United States Patent [19]

Graffagnino

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[54] **METHOD AND APPARATUS FOR VIDEO COMPRESSION USING BLOCK AND WAVELET TECHNIQUES**

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[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

[56] **References Cited**
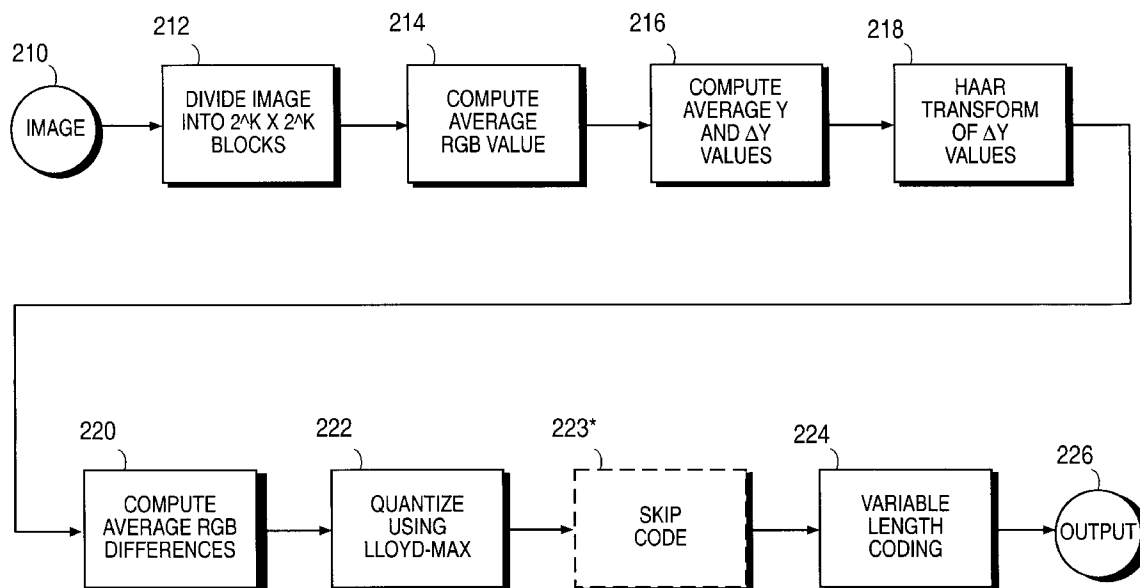
PUBLICATIONS

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

Primary Examiner—Jon Chang
Assistant Examiner—Jayanti K. Patel
Attorney, Agent, or Firm—Hecker & Harriman

[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.
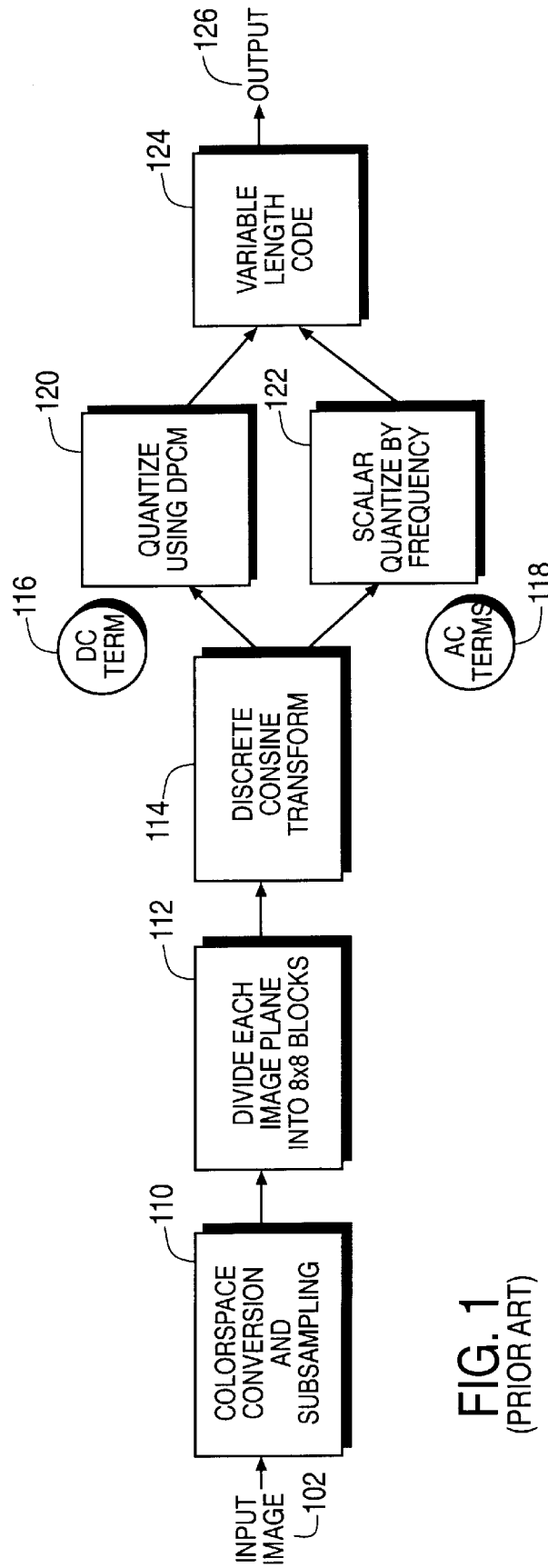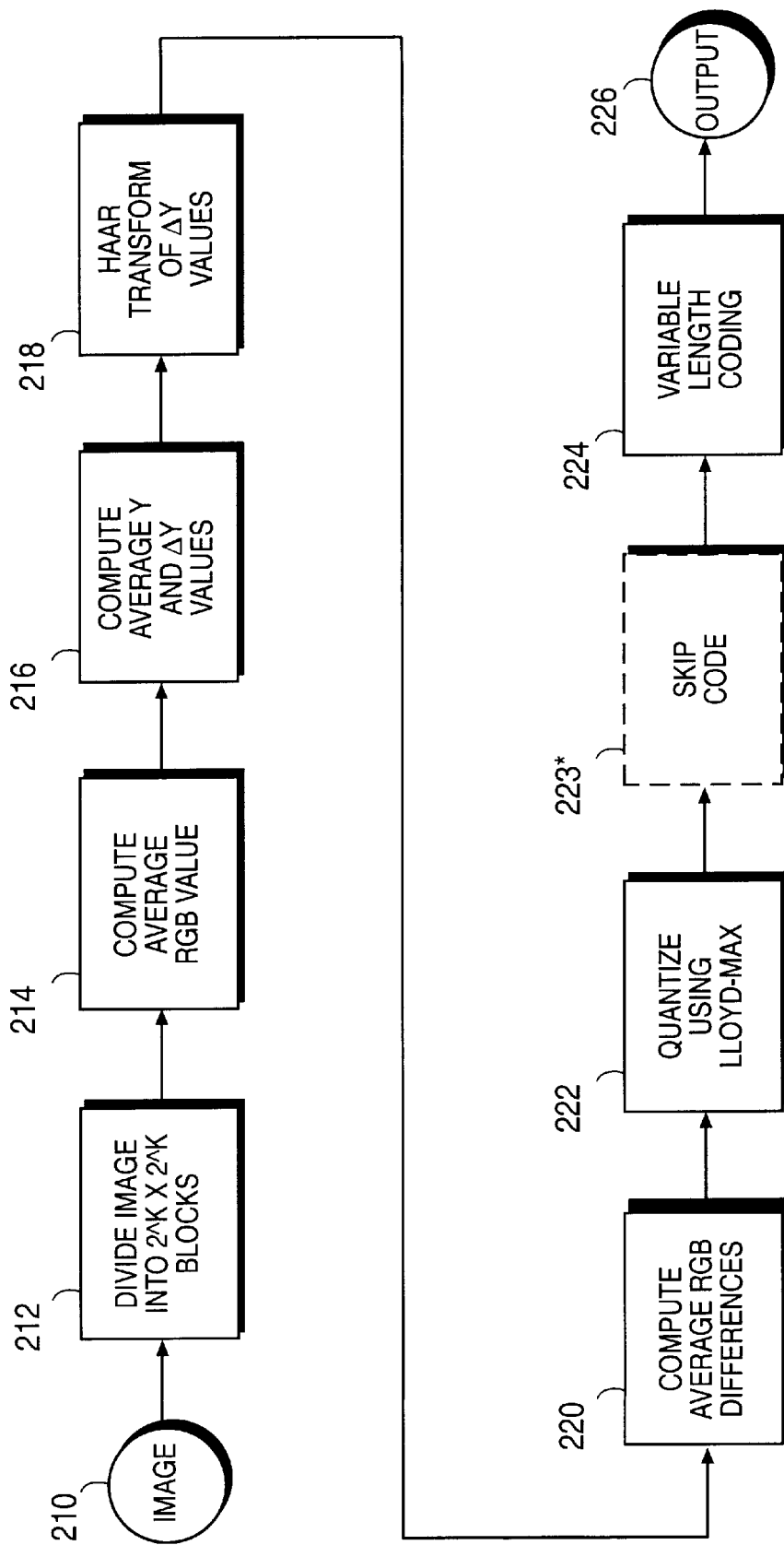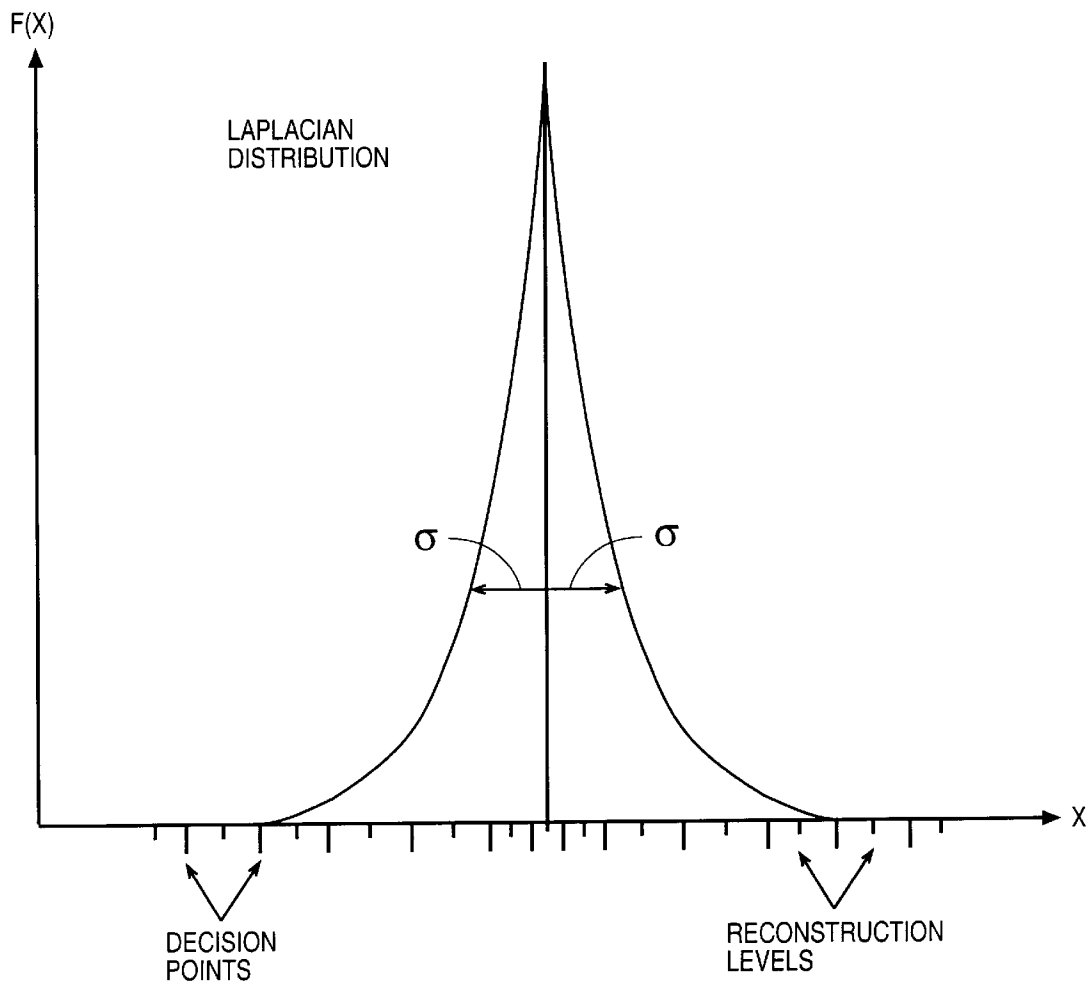
46 Claims, 8 Drawing Sheets

FIG. 1
(PRIOR ART)

INPUT IMAGE 102

COLORSPACE CONVERSION AND SUBSAMPLING 110

DIVIDE EACH IMAGE PLANE INTO 8x8 BLOCKS 112

DISCRETE CONSINE TRANSFORM 114

DC TERM 116

AC TERMS 118

QUANTIZE USING DPCM 120

SCALAR QUANTIZE BY FREQUENCY 122

VARIABLE LENGTH CODE 124

OUTPUT 126

FIG. 2

FIG. 3

FIG. 4

DOCKET ALARM
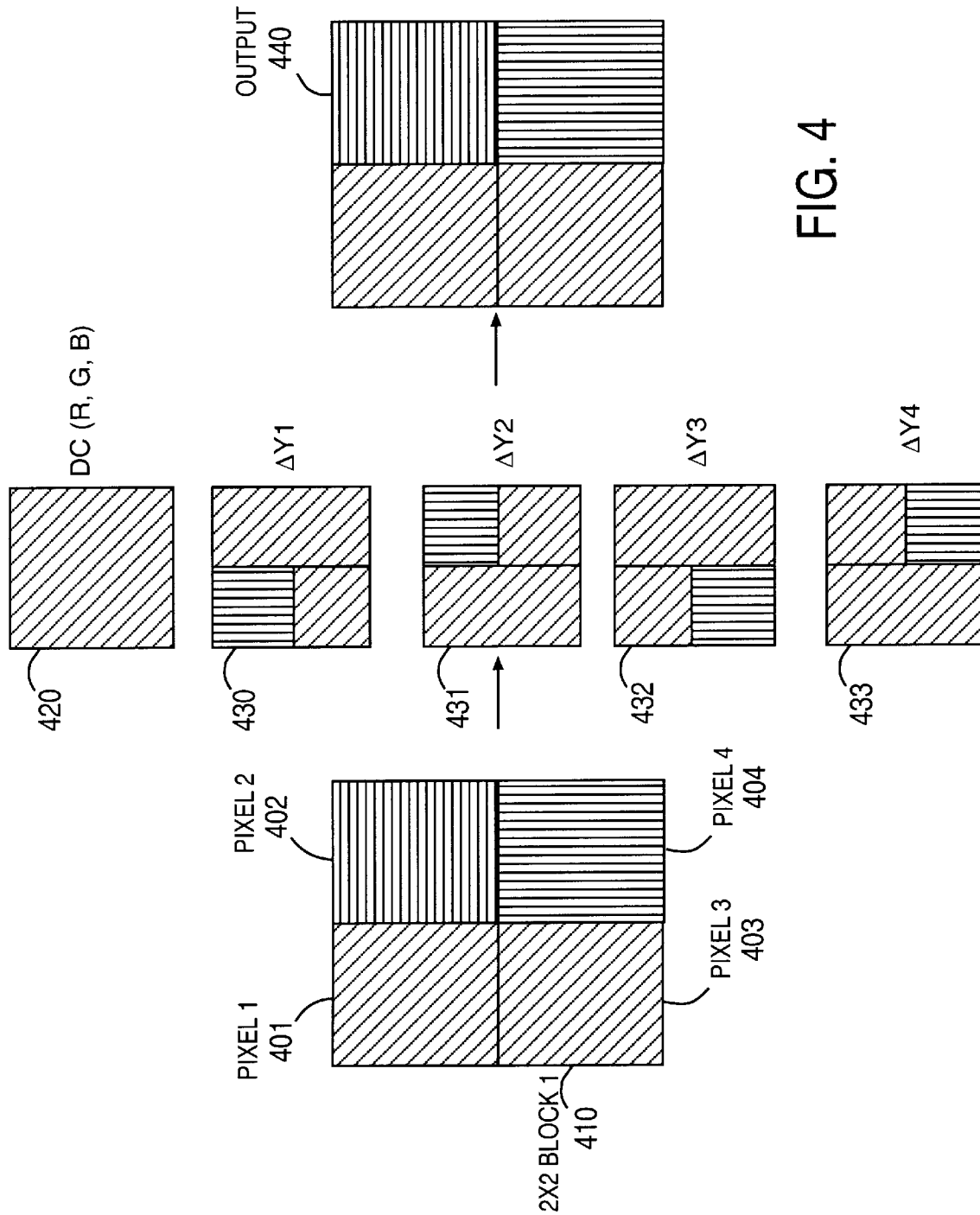
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