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Baumgartner et al.

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[54] **METHOD AND APPARATUS FOR SYNCHRONIZING AUDIO AND VIDEO DATA STREAMS IN A MULTIMEDIA SYSTEM**

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[51] Int. Cl.^{6} **H04N 5/04**

[52] U.S. Cl. **348/515**; 395/806

[58] Field of Search 348/515; 395/154, 395/162–164; 345/122; 375/355; H04N 5/04, 5/12

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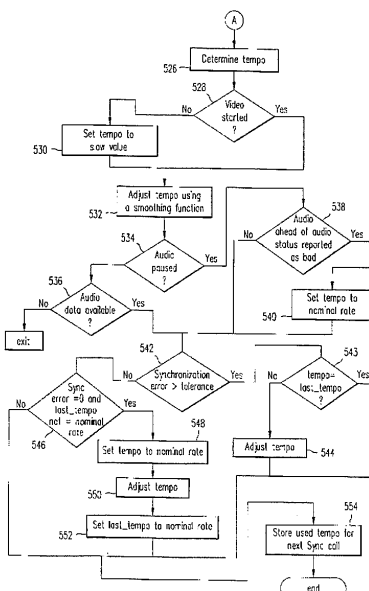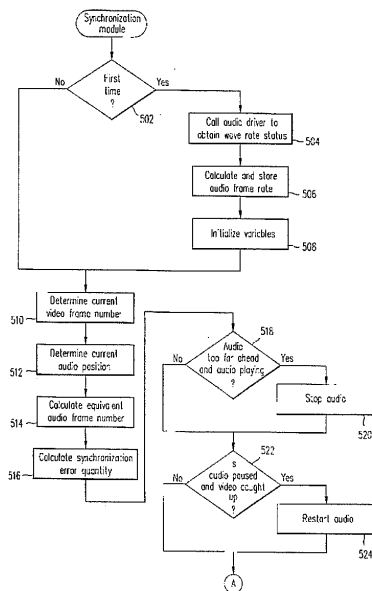
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Primary Examiner—Sherrie Hsia

[57] **ABSTRACT**

A method and apparatus for synchronizing audio and video data streams in a computer system during a multimedia presentation to produce a correctly synchronized presentation. The preferred embodiment of the invention utilizes a nonlinear feedback method for data synchronization. The method of the present invention periodically queries each driver for the current audio and video position (or frame number) and calculates the synchronization error. The synchronization error is used to determine a tempo value adjustment to one of the data stream designed to place the video and audio back in sync. The method then adjusts the audio or video tempo to maintain the audio and video data streams in synchrony. In the preferred embodiment of the invention, the video tempo is changed nonlinearly over time to achieve a match between the video position and the equivalent audio position. The method applies a smoothing function to the determined tempo value to prevent overcompensation. The method of the present invention can operate in any hardware system and in any software environment and can be adapted to existing systems with only minor modifications.
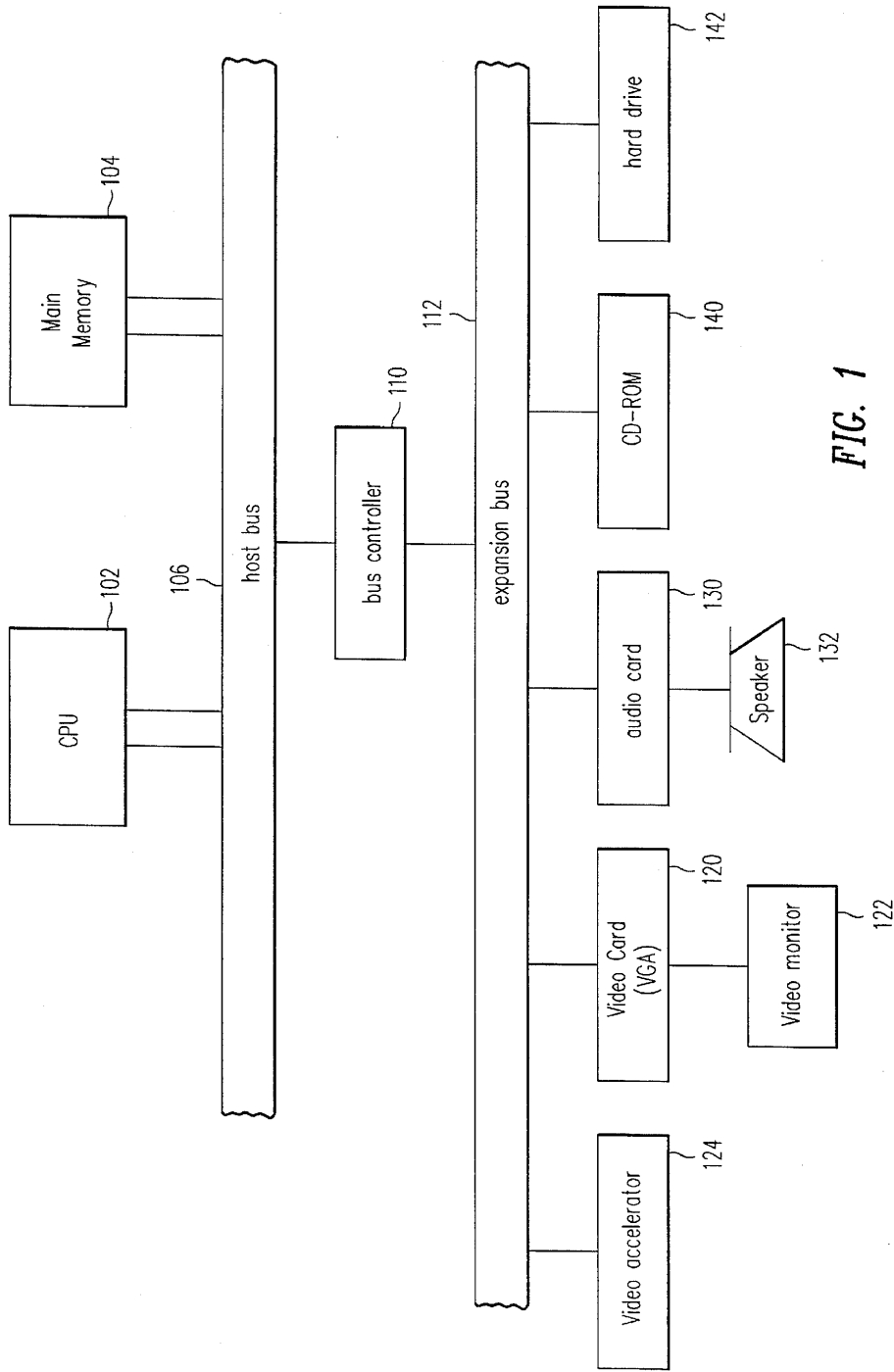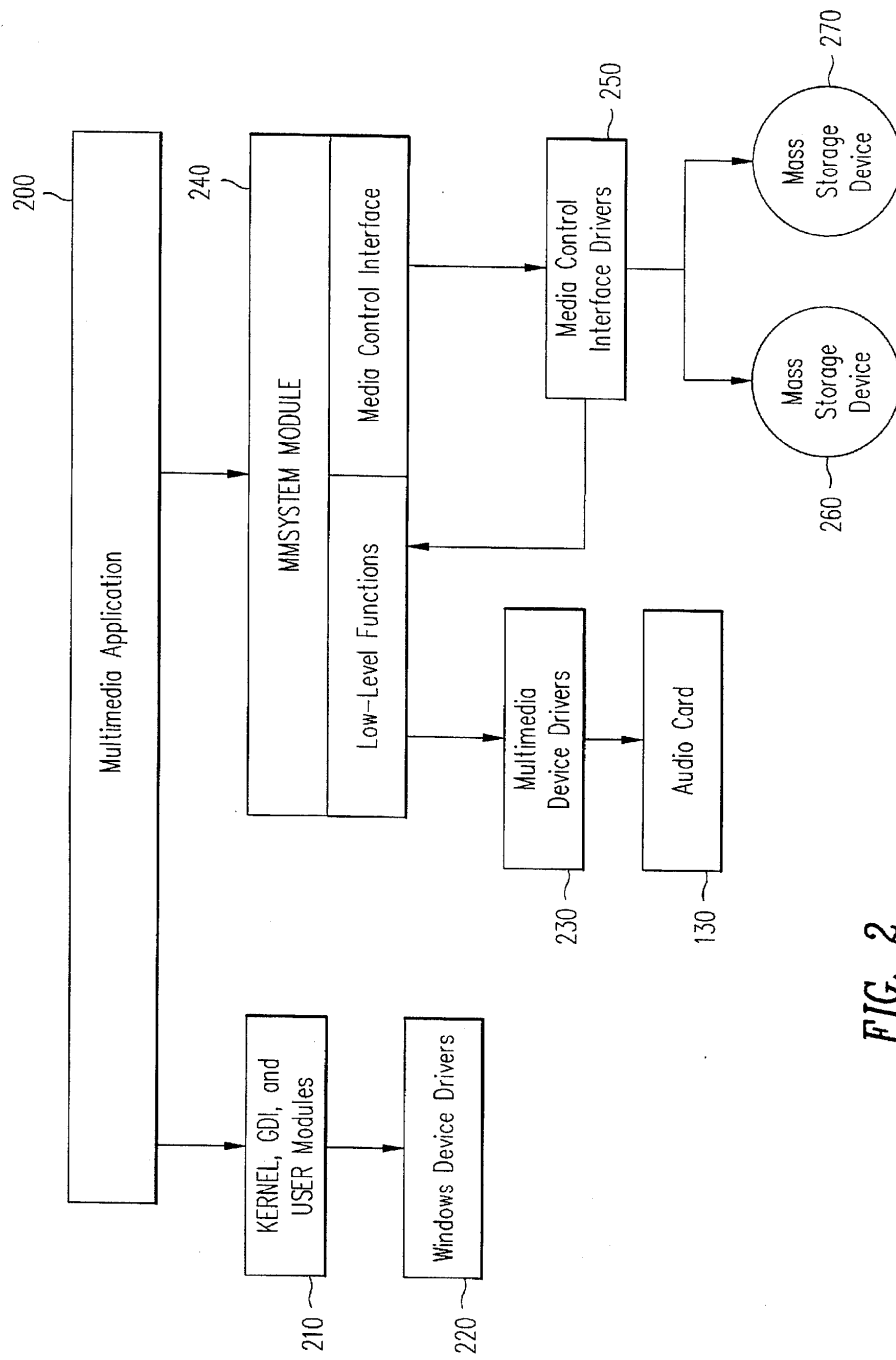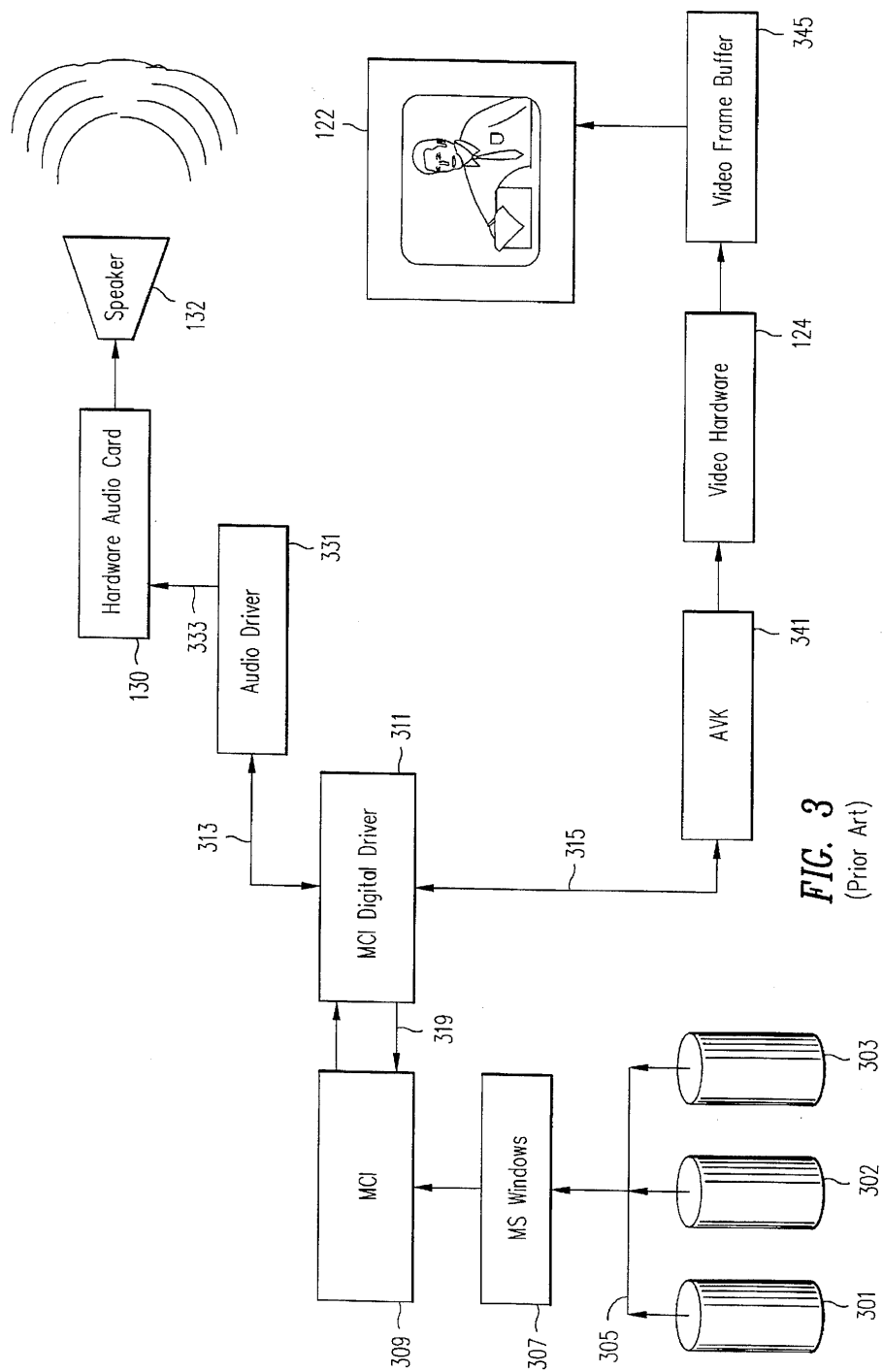
40 Claims, 7 Drawing Sheets

Main Memory 104

CPU 102

host bus 106

bus controller 110

expansion bus 112

hard drive 142

CD-ROM 140

audio card 130

Speaker 132

Video Card (VGA) 120

Video monitor 122

Video accelerator 124

FIG. 1
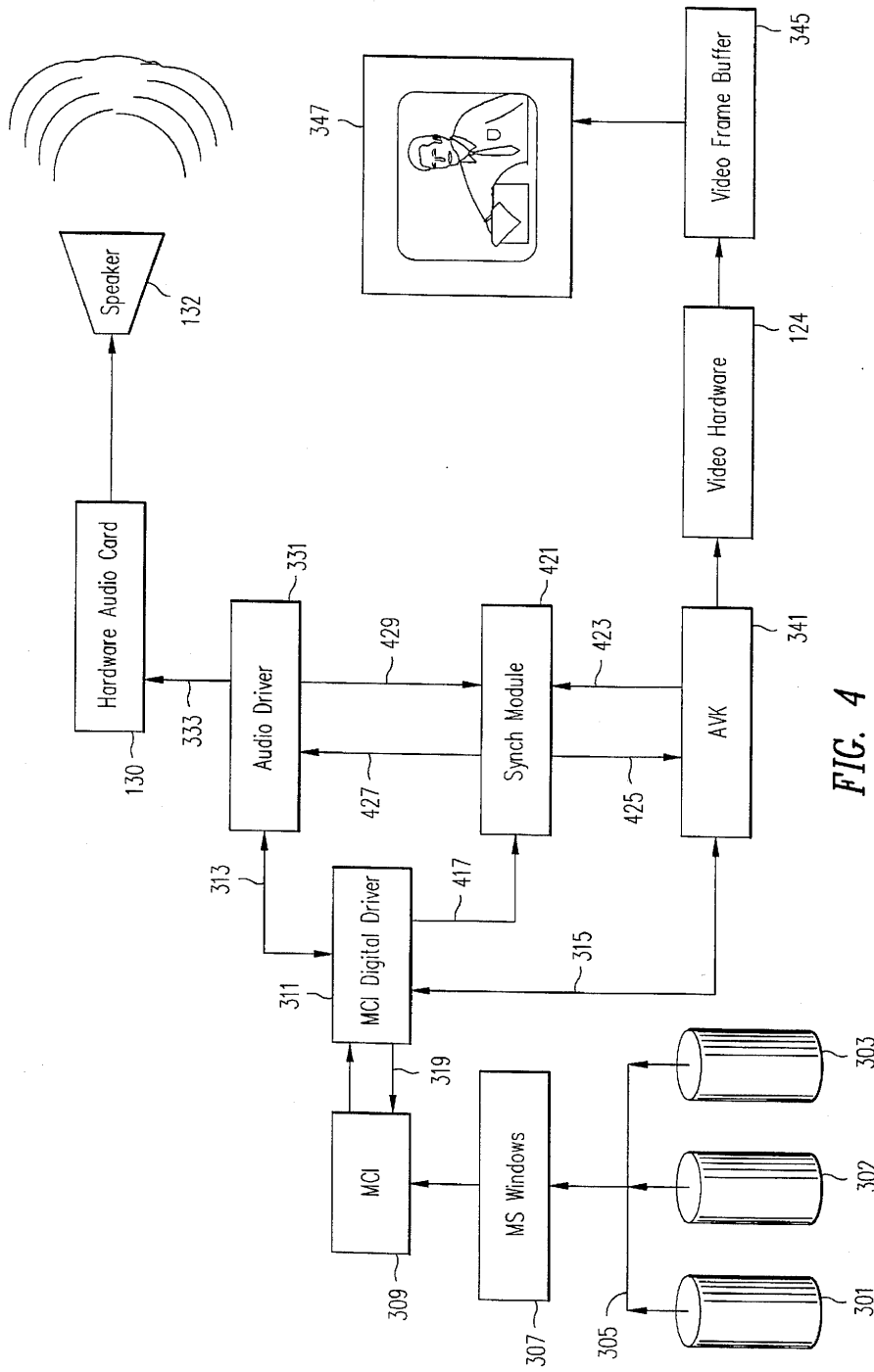
FIG. 2

FIG. 3
(Prior Art)

FIG. 4

DOCKET ALARM

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