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Huang et al.

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- (54) **TELECONFERENCING SYSTEM WITH VISUAL FEEDBACK**
- (75) Inventors: **Jixiong Huang**, Brighton; **Richard S. Grinnell**, Brookline, both of MA (US)
- (73) Assignee: **Gentner Communications Corporation**, Salt Lake City, UT (US)
- (*) Notice: Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.
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- (51) **Int. Cl.**⁷ **H04R 1/40**
- (52) **U.S. Cl.** **381/92; 379/202**
- (58) **Field of Search** 381/92; 367/118, 367/119, 121, 122, 124, 126; 379/202
- (56) **References Cited**

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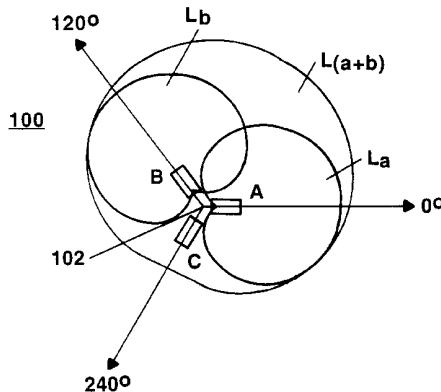
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Primary Examiner—David R. Hudspeth
Assistant Examiner—Harold Zintel
(74) *Attorney, Agent, or Firm*—Kudirka & Jobse, LLP

(57) **ABSTRACT**

A telephone system includes two or more cardioid microphones held together and directed outwardly from a central point. Mixing circuitry and control circuitry combines and analyzes signals from the microphones and selects the signal from one of the microphones or from one of one or more predetermined combinations of microphone signals in order to track a speaker as the speaker moves about a room or as various speakers situated about the room speak then fall silent. Visual indicators, in the form of light emitting diodes (LEDs) are evenly spaced around the perimeter of a circle concentric with the microphone array. Mixing circuitry produces ten combination signals, A+B, A+C, B+C, A+B+C, A-B, B-C, A-C, A-0.5(B+C), B-0.5(A+C), and C-0.5(B+A), with the "listening beam" formed by combinations, such as A-0.5(B+C), that involve the subtraction of signals, generally being more narrowly directed than beams formed by combinations, such as A+B, that involve only the addition of signals. An omnidirectional combination A+B+C is employed when active speakers are widely scattered throughout the room. Weighting factors are employed in a known manner to provide unity gain output. Control circuitry selects the signal from the microphone or from one of the predetermined microphone combinations, based generally on the energy level of the signal, and employs the selected signal as the output signal. The control circuitry also operates to limit dithering between microphones and, by analyzing the beam selection pattern, may switch to a broader coverage pattern, rather than switching between two narrower beams that each covers one of the speakers.

19 Claims, 7 Drawing Sheets



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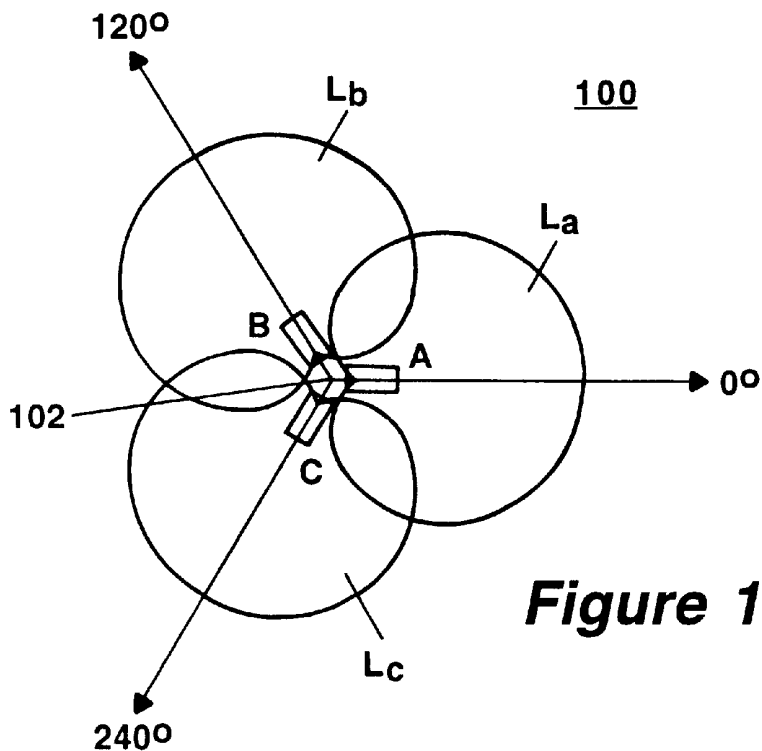


Figure 1

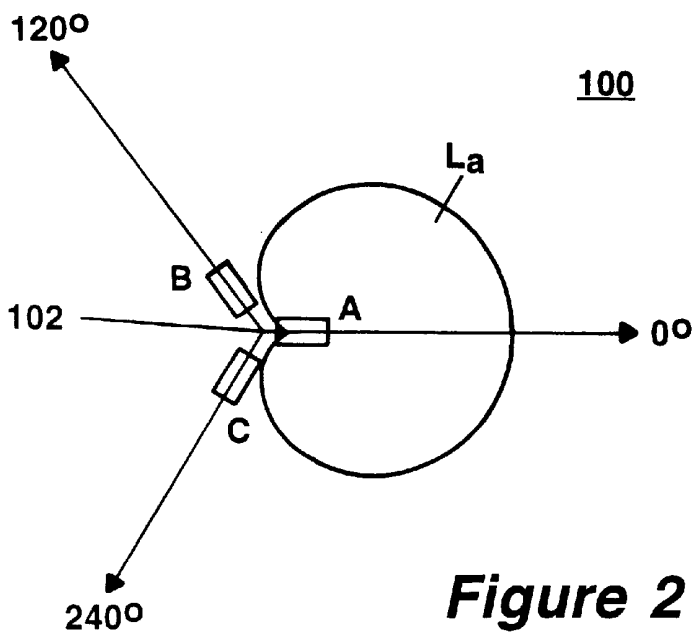


Figure 2

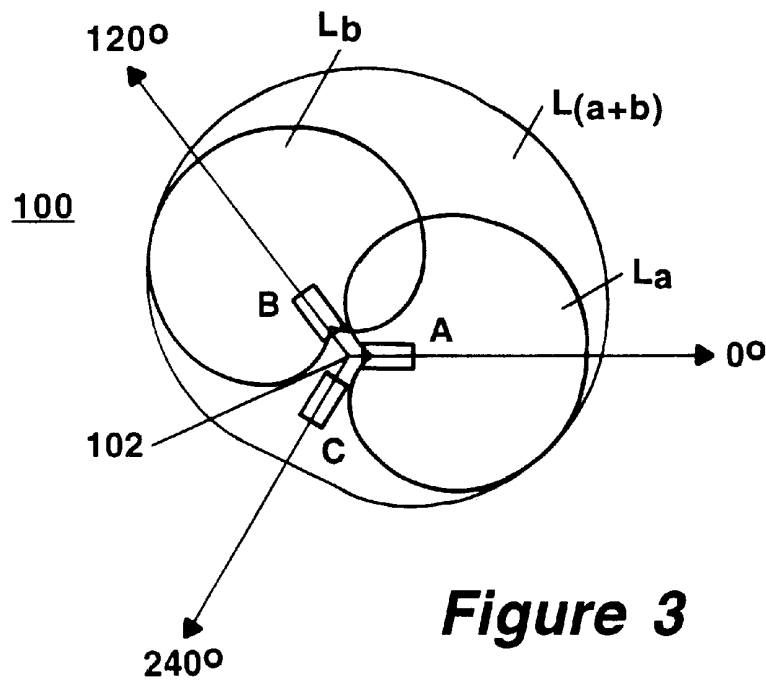


Figure 3

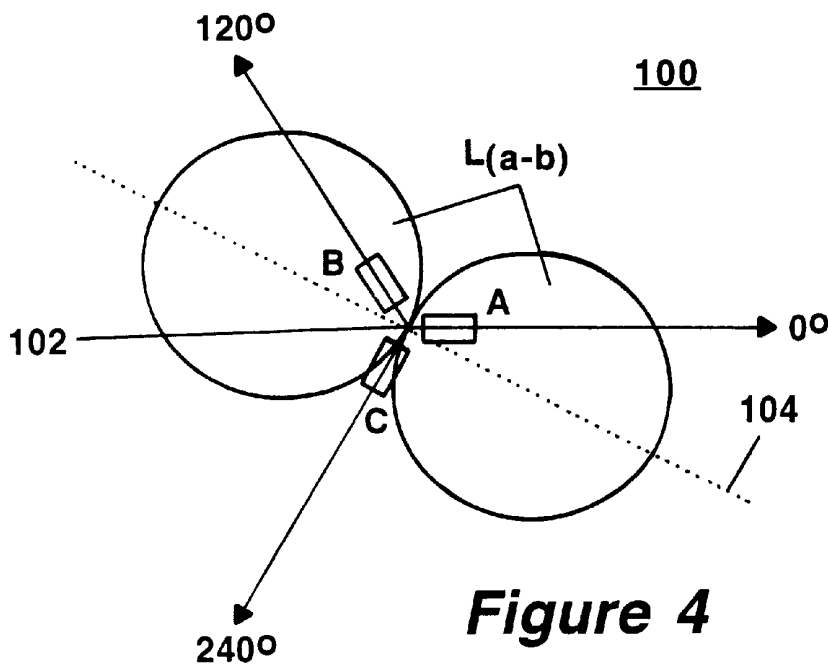


Figure 4

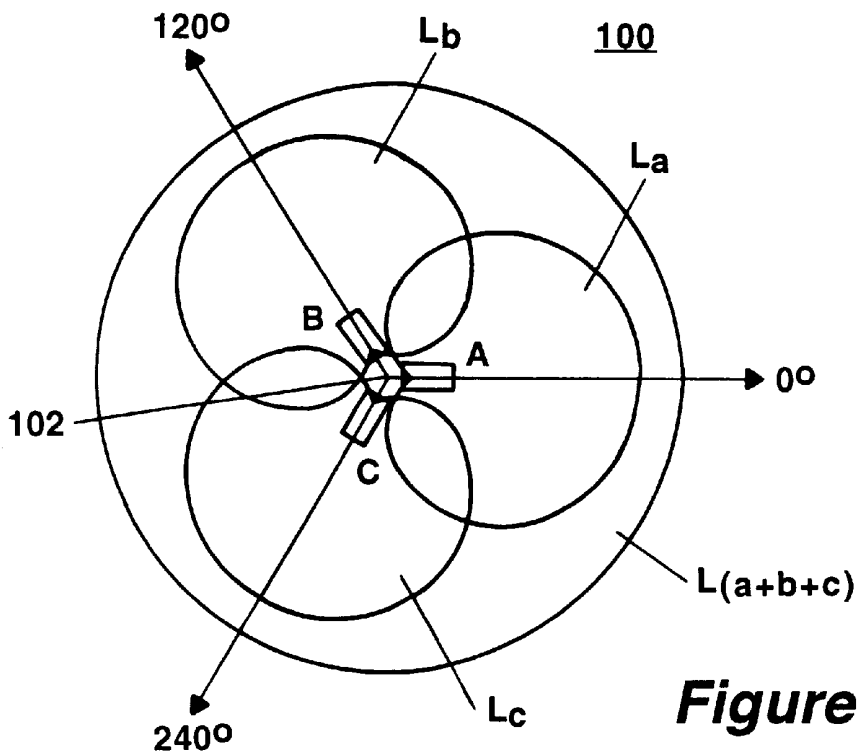


Figure 5

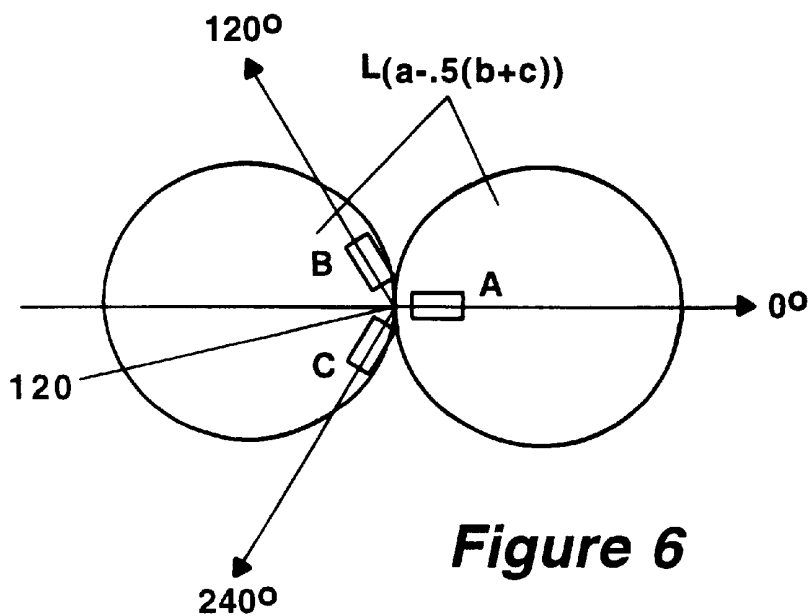


Figure 6

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