United States Patent [19]

Akagiri et al.

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[54] **TWO-STAGE COMPRESSION AND EXPANSION OF COUPLING PROCESSED MULTI-CHANNEL SOUND SIGNALS FOR TRANSMISSION AND RECORDING**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.^{6}** **H04S 3/00**; H04B 1/66; H04H 5/00

[52] **U.S. Cl.** **704/500**; 381/2; 704/227; 704/229

[58] **Field of Search** 395/2.36, 2.38, 395/2.39; 381/2; 704/227, 229, 230, 500

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[57] **ABSTRACT**

A multi-channel signal compressor for compressing digital sound signals in the respective channels of a multi-channel sound system. The apparatus comprises a first-stage compression system and a second-stage compression system. In the first-stage compression system, a coupling circuit performs coupling between the digital sound signals of at least two of the channels to generate coupling-processed signals, one for each of the channels. A compressor circuit receives the coupling-processed signals from the coupling circuit and frequency divides each coupling-processed signal into frequency range signals in respective frequency ranges, and compresses the frequency range signals obtained by dividing each coupling-processed signal to generate a first-stage compressed signal. In the second-stage compression system, a determining circuit receives the first-stage compressed signal for each channel from the first-stage compression system and determines an energy for each channel from the first-stage compressed signal of the respective channel. A channel bit apportionment decision circuit operates in response to the determining circuit, and apportions a predetermined number of bits among the channels to apportion a number of bits to each channel. Finally, an additional compressor additionally compresses the first-stage compressed signal of each channel using, for each channel, the number of bits apportioned to the respective channel by the channel bit apportionment decision circuit.
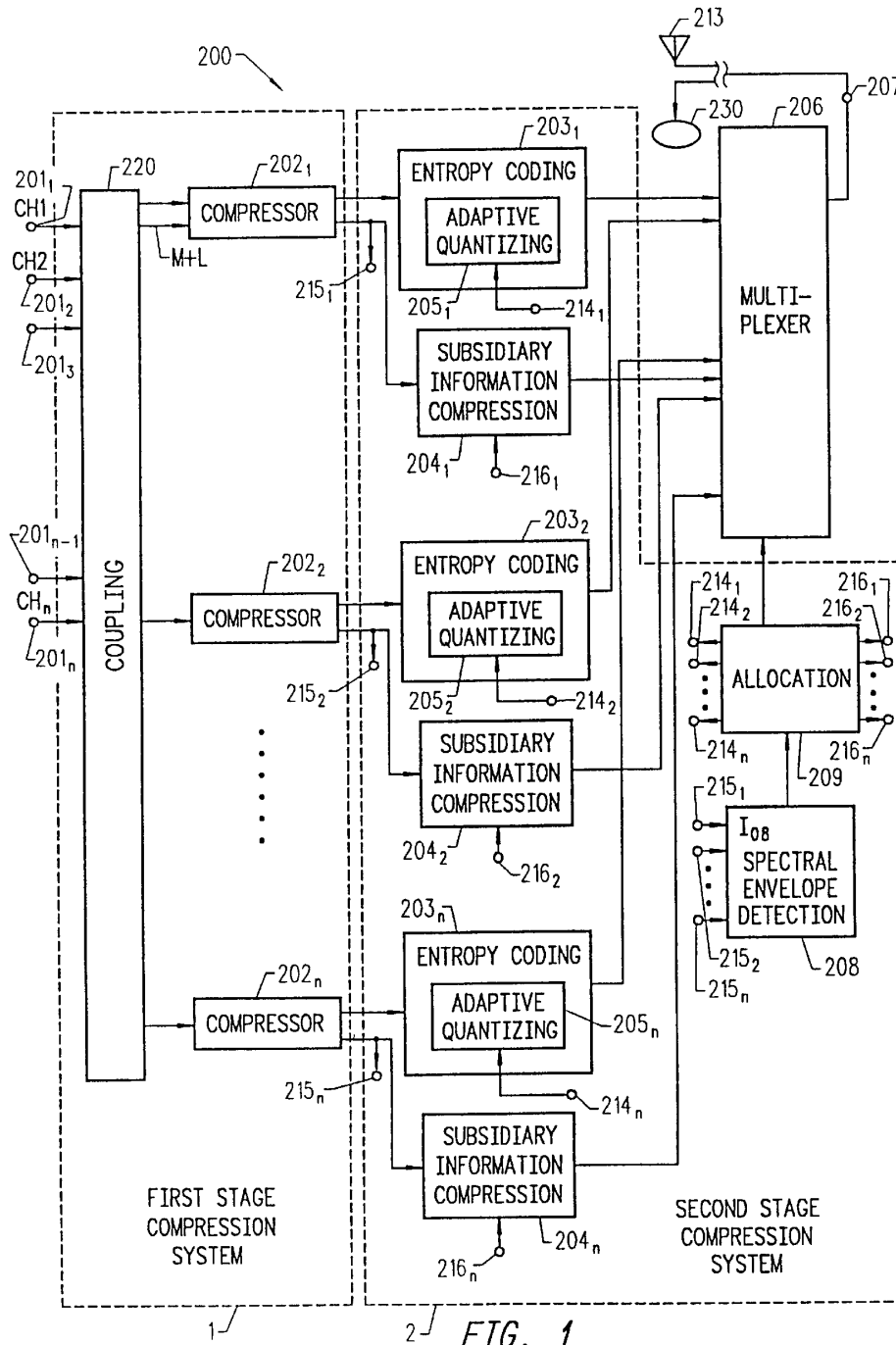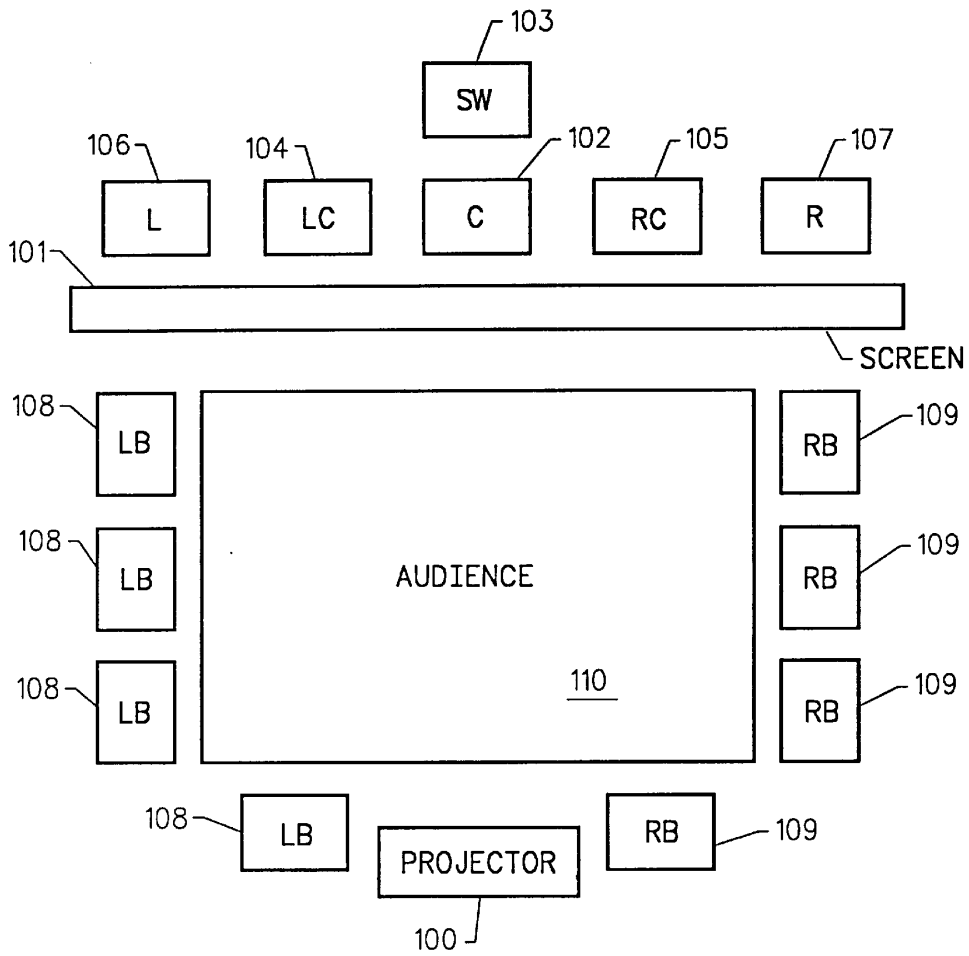
16 Claims, 10 Drawing Sheets

FIG. 1

FIG. 2

FIG. 3

FIG. 4
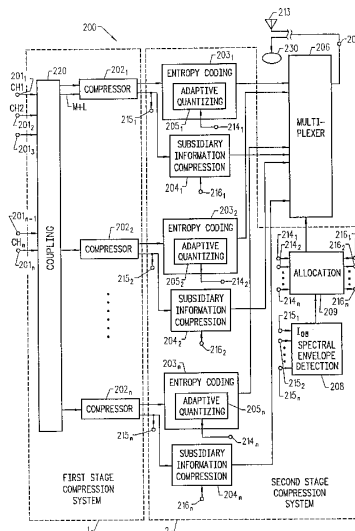
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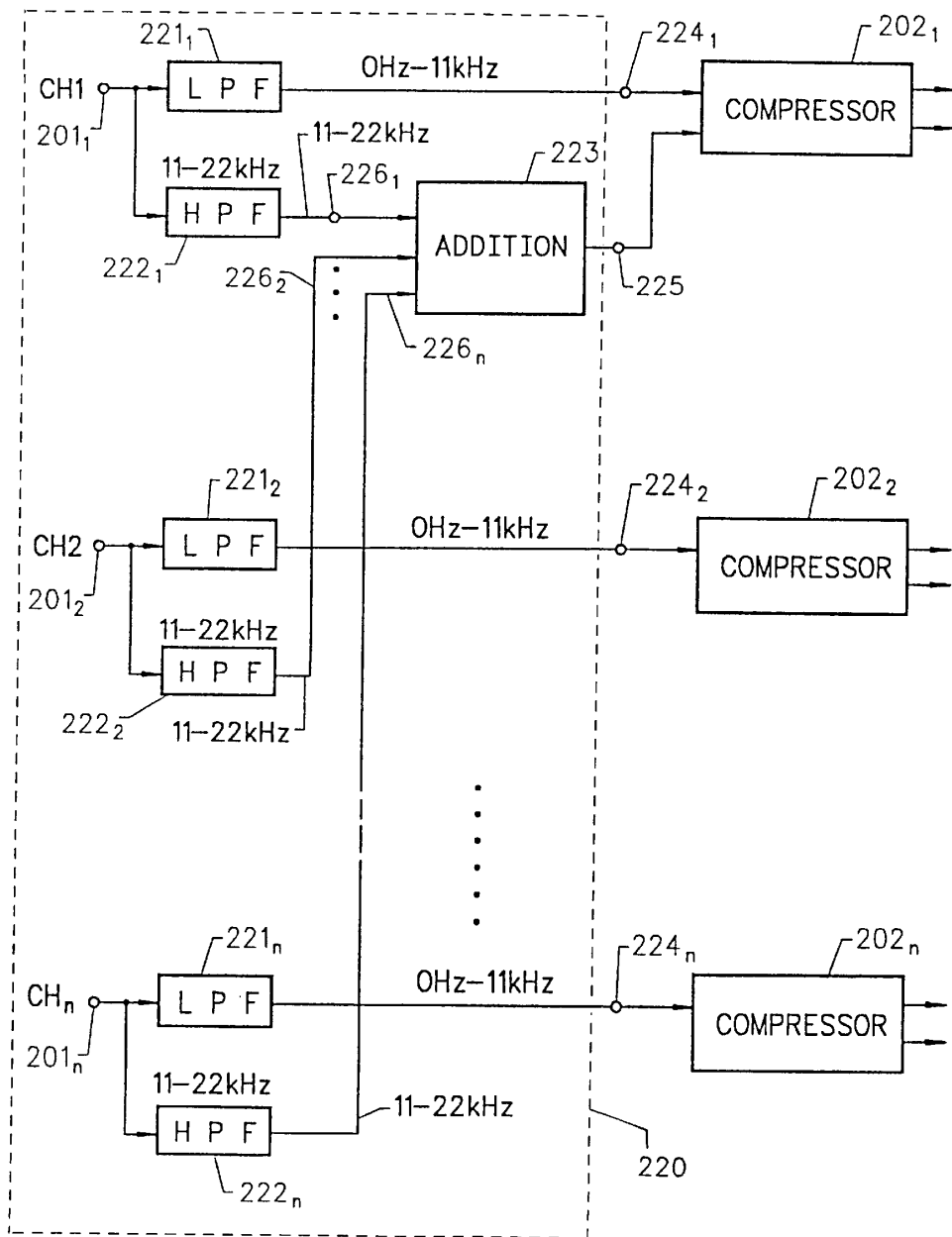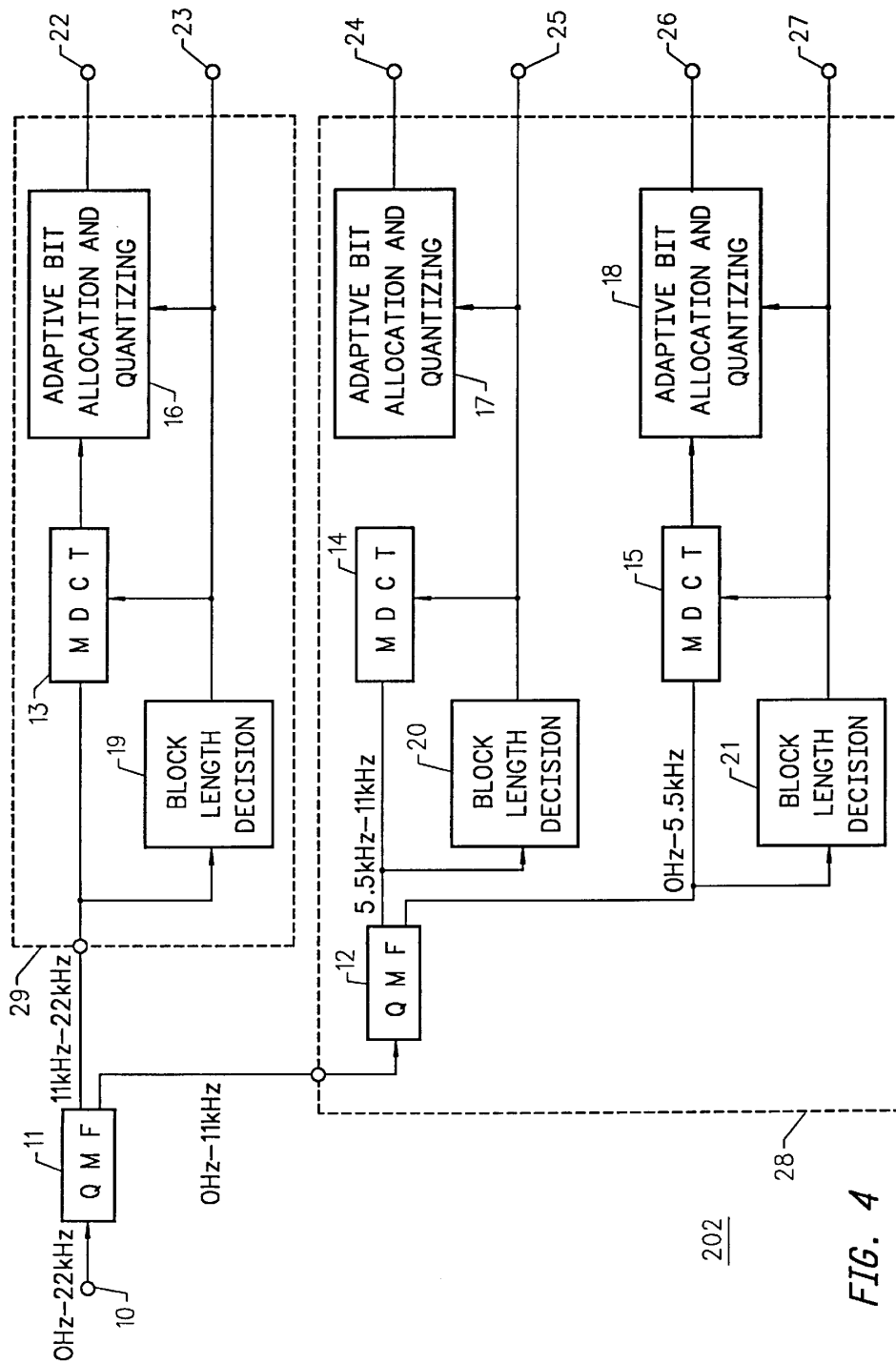
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