

- [54] **PROGRESSIVE IMAGE TRANSMISSION**
- [75] Inventor: **Kenneth C. Knowlton**, Plainfield, N.J.
- [73] Assignee: **Bell Telephone Laboratories, Incorporated**, Murray Hill, N.J.
- [21] Appl. No.: **942,599**
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- [51] Int. Cl.² **H04N 1/00; G01T 1/29**
- [52] U.S. Cl. **358/263; 358/260; 358/133; 364/515**
- [58] Field of Search **358/260, 261, 263, 133; 340/345, 146.3 R; 364/515**

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[57] **ABSTRACT**

A gray-scale image is progressively transmitted over a narrow-band channel after the gray-scale values of all picture elements (pixels) have been formatted into a hierarchical structure of picture subdivisions of successive sizes from entire image down to basic element values. Each formatted value is encoded as an approximate average of paired values. Transmission involves sending the primary value, representing the overall gray-scale magnitude, and following with successively split image values so that the entire image can be reconstructed at a receiver in progressively finer detail until the ultimate image results. The coding is nonredundant and full reconstruction is accomplished by transmitting the same number of bits that are required to send the image pixel-by-pixel and line-by-line with the difference that an intermediate version can supply enough image detail for recognition. Unwanted images can be aborted at any intermediate stage, thus saving overall transmission time and effecting an equivalent picture compression when many images need to be examined in rapid succession.

- [56] **References Cited**
- U.S. PATENT DOCUMENTS**
- 3,609,670 9/1971 Knowlton 364/300
- OTHER PUBLICATIONS**
- D. H. Hamsher, "Facsimile" *Comm. Systems Eng. Handbook*, 1967, pp. 2-67.
- S. Tanimoto et al., "A Hierarchical Data Structure for Picture Processing", *Comp. Graphics and Image Processing*.
- Primary Examiner*—Robert L. Griffin
- Assistant Examiner*—Edward L. Coles

13 Claims, 8 Drawing Figures

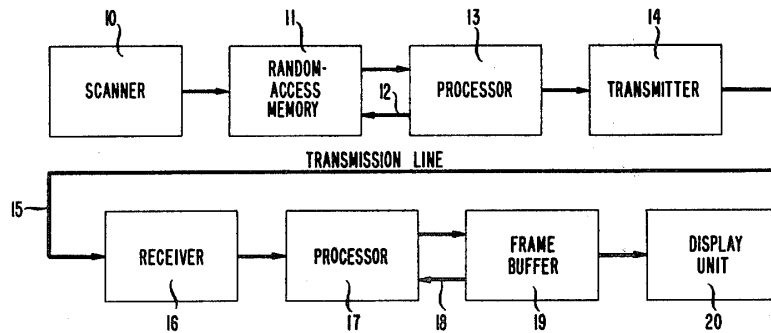


FIG. 1

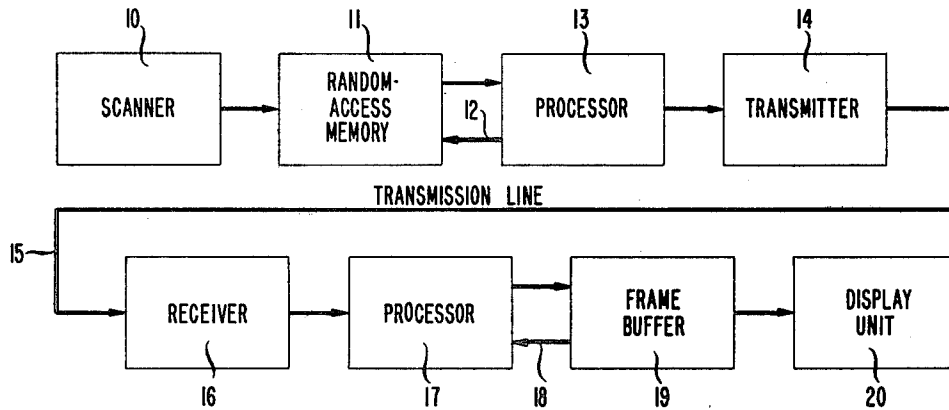


FIG. 2

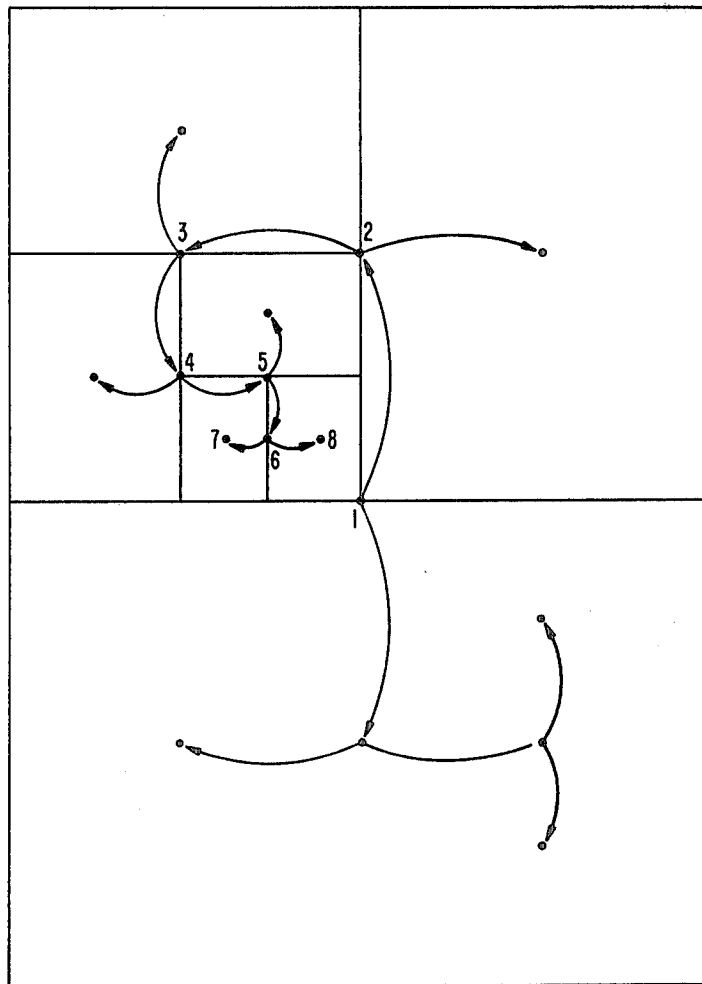


FIG. 3

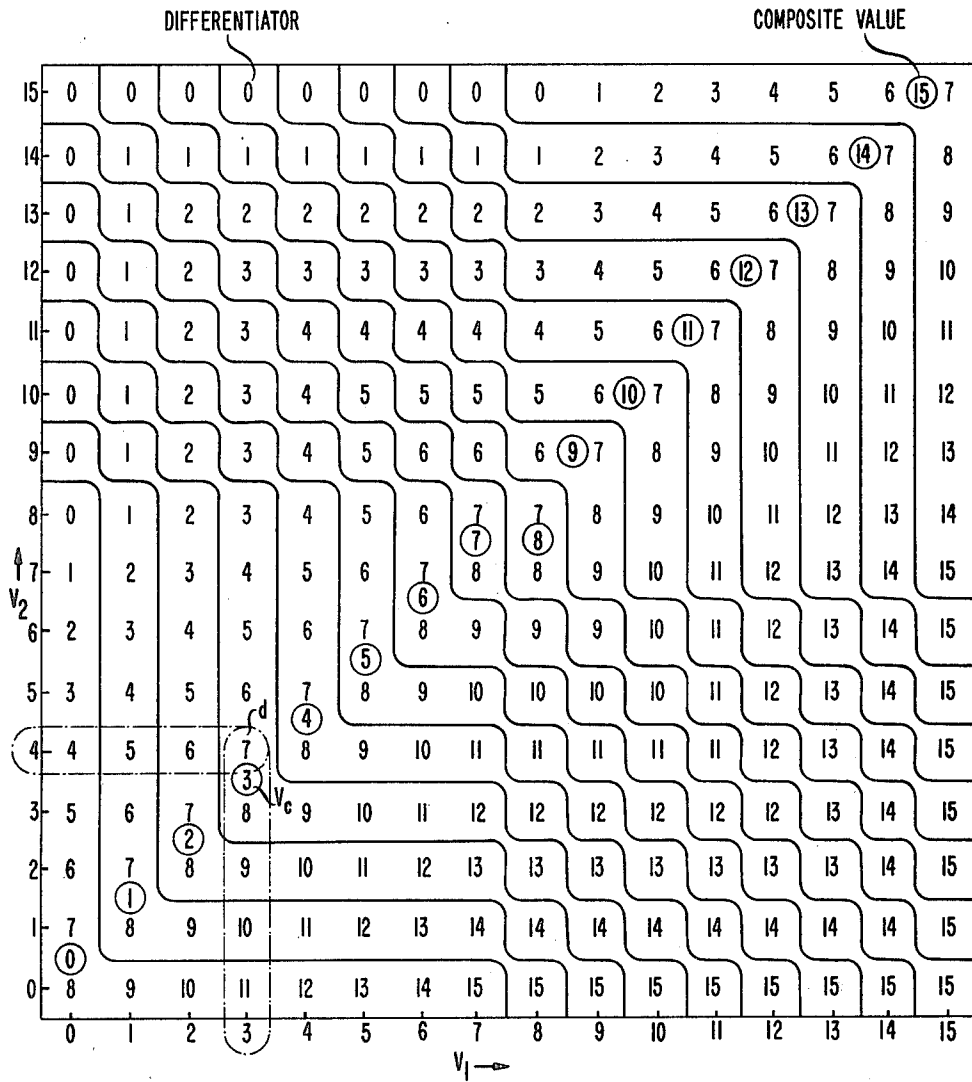


FIG. 4

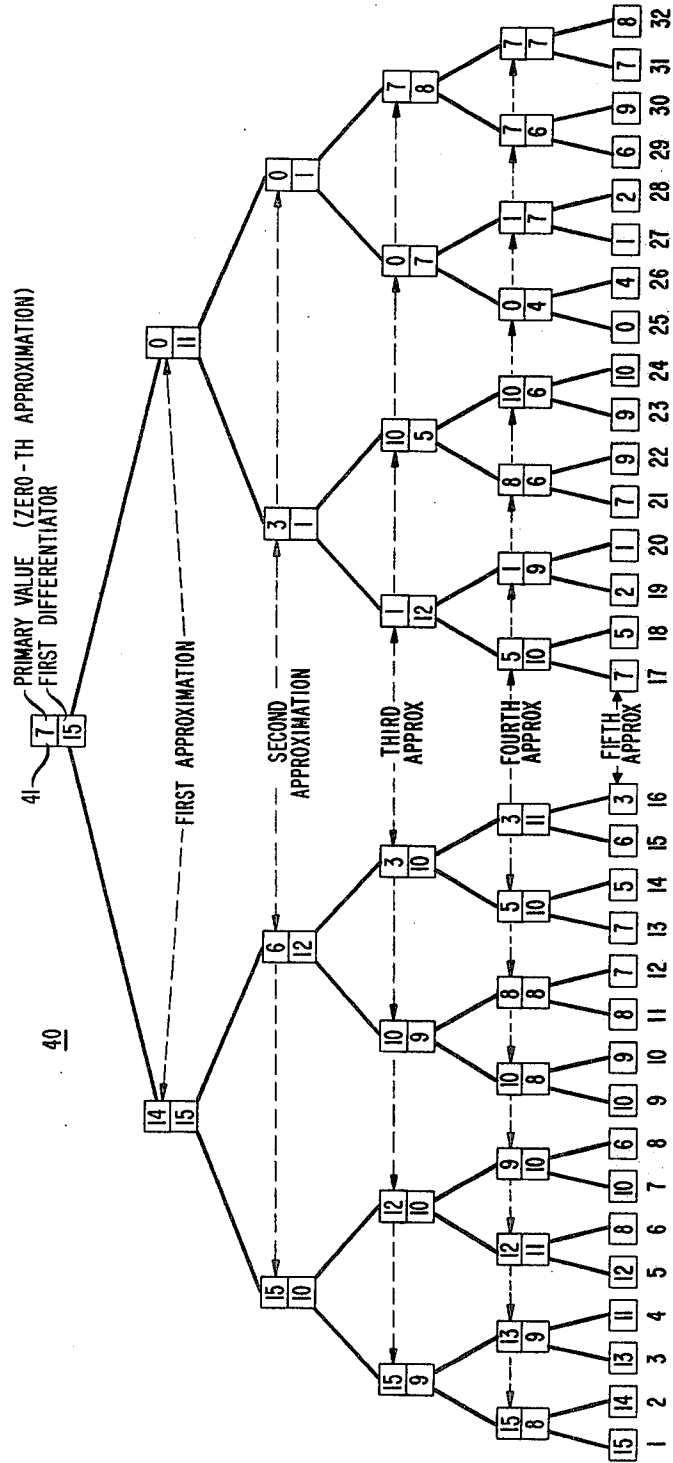
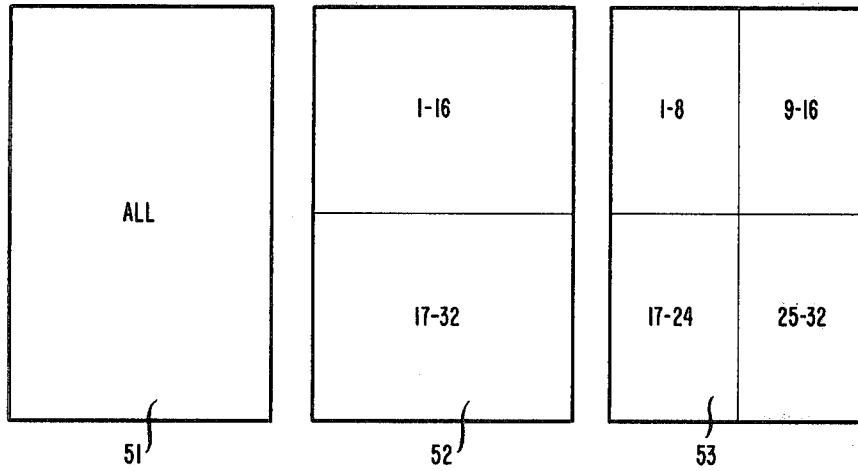
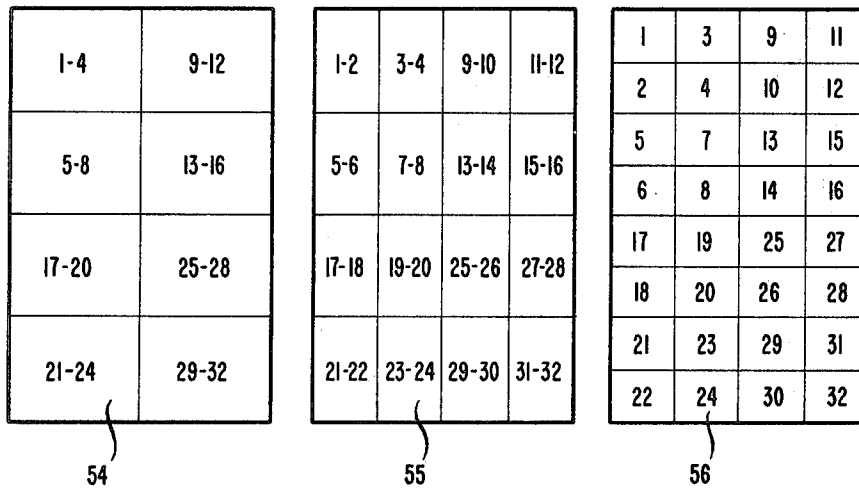


FIG. 5



NOTE: NUMBERS IN RECTANGLES ARE INDEXED TO FIG. 4



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