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Ludwig et al.

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[54] **MULTIMEDIA COLLABORATION SYSTEM ARRANGEMENT FOR ROUTING COMPRESSED AV SIGNAL THROUGH A PARTICIPANT SITE WITHOUT DECOMPRESSING THE AV SIGNAL**

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[51] **Int. Cl.**[6] **H04N 7/15**; H04L 12/00

[52] **U.S. Cl.** **395/200.02**; 395/200.04; 395/200.15; 395/200.2; 370/260; 370/270; 348/15; 348/16

[58] **Field of Search** 395/200.04, 200.15; 370/62, 260, 261, 265, 270; 348/12, 16, 15

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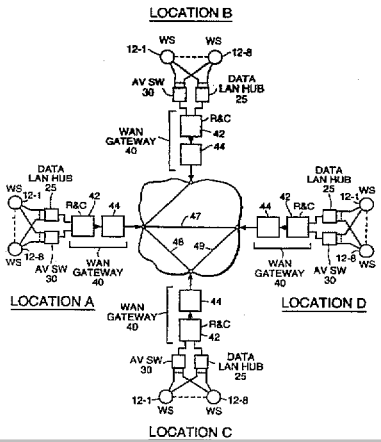
Attorney, Agent, or Firm—Cooley Godward, LLP; Craig P. Opperman

[57] **ABSTRACT**

A multimedia collaboration system that integrates separate real-time and asynchronous networks—the former for real-time audio and video, and the latter for control signals and textual, graphical and other data—in a manner that is interoperable across different computer and network operating system platforms and which closely approximates the experience of face-to-face collaboration, while liberating the participants from the limitations of time and distance. These capabilities are achieved by exploiting a variety of hardware, software and networking technologies in a manner that preserves the quality and integrity of audio/video/data and other multimedia information, even after wide area transmission, and at a significantly reduced networking cost as compared to what would be required by presently known approaches. The system architecture is readily scalable to the largest enterprise network environments. It accommodates differing levels of collaborative capabilities available to individual users and permits high-quality audio and video capabilities to be readily superimposed onto existing personal computers and workstations and their interconnecting LANs and WANs. In a particular preferred embodiment, a plurality of geographically dispersed multimedia LANs are interconnected by a WAN. The demands made on the WAN are significantly reduced by employing multi-hopping techniques, including dynamically avoiding the unnecessary decompression of data at intermediate hops, and exploiting video mosaicing, cut-and-paste and audio mixing technologies so that significantly fewer wide area transmission paths are required while maintaining the high quality of the transmitted audio/video.

43 Claims, 34 Drawing Sheets



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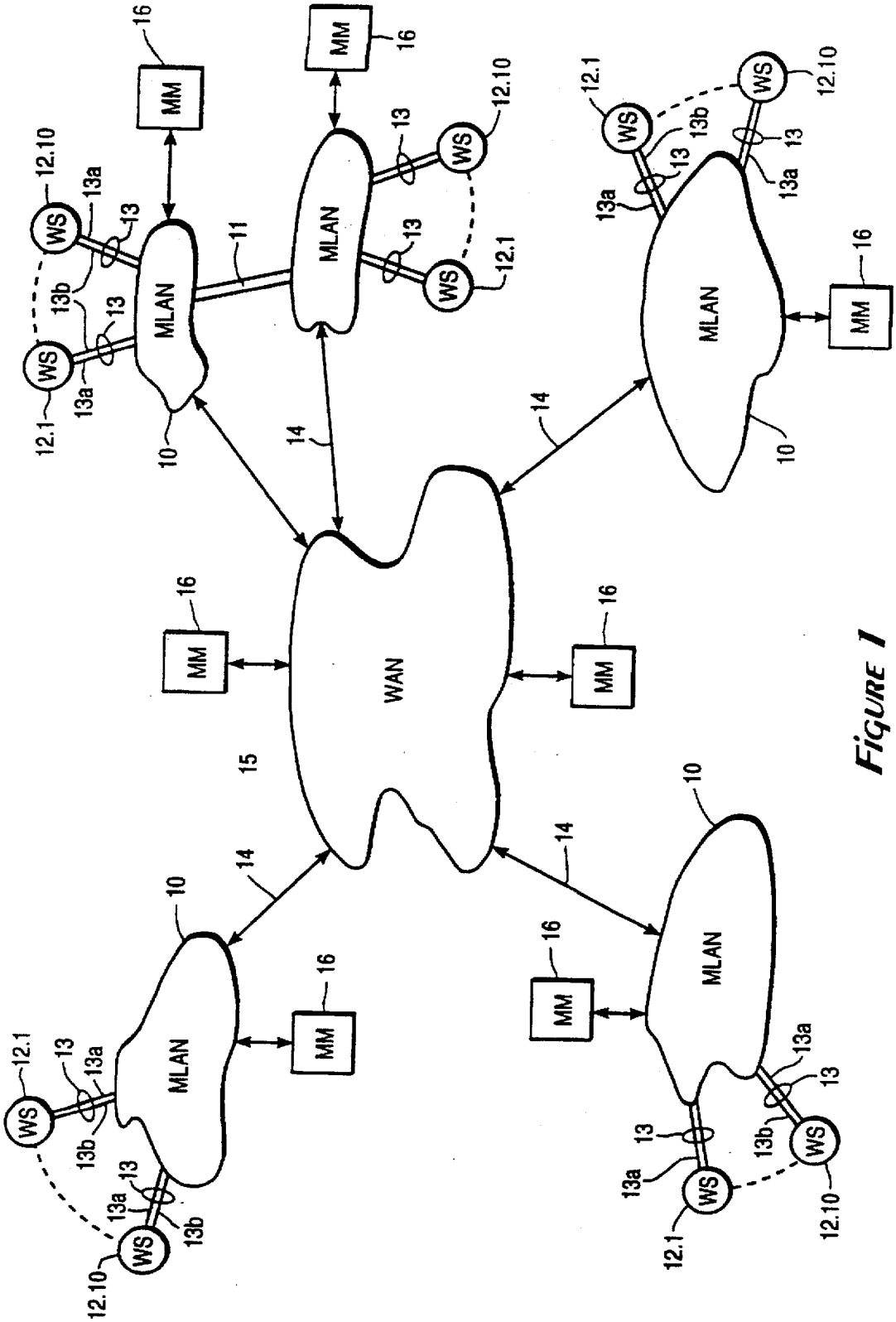

FIGURE 1

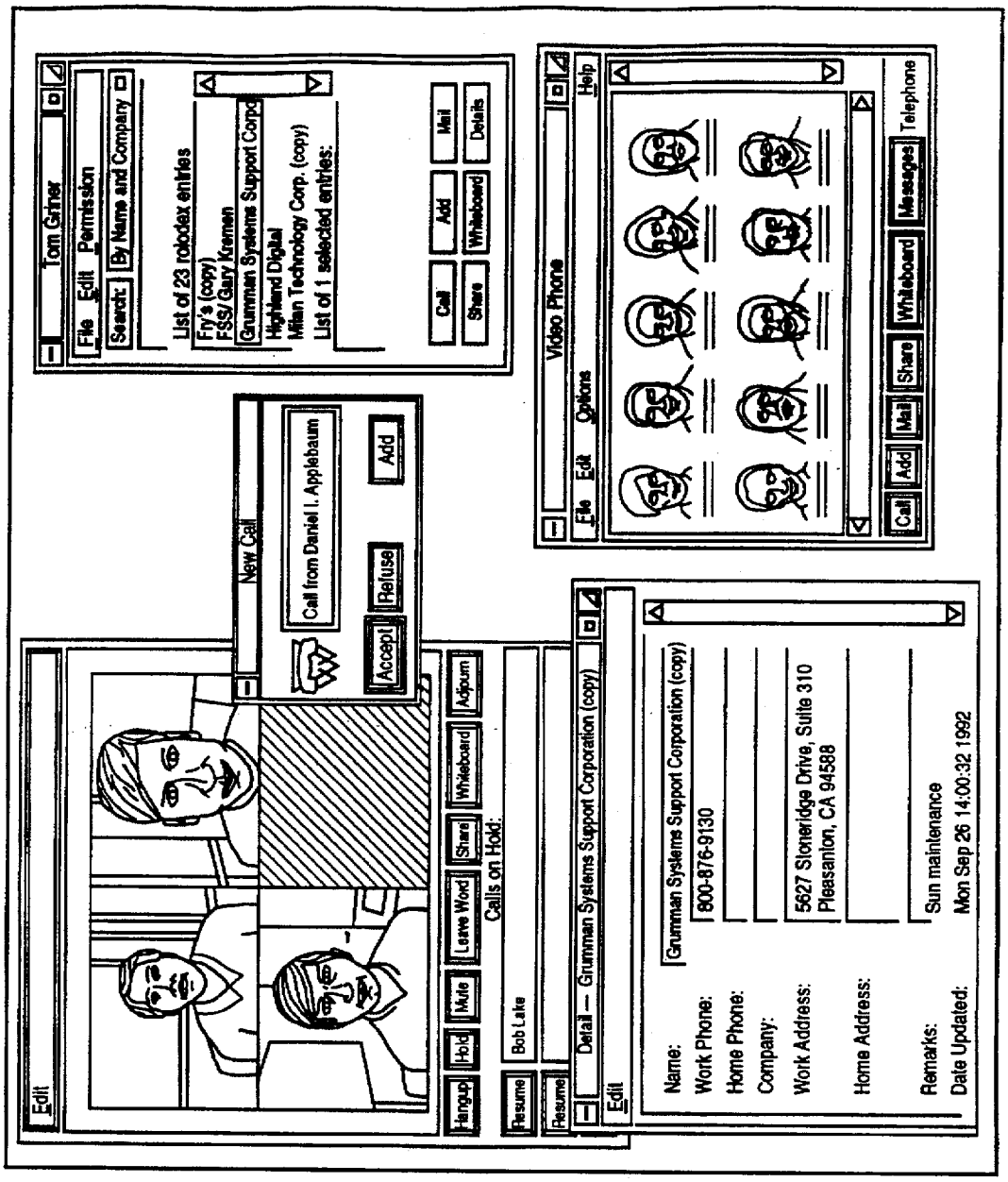

FIGURE 2A

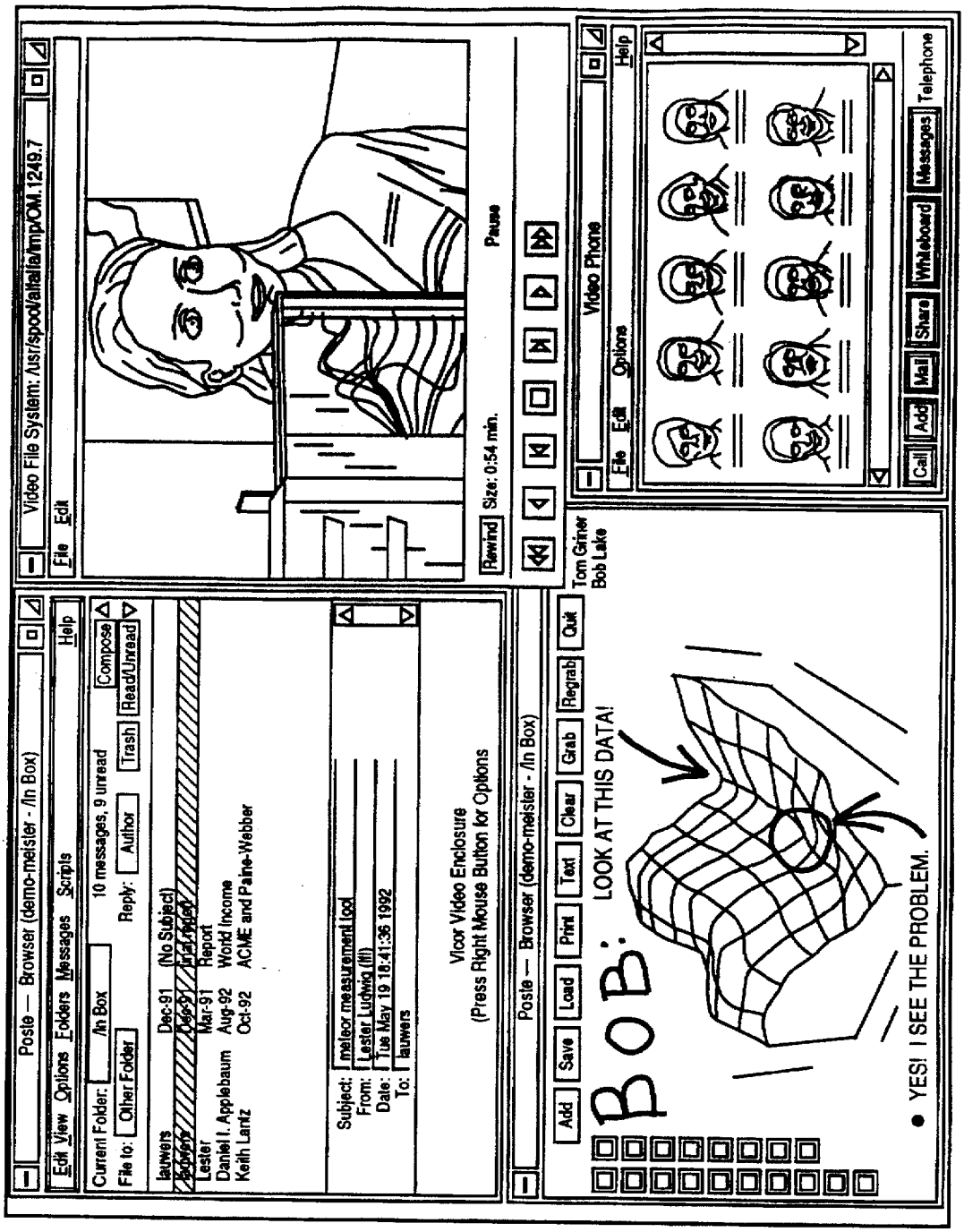

FIGURE 2B

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