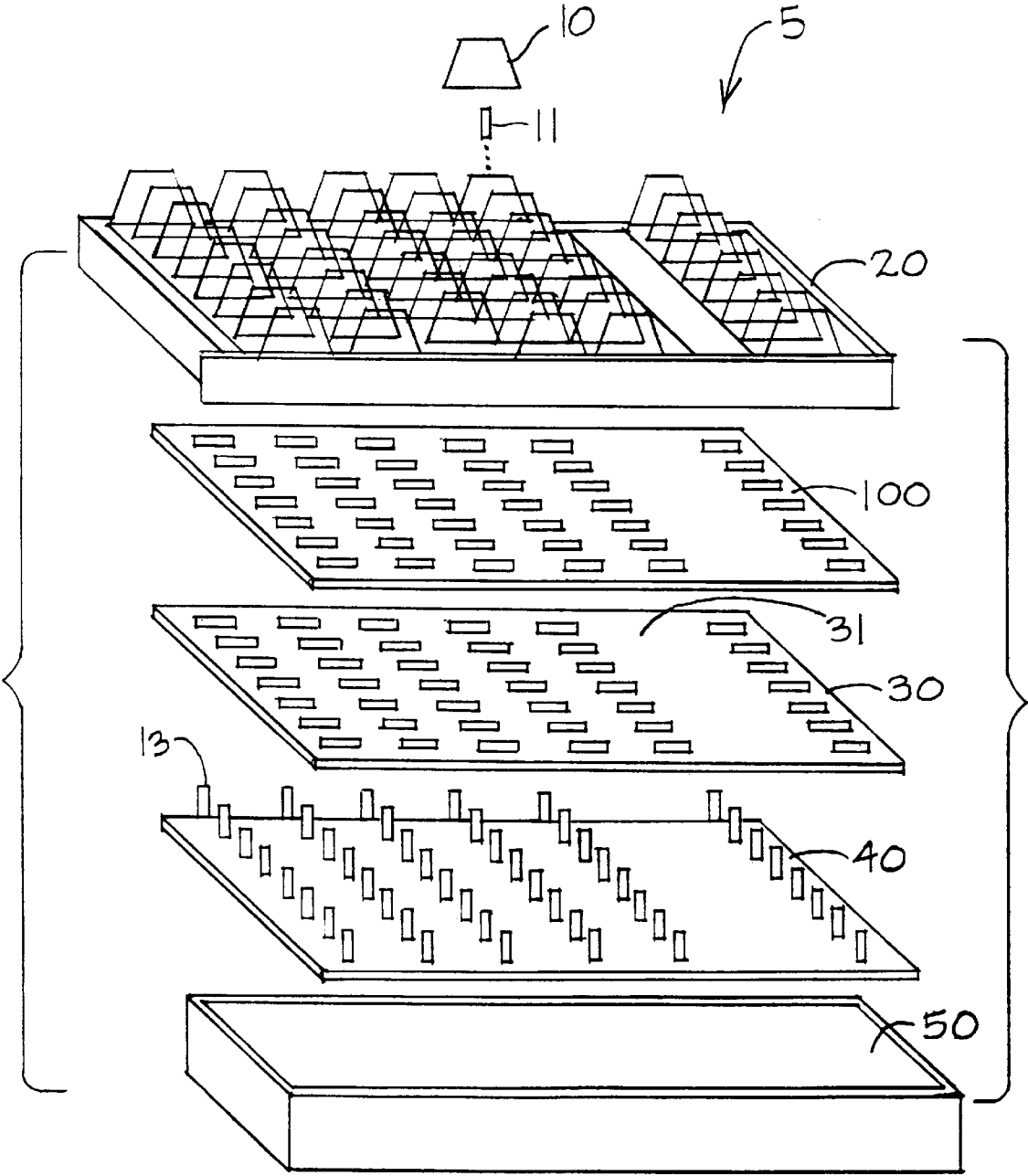


FIG. 5

**LOW POWER, LOW COST ILLUMINATED
KEYBOARDS AND KEYPADS**

SPECIFICATION

1. Field of the Invention

The present invention relates to illumination of keyboards, keypads, and other data entry devices.

2. Background of the Invention

Keyboards, keypads, mice, and other data entry devices (hereinafter referred to generally as keyboards) are used in a variety of applications for entry of alphanumeric and other types of data into a machine such as a calculator or computer. Keyboards have been developed that are light weight, low in cost, and relatively easy to manufacture. However, difficulty has been encountered in the development of illuminated keyboards that are light weight, low in cost and easy to manufacture. For example, methods have been developed which require placement of a light source below and in proximity of each key of the keyboard, and each of these light sources must be connected to a power supply, rendering the manufacture of such a keyboard difficult and expensive. Another method for illuminating a keyboard requires a single light source that provides light to each key by means of optical light paths. The optical light paths are difficult to construct in order to illuminate the keys uniformly and efficiently. These methods have the disadvantage of requiring considerable power for illumination, an important consideration for laptop computers and calculators operating under battery power. Moreover, all of these methods are unsuitable for many of the new keyboards that have been developed which are not flat, such as ergonomic keyboards that are upward and outward from a horizontal surface. More generally, none of the methods of the prior art are readily adaptable to existing keyboard manufacturing processes. Thus, the manufacturing process for manufacturing ordinary non-illuminated keyboards cannot readily and easily be adapted to the manufacture of illuminated keyboards.

SUMMARY OF THE INVENTION

An object of the present invention is to provide methods for manufacture of illuminated keyboards that can easily be adapted and incorporated into the manufacture processes that exist for non-illuminated keyboards.

Another object of the present invention is to provide methods for manufacture of illuminated keyboards that may be applied to keyboards of any shape, including ergonomic keyboards.

Another object of the present invention is to provide uniform illumination of the keys in a manner that does not require implementation of complex optical pathways or separate light sources for each key, and further provides illumination that consumes very low power.

Yet another object of the present invention is to provide illumination that possesses controllable visual functionality as well as aesthetic attributes.

According to one aspect of the present invention a flexible, thin, low power, inexpensive, luminescent sheet is adhered to the surface of the key board well plate of a keyboard. The key board well plate is manufactured in any manner and shape as required by the manufacturing process typically used and as required by the shape of the keyboard to be produced. The luminescent sheet may be adhered to the upper surface of the keyboard well plate. Alternatively, the luminescent sheet may be placed between the keyboard well plate and the circuit board of the keyboard. In this configura-

tion the keyboard well plate is made from any optically transmissive material possessing sufficient rigidity to function as a key board well plate. Such materials, such as plexi-glass and other moldable plastics are well known in the art. The keys are also manufactured as required by the manufacturing process ordinarily used, except that the keys are made from an optically transmissive material, and may further contain phosphorescent material that glows residually during and after illumination. The luminescent sheet may be easily connected to a battery or any available power source, including the source that provides power to the keyboard itself. Further, the luminescent sheet may be connected to a device such as a rheostat to allow the user to vary the intensity of illumination. Also, a photo cell may be connected to the source of power of the luminescent sheet to cause the intensity of light from the sheet to automatically vary in response to the darkness of the environment in which the keyboard is used.

According to the present invention, luminescent sheets of different colors can be placed under different sections of keys to improve visual differentiation of key groups. Also, the optically transmissive keys can be tinted so that the same luminescent sheets will cause keys tinted by different colors to appear in different colors. Similarly, the top plate of the keyboard which is normally opaque can also be manufactured from an optically transmissive material so that the entire upper surface of the keyboard will be illuminated. The top plate may be tinted to provide visual contrast. Also, one luminescent sheet of one color can be applied to illuminate the top plate with a color that is different from the color of the luminescent sheet that illuminates the keys. All of these features may be combined to provide an illuminated keyboard that possesses controllable visual functionality and aesthetic attributes. Further, the methods of the present invention disclosed herein can be implemented by persons of ordinary skill in the art to convert existing keyboards into illuminated keyboards.

These and other features, aspects and advantages of the present invention will become apparent and better understood with reference to the following written description, attached drawings, and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a construction of a typical keyboard.

FIG. 2 illustrates placement of a luminescent sheet below a well plate.

FIGS. 3a, 3b and 3c illustrate construction and electrical connection of a typical luminescent sheet.

FIG. 4 illustrates an embodiment for illumination of a top plate.

FIG. 5 illustrates placement of a luminescent sheet above a well plate.

**DETAILED DESCRIPTION OF THE
PREFERRED EMBODIMENTS**

A functional diagram of the construction of a typical keyboard is shown in FIG. 1. Typically, a keyboard is comprised of keypads 10, keystems 11, a keyboard top plate 20, a keyboard well plate 30, a circuit board 40 with key spring switches 13 and a key board bottom plate 50. Typically all of these components are manufactured of opaque materials. Keystems 11 are inserted through holes 12 in keyboard well plate 30. Holes 12 in keyboard well plate 30 are aligned with key spring switches 13 of circuit board 40. Circuit board 40 is secured to key board bottom plate 50.

Key board top plate **20** fits over or otherwise attaches to key board bottom plate **50**, and thereby provides enclosure for the keyboard. Typically, keys are grouped in a keyboard according to function. For example, on a typical keyboard for typing words and data into a word processor, a set of alphabet keys, number keys, and other certain symbol keys are grouped together in a traditional typewriter key layout, herein referred to as the typewriter keys. Another separately grouped set of keys are the arrow keys which allow control of a cursor displayed on a video monitor. Function keys are separately grouped in a single line across the upper portion of the key board. Etc. These separately grouped sets of keys will be referred to as key groups. Top plate **20** is designed so that when placed in position, the keypads **10** extend through top plate **20** while the areas between key groups are covered by surface **21** of top plate **20**.

A preferred embodiment of the present invention is illustrated in FIG. 2. A flexible luminescent sheet **100** is adhered to the lower surface **32** of key board well plate **30** that faces the surface of circuit board **40**. Any suitable substance known in the art that is optically transmissive may be used to adhere luminescent sheet **100** to lower surface **32**. Alternatively, flexible luminescent sheet **100** may be placed between keyboard well plate **30** and circuit board **40** without the use of an adhering substance, if luminescent sheet **100** will be sufficiently compressed between keyboard well plate **30** and circuit board **40** to remain in place. Holes **112** are made in flexible luminescent sheet **100** to align with holes **12** in keyboard well plate **30**.

Luminescent sheet **100** is comprised of a commercially available electroluminescent (E-L) lamp. E-L lamps are solid state devices constructed of thin phosphor-coated plastic sheets with conductive surfaces. When a power source is applied to the conductive surfaces the phosphors illuminate and light is emitted from the entire surface. E-L lamps are thin, flexible and can be twisted, bent or formed into any shape. These lamps draw very little power and produce very little heat. A typical construction of luminescent sheet **100** is illustrated in FIG. 3A. Each conductive surface, metallized polyester film **131** and rear electrode **132**, is connected at an edge of sheet **100** by electric leads **105**. The upper conductive surface, metallized polyester film **131**, is an optically transmissive conductor. When leads **105** are connected to a power source **110**, the entire sheet illuminates with an intensity that is substantially uniform across the entire surface of sheet **100**. Luminescent sheets are commercially available in a variety of colors such as white, yellow, blue and green. They may be cut to order by the manufacturer, who will provide electrical tabs connected to the conductive surfaces for connection to an electrical power source. For example, flexible luminescent sheets may be obtained from SEG Corporation. SEG may be contacted through their Internet address: www.flashseg.com.

Flexible luminescent sheet **100** is connected through leads **105** to any convenient power source **110**, which may be a battery or the power source of keyboard **5**. The intensity of light from luminescent sheet **100** can be varied using an intensity control device **85** such as a rheostat in series with power source **110**, as illustrated in FIG. 3B. In addition, or in the alternative as shown in FIG. 3B, intensity may be controlled by providing a photosensitive device **90**, such as a photo-cell, and associated circuitry to control the intensity of luminescent sheet **100** in response to the intensity of light in the environment in which keyboard **5** is used. A variety of methods, devices, and circuitry for controlling the intensity of luminescent sheet **100** will readily be recognized by persons of ordinary skill in the art.

In this embodiment, keyboard well plate **30** is manufactured from an optically transmissive material. Any optically transmissive material that is sufficiently rigid to achieve the ordinary purposes of a keyboard well plate will suffice. Even a partially opaque optically transmissive material may be used as long as light of sufficient intensity is transmitted through keyboard well plate **30** to provide illumination visual to the user. Examples of materials that can be used for this purpose are plexiglass and other optically transmissive plastics. Other suitable materials will be known to persons of ordinary skill in the art. Similarly, keypads **10** and key stems **11** will be manufactured from an optically transmissive material, that is, materials that are at most only partially opaque and transmit sufficient light intensity to render the keys visual to the user. In addition, keypads **10** may comprise phosphors that will illuminate in response to the light received from luminescent sheet **100**. Thus, in this embodiment, luminescent sheet **100** transmits light through keyboard well plate **30** and through keypads **10** to provide visual illumination of keyboard **5**.

It may be desirable in some applications to provide a keyboard in which different keys, key groups and keyboard areas appear in different colors of illumination. A variety of methods can be implemented to achieve this according to the methods of the present invention. One method is to provide a plurality of luminescent sheets **100** of different colors under different portions of keyboard well plate **30** to cause different keys, keygroups and keyboard areas to be illuminated by different colors. Another method for providing keys of different colors is to tint the optically transmissive material from which the keys are made, so that when the keys are illuminated by a luminescent sheet **100**, the key color will be a composite of the light from the luminescent sheet and the tint of the keys. Also, the optically transmissive keys from which the keys are made may be mixed with phosphors of different colors when illuminated by luminescent sheet **100**.

A further variation of the method of illuminating a keyboard as described above is to manufacture top plate **20** of an optically transmissive material so that light from luminescent sheet **100** will transmit through the top plate to provide illumination of the top plate surface areas as well as the keys. Top plate **20** can be illuminated with a separate luminescent sheet **100** of a desired color by placing the separate luminescent sheet **100** under the surface area **22** of top plate **20**, such that the upper surface are **131** of luminescent sheet **100** is aligned with surface area **22** of top plate **20**, as illustrated in FIG. 4. Top plate **20** can also be made of an optically transmissive material that is tinted with a desired color and, or, mixed with phosphors to provide luminescence in response to light received from luminescent sheet **100**.

In an alternative embodiment, luminescent sheet **100** can be adhered to the upper surface **31** of key board well plate **30**, as illustrated in FIG. 5. In this configuration, keyboard well plate **40** can be made of any opaque material as is usually used, because light from luminescent sheet **100** illuminates the keys more directly without the necessity of transmission through key board well plate **30**. Also, the substance used to adhere luminescent sheet **100** to upper surface **31** of keyboard well plate **30** need not be an optically transmissive material in this configuration. In this configuration the keypads **10** are made of optically transmissive material, and top plate **20** can also be illuminated as described above.

An advantage of using a flexible luminescent sheet is the ability to provide illumination for non-traditional keyboards, such as ergonomic keyboards that are arcuate in shape in one

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or more spatial directions. Moreover, the methods of key-board illumination disclosed herein can readily be adapted to any keyboard manufacturing process. This would enable a manufacturer of non-illuminated keyboards to quickly and inexpensively become a manufacturer of illuminated key-boards without developing an entirely new manufacturing process to accommodate specialized configurations. Further, the methods of the present invention disclosed herein can be implemented by any person of ordinary skill in the art to convert existing keyboards into illuminated keyboards. Moreover, the methods of the present invention disclosed herein can be applied to the manufacture of an illuminated mouse, by making the mouse buttons and exterior enclosure of an optically transmissive material and underlying these components with one or more luminescent sheets connected to a suitable power source.

While this invention has been described with reference to the foregoing preferred embodiments, the scope of the present invention is not limited by the foregoing written description. Rather, the scope of the present invention is defined by the following claims and equivalents thereof

We claim:

1. A method for illuminating one or more components of a data-entry apparatus, comprising:
 - making said one or more components of optically transmissive material;
 - providing a luminescent sheet underlying said one or more components to provide an intensity of illumination to said components visual to a user of the apparatus; and
 - providing a photosensitive device to control the intensity of illumination provided by said luminescent sheet in response to an intensity of light in an environment external to said apparatus.
2. A method for illuminating one or more components of a data-entry apparatus, comprising:
 - making said one or more components of optically transmissive material;
 - providing a luminescent sheet underlying said one or more components to provide an intensity of illumination to said components visual to a user of the apparatus; and
 - providing an intensity control device to enable the user of said apparatus to vary the intensity of illumination provided by said luminescent sheet.
3. The method of claim 2, wherein luminescent sheets of different colors illuminate different components of said apparatus.
4. The method of claim 2, wherein different ones of said components may be tinted with different colors to emit light of different colors.
5. The method of claim 2 wherein providing an intensity control device includes providing a rheostat.
6. A method for illuminating one or more components of a data-entry apparatus, comprising:
 - making said one or more components of optically transmissive material;
 - providing a luminescent sheet underlying said one or more components to provide an intensity of illumination to said components visual to a user of the apparatus, wherein different ones of said components

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- may comprise phosphors of different colors to emit light of different colors.
- 7. A method for illuminating keys of a data-entry apparatus, comprising:
 - making said keys of an optically transmissive material;
 - providing one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus, wherein different keys or groups of keys are made of optically transmissive materials comprising phosphors that emit light of different colors to provide keys or groups of keys that emit light of different colors.
- 8. The method of claim 7, wherein different keys or groups of keys are illuminated by different colors by providing luminescent sheets that emit light of different colors underlying different keys or groups of keys.
- 9. The method of claim 7, wherein different keys or groups of keys are tinted with different colors to provide illuminated keys or groups of keys that emit light of different colors.
- 10. A data-entry apparatus with one or more illuminated components comprising:
 - one or more components comprising an optically transmissive material;
 - a flexible luminescent sheet underlying said one or more components to provide an intensity of illumination to said components visual to a user of the apparatus; and
 - a photosensitive device to control the intensity of illumination provided by said luminescent sheet in response to an intensity of light in an environment external to said apparatus.
- 11. A data-entry apparatus with one or more illuminated components comprising:
 - one or more components comprising an optically transmissive material;
 - a flexible luminescent sheet underlying said one or more components to provide an intensity of illumination to said components visual to a user of the apparatus; and
 - an intensity control device to enable a user of said apparatus to vary the intensity of illumination provided by said luminescent sheet.
- 12. The apparatus of claim 11, wherein luminescent sheets of different colors illuminate different components of said apparatus.
- 13. The method of claim 11, wherein said luminescent sheet is adhered to an underlying surface of one of said one or more components.
- 14. The apparatus of claim 11, wherein the intensity control device comprises a rheostat.
- 15. A data entry apparatus with illuminated keys comprising:
 - keys of an optically transmissive material;
 - one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus, wherein one or more of said keys are made of an optically transmissive material comprising phosphors.
- 16. The apparatus of claim 15, wherein different keys or groups of keys emit light of different colors.

* * * * *



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(12) **United States Patent**
Dombrowski et al.

(10) **Patent No.:** **US 7,360,957 B2**
(45) **Date of Patent:** **Apr. 22, 2008**

(54) **THIN KEYPAD ASSEMBLIES AND COMPONENTS FOR ELECTRONICS DEVICES AND METHODS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 218 days.

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(51) **Int. Cl.**
G06F 3/023 (2006.01)

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(58) **Field of Classification Search** None
See application file for complete search history.

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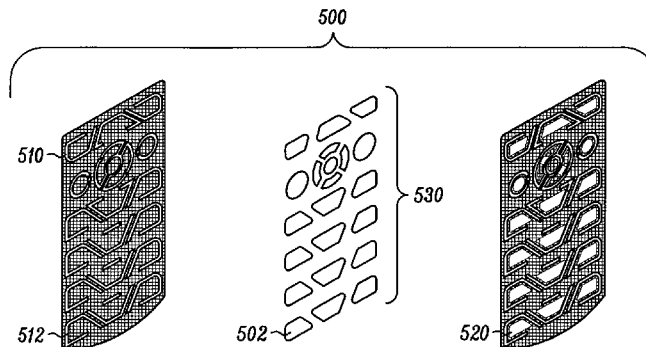
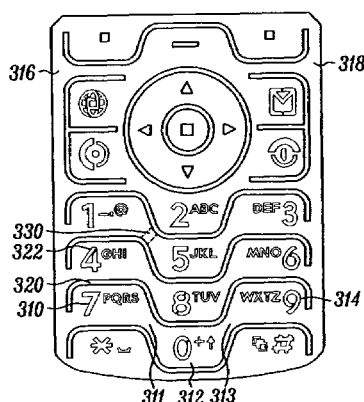
(74) *Attorney, Agent, or Firm*—Roland K. Bowler, II

(57) **ABSTRACT**

A keypad assembly, the keypad assembly including a keycap layer **110** having multiple user interface key caps flexibly coupled to a carrier portion, a luminescent layer **120** disposed toward a backside of the plurality of key cap layer, the luminescent layer carrying a plurality of switch domes aligned with a corresponding one of the plurality of key caps of the key cap layer. In some embodiments, a backing material is applied to a backside of the user interface keycaps.

17 Claims, 6 Drawing Sheets

300



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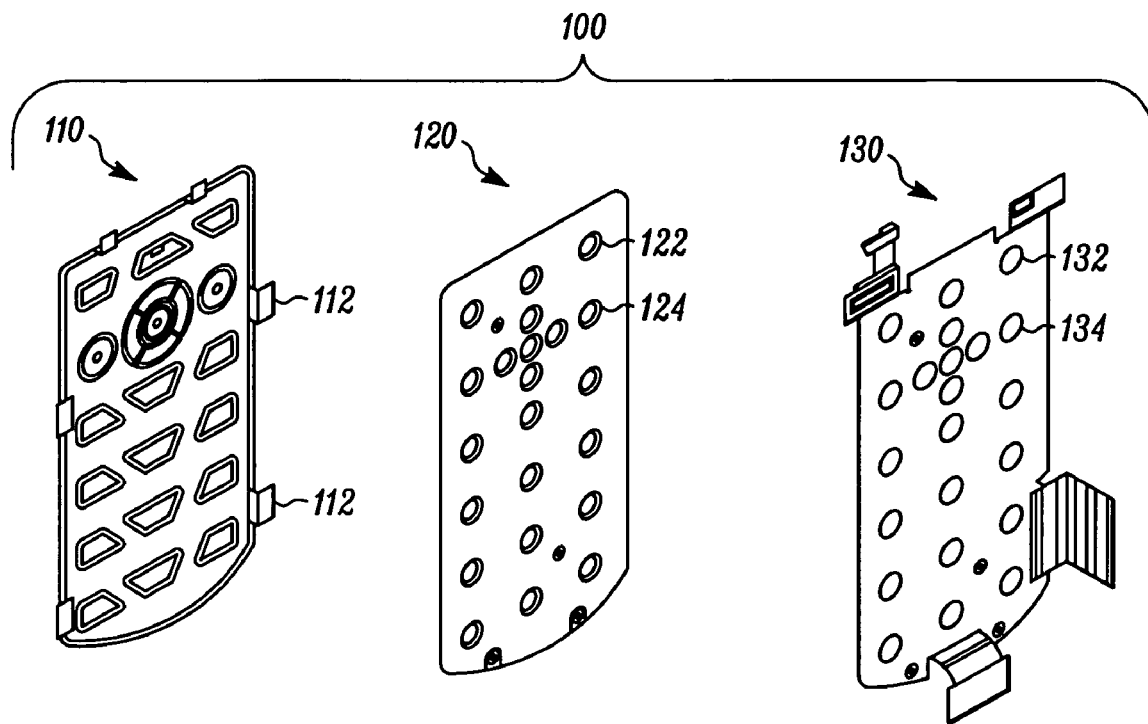


FIG. 1

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200

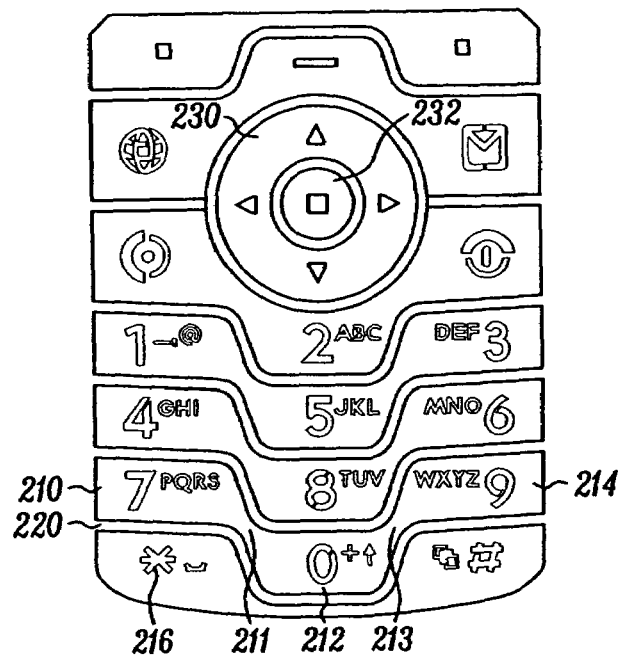


FIG. 2

300

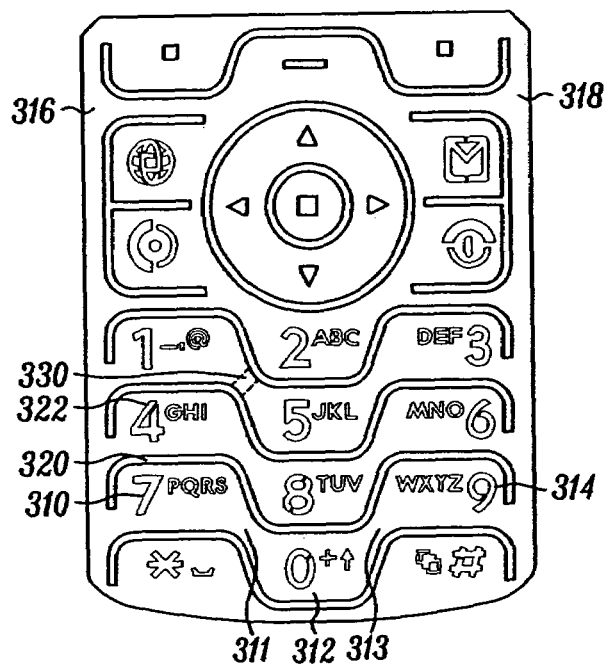


FIG. 3

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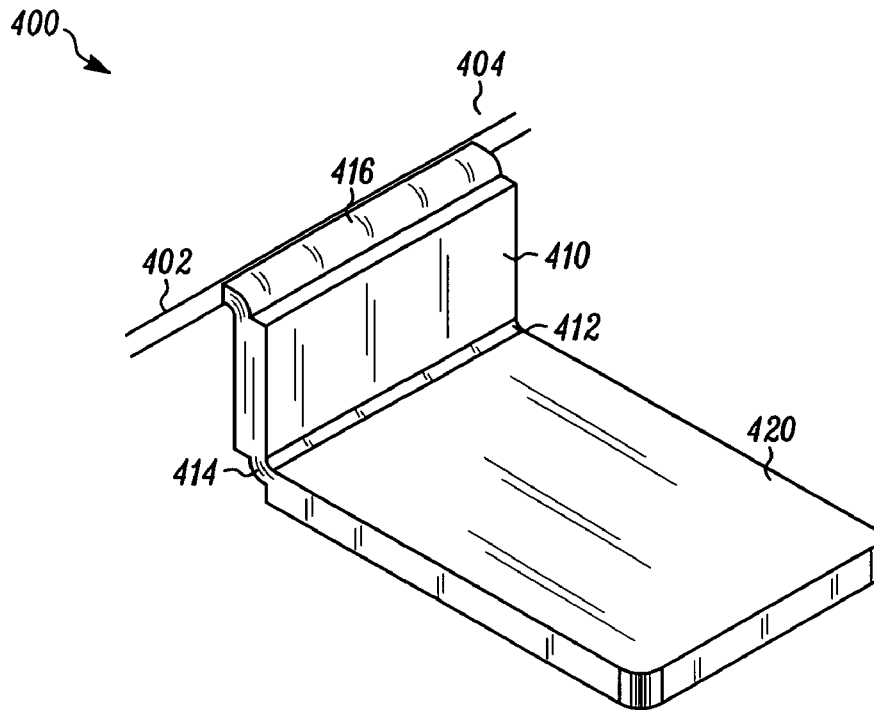


FIG. 4

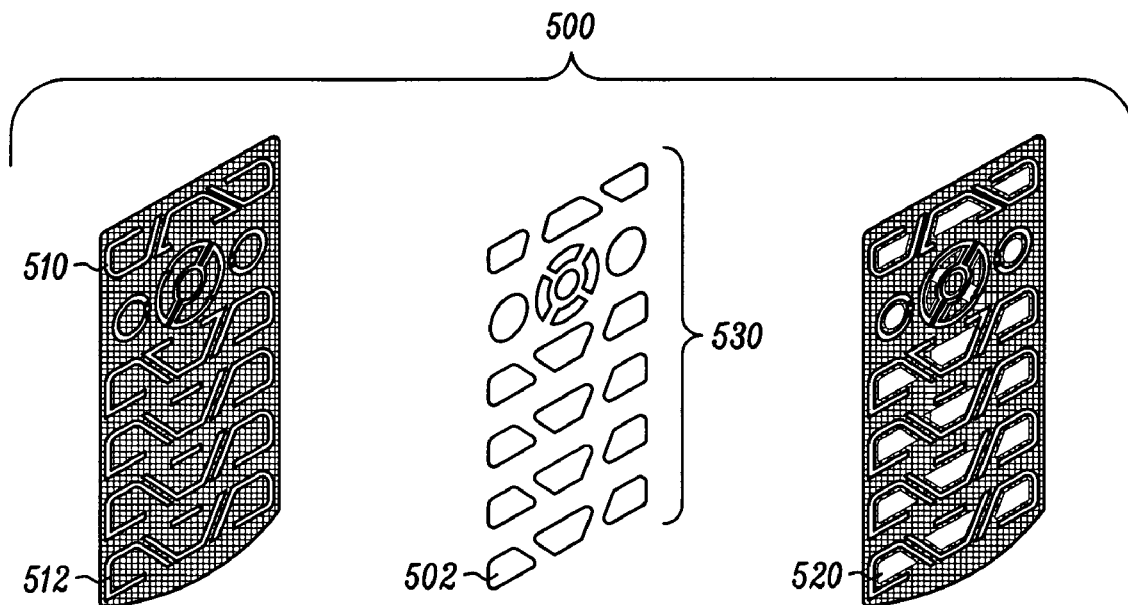


FIG. 5

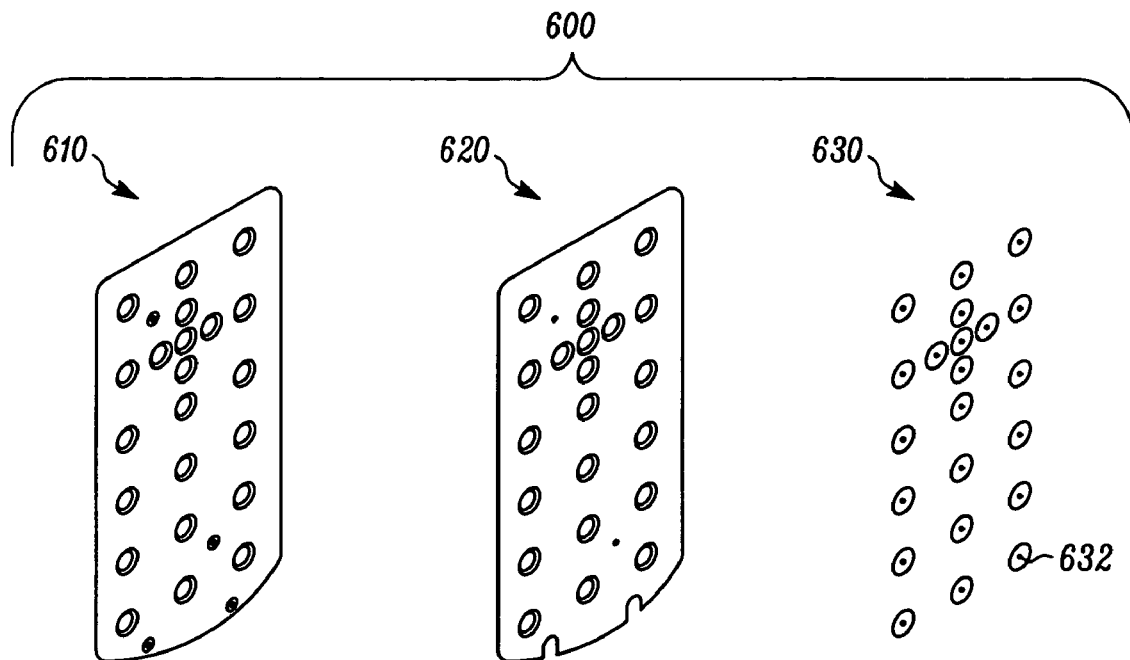


FIG. 6

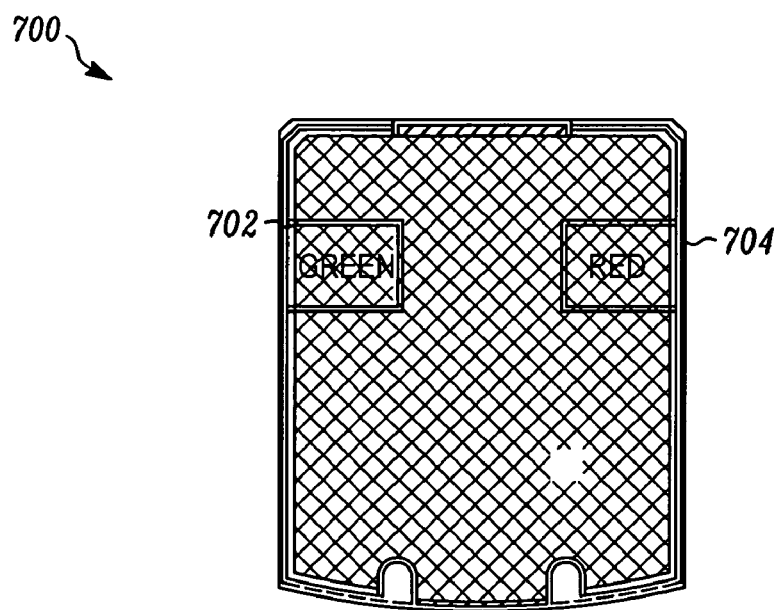


FIG. 7

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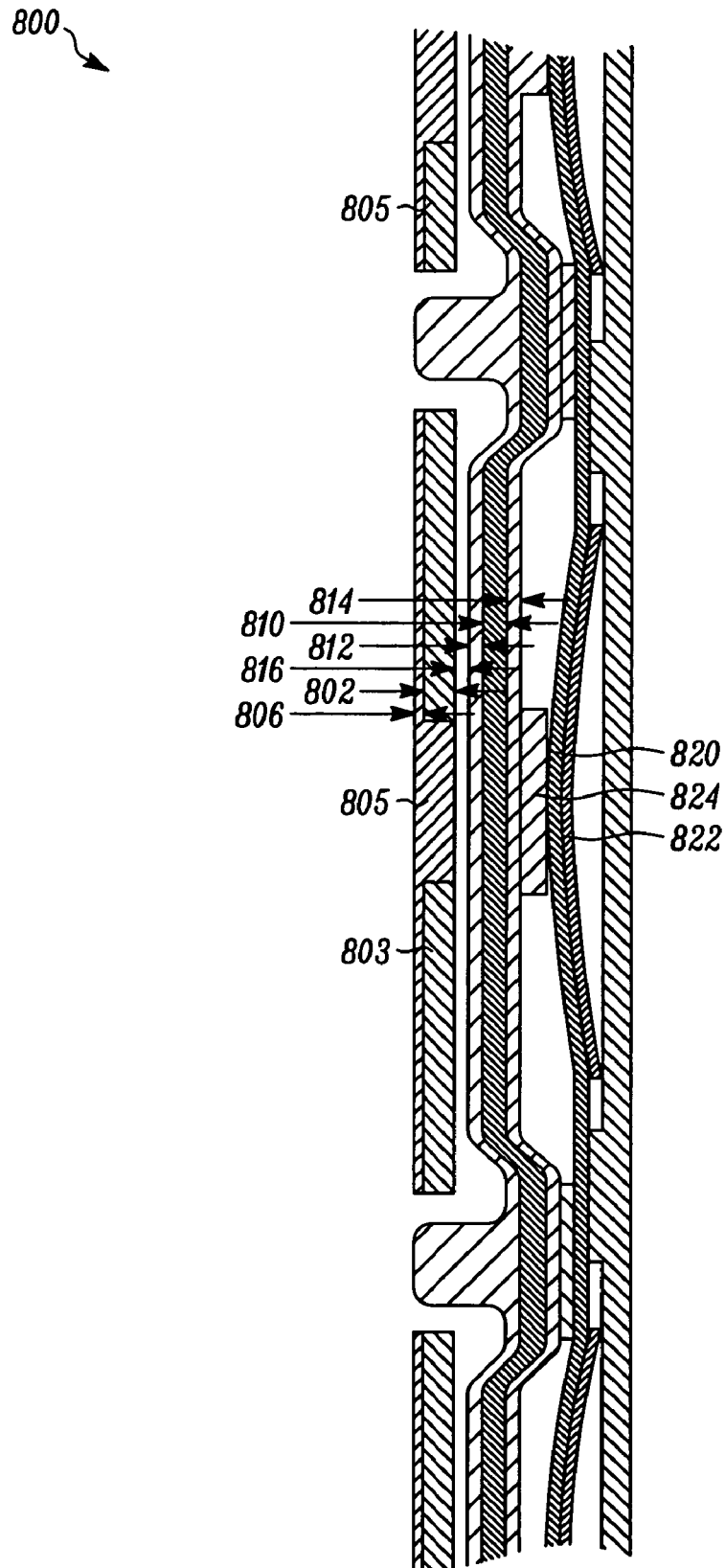


FIG. 8

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900

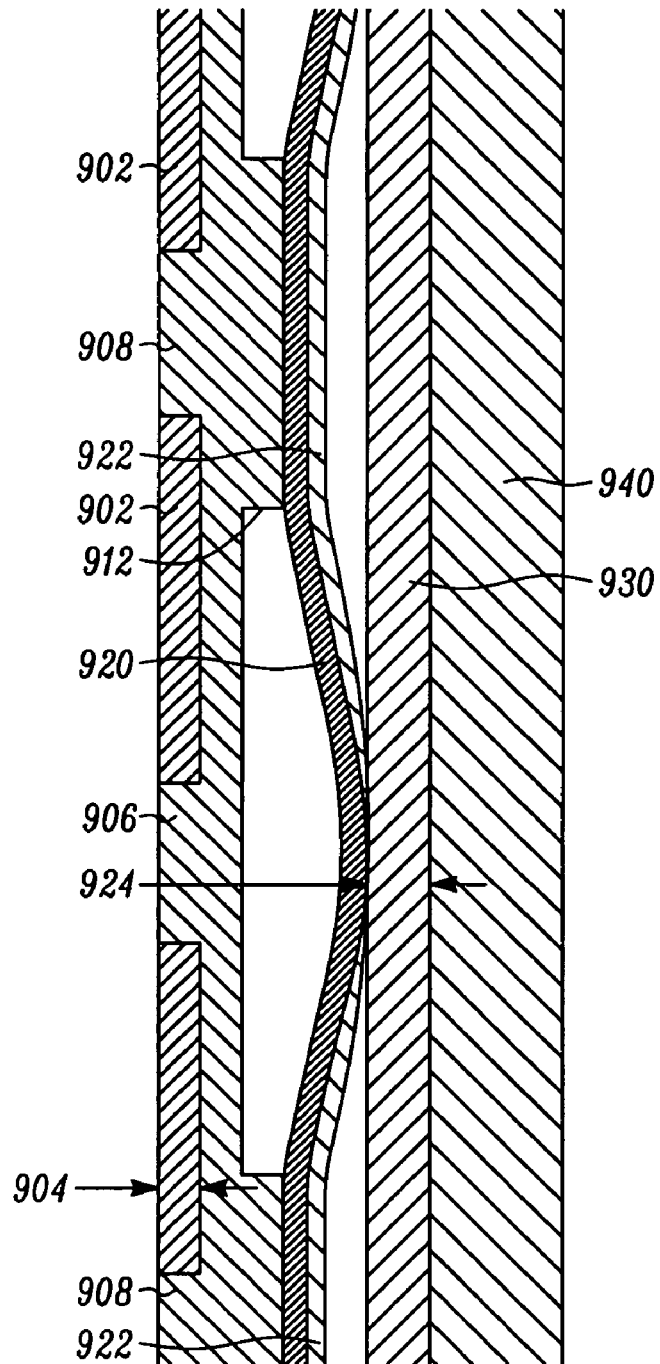


FIG. 9

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THIN KEYPAD ASSEMBLIES AND COMPONENTS FOR ELECTRONICS DEVICES AND METHODS

CROSS REFERENCE TO RELATED APPLICATIONS

The present application is a division of commonly assigned and U.S. application Ser. No. 10/871,664 filed on 18 Jun. 2004 now U.S. Pat. No. 7,070,349, from which benefits under 35 U.S.C. 120 are hereby claimed and the subject matter of which is incorporated herein by reference.

FIELD OF THE DISCLOSURE

The present disclosure relates generally to input devices, and more particularly to keypad assemblies and keypad components, for example, keypad assemblies and components for use in super-thin applications, for example, in wireless communications devices, and corresponding methods.

BACKGROUND OF THE DISCLOSURE

In the past, keypads on cellular radiotelephones have comprised a multi-layered structure having a large part count and that is relatively thick, thus limiting in the thinness of the devices in which the keypad may be integrated. Typical keypads include user interface forming user accessible key caps, which are sometimes interconnected by a web. The key caps are each aligned over a corresponding switch-dome mounted on a carrier made of Mylar or some other carrier material. The carrier and dome assembly is disposed on a switch contact circuitry layer.

To provide keypad lighting, it is known to dispose a luminescent layer between the dome carrier and the key caps. The luminescent layer however includes cutouts through which plunger portions of the key caps may contact the domes to actuate switches on the circuit layer. This configuration lacks luminescence directly below or behind the key caps where it is desired most. Instead, the key caps are lighted indirectly by dispersed light, some of which emanates from circumferential areas surrounding the keys.

The various aspects, features and advantages of the disclosure will become more fully apparent to those having ordinary skill in the art upon careful consideration of the following Detailed Description thereof with the accompanying drawings described below.

BRIEF DESCRIPTION OF THE DRAWINGS

- FIG. 1 is an exemplary keypad assembly.
FIG. 2 is an exemplary key cap layer.
FIG. 3 is another exemplary key cap layer.
FIG. 4 is an exemplary key cap layer fastening tab.
FIG. 5 is an exploded view of an exemplary key cap layer assembly.
FIG. 6 is an exploded diagram of an exemplary switch-dome/luminescent layer.
FIG. 7 is an exemplary luminescent layer having colored portions.
FIG. 8 is a sectional view of a portion of an exemplary keypad assembly.
FIG. 9 is a sectional view of portion of another exemplary keypad assembly.

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DETAILED DESCRIPTION

FIG. 1 illustrates an exploded view of an exemplary keypad assembly 100 comprising generally a user interface keycap layer assembly 110, a switch-dome/luminescent layer assembly 120 and a keypad circuitry layer 130. The exemplary keypad assembly 100 and variations thereof, which will become more apparent from the discussion below, have applications in handheld electronics devices, for example, in calculators, personal organizers, personal digital assistants, wired and wireless communications devices including cellular telephones, and portable computing machines, among other devices.

The exemplary key cap assembly layer 110 comprises generally a key cap layer having a plurality of user interface key caps flexibly coupled to a carrier or carrier portions. FIG. 5 illustrates an exemplary key cap layer 510. In one embodiment, each key cap is flexibly coupled to the carrier along at least one side of the key cap, and other remaining sides of the key cap are separated from other key caps and/or carrier portions by a space, thereby allowing the key caps to flex in response to a tactile depressing action by a user. In another embodiment, each of the plurality of user interface key caps are coupled to the carrier by a flexible carrier portion disposed along not more than one side of the corresponding user interface key cap, wherein other sides of each of the user interface key caps separated from neighboring key caps and/or carrier portions by a space.

FIG. 2 illustrates an exemplary key cap assembly layer 200 viewed from the user interface side thereof. The exemplary keypad assembly layer 200 includes a plurality of key caps, for example, the "7" key cap 210, the "0" key cap 212 and the "9" key cap 214 flexibly coupled by intermediate carrier portions 211 and 213. FIG. 2 also illustrates space between adjacent key caps and between key caps and carrier portions. For example, there is space 220 between key cap 210 and the "*" key cap 216. The same space 220 separates key cap 216 from the carrier portion 211. In FIG. 2, at least some of the plurality of key caps and some of the carrier portions form a unitary member, for example, key caps 210, 212, 214 and carrier portions 211 and 213.

FIG. 3 illustrates another exemplary key cap assembly layer 300 viewed also from the user interface side thereof. The exemplary keypad assembly layer 300 includes a plurality of key caps, for example, the "7" key cap 310, the "0" key cap 312, and the "9" key cap 314 flexibly coupled to intermediate carrier portions 311 and 313. The key cap assembly layer of FIG. 3 is distinguished from that of FIG. 2 by a carrier portion or portions 316 and 318 along lateral sides of the plurality of user interface key caps. The exemplary lateral carrier portions 316 and 318 interconnect all of the rows of key caps, for example, the row containing key caps "1", "5" and "9" and the row containing key caps "4", "8" and "0", thereby forming a unitary member comprising the plurality of key caps and carrier portions. FIG. 3 also illustrates spaces between adjacent key caps and between key caps and the carrier portions. For example, there is space 320 between key cap 310 and the numeral "4" key cap 322. The space 320 also extends between key cap 310 and the carrier portion 316.

FIG. 5 illustrates an exploded view of an exemplary key cap assembly layer 500 comprising a key cap layer 510, and a flexible web 520 applied to a backside of the key cap layer. In one embodiment, the key cap layer including the plurality of user interface key caps flexibly coupled to the carrier is formed from a single sheet of material, for example, stainless steel, or aluminum, or phosphor bronze, or copper alloy

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or some other suitable metal material. In one exemplary embodiment, the key cap layer is grade SS304 stainless steel. In other embodiments, the key cap layer is formed of a synthetic or composite material with suitable rigidity and flexibility characteristics. In some embodiments, the plurality of key caps are defined by forming the spaces in a stamping process or in some other material removal process, for example, by chemical or laser etching, high velocity fluid cutting, etc. In other embodiments, the key caps are formed in a molding or casting or some other fabricating process. In one embodiment, the key cap layer is not more than 1.5 mm thick, and in an exemplary super-thin keypad application the key cap layer is between approximately 0.2 and approximately 0.3 mm thick. These exemplary ranges however are not intended to be limiting. Other exemplary ranges are discussed below.

In FIG. 1, the exemplary key cap assembly layer 110 comprises a plurality of fastening tabs protruding from the side portions of the key cap layer. FIG. 4 is a more detailed view of an exemplary fastening tab 400. The fastening tab 400 includes a first flange 410 extending from a lateral carrier portion 404 of the key cap, and a second flange 420 extending from the first flange. The fastening tab is preferably formed unitarily with the key caps and the carrier from a single sheet of material, though in other embodiments the fastening tabs may be appended by some fastening means. FIG. 4 illustrates a bent corner portion 412 between the first flange and the second flange.

In some embodiments, the corner portion 412 is formed along a thinned portion 414 of the sheet material from which the fastening tab is fabricated. The thinned portion 414 facilitates formation of the corner portion and may be formed by etching or some other process. FIG. 4 also illustrates a corner portion 416 between the lateral carrier portion and the first flange 410. In one embodiment, the corner portion 416 is thinned to facilitate bending and to provide continuity of an edge portion 402 along the lateral carrier portion 404. Unlike conventional key pad assemblies that must be installed from the inside of electronics device housings, keypad assemblies comprising the exemplary key cap layers disclose herein may be installed from the outside of the device housing, and be fastened to the housing by the fastening tabs.

In some embodiments, the flexible portion of the carrier flexibly coupling the plurality of user interface key caps to the carrier portion is relatively thin compared to other portions of the carrier and/or key caps. In FIG. 3, for example, the carrier portion 330 between key caps "1" and "5" has reduced thickness to provide increased flexibility. The amount of any required carrier thinning is dependent many factors, including, among others, the thickness and rigidity of the sheet material from which the carrier and key caps are formed, desired tactile performance, etc. In one embodiment, the thinned carrier portion is formed by etching or by some other material removal process applied to the surface of the sheet material from which the key cap layer is formed.

In one embodiment, a flexible web interconnects at least some of the plurality of user interface key caps. The flexible web generally bridges the space between the plurality of user interface key caps and the space between the key caps and any carrier portions, for example, lateral carrier portions 316 and 318 in FIG. 3. The flexible web generally prevents debris from entering into the space between the keycaps, and in some embodiments forms part of the exterior of the key cap layer.

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In one embodiment, the flexible web interconnecting the plurality of user interface key caps comprises a material different than the material of the user interface key caps. In one exemplary embodiment, the flexible web is a resilient material, for example, silicone. More generally, in other embodiments, the flexible web may be some other elastomer material. In one embodiment, the flexible web is formed of a translucent material that permits emanation of backlighting from luminescent layer, which is discussed further below. The flexible web may be clear or tinted to provide contrast relative to the key caps. In some embodiments, the flexible material is doped with the materials to provide special effects, and/or it may be coated with ink or other coloration.

FIG. 5 illustrates the exemplary key cap assembly layer 500 comprising the key cap layer 510 discussed above, and a flexible web 520 applied to a backside of the key cap layer. The exemplary flexible web 520 may be molded, for example, injection molded or insert molded or otherwise deposited on the backside of the key cap layer. In one embodiment, the flexible web material protrudes into the space between key caps and any carrier portions, and in some embodiments the flexible web forms part of the visible exterior of the key cap layer. In FIG. 5, the exemplary flexible web 520 is applied largely to the carrier and partly to the key caps, leaving portions of the key cap exposed for the application of another backing material discussed further below.

In other embodiments, the flexible web may be a flexible web film disposed over or applied to an outer surface of the key cap layer. In another alternative embodiment, the flexible web and the plurality of user interface key caps comprise a common material forming the unitary member. According to this alternative embodiment, the flexible web is formed from the sheet material from which the key cap layer is formed. In one embodiment, the flexible web portions between key caps and any carrier portions is formed by reducing the thickness of portions of the sheet material, for example, by etching. In this embodiment, the removed portion of the sheet material forms the space between individual key caps, and the reduced thickness portion of the sheet material also forms the flexible web bridging the space.

In one exemplary key cap layer assembly, a backing material is disposed on the backside of corresponding key caps. In some embodiments, the backing material provides rigidity for the key caps, particularly in applications where the key cap is relatively thin and also in embodiments where the key cap material is insufficiently rigid to provide the desired tactile performance. In the exemplary embodiment of FIG. 5, backing material portions 530 are disposed on corresponding key caps of the key cap layer 510, for example, backing portion 502 is applied to key cap 512.

In some embodiments, the backing material is different than the material constituting the flexible web. For the example, the flexible web may be a relatively resilient or elastic material and the backing material may be a relatively rigid or hard material. In one exemplary embodiment, the backing is a TOYOLAC 900 Series material. In some embodiments, the backing material is doped with materials to provide special effects, and/or it may be coated with ink or other coloration.

In one exemplary application process, the backing material is applied to a backside of a plurality of key caps, for example, keycaps flexible interconnected by a carrier portion. In embodiments where multiple user interface key caps are flexibly coupled to one or more carrier portions, a flexible web is applied to the backside of the key cap layer.

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In one embodiment, the flexible web is applied to the backside of the key cap layer. The flexible web may be applied by any application procedure, for example, an insert molding process. In an alternative embodiment, the resilient material is applied to the key cap first, so that the resilient material forms a wall portion surrounding the portion of the key cap where the backing material is desired. The backing material is then applied to the portion of the key cap surrounded by the resilient material wall portion, wherein the resilient material wall portion captures the backing material applied to the key cap. In another alternative embodiment, the backing material is part of the flexible web disposed on the backside of the key caps.

In some embodiments, some or all of the key caps have artwork disposed thereon for indicating functionality and/or for providing other information associated with the corresponding key cap. The artwork may be printed or imprinted on the key caps. In other embodiments, embossed or intaglio artwork is applied to the key caps, for example, to a home key like the "5" key, or to all of the key caps to provide a tactile interface.

The exemplary key cap layers **200** and **300** of FIGS. **2** and **3** comprise key caps including artwork apertures. The exemplary artwork apertures include alphanumeric characters and other functional symbols suitable for use in a communications device application. In some embodiments, the key cap backing material covers or fills the artwork aperture. In one embodiment, the backing material is a clear or tinted translucent material that permits light to emanate from a luminescent layer disposed below the key caps as discussed further below. According to a related aspect of the disclosure, the backing material disposed in the artwork aperture may be used to capture portions of the artwork that would otherwise require support structure or be susceptible to dislodgement. These captured artwork portions include, for example, the center portions of the numerals "0", "4", "6", "8" etc. A tactile interface may be formed on some or all of the key caps as discussed above or by allowing some of the backing material to protrude through the artwork aperture beyond the surface of the key cap. The tactile interface may also be produced by embossing or by an intaglio process.

According to another process for making the key cap layer assembly, key cap function or identification artwork is etched in a relatively thin metal sheet, for example, a thickness between 0.2 mm and 0.3 mm. Then a hard translucent plastic material is molded to a backside of the metal sheet where the key caps will be defined. Next, the key cap perimeters are etched in the thin sheet. And then the flexible web is formed around the key cap perimeter, as discussed above. The flexible web allows the key caps to move independently, and it also prevents the key caps from being pulled up. As a final step, the key caps may be subject to finishing operations to polish the cosmetic surface and/or to remove excess molded in material from the key cap layer.

In FIG. **1**, the switch-dome/luminescent layer **120** comprises a luminescent layer, for example, an electro-luminescent layer. In the exemplary embodiment, the luminescent layer functions as a carrier for an array of switch-domes aligned with corresponding key caps of the key cap layer. FIG. **6** is an exploded diagram of an exemplary switch-dome/luminescent layer assembly **600**. The exemplary assembly comprises a luminescent layer **610**. In one embodiment, the luminescent layer **610** is an electro-luminescent layer, for example, the Durel DFLX-665 flexible electro-luminescent lamp manufactured by Rogers Corpo-

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ration, Durel Division, Chandler, Ariz. In other embodiments, the luminescent layer may comprise other luminescent materials.

In one embodiment, the luminescent layer is colored or tinted to provide colored backlighting. In FIG. **7**, the exemplary luminescent layer includes a green colored or tinted portion **702** and a red colored or tinted portion **704**. The exemplary green and red colored portions may be located behind ON or SEND keys and OFF or END keys, respectively. In other embodiments, other colors may be used on these and other keys.

FIG. **6** also illustrates an adhesive layer **620**, for example, a screen-printed adhesive, which is adhered to a side of the luminescent layer **610**. Also included with the switch-dome/luminescent layer is an array of switch domes **630** adhered to the luminescent layer **610** by the adhesive layer **620** in alignment with the corresponding key caps. Alternatively, the domes **630** may be adhered to the luminescent layer **610** by discrete amounts of adhesive, without the requirement for the exemplary adhesive layer. In other embodiments, the switch-domes may be coupled to the luminescent layer by some other fastening means. Carrying the domes on the luminescent layer eliminates the need for the dedicated carrier, e.g., the Mylar layer, used in conventional designs.

In the exemplary embodiment, the switch-domes array **630** is adhered to a backside of the luminescent layer **610** by the intermediate adhesive layer **620**. In one embodiment, the luminescent layer is a pliable material that conforms about the domed surface of the switch dome, thereby ensuring sufficient adhesion with the adhesive layer. In an alternative embodiment, the domes may be disposed between the luminescent layer and some other layer. Locating the switch-domes on the backside of the luminescent layer ensures that light emanates from the luminescent layer directly behind the key caps. In an alternative embodiment, the switch-domes are disposed on a front-side of, or atop, the luminescent layer. The use of a clear or translucent switch-dome will reduce any obstruction, by the dome, of light emanating from directly behind the key caps. In the exemplary embodiment, the switch-domes include a nipple **632**, which provides good tactile performance by ensuring that the dome sweet spot is actuated. In other embodiments, the protrusion may be located in or on the backing material disposed on the key caps.

In alternative embodiments, the luminescent layer includes cutout portions that accommodate the switch-domes or portions thereof, thereby reducing the thickness of the assembly resulting from layer stacking. In other embodiments, a conventional carrier layer, for example, a Mylar layer, carries the switch-domes. The switch-domes carrier layer is positioned so that the domes adhered or otherwise fastened thereto are aligned with corresponding switches on a keypad circuitry layer. In FIG. **1**, the exemplary luminescent layer dome carrier **120** is positioned so that the plurality of switch-domes, e.g., domes **122** and **124**, disposed thereon are positioned over corresponding switches, e.g., switch **132** and **134**, on the circuitry layer **130**. The resulting assembly of the keypad layer assembly **110**, the switch-dome/luminescent layer **120** and the circuitry layer provides for a relatively compact keypad assembly having an overall thickness between approximately 1.0 mm and 5.0 mm.

In FIG. **8**, a sectional portion of an exemplary keypad assembly **800** comprises an exemplary keypad assembly incorporating features discussed above. The section portion of FIG. **8** corresponds, for example, to a section through the directional cursor controller **230** and selection key **232** in FIG. **2**. A key cap layer **802** includes a selection key cap **803**

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and a directional cursor controller input **805** corresponding to the selection key **232** and cursor controller **230** of FIG. 2. The exemplary key cap layer is approximately 0.15 mm and includes a surface coating **806**, for example, Urethane. The selection key cap includes an artwork aperture filed with a translucent material **805** to permit the passage of light from a backlight source, discussed below. A base film **810**, which is preferably transparent, is co-molded between top and bottom silicone films **812** and **814**, respectively. The key top layer is adhered to the base film by a glue layer **816**. A luminescent layer **820** functions as a dome carrier. An exemplary dome **822** is located below the key cap **803**. A plunger **824** is disposed between the key cap **803** and the dome **822**. The plunger may be a part of, or attached, to the dome or to structure opposite the dome. The overall thickness of the exemplary keypad layer is less than approximately 1.2 mm.

In FIG. 9, another exemplary keypad assembly **900** comprises a key cap layer including a first key cap **902** and a second key cap **904**. A flexible web portion **906** is disposed between adjacent key caps **902** and **904** and other neighboring key caps. A backing material **908** is disposed on a backside of key cap **902** and protrudes through an artwork aperture in the key cap, as illustrated. A plunger **912** is formed integrally with the backing material a switch-dome below the key cap **902**. A luminescent layer **920** is disposed below the key cap layer assembly. The exemplary luminescent layer **920** functions as a carrier for switch-domes **922**, which are adhered thereto by an intermediate adhesive layer **924**, as discussed above. The luminescent layer and switch-domes are disposed on a circuit board **930**, which is mounted in a housing **940**.

While the present disclosure and what the best modes of the inventions have been described in a manner establishing possession thereof by the inventors and enabling those of ordinary skill in the art to make and use the same, it will be understood and appreciated that there are many equivalents to the exemplary embodiments disclosed herein and that modifications and variations may be made thereto without departing from the scope and spirit of the inventions, which are to be limited not by the exemplary embodiments but by the appended claims.

What is claimed is:

1. A keypad assembly, the keypad assembly comprising: a plurality of key caps flexibly coupled to a carrier portion, the plurality of key caps having a user interface side and a backside, the plurality of key caps and the carrier portion constitute a substantially planar unitary member, the plurality of key caps defined by slots through the unitary member, the slots devoid of material from which the plurality of key caps and the carrier are formed, no portion of the carrier portion extending into the slots between adjacent key caps; a resilient material bridging the slots between the plurality of key caps; a luminescent layer disposed toward the backside of the plurality of key caps, the luminescent layer carrying a plurality of switch domes, the plurality of switch domes each aligned with a corresponding one of the plurality of key caps.
2. The keypad assembly of claim 1, the luminescent layer disposed between the plurality of switch domes and the plurality of key caps flexibly coupled to the carrier portion.
3. The keypad assembly of claim 2 further comprising, a keypad circuitry layer, the luminescent layer disposed

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between the keypad circuitry layer and the plurality of key caps flexibly coupled to the carrier portion, the plurality of switch domes disposed between the keypad circuitry layer and the luminescent layer.

4. The keypad assembly of claim 2, the resilient material is a translucent material.

5. The keypad assembly of claim 2 further comprising, a backing material disposed on a backside of at least some of the plurality of key caps.

6. The keypad assembly of claim 2, at least one of the plurality of key caps includes an artwork aperture.

7. The keypad assembly of claim 6, the artwork aperture covered by a translucent material.

8. The keypad assembly of claim 1, the plurality of key caps defined by and located between nested slots formed through the unitary member.

9. The keypad assembly of claim 8, the nested slots having a substantially serpentine configuration.

10. A keypad assembly, the keypad assembly comprising: a user interface layer including a plurality of key caps flexibly coupled to a carrier portion, the plurality of key caps defined by slots through a unitary member, the slots devoid of material from which the plurality of key caps and the carrier portion are formed, the plurality of key caps and the carrier portion constituting the unitary member;

a resilient material bridging the slots between the plurality of key caps,

the resilient material having a different flexibility characteristic than the material from which the plurality of key caps and the carrier are formed;

a luminescent layer disposed below the user interface layer,

the luminescent layer carrying a plurality of switch domes on one side thereof, the plurality of switch domes each aligned with a corresponding one of the plurality of key caps of the user interface layer.

11. The keypad assembly of claim 10, the luminescent layer disposed between the plurality of switch domes and the key caps of the user interface layer.

12. The keypad assembly of claim 10 further comprising, a keypad circuitry layer,

the luminescent layer disposed between the keypad circuitry layer and the plurality of key caps flexibly coupled to the carrier portion, the plurality of switch domes disposed between the keypad circuitry layer and the luminescent layer.

13. The keypad assembly of claim 10,

the plurality of key caps defined by and located between nested slots formed through the unitary member.

14. The keypad assembly of claim 13, each nested slot having a substantially serpentine configuration.

15. A keypad, comprising:

a plurality of user interface key caps flexibly coupled to a carrier,

the plurality of user interface key caps defined by voids formed in a unitary member, the voids devoid of material from which the plurality of user interface key caps and the carrier are formed;

a flexible web bridging the voids between the plurality of user interface key caps,

the plurality of user interface key caps, the carrier and the flexible web constitute the unitary member;

a luminescent key caps disposed below the plurality of user interface layer,

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the luminescent layer carrying a plurality of switch domes on one side thereof, the plurality of switch domes each aligned with a corresponding one of the plurality of user interface key caps.

16. The keypad of claim 15, a portion of the luminescent layer disposed between the plurality of switch domes and the plurality of user interface key caps. 5

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17. The keypad of claim 15, the plurality of user interface key caps defined by and located between two nested voids formed in the unitary member, each of the nested voids having a substantially serpentine configuration.

* * * * *

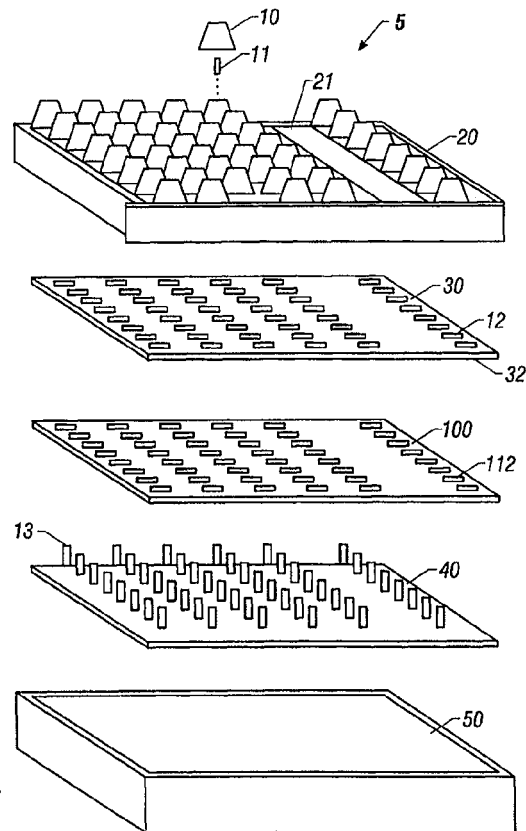
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(21) International Application Number: PCT/US99/16523 (22) International Filing Date: 21 July 1999 (21.07.99) (30) Priority Data: 09/139,927 26 August 1998 (26.08.98) US (71) Applicant: TWENTY-FIRST CENTURY TECHNOLOGY, INC. [US/US]; 33 Caryville Crossing, Bellingham, MA 02019 (US). (72) Inventors: KATRINECZ, Andrew, J., Jr.; 8 Hickory Avenue, Shalimar, FL 32579 (US). BYRD, David, C.; 33 Caryville Crossing, Ballingham, MA 02019 (US). (74) Agent: STELLITANO, Patrick; Fulbright & Jaworski L.L.P., 29th floor, 865 S. Figueroa Street, Los Angeles, CA 90017-2576 (US).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: LOW POWER, LOW COST ILLUMINATED KEYBOARDS AND KEYPADS**(57) Abstract**

Methods are provided for adapting existing manufacturing processes for non-illuminated data-entry devices and mice to the manufacture of illuminated data-entry devices. Luminescent sheets (100) of one or more colors underlying optically transmissive device components provide illumination of the components visual to a user of the device (5). The optically transmissive components may be doped with phosphors or tinted to provide components that emit light of different colors. The intensity of illumination of the luminescent sheet (100) may be controlled by the user and may vary in response to the background light of the environment.

**EXHIBIT D**

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LOW POWER, LOW COST ILLUMINATED
KEYBOARDS AND KEYPADS

APPLICATION FOR PATENT

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Specification

Field of the Invention

The present invention relates to illumination of keyboards, keypads, and other data entry devices.

Background of the Invention

10 Keyboards, keypads, mice, and other data entry devices (hereinafter referred to generally as keyboards) are used in a variety of applications for entry of alphanumeric and other types of data into a machine such as a calculator or computer. Keyboards have been developed that are light weight, low in cost, and relatively easy to manufacture. However, difficulty has been encountered
15 in the development of illuminated keyboards that are light weight, low in cost and easy to manufacture. For example, methods have been developed which require placement of a light source below and in proximity of each key of the keyboard, and each of these light sources must be connected to a power supply, rendering the manufacture of such a keyboard difficult and expensive.
20 Another method for illuminating a keyboard requires a single light source that provides light to each key by means of optical light paths. The optical light paths are difficult to construct in order to illuminate the keys uniformly and efficiently. These methods have the disadvantage of requiring considerable power for illumination, an important consideration for laptop computers and calculators
25 operating under battery power. Moreover, all of these methods are unsuitable for many of the new keyboards that have been developed which are not flat, such as ergonomic keyboards that arc upward and outward from a horizontal surface. More generally, none of the methods of the prior art are readily

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adaptable to existing keyboard manufacturing processes. Thus, the manufacturing process for manufacturing ordinary non-illuminated keyboards cannot readily and easily be adapted to the manufacture of illuminated keyboards.

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Summary of the Invention

An object of the present invention is to provide methods for manufacture of illuminated keyboards that can easily be adapted and incorporated into the manufacture processes that exist for non-illuminated keyboards.

Another object of the present invention is to provide methods for
10 manufacture of illuminated keyboards that may be applied to keyboards of any shape, including ergonomic keyboards.

Another object of the present invention is to provide uniform illumination of the keys in a manner that does not require implementation of complex optical pathways or separate light sources for each key, and further provides
15 illumination that consumes very low power.

Yet another object of the present invention is to provide illumination that possesses controllable visual functionality as well as aesthetic attributes.

According to one aspect of the present invention a flexible, thin, low-power, inexpensive, luminescent sheet is adhered to the surface of the key
20 board well plate of a keyboard. The key board well plate is manufactured in any manner and shape as required by the manufacturing process typically used and as required by the shape of the keyboard to be produced. The luminescent sheet may be adhered to the upper surface of the keyboard well plate. Alternatively, the luminescent sheet may be placed between the keyboard well
25 plate and the circuit board of the keyboard. In this configuration the keyboard well plate is made from any optically transmissive material possessing sufficient rigidity to function as a key board well plate. Such materials, such as plexi-glass and other moldable plastics are well known in the art. The keys are also manufactured as required by the manufacturing process ordinarily used, except
30 that the keys are made from an optically transmissive material, and may further contain phosphorescent material that glows residually during and after

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illumination. The luminescent sheet may be easily connected to a battery or any available power source, including the source that provides power to the keyboard itself. Further, the luminescent sheet may be connected to a device such as a rheostat to allow the user to vary the intensity of illumination. Also, a photo cell may be connected to the source of power of the luminescent sheet to cause the intensity of light from the sheet to automatically vary in response to the darkness of the environment in which the keyboard is used.

According to the present invention, luminescent sheets of different colors can be placed under different sections of keys to improve visual differentiation of key groups. Also, the optically transmissive keys can be tinted so that the same luminescent sheets will cause keys tinted by different colors to appear in different colors. Similarly, the top plate of the keyboard which is normally opaque can also be manufactured from an optically transmissive material so that the entire upper surface of the keyboard will be illuminated. The top plate may be tinted to provide visual contrast. Also, one luminescent sheet of one color can be applied to illuminate the top plate with a color that is different from the color of the luminescent sheet that illuminates the keys. All of these features may be combined to provide an illuminated keyboard that possesses controllable visual functionality and aesthetic attributes. Further, the methods of the present invention disclosed herein can be implemented by persons of ordinary skill in the art to convert existing keyboards into illuminated keyboards.

These and other features, aspects and advantages of the present invention will become apparent and better understood with reference to the following written description, attached drawings, and appended claims.

Brief Description of the Drawings

Figure 1 illustrates a construction of a typical keyboard.

Figure 2 illustrates placement of a luminescent sheet below a well plate.

Figure 3 illustrates construction and electrical connection of a typical luminescent sheet.

Figure 4 illustrates an embodiment for illumination of a top plate.

Figure 5 illustrates placement of a luminescent sheet above a well plate.

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Detailed Description of the Preferred Embodiments

A functional diagram of the construction of a typical keyboard is shown in Figure 1. Typically, a keyboard 5 is comprised of keypads 10, keystems 11, a keyboard top plate 20, a keyboard well plate 30, a circuit board 40 with key spring switches 13 and a key board bottom plate 50. Typically all of these components are manufactured of opaque materials. Keystems 11 are inserted through holes 12 in keyboard well plate 30. Holes 12 in keyboard well plate 30 are aligned with key spring switches 13 of circuit board 40. Circuit board 40 is secured to key board bottom plate 50. Key board top plate 20 fits over or otherwise attaches to key board bottom plate 50, and thereby provides enclosure for the keyboard. Typically, keys are grouped in a keyboard according to function. For example, on a typical keyboard for typing words and data into a word processor, a set of alphabet keys, number keys, and other certain symbol keys are grouped together in a traditional typewriter key layout, herein referred to as the typewriter keys. Another separately grouped set of keys are the arrow keys which allow control of a cursor displayed on a video monitor. Function keys are separately grouped in a single line across the upper portion of the key board. Etc. These separately grouped sets of keys will be referred to as key groups. Top plate 20 is designed so that when placed in position, the keypads 10 extend through top plate 20 while the areas between key groups are covered by surface 21 of top plate 20.

A preferred embodiment of the present invention is illustrated in Figure 2. A flexible luminescent sheet 100 is adhered to the lower surface 32 of keyboard well plate 30 that faces the surface of circuit board 40. Any suitable substance known in the art that is optically transmissive may be used to adhere luminescent sheet 100 to lower surface 32. Alternatively, flexible luminescent sheet 100 may be placed between keyboard well plate 30 and circuit board 40 without the use of an adhering substance, if luminescent sheet 100 will be sufficiently compressed between keyboard well plate 30 and circuit board 40 to remain in place. Holes 112 are made in flexible luminescent sheet 100 to align with holes 12 in keyboard well plate 30.

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Luminescent sheet 100 is comprised of a commercially available electro-luminescent (E-L) lamp. E-L lamps are solid state devices constructed of thin phosphor-coated plastic sheets with conductive surfaces. When a power source is applied to the conductive surfaces the phosphors illuminate and light is emitted from the entire surface. E-L lamps are thin, flexible and can be twisted, bent or formed into any shape. These lamps draw very little power and produce very little heat. A typical construction of luminescent sheet 100 is illustrated in Figure 3A. Each conductive surface, metallized polyester film 131 and rear electrode 132, is connected at an edge of sheet 100 by electric leads 105. The upper conductive surface, metallized polyester film 131, is an optically transmissive conductor. When leads 105 are connected to a power source 110, the entire sheet illuminates with an intensity that is substantially uniform across the entire surface of sheet 100. Luminescent sheets are commercially available in a variety of colors such as white, yellow, blue and green. They may be cut to order by the manufacturer, who will provide electrical tabs connected to the conductive surfaces for connection to an electrical power source. For example, flexible luminescent sheets may be obtained from SEG Corporation. SEG may be contacted through their Internet address: www.flashseg.com.

Flexible luminescent sheet 100 is connected through leads 105 to any convenient power source 110, which may be a battery or the power source of keyboard 5. The intensity of light from luminescent sheet 100 can be varied using an intensity control device 85 such as a rheostat in series with power source 110, as illustrated in Figure 3B. In addition, or in the alternative as shown in Figure 3B, intensity may be controlled by providing a photosensitive device 90, such as a photo-cell, and associated circuitry to control the intensity of luminescent sheet 100 in response to the intensity of light in the environment in which keyboard 5 is used. A variety of methods, devices, and circuitry for controlling the intensity of luminescent sheet 100 will readily be recognized by persons of ordinary skill in the art.

In this embodiment, keyboard well plate 30 is manufactured from an optically transmissive material. Any optically transmissive material that is sufficiently rigid to achieve the ordinary purposes of a keyboard well plate will

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suffice. Even a partially opaque optically transmissive material may be used as long as light of sufficient intensity is transmitted through keyboard well plate 30 to provide illumination visual to the user. Examples of materials that can be used for this purpose are plexiglass and other optically transmissive plastics.

5 Other suitable materials will be known to persons of ordinary skill in the art. Similarly, keypads 10 and key stems 11 will be manufactured from an optically transmissive material, that is, materials that are at most only partially opaque and transmit sufficient light intensity to render the keys visual to the user. In addition, keypads 10 may comprise phosphors that will illuminate in response

10 to the light received from luminescent sheet 100. Thus, in this embodiment, luminescent sheet 100 transmits light through keyboard well plate 30 and through keypads 10 to provide visual illumination of keyboard 5.

It may be desirable in some applications to provide a keyboard in which different keys, key groups and keyboard areas appear in different colors of

15 illumination. A variety of methods can be implemented to achieve this according to the methods of the present invention. One method is to provide a plurality of luminescent sheets 100 of different colors under different portions of keyboard well plate 30 to cause different keys, keygroups and keyboard areas to be illuminated by different colors. Another method for providing keys

20 of different colors is to tint the optically transmissive material from which the keys are made, so that when the keys are illuminated by a luminescent sheet 100, the key color will be a composite of the light from the luminescent sheet and the tint of the keys. Also, the optically transmissive keys from which the keys are made may be mixed with phosphors of different colors when

25 illuminated by luminescent sheet 100.

A further variation of the method of illuminating a keyboard as described above is to manufacture top plate 20 of an optically transmissive material so that light from luminescent sheet 100 will transmit through the top plate to provide illumination of the top plate surface areas as well as the keys. Top plate

30 20 can be illuminated with a separate luminescent sheet 100 of a desired color by placing the separate luminescent sheet 100 under the surface area 22 of top plate 20, such that the upper surface are 131 of luminescent sheet 100 is

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aligned with surface area 22 of top plate 20, as illustrated in Figure 4. Top plate 20 can also be made of an optically transmissive material that is tinted with a desired color and, or, mixed with phosphors to provide luminescence in response to light received from luminescent sheet 100.

5 In an alternative embodiment, luminescent sheet 100 can be adhered to the upper surface 31 of key board well plate 30, as illustrated in Figure 5. In this configuration, keyboard well plate 40 can be made of any opaque material as is usually used, because light from luminescent sheet 100 illuminates the keys more directly without the necessity of transmission through key board well plate
10 30. Also, the substance used to adhere luminescent sheet 100 to upper surface 31 of keyboard well plate 30 need not be an optically transmissive material in this configuration. In this configuration the keypads 10 are made of optically transmissive material, and top plate 20 can also be illuminated as described above.

15 An advantage of using a flexible luminescent sheet is the ability to provide illumination for non-traditional keyboards, such as ergonomic keyboards that are arcuate in shape in one or more spatial directions. Moreover, the methods of keyboard illumination disclosed herein can readily be adapted to any keyboard manufacturing process. This would enable a manufacturer of
20 non-illuminated keyboards to quickly and inexpensively become a manufacturer of illuminated keyboards without developing an entirely new manufacturing process to accommodate specialized configurations. Further, the methods of the present invention disclosed herein can be implemented by any person of ordinary skill in the art to convert existing keyboards into illuminated keyboards.
25 Moreover, the methods of the present invention disclosed herein can be applied to the manufacture of an illuminated mouse, by making the mouse buttons and exterior enclosure of an optically transmissive material and underlying these components with one or more luminescent sheets connected to a suitable power source.

30 While this invention has been described with reference to the foregoing preferred embodiments, the scope of the present invention is not limited by the

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foregoing written description. Rather, the scope of the present invention is defined by the following claims and equivalents thereof.

We claim:

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PCT/US99/16523

CLAIMS

1. A method for illuminating one or more components of a data-entry apparatus comprising the steps of:
 - making said one or more components of optically transmissive material; and
 - providing a luminescent sheet underlying said one or more components to provide an intensity of illumination to said components visual to a user of the apparatus.
2. The method of claim 1 further comprising the steps of:
 - providing a photosensitive device to control the intensity of illumination provided by said luminescent sheet in response to an intensity of light in an environment external to said apparatus.
3. The method of claim 1, further comprising the steps of:
 - providing an intensity control device to enable the user of said apparatus to vary the intensity of illumination provided by said luminescent sheet.
4. The method of claim 1, wherein luminescent sheets of different colors illuminate different components of said apparatus.
5. The method of claim 1, wherein different ones of said components may be tinted with different colors to emit light of different colors.
6. The method of claim 1, wherein different ones of said components may comprise phosphors of different colors to emit light of different colors.
7. A method for illuminating keys of a data-entry apparatus comprising the steps of:
 - making said keys of an optically transmissive material;

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PCT/US99/16523

providing one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus.

8. The method of claim 7, wherein different keys or groups of keys are illuminated by different colors by providing luminescent sheets that emit light of different colors underlying different keys or groups of keys.

9. The method of claim 7, wherein different keys or groups of keys are tinted with different colors to provide illuminated keys or groups of keys that emit light of different colors.

10. The method of claim 7, wherein different keys or groups of keys are made of optically transmissive materials comprising phosphors that emit light of different colors to provide keys or groups of keys that emit light of different colors.

11. The method of claim 7, further comprising the step of:
providing an optically transmissive top plate with a surface and areas through which said keys extend.

12. The method of claim 11, wherein said top plate comprises phosphors to emit light of a desired color.

13. The method of claim 11, wherein said top plate is tinted to emit light of a desired color.

14. The method of claim 11, further comprising the step of:
providing one or more luminescent sheets underlying said top plate to provide illumination of said top plate visual to said user.

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PCT/US99/16523

15. A data-entry apparatus with one or more illuminated components comprising:
- one or more components comprising an optically transmissive material; and
- 5 a flexible luminescent sheet underlying said one or more components to provide an intensity of illumination to said components visual to a user of the apparatus.
16. The apparatus of claim 15 further comprising:
- a photosensitive device to control the intensity of illumination
- 10 provided by said luminescent sheet in response to an intensity of light in an environment external to said apparatus.
17. The apparatus of claim 15, further comprising:
- an intensity control device to enable a user of said apparatus to vary the intensity of illumination provided by said luminescent sheet.
- 15 18. The apparatus of claim 15, wherein luminescent sheets of different colors illuminate different components of said apparatus.
19. The method of claim 15, wherein said luminescent sheet is adhered to an underlying surface of one of said one or more components.
20. A data entry apparatus with illuminated keys comprising:
- 20 keys of an optically transmissive material;
- one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus.
21. The apparatus of claim 20, wherein different keys or groups of keys emit
- 25 light of different colors.

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PCT/US99/16523

22. The apparatus of claim 20, wherein one or more of said keys are made of an optically transmissive material comprising phosphors.
23. The apparatus of claim 20, further comprising:
an optically transmissive key board top plate.
- 5 24. The apparatus of claim 21, wherein said top plate emits light of a desired color.
25. The apparatus of claim 24, further comprising;
one or more luminescent sheets underlying said top plate to provide illumination of said top plate visual to said user.
- 10 26. An illuminated mouse comprising:
one or more components comprising an optically transmissive material; and
a flexible luminescent sheet underlying said one or more components to provide an intensity of illumination to said components
15 visual to a user of the apparatus.

1/5

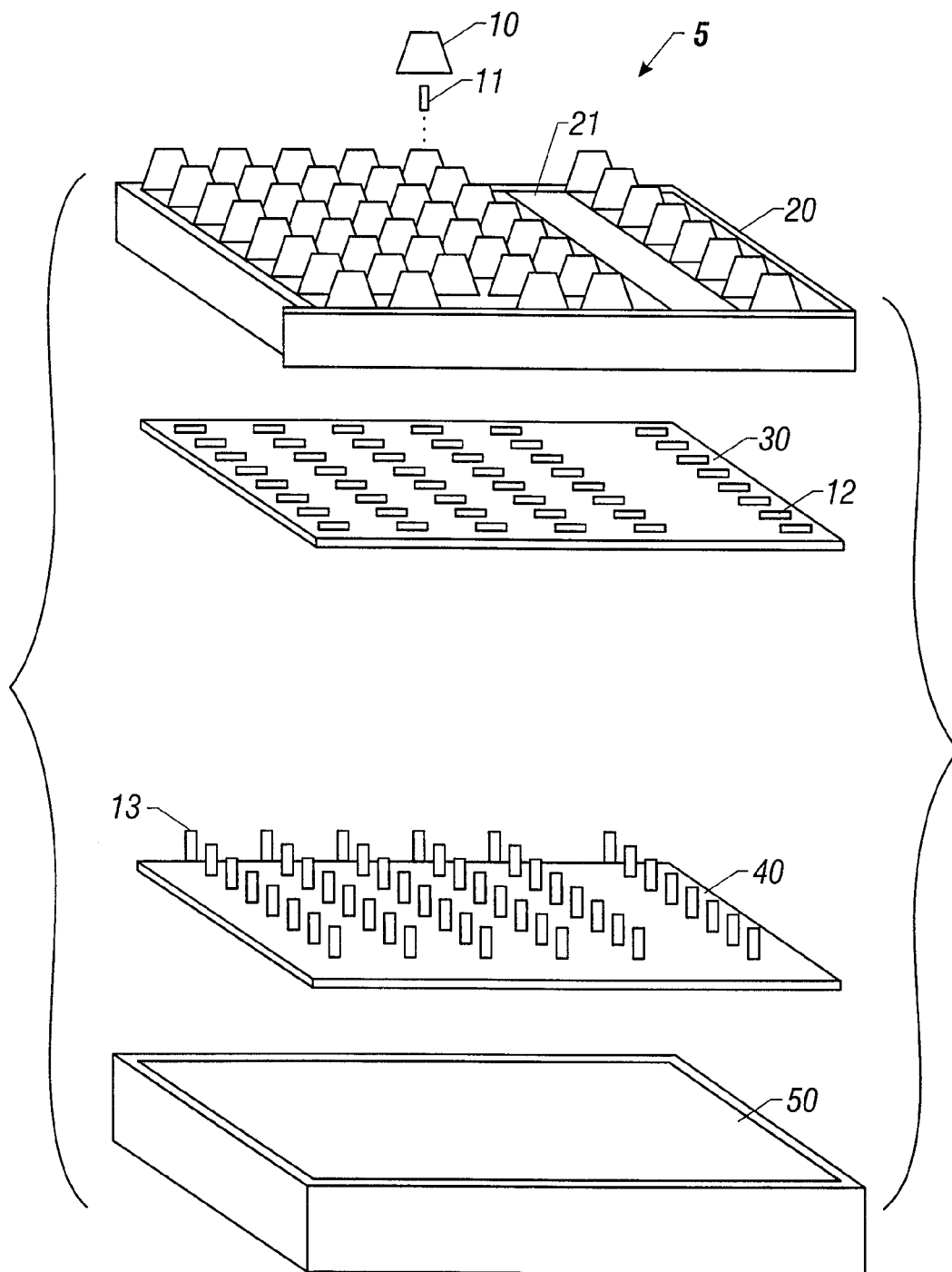


FIG. 1

SUBSTITUTE SHEET (RULE 26)

KATRINECZ-MMLLC 001334

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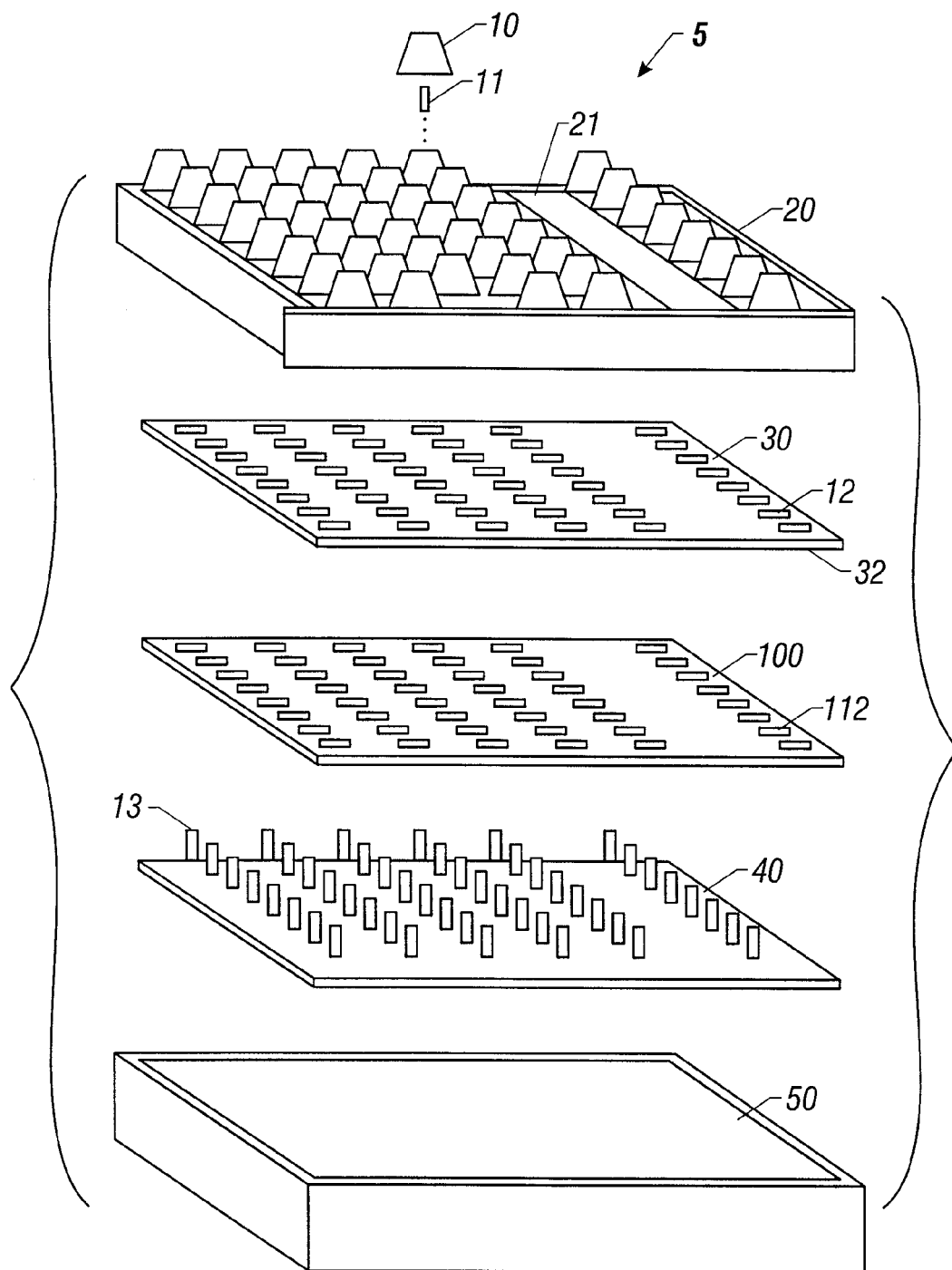
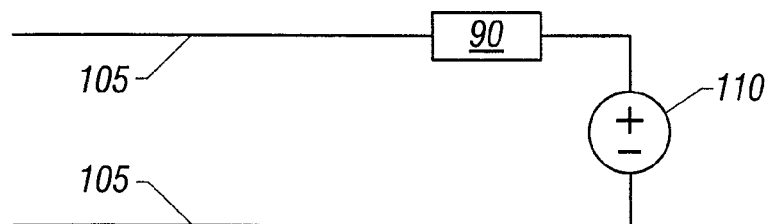
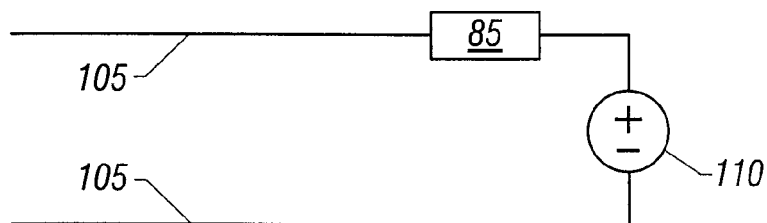
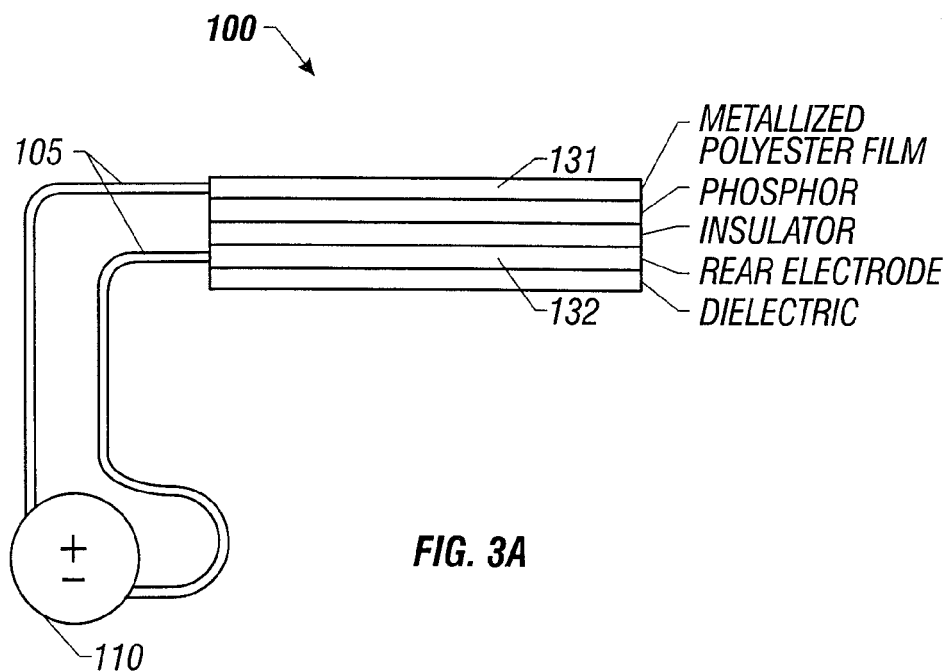


FIG. 2
SUBSTITUTE SHEET (RULE 26)

3/5

4/5

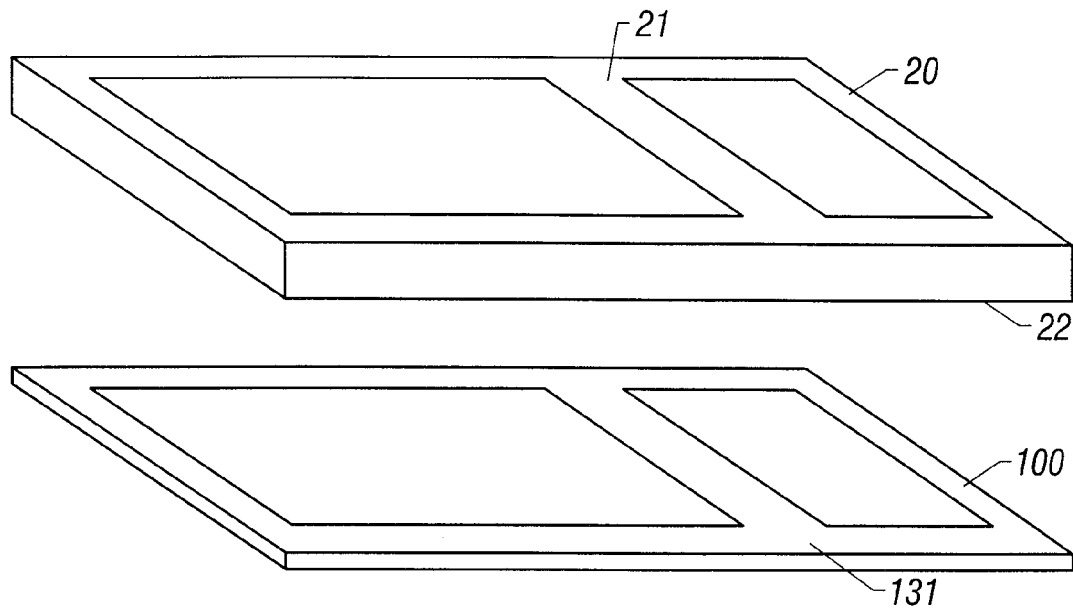


FIG. 4

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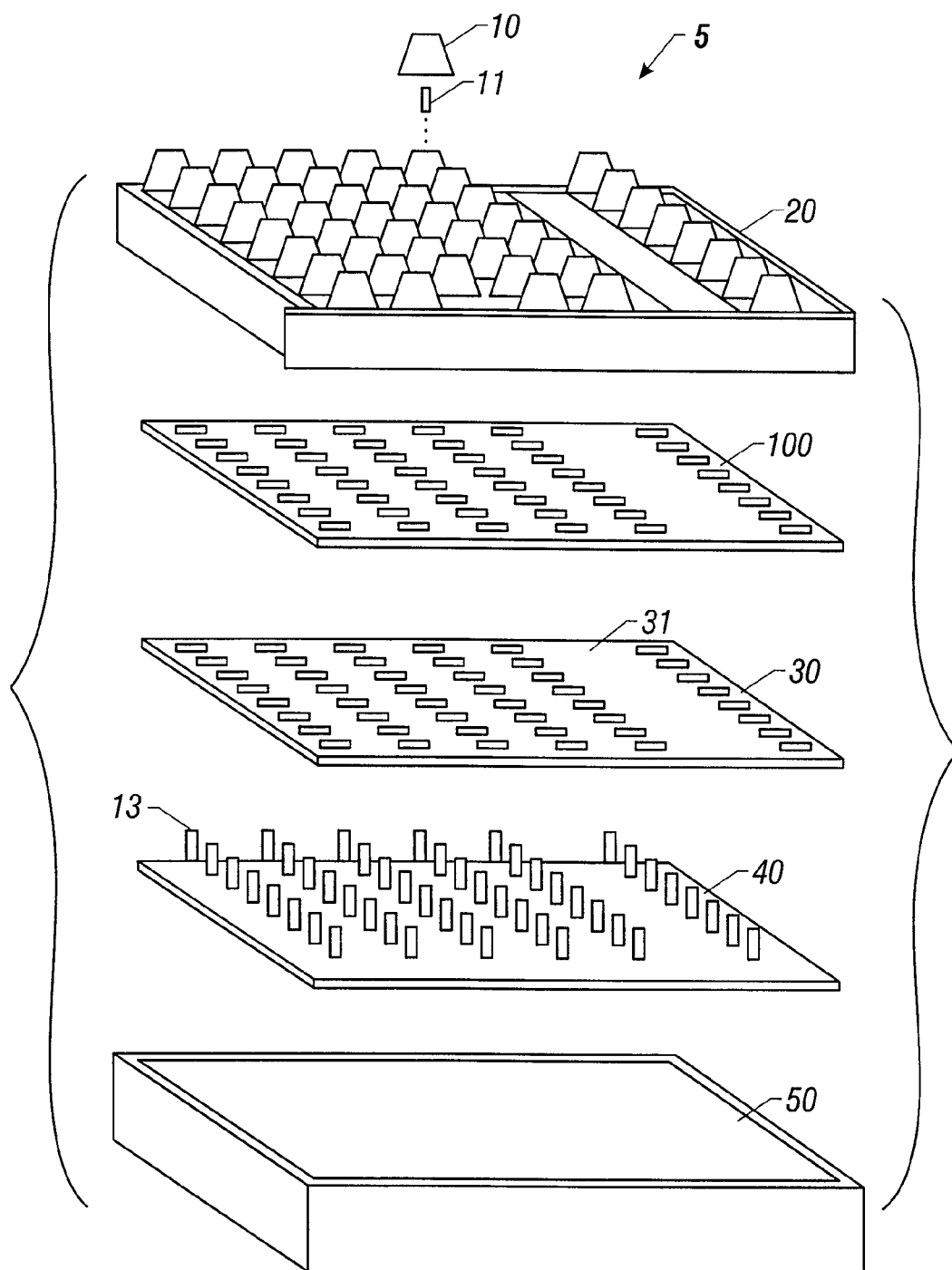
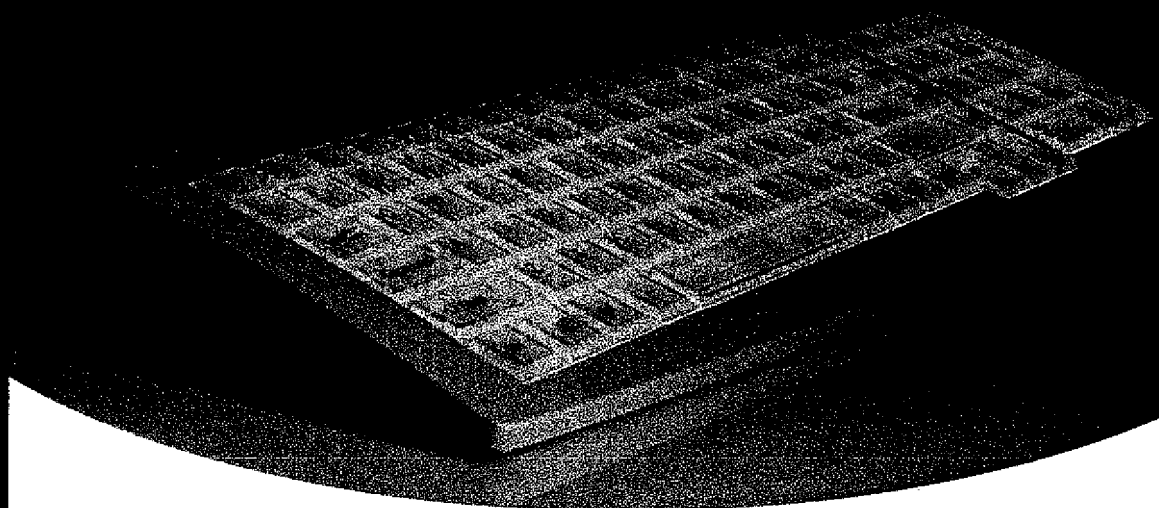


FIG. 5

SUBSTITUTE SHEET (RULE 26)



eluminX™



The EluminX Illuminated Keyboard is a computer keyboard with internal luminescence or lighting – the first commercially available computer keyboard that remains totally visible even in dark or low-lit workspaces.

EluminX was designed for both consumers and business professionals. The perfect solution for late night web surfers, gamers, and computer users.

Using ElectroLuminescent technology, EluminX:

- Eliminates the glare from task lighting
- Eases eyestrain
- Makes the keys easy to see

auravision™

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San Juan Capistrano,
CA 92675

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1.866.358.6469 toll free
info@auravisionllc.com

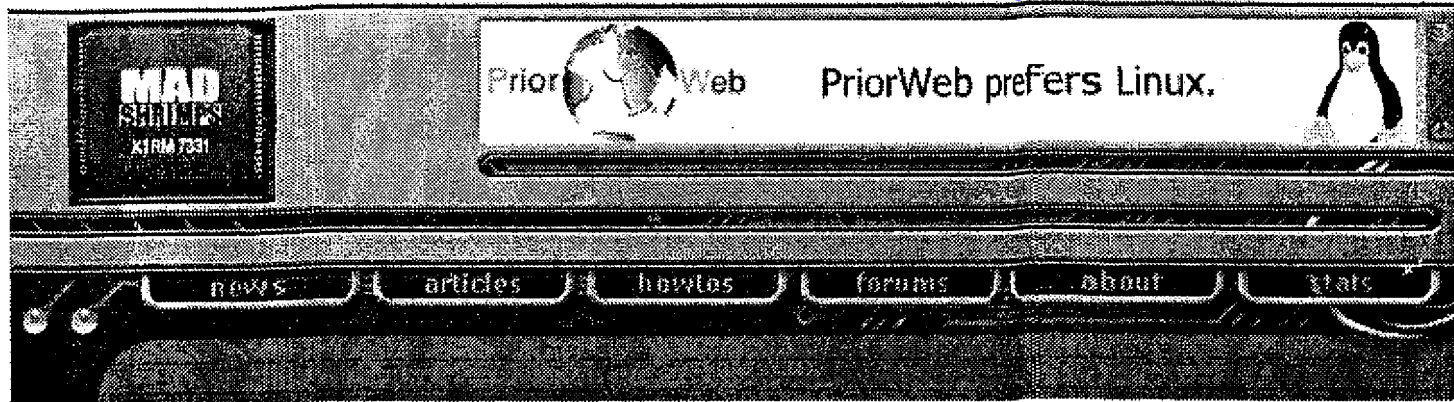
www.auravisionllc.com
www.eluminx.com

The Future is Bright™

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US Patent No. 6,199,996 B1, foreign patents are pending in 27 countries.

EXHIBIT E

KATRINECZ-MMLLC 001271



HWFAQ ☆

Contests ☆

HWBot ☆

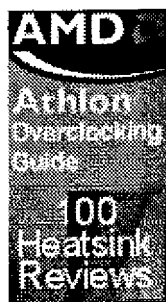
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BlueWizard

Eluminx Keyboard Review



We take a look at the latest product from Auravision, the EluminX. It comes equipped with a set of transparent keys and a backlight for those who work on their PCs during the graveyard shift.

Author *jmke*

Editor *jmke*

Date 2003-C

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1 - Introduction

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Customize with key printing, color keys, stickers, and templates.

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High Grade Commercial & Industrial Rack Mount And Desktop Keyboards.

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I-Tech Rackmount LCD KVM

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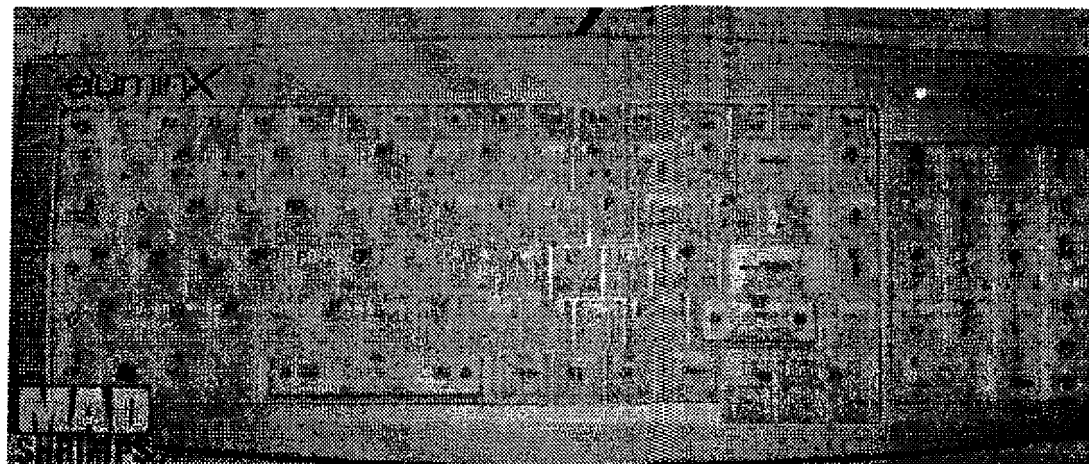
\$119.95. Free RSI book w/ purchase. Free same day shipping. In stock.

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Introduction:

A cardboard box was delivered to my doorstep last weekend, curiously I opened the package and looked inside, a lightweight keyboard occupied the interior of the box.

After removing the protective wrapping I was left with this, Eluminx Keyboard



Click the image for a detailed shot!

A quick overview of the specifications of this keyboard:

- High Quality
- 104 keys
- 12 function keys
- Slim ergo curve design
- Illumination Color: Aqua Marine
- Fully compatible with PS2

EXHIBIT F

KATRINECZ-MMLLC 001150

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Club3D
CoolerMaster
Corsair
Crucial
Danger Den
EasyPCKits
G.Skill
Geil
Hiper
Hofline
I-Star
ITC
Kingston
KoolSolutions
Lovenio
mCubed
Mushkin
Noctua
NZXT
OCZ
PC-Memory
PolarFLO
QuietPC
Scythe
Seasonic
Sharkoon
SilverStone
Speeze
Spire
Sunbeamtech
ThermalTake
Transcend
TTIC
Ultra Products
Vantec
X-Trac

- Laser printing keycaps for longer wear
- Keyboard dimension: 420(L)*156(W)*16(H)mm
- Works with: Windows 95/98/2000/XP/NT/ME, IBM PC
- MTBF : + 60,000 hours
- Safety : FCC class B , CE

The people over at Auravision informed me that new colours will be available soon for the Eluminx, a wide range of everybody's needs: Citrine, White, Amethyst, Sapphire, Amethyst and Tourmaline.

I hooked it up straight away to the PS2 on my motherboard, with an adapter (not provided) you can also connect any free USB port!

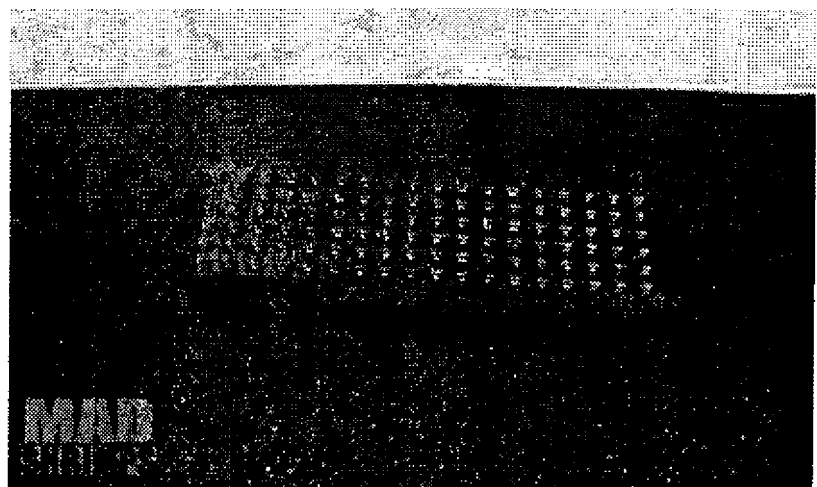
The first thing you'll notice is the similarity of the keyboard with that of a laptop, except for the numeric pad, hardly ever present on notebooks.

This keyboard is ideal for people on the go or for use at a LAN-party. The size difference is quite striking and it saves space on your desktop!



Size does matter, the AL is really a compact keyboard solution

Thanks to rubber feet at the back it remains steady on its given place. The first downside I encountered was to change the height. I am used to working on keyboards which are tilted a bit, this is a feature I'm looking for to see appear on future versions!



No sliding thanks to these rubber pads

Typing on the Eluminx is accompanied by little or no sound as the keys are of high quality and they feel sturdy.

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION

ANDREW KATRINECZ and
DAVID BYRD,
Plaintiffs,

v.

Motorola Mobility, Inc.,
Defendant.

§
§
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§
§
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§

CASE NO. 1:12-CV-00235-LY

**PLAINTIFFS' DISCLOSURE OF
ASSERTED CLAIMS AND INFRINGEMENT CONTENTIONS**

Andrew Katrinecz and David Byrd ("Plaintiffs") serve this *Disclosure of Asserted Claims and Infringement Contentions* on Defendant Motorola Mobility, Inc. ("Defendant").

1. DISCLOSURE OF ASSERTED CLAIMS AND PRELIMINARY INFRINGEMENT CONTENTIONS.

Plaintiffs contend as follows:

A. Each claim of each patent in suit that is allegedly infringed by each opposing party.

At the present time, Plaintiffs allege that the Defendant infringes the following claims from United States Patent No. 7,284,872 B2 ("the '872 Patent") either literally or under the doctrine of equivalents: 5, 6, 7, 8, and 9. Plaintiffs reserve the right to amend their contentions as discovery progresses and additional information is gathered.

B. Separately for each asserted claim, each accused apparatus, product, device, process, method, act, or other instrumentality ("Accused Instrumentality") of each opposing party of which the party is aware.

Plaintiffs identify the following products as Accused Instrumentality for each asserted claim set forth above: Plaintiffs have examined and therefore identify Defendant's cell phones with the following model numbers:

RAZR V3i
RAZR V3c
RAZR maxx Ve
RAZR V3t
RAZR V3m
RAZR V3x
RAZR V3
KRZR K1
RAZR2 V8
RAZR V8
RAZR V3xx
ROKR U9
ROKR W5
RIZR Z3
PEBL U6

An infringement analysis for each of these phones is attached hereto as exhibits. Additionally, Plaintiff identifies the following additional models because Plaintiff believes, upon information and belief, that these models have the same relevant components and functionality as inspected in the above cell phones, and therefore also infringe one or more of the asserted claims:

KRZR K3
KRZR K3m
RAZR V3a
RAZR V3r
RAZR maxx V6
RIZR Z8
PEBL U3
RIZR Z8
ROKR Z6
RIZR Z9
RIZR Z10
ROKR E1
ROKR E2
ROKR E6
ROKR E8
AURA
FONE 3
ZINE ZN5

In the event that Defendant produces reliable information to establish that a model identified above does not have a claim element in each of the asserted claims, Plaintiffs will amend their list of Accused Instrumentality.

Moreover, to the extent that Defendant has any other cell phones with the same relevant functionality and components as the phones identified above, then Plaintiffs also identify those cell phones as Accused Instrumentality. Plaintiffs reserve the right to amend their contentions as discovery progresses and additional information is gathered.

- C. A chart identifying specifically where each element of each asserted claim is found within each Accused Instrumentality, including for each element that such party contends is governed by 35 U.S.C. § 112(b), the identity of the structure(s), act(s), or material(s) in the Accused Instrumentality that performs the claimed function.**

Attached hereto as Exhibit A is an infringement chart for the '872 Patent. The infringement analysis was done for Defendant's cell phone model number RAZR V3t. Upon information and belief, the same analysis applies to each model identified above as an infringing device because each model has the same relevant components and functionality. To support this assertion, Plaintiffs have included in attached Exhibit B pictures of the different models identified above as in Plaintiffs' possession to demonstrate that each model has the same relevant components and functionality as Defendant's cell phone model RAZR V3t. Upon information and belief, Plaintiffs believe that the uninspected but similar cell phone models identified above also have the same relevant components and functionality as the models inspected and presented in Exhibits A and B. Therefore, the same infringement analysis will apply. Plaintiffs reserve the right to amend their contentions as discovery progresses and additional information is gathered.

- D. Whether each element of each asserted claim is claimed to be literally present or present under the doctrine of equivalents in the Accused Instrumentality.**

Each element of each asserted claim, as set forth in Exhibit A attached hereto, is literally present or present under the doctrine of equivalents. Plaintiffs reserve the right to amend their contentions as discovery progresses and additional information is gathered.

Respectfully submitted,

By: /s/ Ryan T. Beard
Eric B. Meyertons
State Bar No. is 14004400
Ryan Tyler Beard
State Bar No. 24012264

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David E. Dunham
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Isabelle M. Antongiorgi
State Bar No. 2405938

ATTORNEYS FOR PLAINTIFFS

CERTIFICATE OF SERVICE

I hereby certify that on the 13th day of February, 2013, I served by e-mail a copy of this pleading on counsel for all parties to this case.

/s/ Ryan T. Beard

Ryan T. Beard

EXHIBIT A

Asserted Claims	Accused System	Infringement
5. A data entry apparatus with illuminated keys comprising:	As shown in picture nos. 3, 4 and 7 in this Exhibit, Defendant's cell phone allows the user to input data into the cell phone using the keys of the cell phone. As shown in picture no. 4 in this Exhibit, the keys illuminate.	Literal and Doctrine of Equivalence
keys of an optically transmissive material;	As shown in picture nos. 4, 7, and 8 in this Exhibit, the keys of the cell phone are an optically transmissive material. In other words, the keys are made of a transmissive material, which allows light from the luminescent sheet under the keys to shine through the keys and be visible to the user.	Literal
one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus;	As shown in picture nos. 4 and 6 in this Exhibit, the luminescent sheet provides light or illumination through the keys (which are optically transmissive as described above) and the user of the cell phone can see the keys in the dark because of this illumination.	Literal
and an optically transmissive keyboard top plate.	As shown in picture nos. 4 and 7 in this Exhibit, the cell phone has numerous areas that set forth an optically transmissive keyboard top plate, areas that are distinct from the keys and allow light from the luminescent sheet to be visible to the user.	Literal and Doctrine of Equivalence

Asserted Claims	Accused System	Infringement
6. A data entry apparatus with illuminated keys comprising:	As shown in picture nos. 3, 4 and 7 in this Exhibit, Defendant's cell phone allows the user to input data into the cell phone using the keys of the cell phone. As shown in picture no. 4 in this Exhibit, the keys illuminate.	Literal and Doctrine of Equivalence
keys of an optically transmissive material;	As shown in picture nos. 4, 7, and 8 in this Exhibit, the keys of the cell phone are an optically transmissive material. In other words, the keys are made of a transmissive material, which allows light from the luminescent sheet under the keys to shine through the keys and be visible to the user.	Literal
one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus;	As shown in picture nos. 4 and 6 in this Exhibit, the luminescent sheet provides light or illumination through the keys (which are optically transmissive as described above) and the user of the cell phone can see the keys in the dark because of this illumination.	Literal
and an optically transmissive keyboard top plate,	As shown in picture nos. 4 and 7 in this Exhibit, the cell phone has numerous areas that set forth an optically transmissive keyboard top plate, areas that distinct from the keys and allow light from the luminescent sheet to be visible to the user.	Literal and Doctrine of Equivalence
wherein said top plate emits light of a desired color.	As shown in picture nos. 7 and 8 in this Exhibit, the back of the plate has blue transmissive material so that the light from the luminescent sheet will be the desired color.	Literal

Asserted Claims	Accused System	Infringement
7. A data entry apparatus with illuminated keys comprising:	As shown in picture nos. 3, 4 and 7 in this Exhibit, Defendant's cell phone allows the user to input data into the cell phone using the keys of the cell phone. As shown in picture no. 4 in this Exhibit, the keys illuminate.	Literal and Doctrine of Equivalence
keys of an optically transmissive material;	As shown in picture nos. 4, 7, and 8 in this Exhibit, the keys of the cell phone are an optically transmissive material. In other words, the keys are made of a transmissive material, which allows light from the luminescent sheet under the keys to shine through the keys and be visible to the user.	Literal
one or more flexible luminescent sheets underlying said keys to provide an intensity of illumination to said keys visual to a user of the apparatus;	As shown in picture nos. 4 and 6 in this Exhibit, the luminescent sheet provides light or illumination through the keys (which are optically transmissive as described above) and the user of the cell phone can see the keys in the dark because of this illumination.	Literal
an optically transmissive keyboard top plate,	As shown in picture nos. 4 and 7 in this Exhibit, the cell phone has numerous areas that set forth an optically transmissive keyboard top plate, areas that are distinct from the keys and allow light from the luminescent sheet to be visible to the user.	Literal and Doctrine of Equivalence
wherein said top plate emits light of a desired color;	As shown in picture nos. 7 and 8 in this Exhibit, the back of the plate has blue transmissive material so that the light from the luminescent sheet will be the desired color.	Literal
and one or more luminescent sheets underlying said top plate to provide illumination of said top plate visual to said user.	As shown in picture nos. 4 and 6 in this Exhibit, the luminescent sheet provides light or illumination to the top plate so that the user can see the light or illumination.	Literal

Asserted Claims	Accused System	Infringement
8. A method for illuminating the keys of a data entry apparatus comprising the steps of:	As shown in picture nos. 3, 4 and 7 in this Exhibit, Defendant's cell phone allows the user to input data into the cell phone using the keys of the cell phone. As shown in picture no. 4 in this Exhibit, the keys illuminate.	Literal and Doctrine of Equivalence
making said keys of an optically transmissive material;	As shown in picture nos. 4, 7, and 8 in this Exhibit, the keys of the cell phone are an optically transmissive material. In other words, the keys are made of a transmissive material, which allows light from the luminescent sheet under the keys to shine through the keys and be visible to the user.	Literal
and providing one or more flexible luminescent sheets underlying said keys	As shown in picture nos. 5 and 6 in this Exhibit, there is a luminescent sheet under the keys. The luminescent sheet is not rigid and can easily be bent or even rolled.	Literal
to provide an intensity of illumination to said keys visual to a user of the apparatus,	As shown in picture nos. 4 and 6 in this Exhibit, the luminescent sheet provides light or illumination through the keys (which are optically transmissive as described above) and the user of the cell phone can see the keys in the dark because of this illumination.	Literal
wherein different keys or groups of keys are tinted with different colors	As shown in picture nos. 3, 4, 7 and 8 in this Exhibit, the cell phone has numerous keys (e.g., number keys for inputting numbers and alphanumeric data, a send key, an end key, internet access key, e-mail key, etc.). As shown in picture nos. 3, 4, 7 and 8 in this Exhibit, the send key is tinted green, the end key is tinted red, and the mail and internet keys are tinted blue.	Literal
to provide illuminated keys or groups of keys that emit light of different colors.	As shown in picture nos. 3, 4, 7 and 8 in this Exhibit, the cell phone has keys that illuminate in the colors of blue, red, and green. The keys illuminate in color because the light from the luminescent sheet shines through the colored material below the keys.	Literal

Asserted Claims	Accused System	Infringement
9. A data entry apparatus with illuminated keys comprising:	As shown in picture nos. 3, 4 and 7 in this Exhibit, Defendant's cell phone allows the user to input data into the cell phone using the keys of the cell phone. As shown in picture no. 4 in this Exhibit, the keys illuminate.	Literal and Doctrine of Equivalence
keys of an optically transmissive material;	As shown in picture nos. 4, 7, and 8 in this Exhibit, the keys of the cell phone are an optically transmissive material. In other words, the keys are made of a transmissive material, which allows light from the luminescent sheet under the keys to shine through the keys and be visible to the user.	Literal
one or more flexible luminescent sheets underlying said keys	As shown in picture nos. 5 and 6 in this Exhibit, there is a luminescent sheet under the keys. The luminescent sheet is not rigid and can easily be bent or even rolled.	Literal
to provide an intensity of illumination to said keys visual to a user of the apparatus,	As shown in picture nos. 4 and 6 in this Exhibit, the luminescent sheet provides light or illumination through the keys (which are optically transmissive as described above) and the user of the cell phone can see the keys in the dark because of this illumination.	Literal
wherein different keys or groups of keys emit light of different colors.	As shown in picture nos. 3, 4, 7 and 8 in this Exhibit, the cell phone has keys that illuminate in the colors of blue, red, and green. The keys illuminate in color because the light from the luminescent sheet shines through the colored material below the keys.	Literal

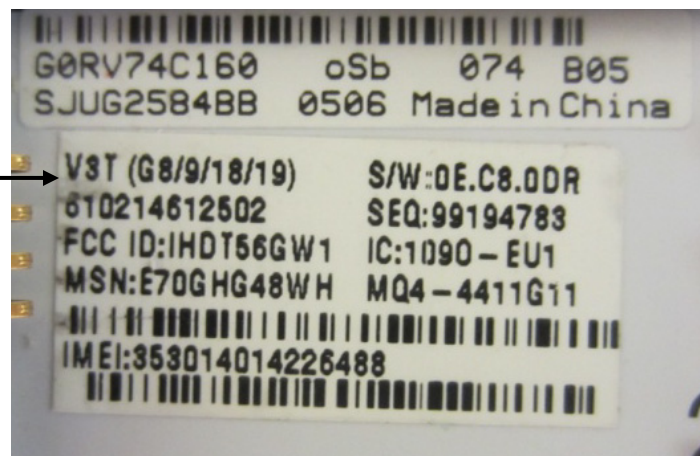
PICTURE NO. 1 – FRONT VIEW OF THE MOTOROLA RAZR V3t



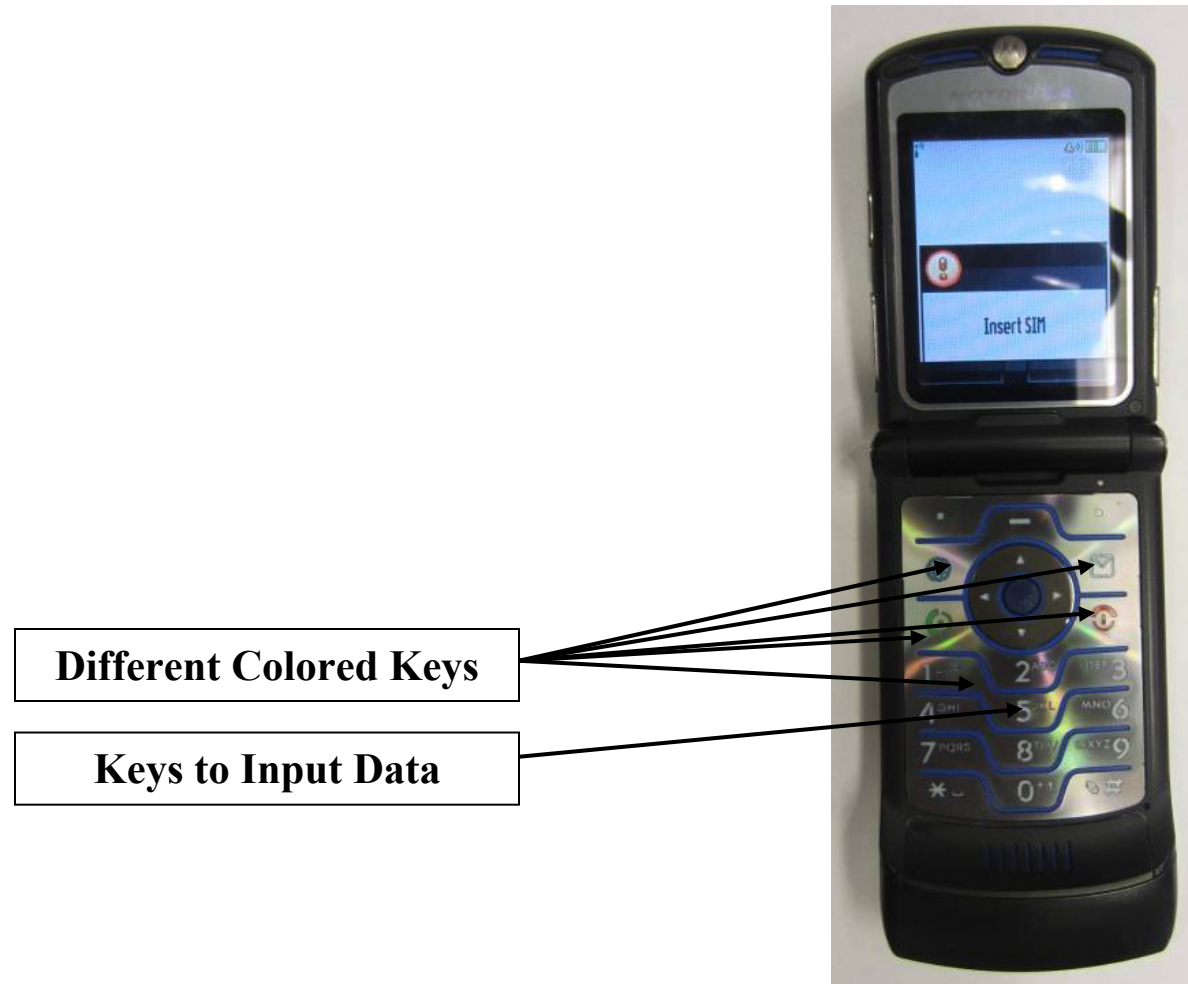
PICTURE NO. 2 – MODEL NUMBER INFORMATION FOR THE MOTOROLA RAZR V3t



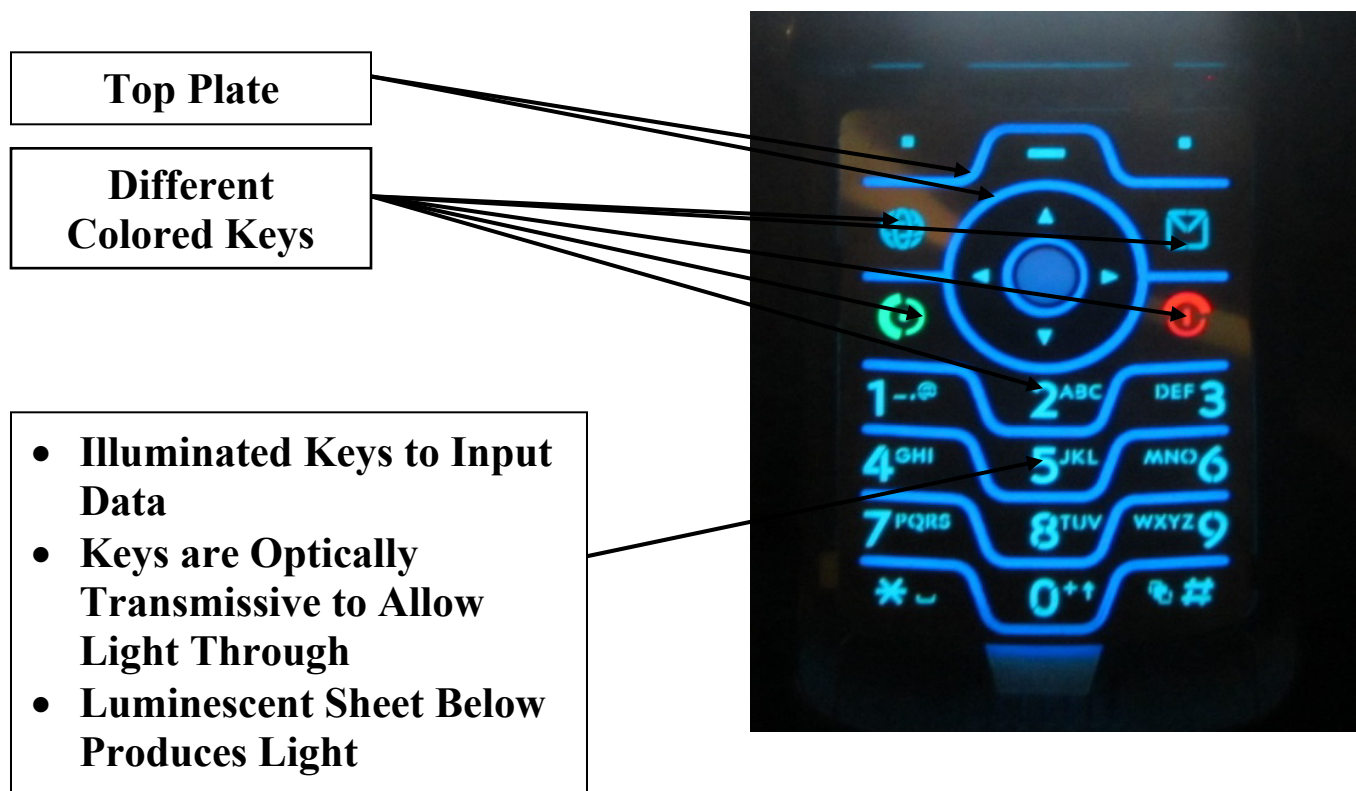
**Model
Number**



PICTURE NO. 3 – OPEN VIEW OF THE MOTOROLA RAZR V3t

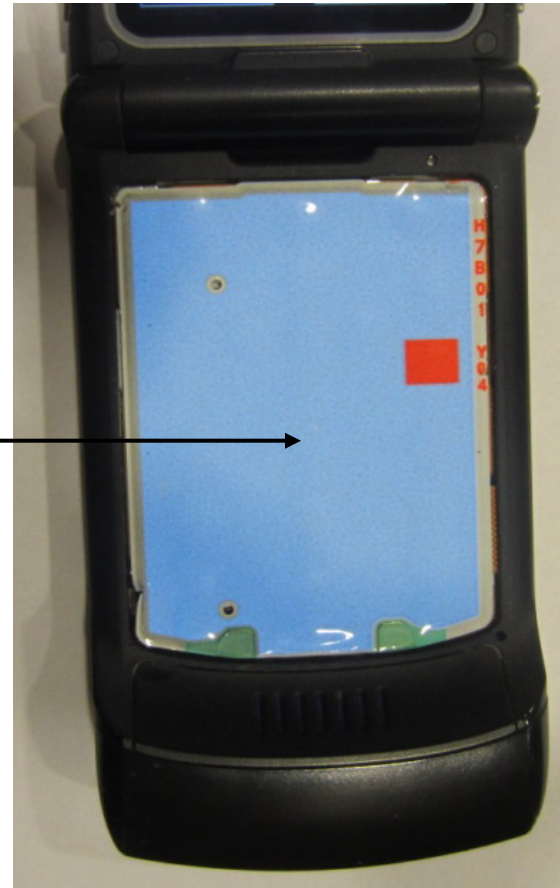


PICTURE NO. 4 – KEYS ILLUMINATED VIEW OF THE MOTOROLA RAZR V3t

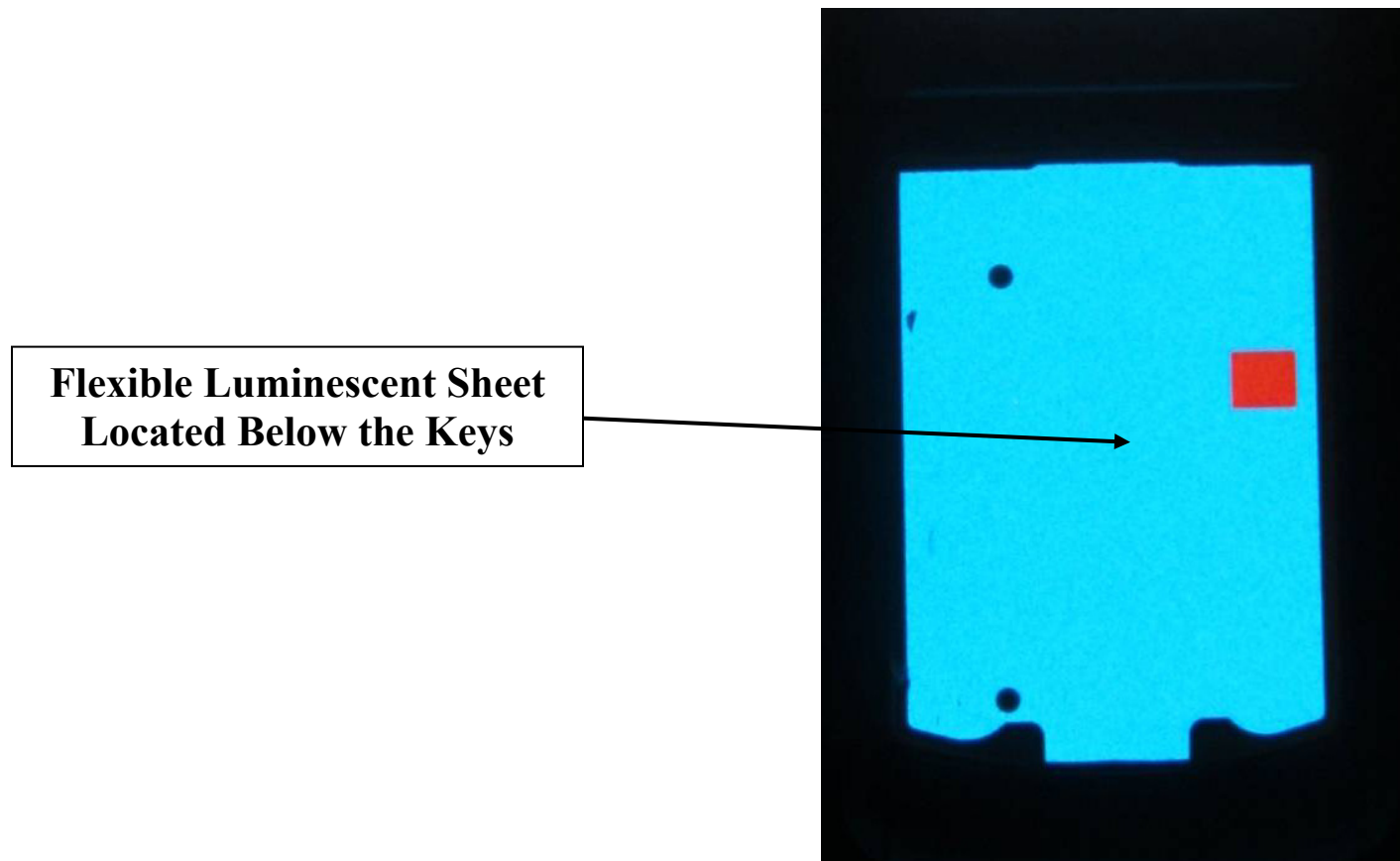


PICTURE NO. 5 – LUMINESCENT SHEET OF THE MOTOROLA RAZR V3t

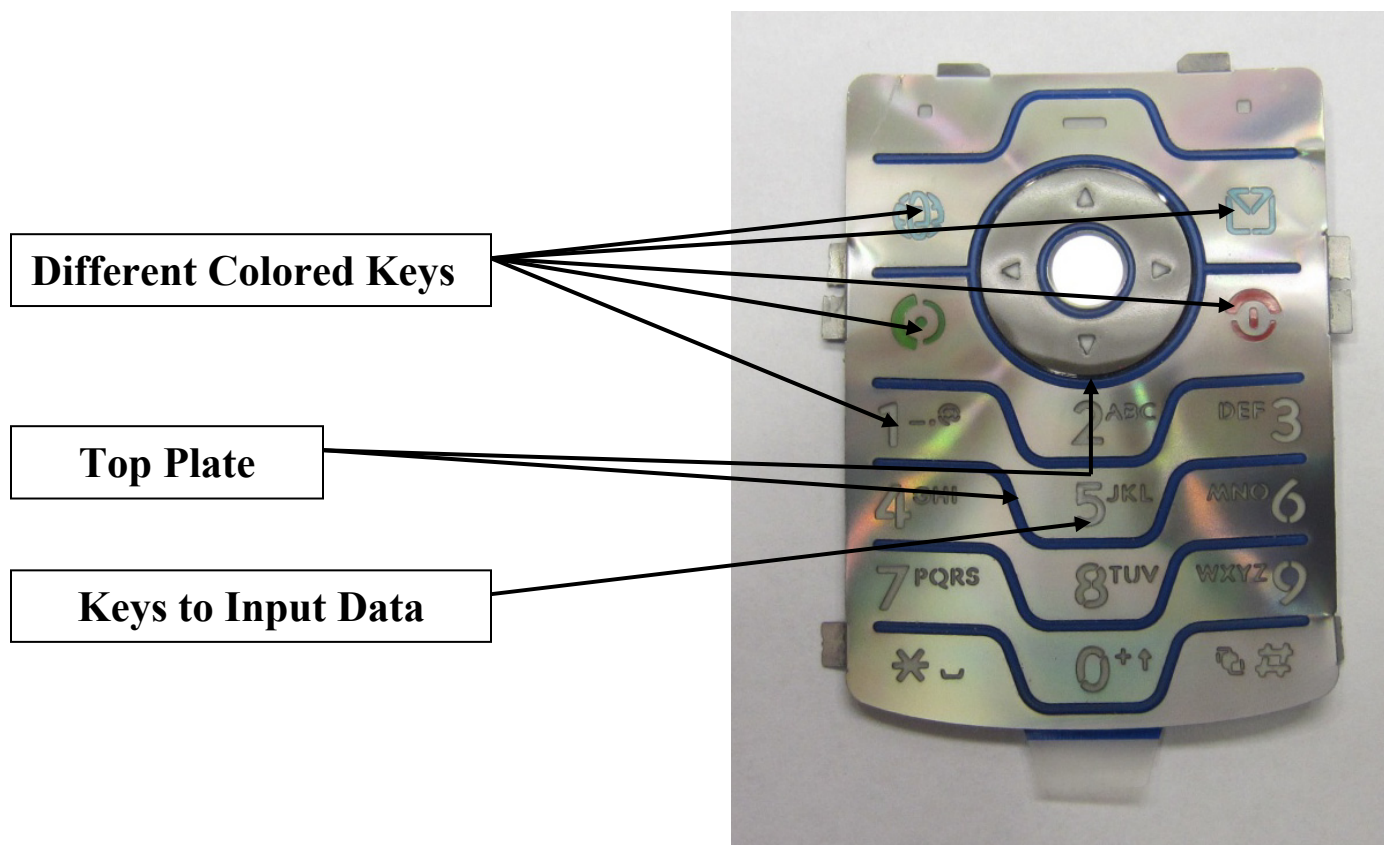
Flexible Luminescent Sheet



PICTURE NO. 6 – ILLUMINATED LUMINESCENT SHEET OF THE MOTOROLA RAZR V3t



PICTURE NO. 7 – FRONT OF THE MOTOROLA RAZR V3t PLATE



PICTURE NO. 8 – BACK OF THE MOTOROLA RAZR V3t PLATE

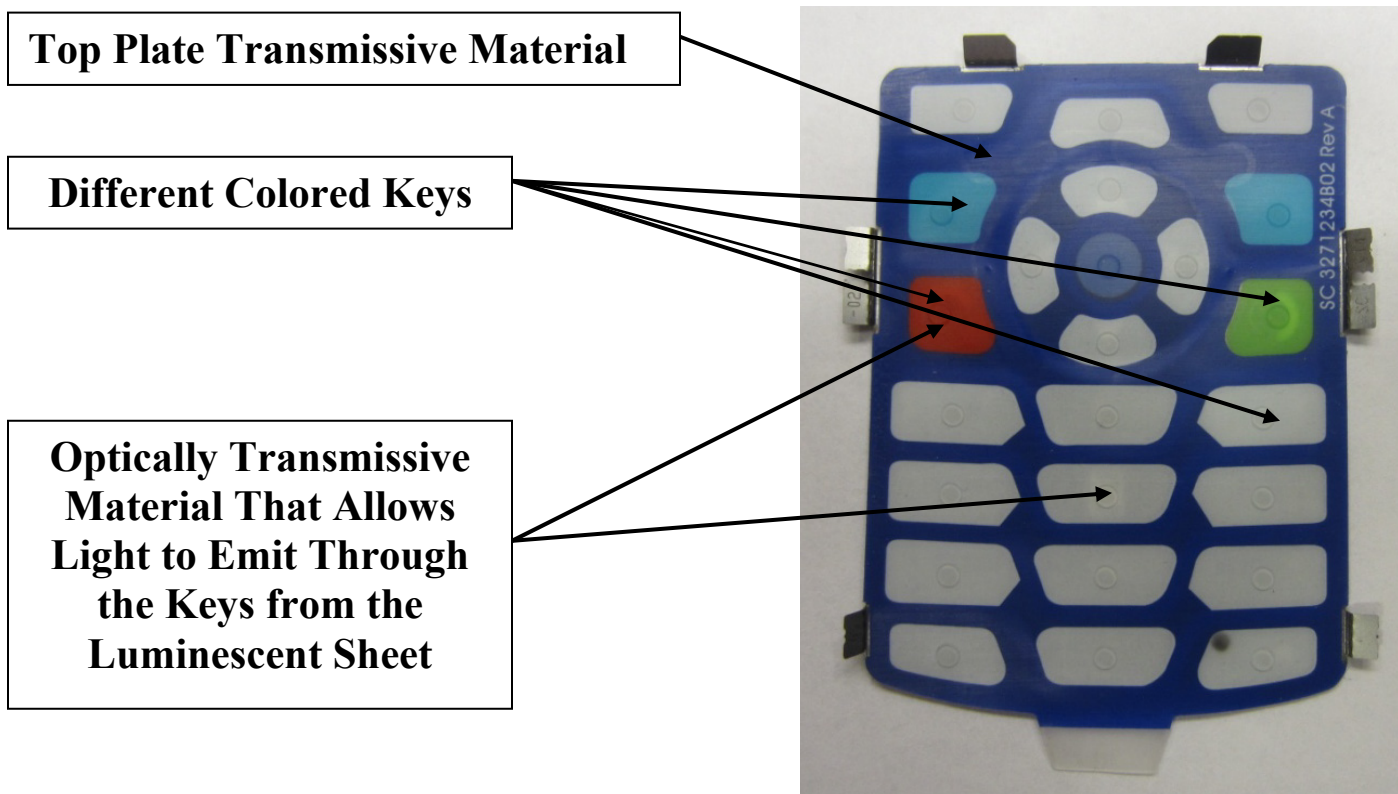
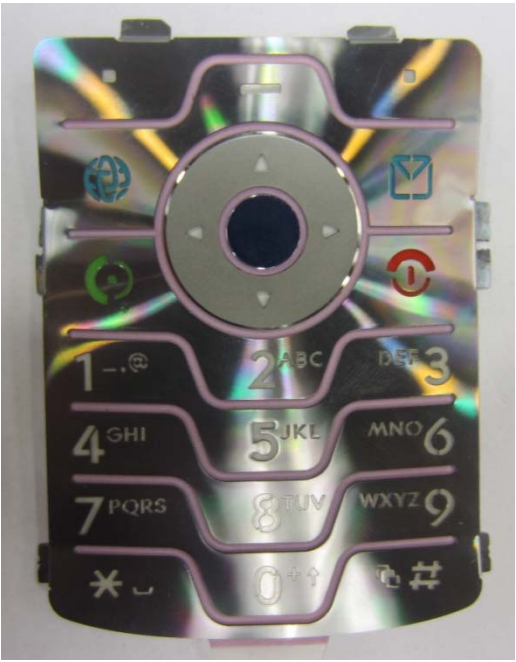
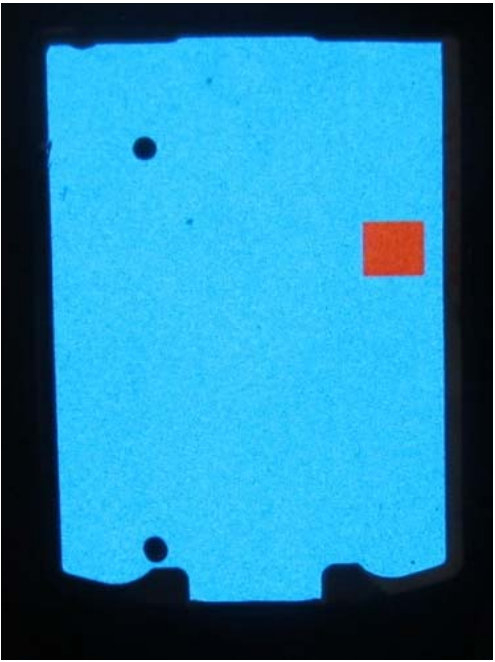
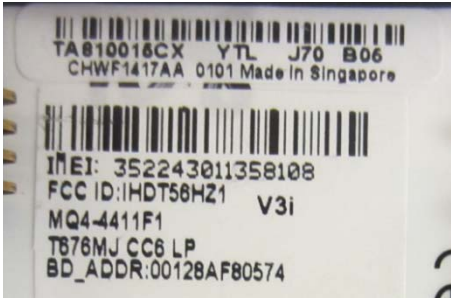


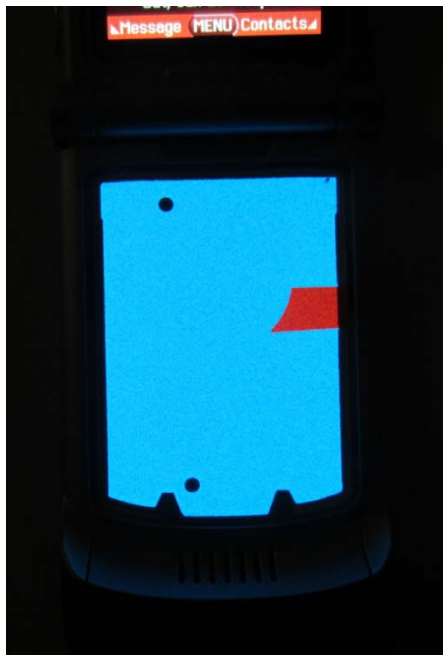
EXHIBIT B



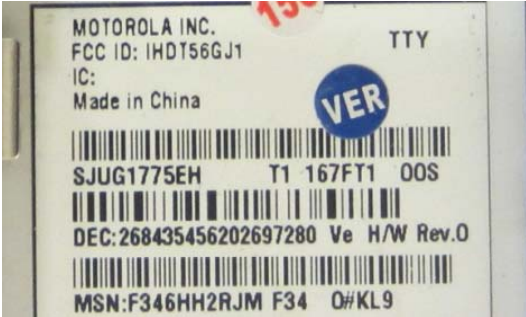
Motorola RAZR V3i



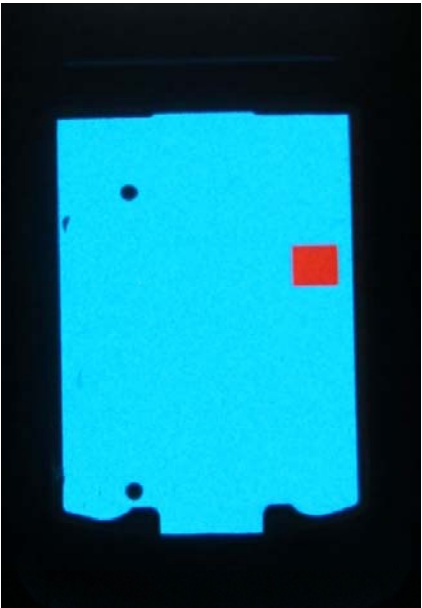
MOTOROLA
FCC ID: IHD756FT1 EE3 TTY
IC: 1090 - FT1
Made in CHINA
SJUG1040EG T1 5354T1 0M
DEC: 03006446099 Model: V3c H/W Rev 0



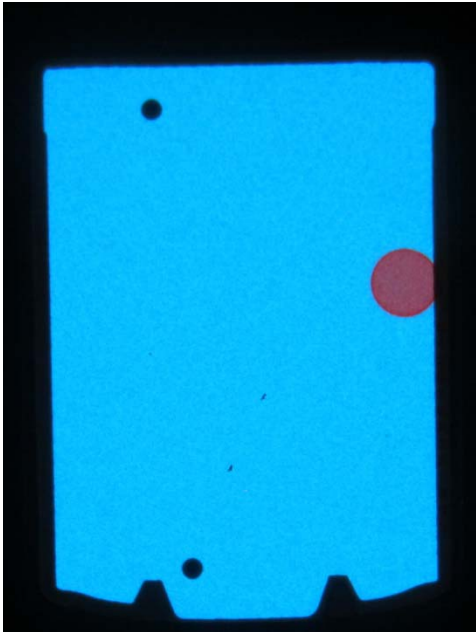
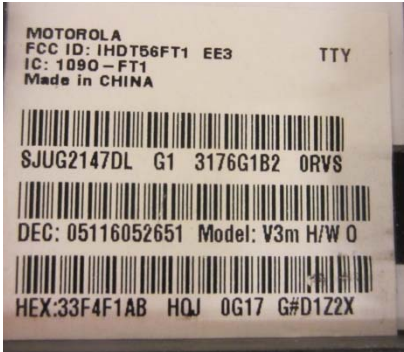
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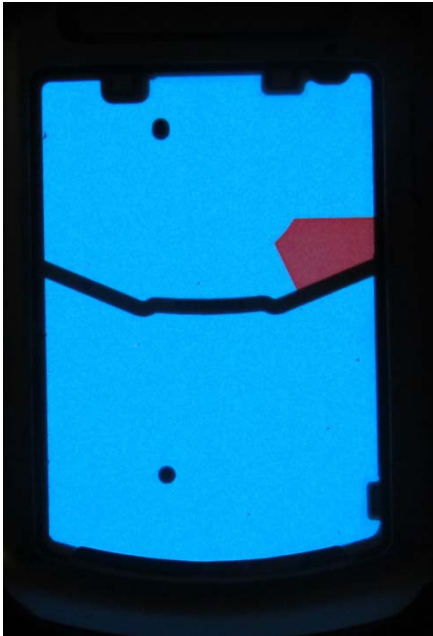
Motorola maxx Ve



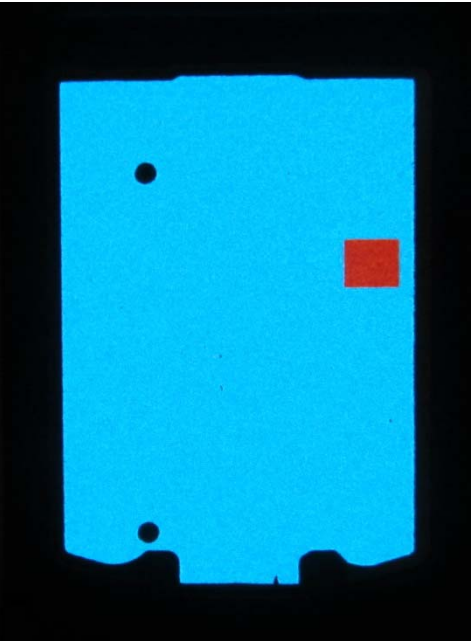
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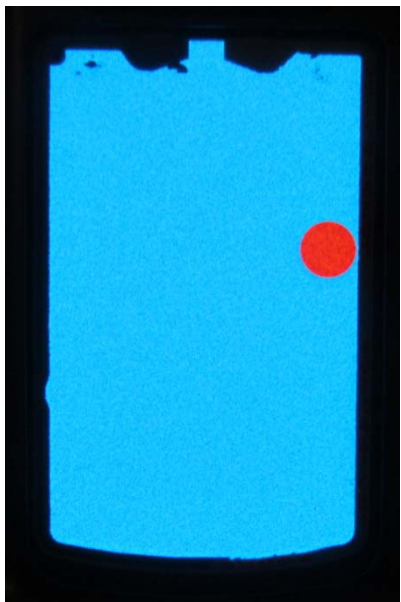
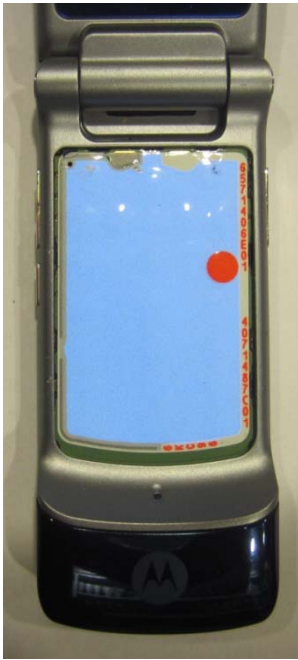
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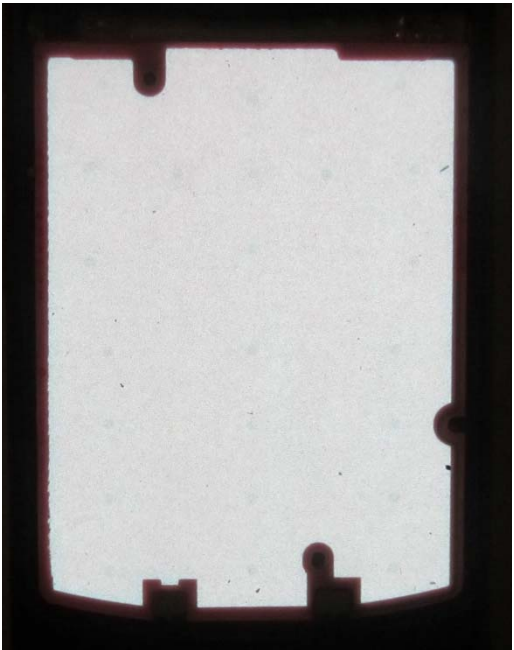
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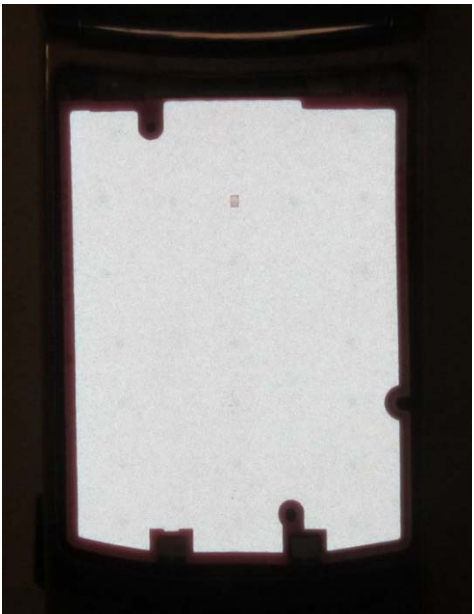
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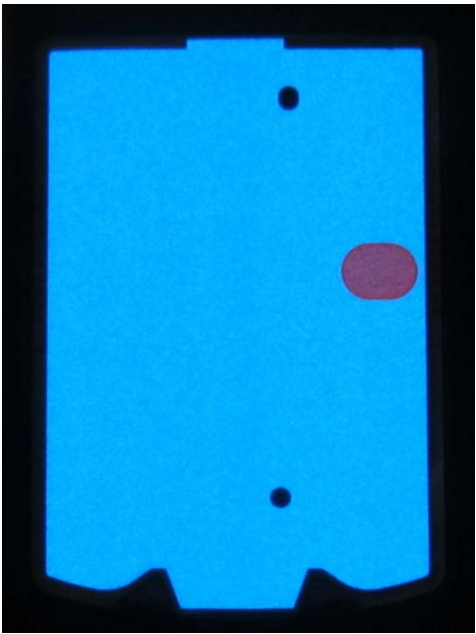
Motorola KRZR K1



Motorola RAZR2 V8



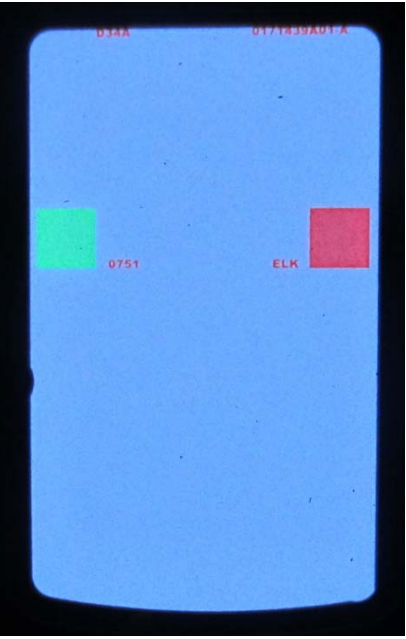
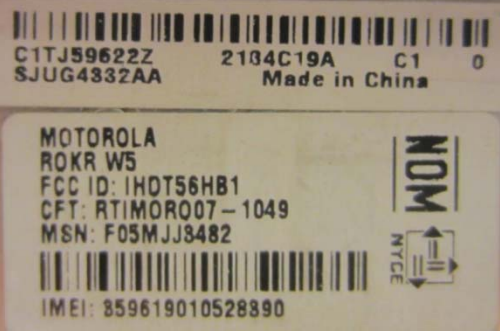
Motorola RAZR V8



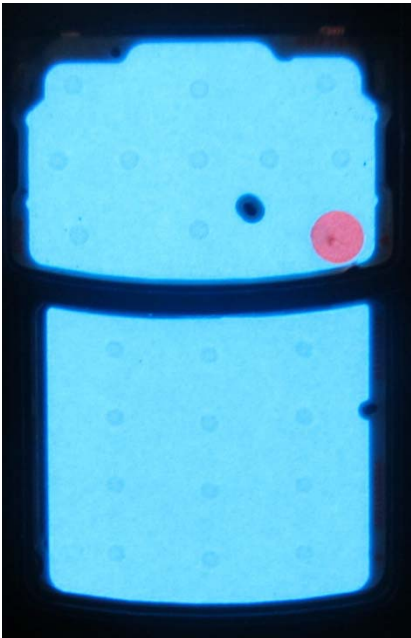
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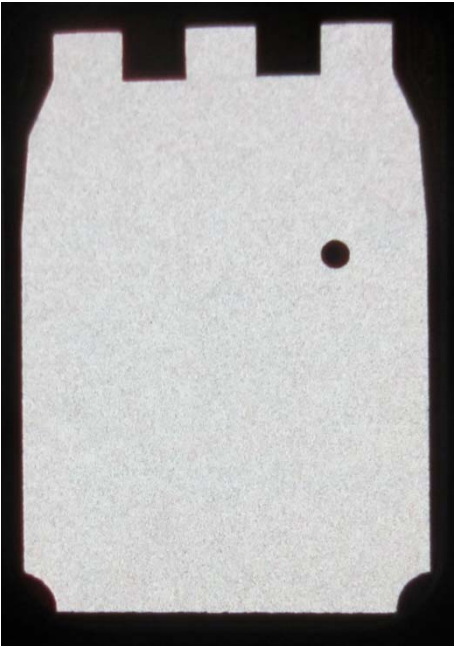
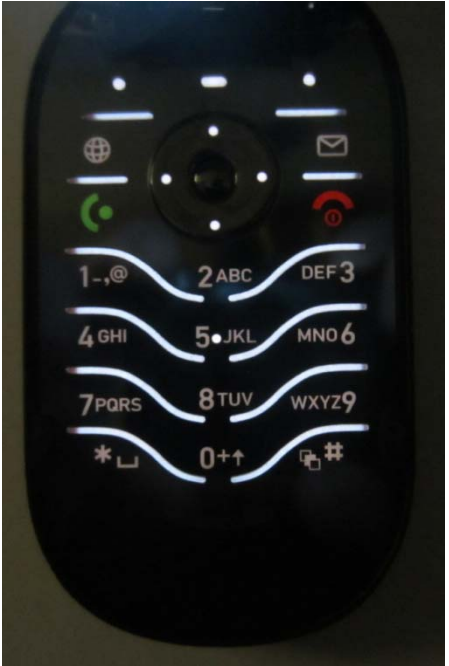
Motorola U9



Motorola ROKR W5



Motorola RIZR Z3



Motorola PEBL U6

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STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	11235806
Filing Date	2005-09-27
First Named Inventor	RICHARD J. DOMBROWSKI
Art Unit	2854
Examiner Name	D. COLILLA
Attorney Docket Number	CS23666RL D01

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	2	4812831	A	1989-03-14	LAIER	
	3	5797482	A	1998-08-25	LaPOINTE ET AL.	
	4	5871088	A	1999-02-16	TANABE	
	5	5950808	A	1999-09-14	TANABE ET AL.	
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	7	6373008	B1	2002-04-16	SAITO ET AL.	
	8	5924555	A	1999-07-20	SADAMORI ET AL.	

EXHIBIT H

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9	5703625	A	1997-12-30	SNIDER ET AL.	
10	6198060	B1	2001-03-06	YAMAZAKI ET AL.	
11	5220521	A	1993-06-15	KIKINIS	
12	4843197	A	1989-06-27	KOJIMA ET AL.	
13	6462294	B2	2002-10-08	DAVIDSON ET AL.	
14	6821467	B2	2004-11-23	WOLFE ET AL.	
15	D491930	S	2004-06-22	WIDIAMAN	
16	D480057	S	2003-09-30	HO-CHEUN ET AL.	
17	D501470	S		YAU ET AL	
18	D504682	S		KETTULA ET AL	
19	D509206	S		JANG, IN WON	

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20	D515543	S	SHINTANI, EIJI
21	D520483	S	PARK ET AL
22	D523837	S	LEE, SANG HO
23	D524276	S	KIM ET AL
24	D526984	S	KIM ET AL
25	D530697	S	WEI ET AL
26	D534517	S	CHO ET AL
27	7180756	B2	STONE ET AL
28	D543178	S	KIM ET AL
29	D548718	S	DAVIS, MURSALIE
30	D551638	S	PARK ET AL

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	2	20040031673	A1	2004-02-19	LEVY	
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	6	20071192804		2007-10-30	DOMBROWSKI (CS23666RLC03)	

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	1	1020040045122	KR	A	2005-12-22	LG ELECTRONICS		<input type="checkbox"/>

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2	0012931	WO	A1	2000-03-09	TWENTY-FIRST CENTURY TECHNOLOGY, INC.	<input type="checkbox"/>
3	3736892	DE	A1	1988-05-11	IDEC IZUMI CORP.	<input type="checkbox"/>
4	3816182	DE	A1	1989-11-23	MOSER HELMUT, BECK GERHARD DIPL ING FH	<input type="checkbox"/>
5	9415289	DE	U1	1995-04-06	KIRSCH GUENTER	<input type="checkbox"/>
6	0818793	EP	B1	1998-01-14	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.	<input type="checkbox"/>
7	1035557	EP	A2	2000-09-13	SEIKO PRECISION INC.	<input type="checkbox"/>
8	09106729	JP	A	1997-04-22	MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD.	<input type="checkbox"/>
9	09093324	JP	A	1997-04-04	FUJITSU LTD.	<input type="checkbox"/>
10	1017076	EP	A2	2000-07-05	NOKIA	<input type="checkbox"/>
11	10283096	JP	A	1998-10-23	KENMOCHI, YOSHIO	<input type="checkbox"/>
12	11213792	JP	A	1999-08-06	KONO, FUMIO	<input type="checkbox"/>

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13	11250758	JP	A	1999-09-17	NISHIMAKI ET AL.		<input type="checkbox"/>
14	2000067693	JP	A	2007-10-23	YOSHINO ET AL.		<input type="checkbox"/>
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16	2004079338	JP	A	2004-03-11	SAITO ET AL.		<input type="checkbox"/>
17	0847066	EP	B1	2003-10-22	INUBUSHI, TOSHIYA		<input type="checkbox"/>
18	2001273831	JP	A	2001-10-05			<input type="checkbox"/>
19	10241483	JP	A	1998-09-11	TOKAI RIKAI CO LTD		<input type="checkbox"/>

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	1	BOB HETHERINGTON; "PHILIPS iPRONTO REMOTE CONTROL"; 3 PAGES; www.hometoys.com/htinews/oct03/reviews/ipronto/ipronto.htm 10-2003	<input type="checkbox"/>
	2	DUREL INTRODUCES NEW DFLX DUREL FLEXIBLE ELECTROLUMINESCENT LAMP FOR HIGH-QUALITY KEYPAD LIGHTING; JULY 7, 2003; 2 PAGES; http://www.rogers-corp.com/dfx.htm	<input type="checkbox"/>

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Art Unit	2854
Examiner Name	D. COLILLA
Attorney Docket Number	CS23666RL D01

3	ROGERS CORP. IN FULL SCALE PRODUCTION OF DFLX LAMPS ITS NEWEST ELECTROLUMINESCENT (EL) PRODUCT THROUGH AN EXCLUSIVE, WORLDWIDE LICENSING AGREEMENT; 2 PAGES; FEBRUARY 20, 2004; http://www.rogers-corp.com/dfxlamps.htm	<input type="checkbox"/>
4	I-MATE SPL, ANNOUNCED SEPTEMBER 2006, <URL:www.gsmarena.com>, RETRIEVED FROM INTERNET 09/28/07	<input type="checkbox"/>
5	AMOI, A675, ANNOUNCED 2Q 2006, <URL:www.gsmarena.com>, RETRIEVED FROM INTERNET 09/28/07	<input type="checkbox"/>
6	PHILIPS 759, ANNOUNCED 1Q 2004, <URL:www.gsmarena.com>, RETRIEVED FROM INTERNET 09/28/07	<input type="checkbox"/>
7	PHILIPS 755, ANNOUNCED 1Q 2006, <URL:www.gsmarena.com>, retrieved from internet 09/28/07	<input type="checkbox"/>

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