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**Beckert et al.**

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(54) **VEHICLE COMPUTER SYSTEM AUDIO ENTERTAINMENT SYSTEM**

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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(57) **ABSTRACT**

(21) Appl. No.: **09/004,076**

A vehicle computer system has an audio entertainment system implemented in a logic unit and audio digital signal processor (DSP) independent from the host CPU. The audio entertainment system employs a set of ping/pong buffers and direct memory access (DMA) circuits to transfer data between different audio devices. Audio data is exchanged using a mapping overlay technique, in which the DMA circuits for two audio devices read and write to the same memory buffer. The computer system provides an audio manager API (application program interface) to enable applications running on the computer to control the various audio sources without knowing the hardware and implementation details of the underlying sound system. Different audio devices and their drivers control different functionality of the audio system, such as equalization, volume controls and surround sound decoding. The audio manager API transfers calls made by the applications to the appropriate device driver(s). The computer system also supports a speech recognition system. Speech utterances are picked up by a microphone and sampled at an internal sampling rate. However, the speech recognition system employs a lower sampling rate. The computer system converts microphone data from the higher internal sampling rate to the desired sampling rate by piggybacking the microphone data on command/message streams to an SPI (serial peripheral interface) of the audio DSP. The DSP performs normal low-pass filtering and down sampling on the data stream and then uses the SPI to send out the microphone data at the lower sampling rate.

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(51) **Int. Cl.**  
**G10L 19/00** (2006.01)

(52) **U.S. Cl.** ..... **704/201; 704/270; 704/275**

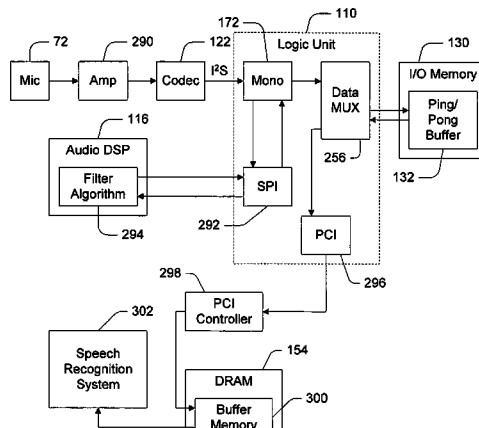
(58) **Field of Classification Search** ..... 704/201, 704/270–275, 235, 217, 212, 244, 230  
See application file for complete search history.

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**20 Claims, 10 Drawing Sheets**



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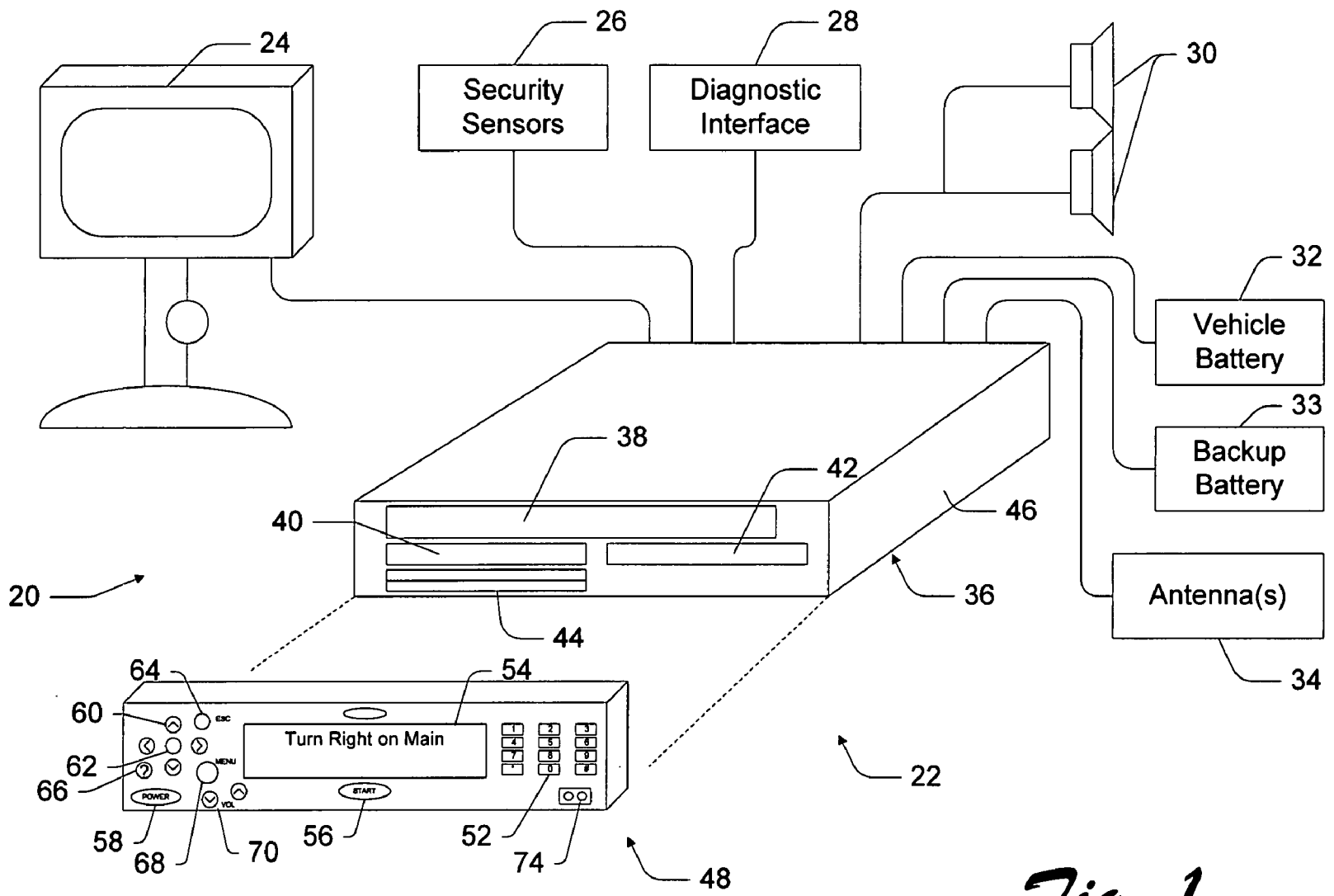


Fig. 1

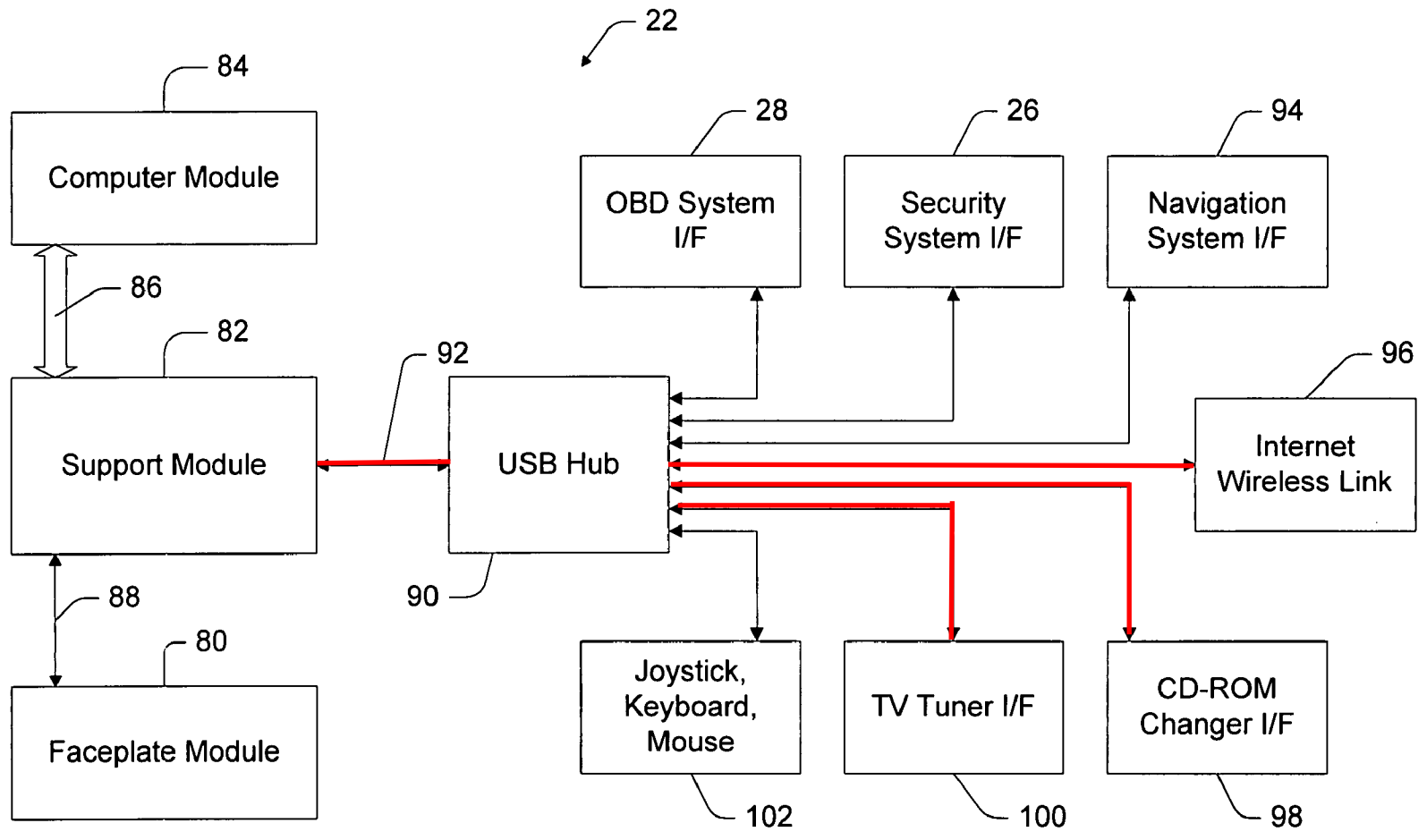


Fig. 2

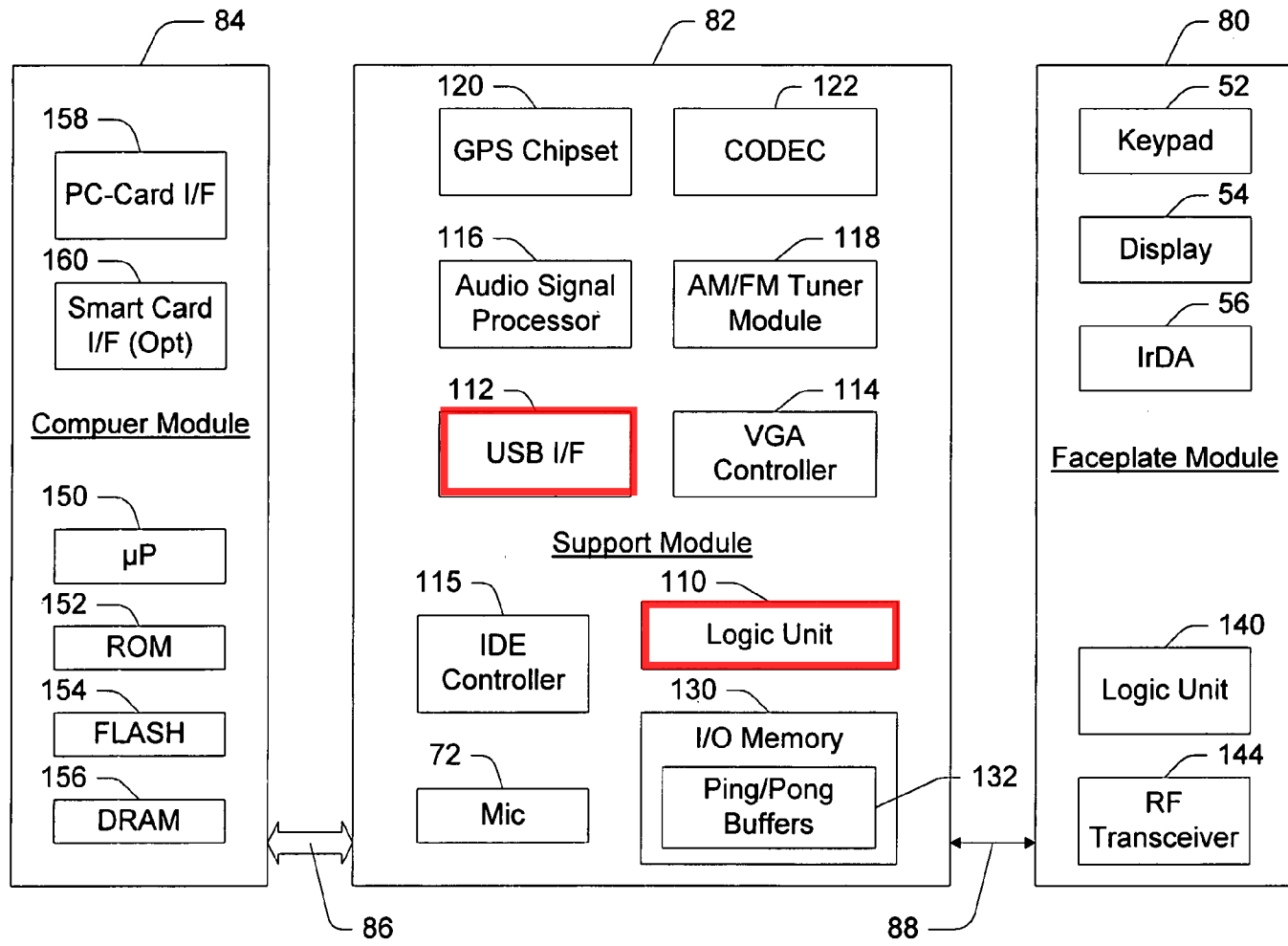


Fig. 3

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