

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

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- (54) **COMPUTER OPERATING SYSTEM USING COMPRESSED ROM IMAGE IN RAM**
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- (73) Assignee: **Apple Computer, Inc.**, Cupertino, CA (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.

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- (51) **Int. Cl.**⁷ **G06F 13/00**; G06F 30/00
- (52) **U.S. Cl.** **713/2**; 710/1; 710/20; 711/165; 711/203; 711/206; 713/1
- (58) **Field of Search** 710/1, 20; 711/165, 711/203, 206; 713/1, 2

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,109,521 A	4/1992	Culley	711/165
5,579,522 A	11/1996	Christeson et al.	713/2
5,600,766 A *	2/1997	Deckys et al.	395/135
5,671,413 A	9/1997	Shipman et al.	713/2
5,696,926 A *	12/1997	Culbert et al.	711/203
5,836,013 A *	11/1998	Greene et al.	713/2
5,901,310 A *	5/1999	Rahman et al.	713/1
5,940,871 A *	8/1999	Goyal et al.	711/206
6,195,107 B1 *	2/2001	Iverson	345/516
6,216,225 B1 *	4/2001	Yoo	713/2

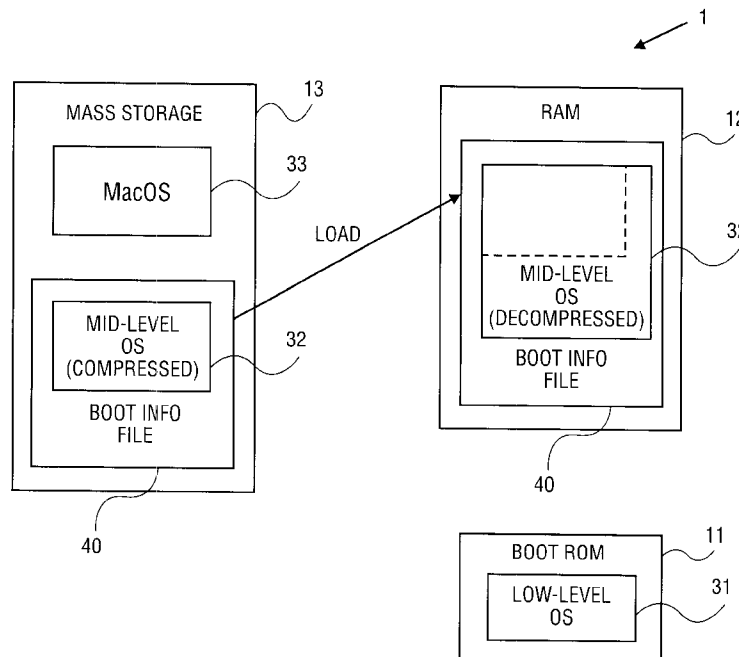
OTHER PUBLICATIONS

Developer Note, Apple Computer, Inc., *Apple iMac Computer*, 1998, pp. 1-75.
 B. Croft, et al., "Network Working Group Request for Comments (RFC) 951", Sep. 1985, 9 pgs.
 IEEE Computer Society, "IEEE Standard for Boot (Initialization Configuration) Firmware: Core Requirements and Practices", Oct. 28, 1994, 264 pgs.
 * cited by examiner
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(57) **ABSTRACT**

A low-level portion of the operating system of a computer system is separated from an intermediate-level portion of the operating system. The low-level portion, including hardware-specific code, is stored in a relatively small read-only memory (ROM), while at least part of the intermediate-level portion is stored as a compressed ROM image on a disk or other mass storage device, which may be located remotely from the computer system. Upon power-up or reset of the computer system, the code in the ROM is executed to read the compressed ROM image into random access memory (RAM) of the computer system. The compressed image is then decompressed and executed as part of the boot sequence. Once decompressed, the portion of RAM storing the intermediate-level code is write-protected in the memory map, and the code in boot ROM is deleted from the memory map. Memory space in RAM that is allocated to the intermediate-level code but not used is returned to the operating system for use as part of system RAM.

41 Claims, 11 Drawing Sheets



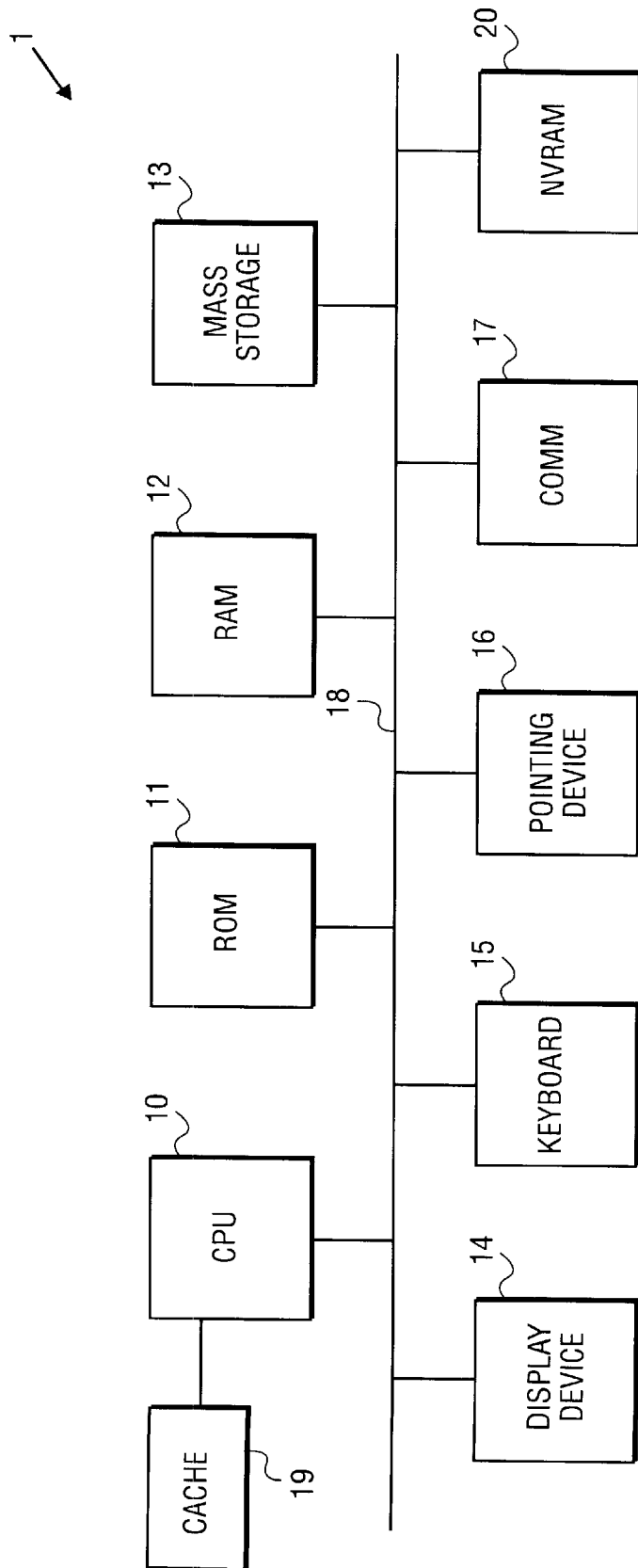


FIG. 1

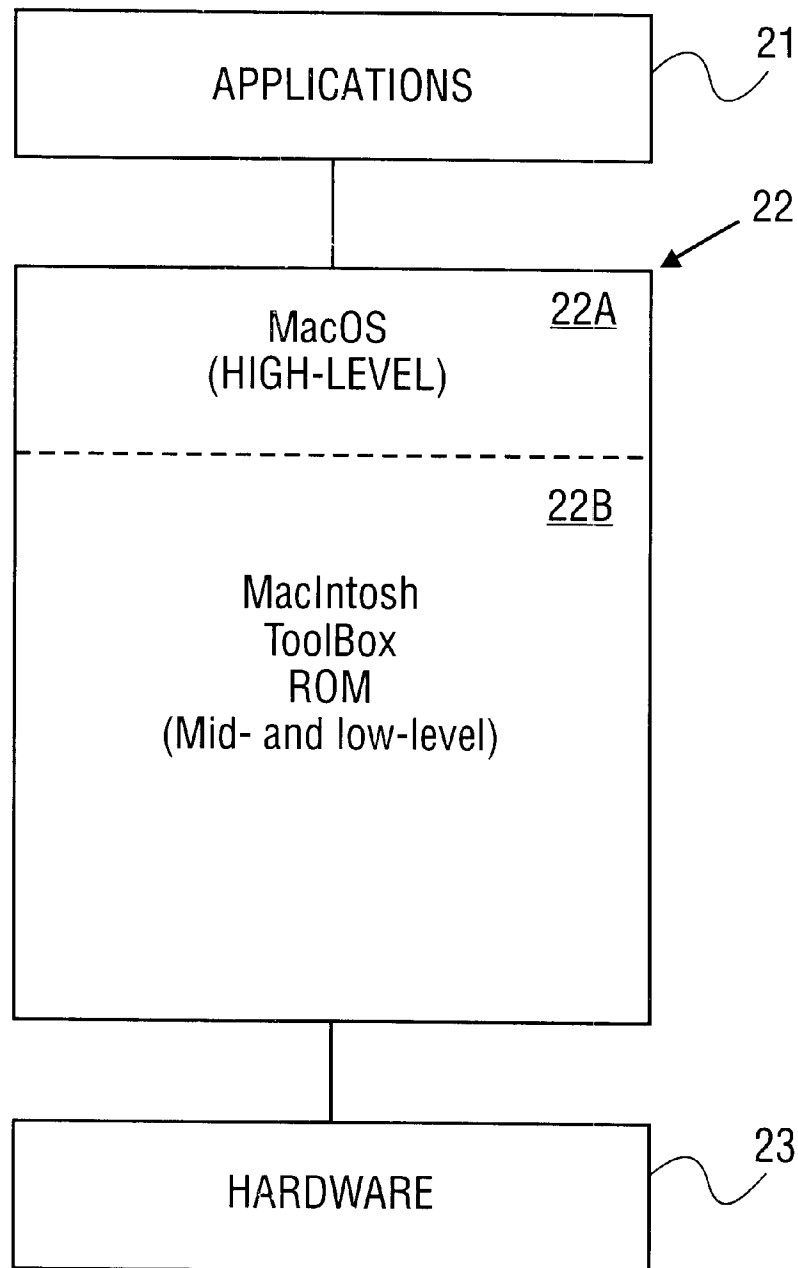


FIG. 2

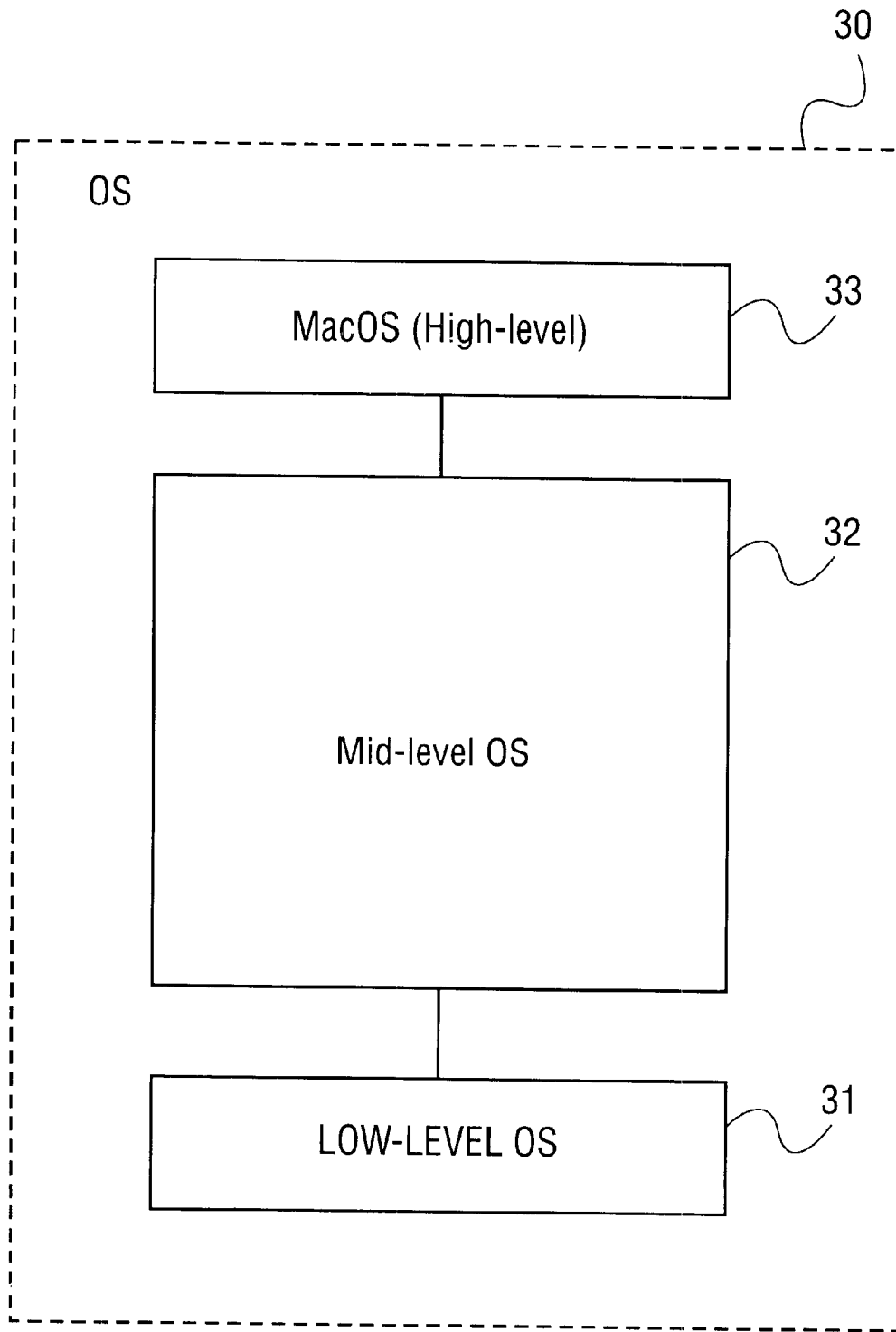


FIG. 3

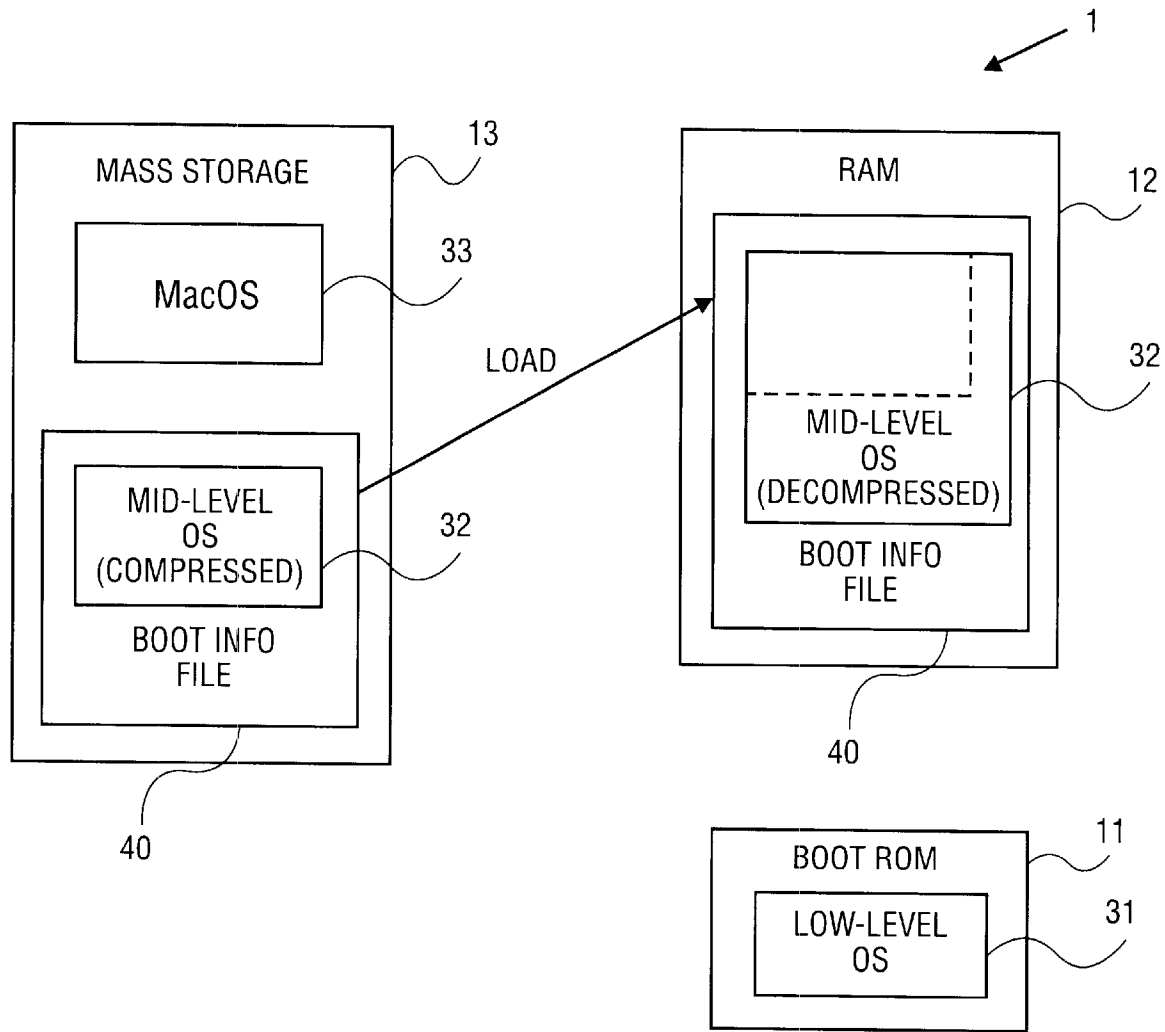


FIG. 4

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