



United States Patent [19] Graffagnino

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[45] **Date of Patent:** Feb. 29, 2000

- [54] **METHOD AND APPARATUS FOR VIDEO COMPRESSION USING BLOCK AND WAVELET TECHNIQUES**
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- [73] Assignee: **NeXT Software, Inc.**, Redwood City, Calif.
- [21] Appl. No.: **08/247,006**
- [22] Filed: **May 19, 1994**
- [51] Int. Cl.⁷ **G06K 9/36; H04N 7/12**
- [52] U.S. Cl. **382/236; 348/396**
- [58] **Field of Search** 382/232-253, 382/162, 166, 219-220, 221, 272; 348/384-405; 358/426-433, 261.1; 341/67

[57] ABSTRACT

A method and apparatus are disclosed for symmetrically compressing and decompressing video information in real time by coupling block and wavelet techniques. In the compression pipeline, the image is divided into blocks comprising $2^k \times 2^k$ pixels (in the preferred embodiment, $k=1$). The average color of each block is computed. The system computes an average luminance for each block and differential luminances of each pixel of the plurality of pixels of each block. A first plurality of frequency details of each block are determined by Haar transforming the differential luminances. The system computes an average color difference between each block and the preceding block, and quantizes the average color difference and the first plurality of frequency details using Lloyd-Max quantization. In an alternate embodiment, skip codes are generated for blocks having the same quantized average color difference and second plurality of frequency details. The quantized average color difference and a second plurality of frequency details are encoded using variable length codes. The system employs lookup tables to decompress the compressed image and to format output pixels. The output of the compression pipeline containing variable length codes is decoded into fixed-length codes, which are then decoded using a first lookup table into three device-independent components that represent each block. The three components index a second lookup table containing precomputed RGB values that include precomputed display dependent formatting to produce the output image. In the alternate embodiment, skip codes contained in the output of the variable length decoder are decoded.

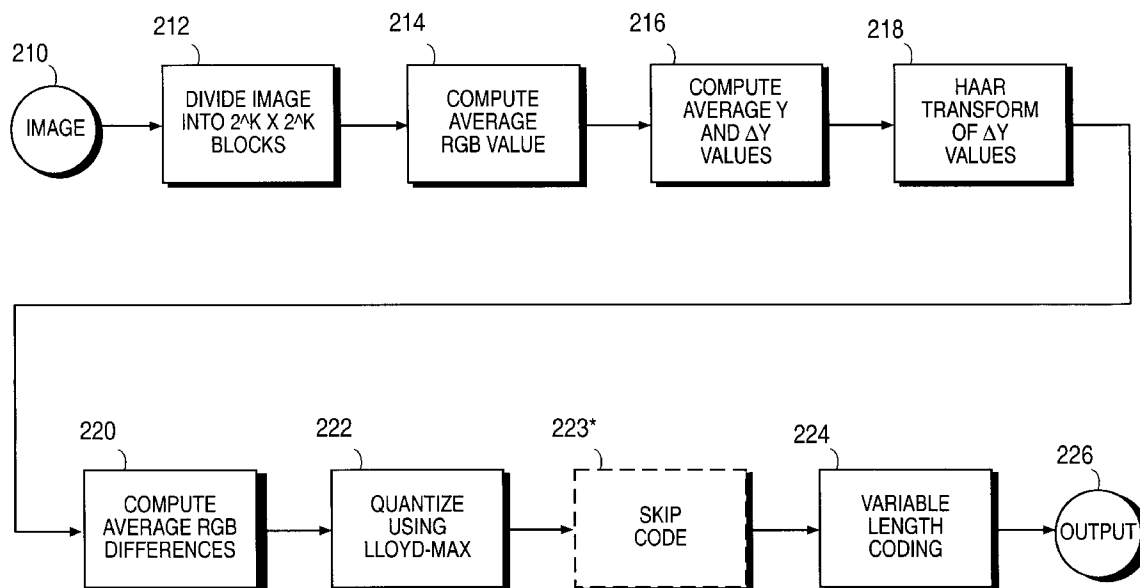
[56] References Cited

PUBLICATIONS

Adobe Systems, Inc., "JPEG Technical Specification, Revision 9" May 4, 1991, PostScript® Developer Support Group.

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Attorney, Agent, or Firm—Hecker & Harriman

46 Claims, 8 Drawing Sheets



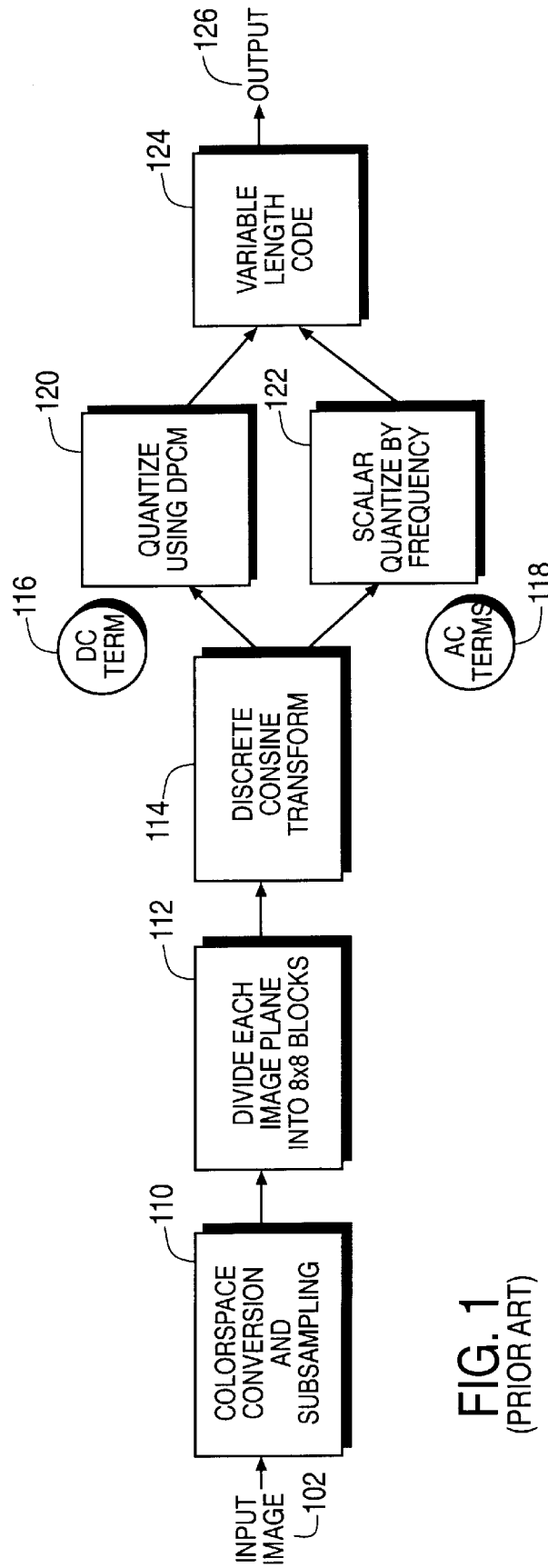


FIG. 1
(PRIOR ART)

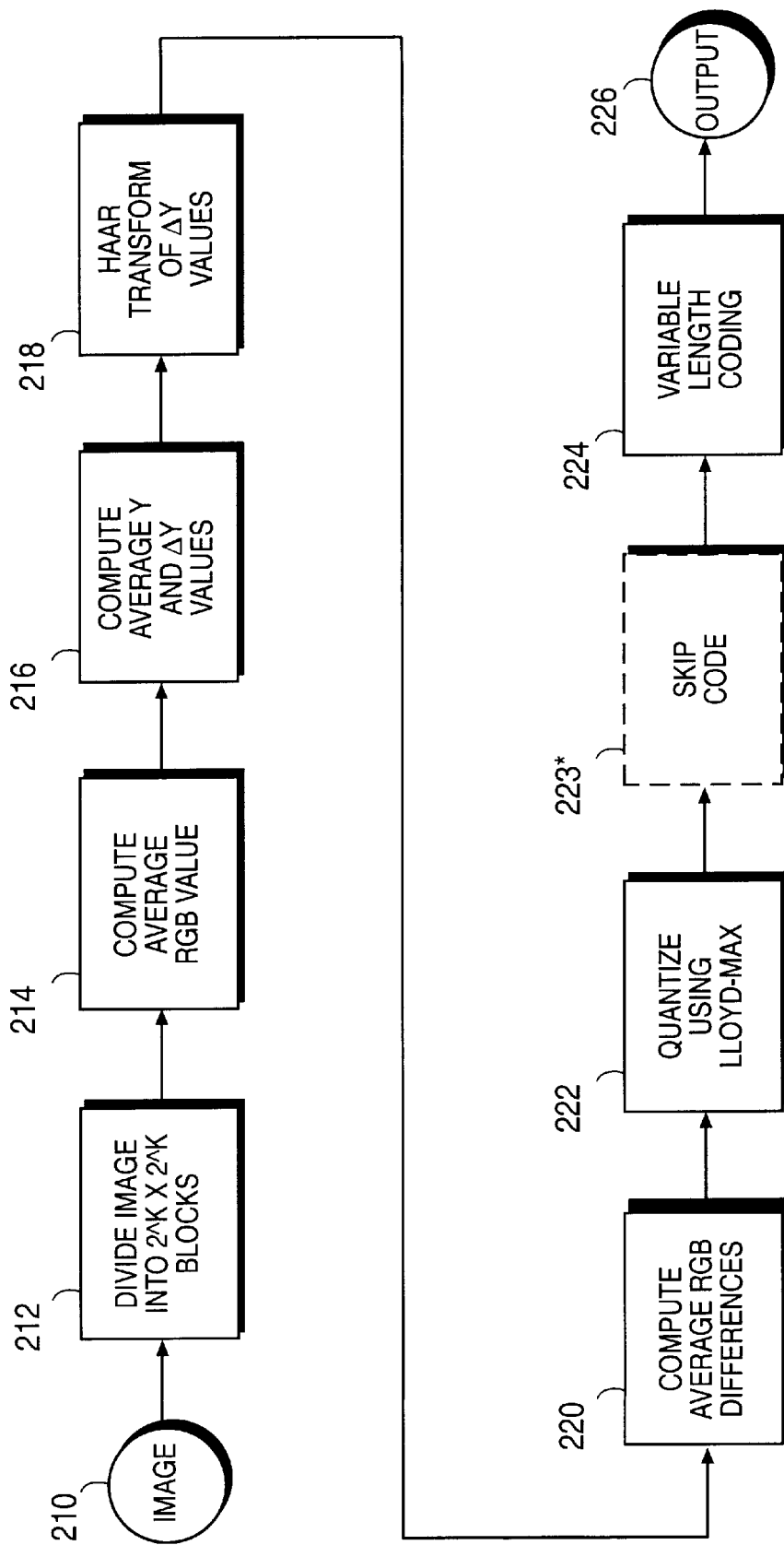


FIG. 2

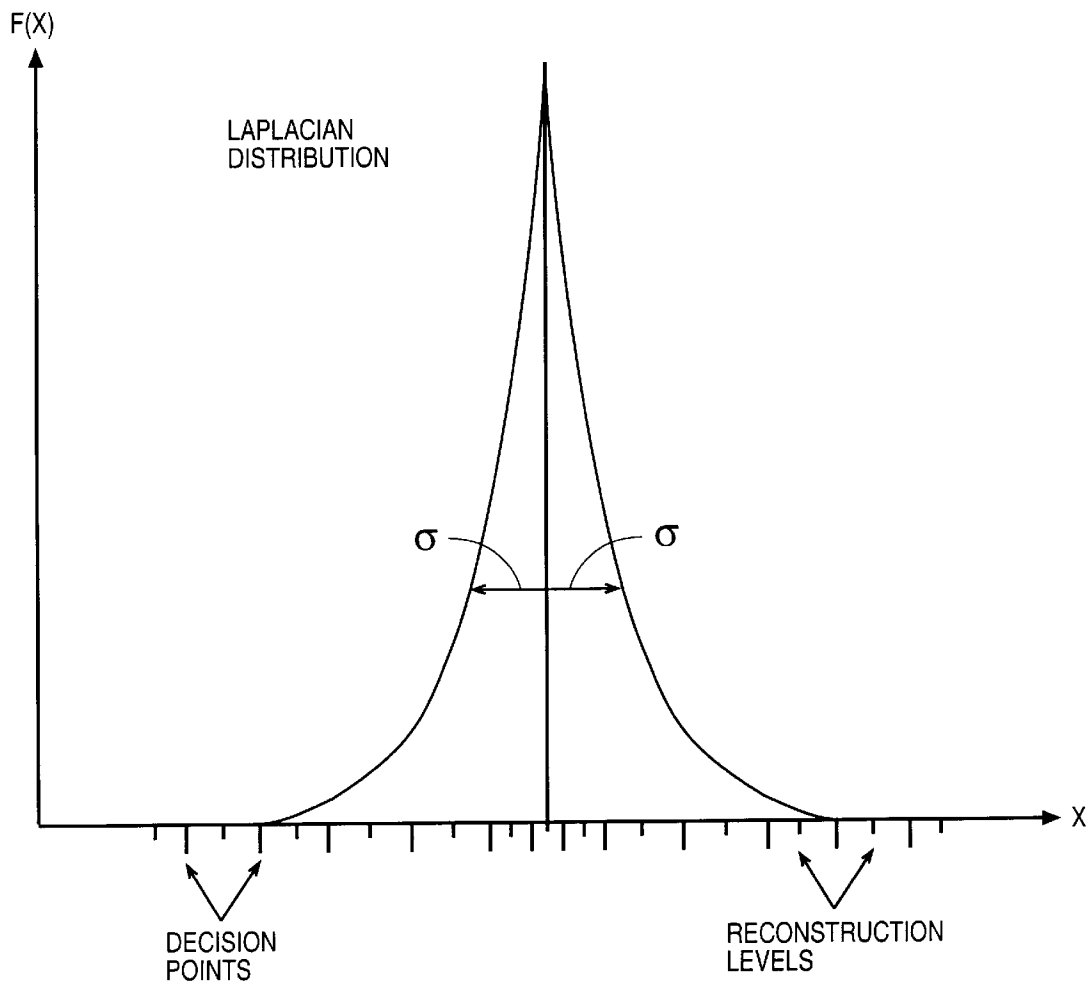


FIG. 3

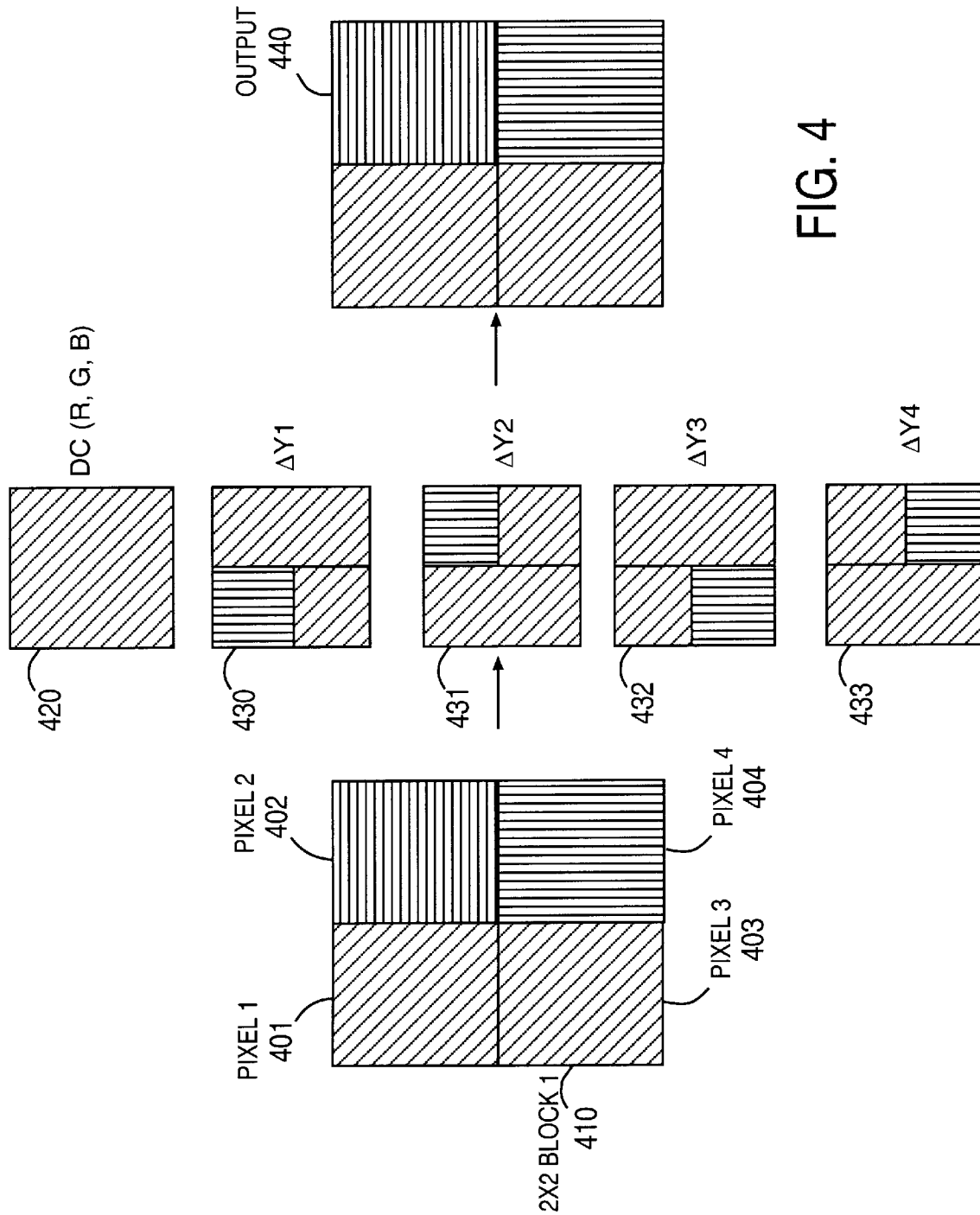


FIG. 4

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