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United States Patent [19]

Jablon et al.

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[54] **METHOD AND APPARATUS FOR ASSESSING INTEGRITY OF COMPUTER SYSTEM SOFTWARE**

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[73] Assignee: **Compaq Computer Corp.,** Houston, Tex.

[21] Appl. No.: **231,443**

[22] Filed: **Apr. 20, 1994**

Related U.S. Application Data

[63] Continuation of Ser. No. 880,050, May 7, 1992.

[51] **Int. Cl.**[6] **G06F 11/00;** H04K 1/00

[52] **U.S. Cl.** **395/575;** 380/4

[58] **Field of Search** 395/575, 700, 750, 425; 380/4

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Assistant Examiner—Joseph E. Palys

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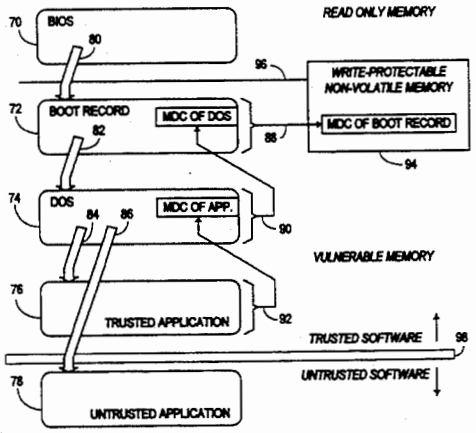
[57] **ABSTRACT**

A method and device for reliably assessing the integrity of a computer system's software prevents execution of corrupted programs at time of system initialization, enhancing system security. Programs and data comprising the system's trusted software, including all startup processes, are verified before being utilized. Methods to verify the trusted software use a hierarchy of both modification detection codes and public-key digital signature codes. The top-level codes are placed in a protectable non-volatile storage area, and are used by the startup program to verify the integrity of subsequent programs. A trusted initialization program sets a hardware latch to protect the codes in the non-volatile memory from being overwritten by subsequent untrusted programs. The latch is only reset at system restart, when control returns to the bootstrap program. Software reconfiguration is possible with trusted programs that write new top-level codes while the latch is open. The mechanism itself is immune to malicious software attack when the write-protect latch is closed before running untrusted software. Preferred embodiments in an IBM-compatible personal computer uses the reset switch to initiate a trusted path between the user and a program. Damage from certain classes of computer virus and trojan horse attacks is prevented. A system recovery process is described. A related improved method for user authentication uses a read-and -write memory protection latch to prevent access to sensitive authentication data.

19 Claims, 8 Drawing Sheets



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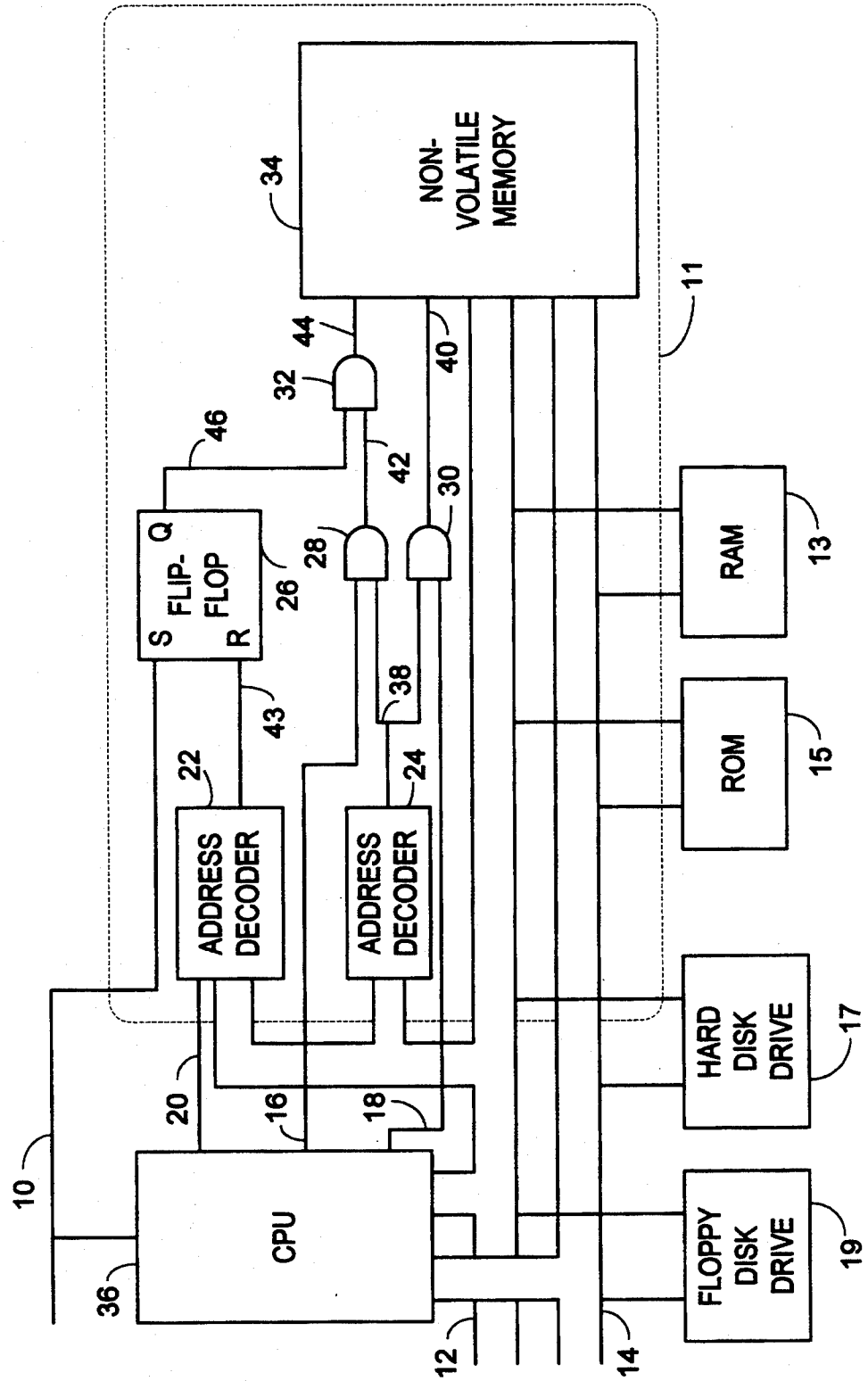

FIG. 1

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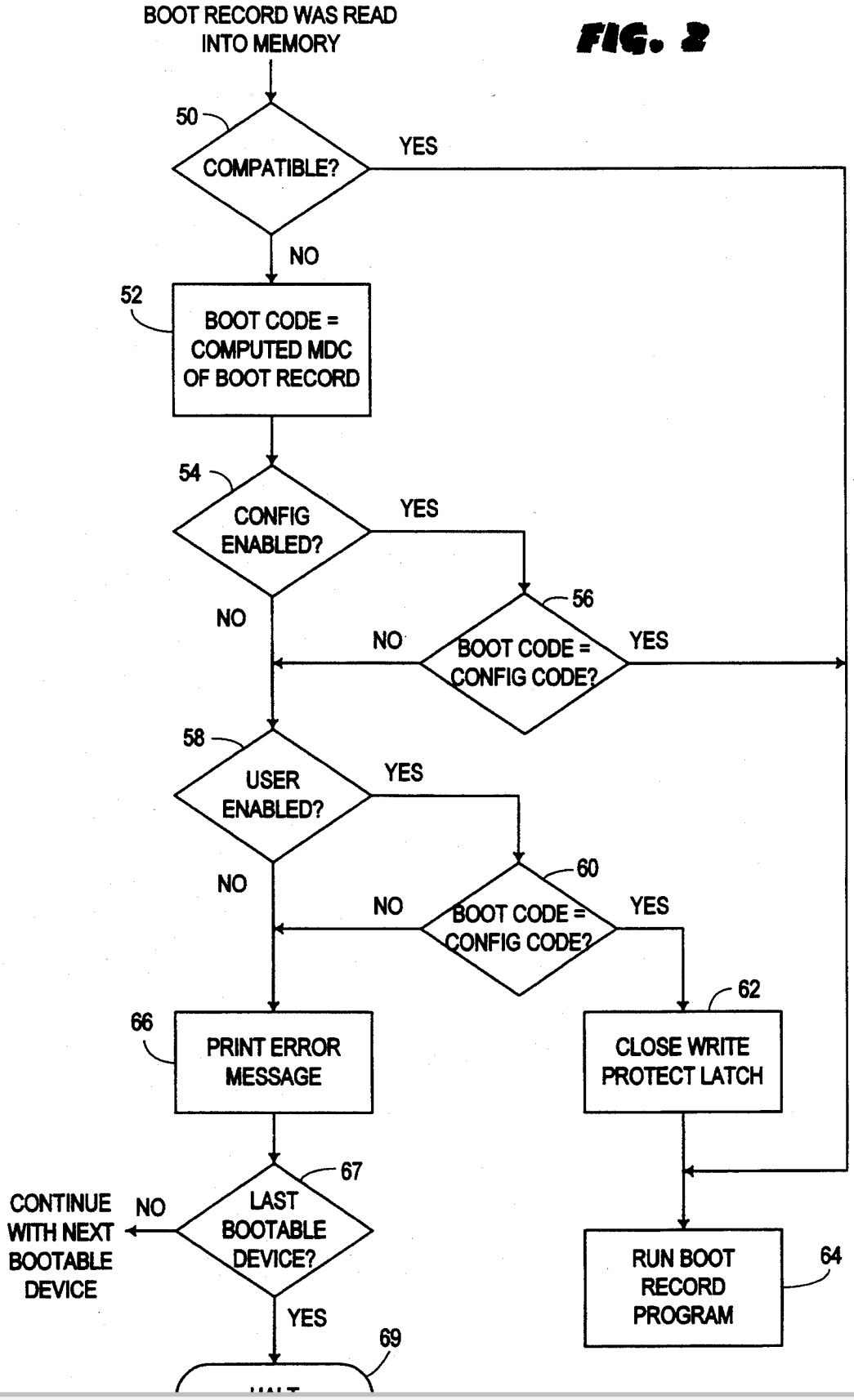
FIG. 2



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A SECURE CONFIGURATION:

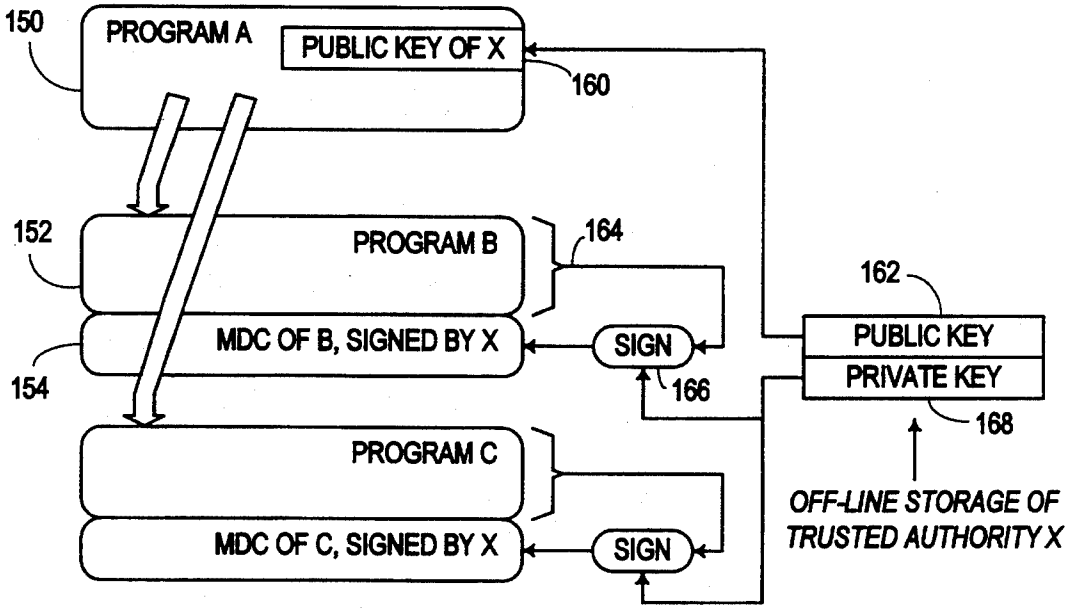
VARIABLE	VALUE	
COMPATIBLE	FALSE	110
USER ENABLED	TRUE	111
USER CODE	A6339DE4DBE72231	112
CONFIG ENABLED	TRUE	113
CONFIG CODE	15088428267F00BA	114

FIG. 3

COMPATIBLE CONFIGURATION:

VARIABLE	VALUE	
COMPATIBLE	TRUE	120
USER ENABLED	UNDEFINED	121
USER CODE	UNDEFINED	122
CONFIG ENABLED	UNDEFINED	123
CONFIG CODE	UNDEFINED	124

FIG. 4



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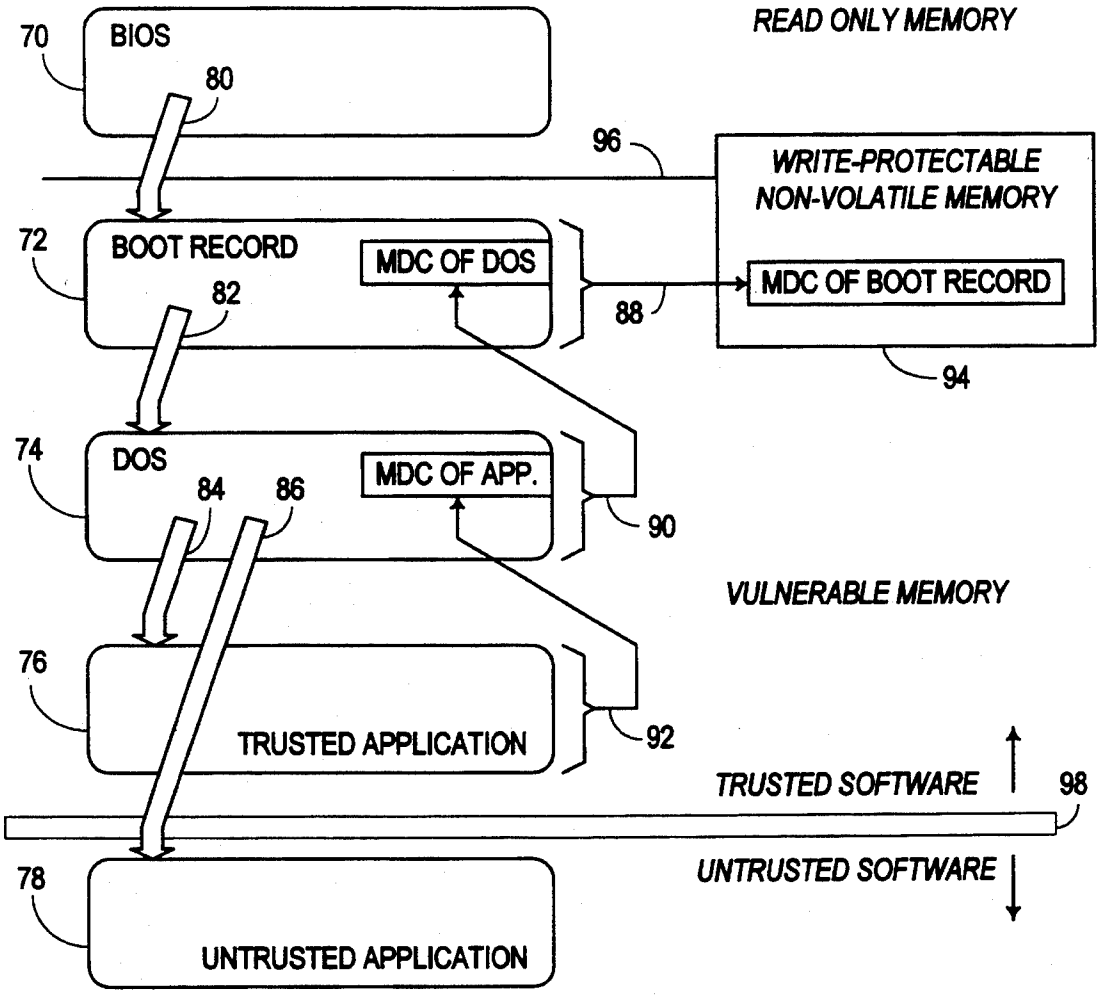

FIG. 5

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