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DeGunther et al.

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[54] **MULTIPLE ANGLE AND REDUNDANT VISIBILITY SENSOR**

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[52] **U.S. Cl.** **356/438;** 356/337; 356/338; 356/339; 356/73; 356/435; 356/340; 356/342; 356/386; 356/387

[58] **Field of Search** 356/438, 337, 338, 339, 356/340, 342, 343, 435, 386, 387, 73

[56] **References Cited**

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[57] **ABSTRACT**

A multiple angle and redundant visibility sensor includes a plurality of optical transmitter/receiver pairs, each pair cooperatively coupled so as to transmit and receive in conically controlled beams along a common optical axis such that each transmitter faces, and directs optical energy directly into, its receiver pair. The plurality of pairs are staggered in angular orientation with respect to each other, with a common volume of intersection through which the approximate center of each optical axis passes. Each transmitter propagates a substantially conical beam of light which passes through an aerosol media which causes molecular scattering of the light. A single transmitter outputs optical energy at any given time, and the receiver intercept the appropriate scattered energy at different scattering angles depending on the relative axial orientation with respect to the scattering volume and the incident radiation. Automatic calibration is effected by measuring the transmission properties through the forward beam, or between cooperating pairs of transmitters and receiver elements. The various scattered energies are then compared to this direct path intensity to obtain the appropriate angular scattering coefficients. Redundant transmit/receive pairs increase the system reliability as well as data validity.

26 Claims, 8 Drawing Sheets