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(71) Applicant *(for all designated States except US)*: **AGERE SYSTEMS INC.** [US/US]; 1110 American Parkway NE, Allentown, PA 18109 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **CHAMBERS, Michael, Joseph** [GB/DE]; Am Europakanal 40, 91056 Erlangen (DE). **KIESSLING, Michael** [DE/DE]; Gartenstrasse 25, 85354 Freising (DE). **TUCHMAN, Kenneth, A.** [US/DE]; Kiesslingerstrasse 28a, 81829 Munich (DE). **WANG, Hai** [DE/DE]; Boehmerwaldstrasse 10, 85586 Poing (DE).

(74) Agent: **RYAN, Joseph, B.**; Ryan, Mason & Lewis, LLP, 90 Forest Avenue, Locust Valley, NY 11560 (US).

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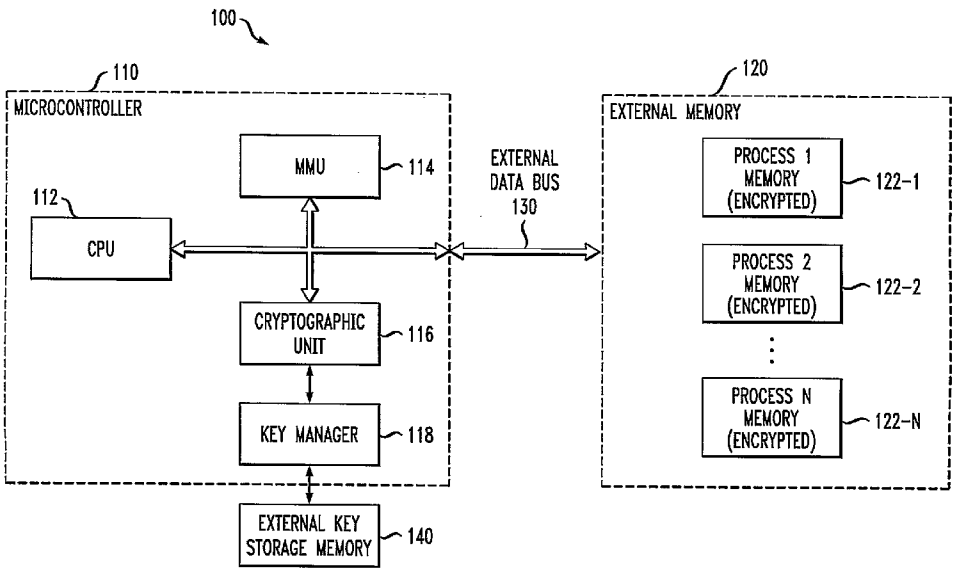
(54) Title: METHODS AND APPARATUS FOR THE SECURE HANDLING OF DATA IN A MICROCONTROLLER



(57) Abstract: Apparatus and methods are presented for protecting data in microcontrollers from both malicious software processes running inside the device as well as from unauthorized attempts to read the data from an external data bus and/or external memory. An illustrative embodiment of the invention accomplishes these security improvements, in part, by utilizing an enhanced memory management unit (MMU). The enhanced MMU is configured to prevent one software process running on the microcontroller from accessing data associated with a different software process running on the same microcontroller. Moreover, data transmitted over an external data bus or stored in an external memory is encrypted, thereby reducing the chances that unauthorized users will gain exploitable information from this data.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 06/28746

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - H04L 9/00 (2007.01)
USPC - 713/171
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
713/171

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 713/164; 380/181, 264, 277, 284

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PubWEST - terms: central processing unit, CPU, memory unit, encrypted data, encryption data, data bus, random access memory, RAM, mobile device, flash memory, integrated circuit, microcontroller, electronic mail, email, cryptographic unit, encryption key, personal digital assistant, PDA, cellular phone, memory key storage ...

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2003/0229789 A1 (MORAIS, et al.) 11 December 2003 (11.12.2003), abstract and para [0021]-[0104], [0113], [0115]-[0122], [0126], [0128]-[0130], [0134], [0141].	1-8, 10 and 18-19 --- 9, 11-17 and 20
Y	US 2002/0048369 A1 (GINTER, et al.) 25 April 2002 (25.04.2002), abstract and para [0466]-[0470], [0495], [0508]-[0509], [0525]-[0526], [0549]-[0562].	9, 11-13 and 20
Y	US 2003/0140245 A1 (DAHAN, et al.) 24 July 2003 (24.07.2003), abstract and para [0029], [0164]-[0173].	14-17
A	US 2005/0172121 A1 (RISAN, et al.) 4 August 2005 (04.08.2005), entire document, especially abstract and para [0043]-[0045], [0059]-[0069], [0098]-[0104], [0220], [0269]-[0271].	1-20

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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