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(12) **United States Patent**
Philipp

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(54) **CAPACITIVE KEYBOARD WITH NON-LOCKING REDUCED KEYING AMBIGUITY**

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(73) Assignee: **Atmel Corporation**, San Jose, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 444 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/347,312**

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(65) **Prior Publication Data**

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Related U.S. Application Data

(63) Continuation of application No. 12/899,229, filed on Oct. 6, 2010, now Pat. No. 8,102,286, which is a continuation of application No. 11/279,402, filed on Apr. 12, 2006, now Pat. No. 7,821,425, which is a

(Continued)

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G06F 3/023	(2006.01)
G06F 3/041	(2006.01)

(Continued)

(52) **U.S. Cl.**

CPC ***G06F 3/0237*** (2013.01); ***G06F 3/0416*** (2013.01); ***G06F 3/044*** (2013.01); ***H03K 17/9622*** (2013.01); *H03K 17/9643* (2013.01); *H03K 2217/960705* (2013.01)

(58) **Field of Classification Search**

CPC H03M 11/20; G06F 3/0237; G06F 3/0416; G06F 3/044

USPC 341/20, 22, 26, 33; 345/173; 715/773

See application file for complete search history.

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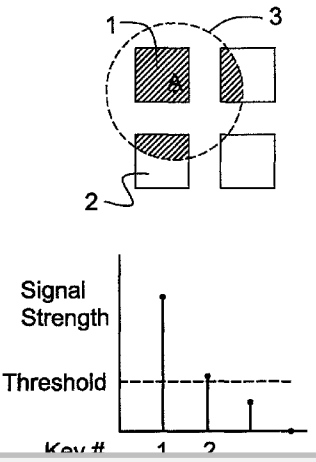
(57) **ABSTRACT**

Keyboards, keypads and other data entry devices can suffer from a keying ambiguity problem. In a small keyboard, for example, a user's finger is likely to overlap from a desired key to onto adjacent ones. An iterative method of removing keying ambiguity from a keyboard comprising an array of capacitive keys involves measuring a signal strength associated with each key in the array, comparing the measured signal strengths to find a maximum, determining that the key having the maximum signal strength is the unique user-selected key, and maintaining that selection until either the initially selected key's signal strength drops below some threshold level or a second key's signal strength exceeds the first key's signal strength.

24 Claims, 7 Drawing Sheets



Related U.S. Application Data

continuation-in-part of application No. 11/160,885, filed on Jul. 14, 2005, now Pat. No. 7,256,714, which is a continuation of application No. 10/617,602, filed on Jul. 11, 2003, now Pat. No. 6,993,607.

(60) Provisional application No. 60/597,851, filed on Dec. 21, 2005, provisional application No. 60/395,368, filed on Jul. 12, 2002.

(51) **Int. Cl.**

G06F 3/044	(2006.01)
H03K 17/96	(2006.01)

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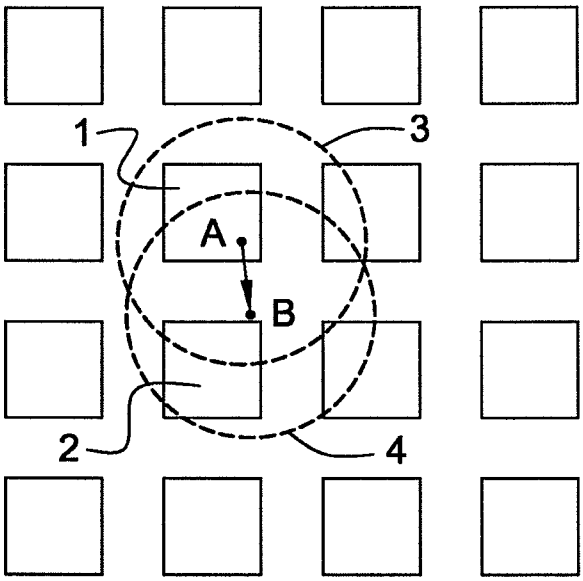

FIG. 1A

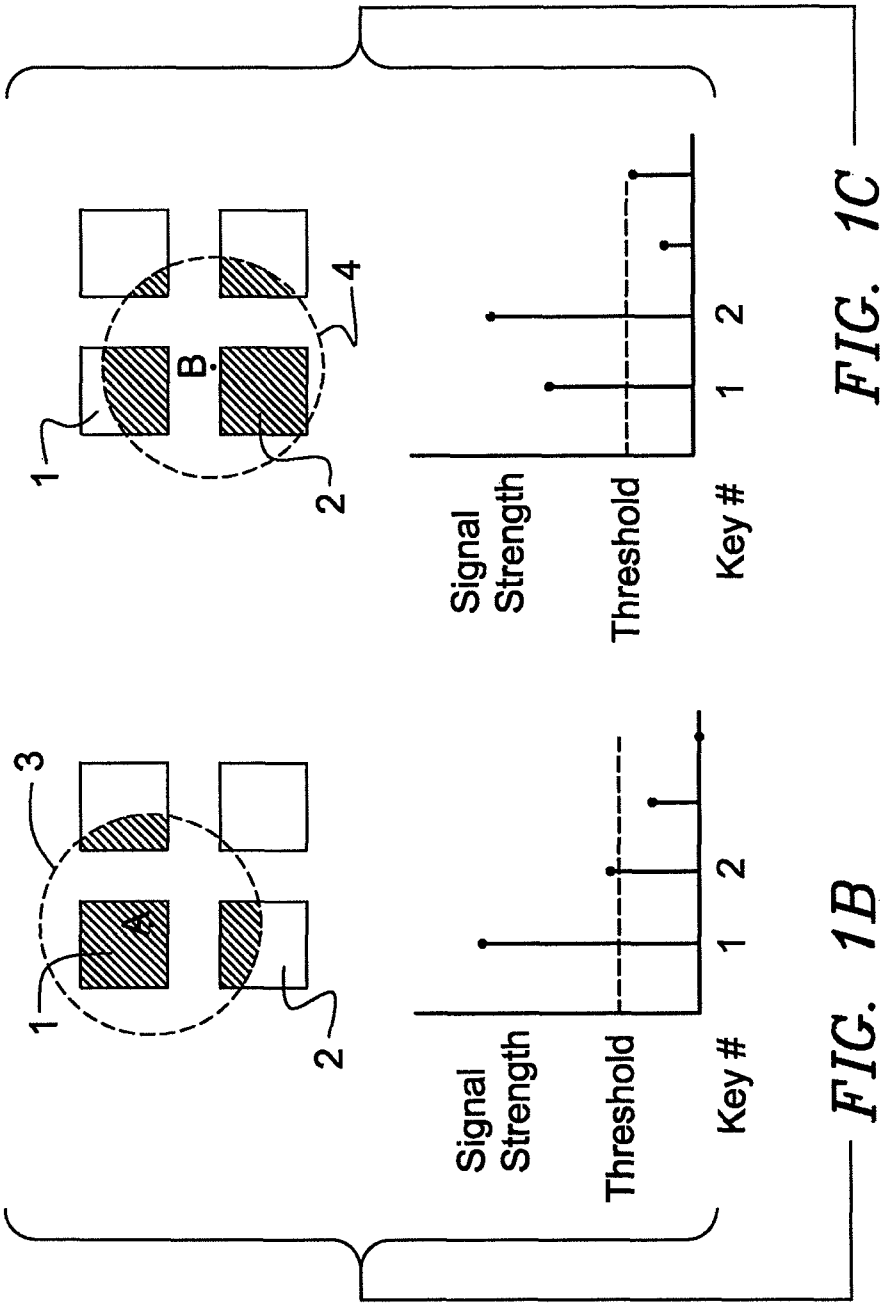

FIG. 1B

FIG. 1C

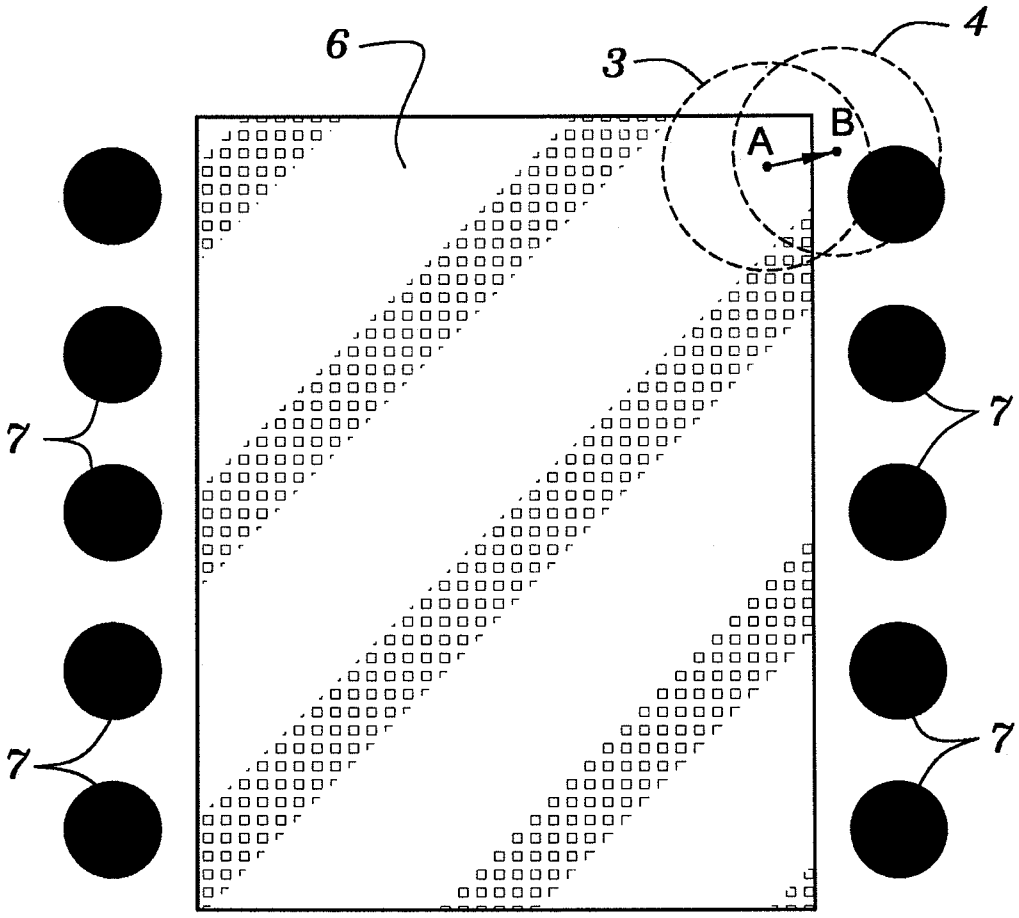

FIG. 2

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