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United States Patent [19]

Beretta et al.

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[45] **Date of Patent: Dec. 15, 1998**

[54] **TEXT AND IMAGE SHARPENING OF JPEG COMPRESSED IMAGES IN THE FREQUENCY DOMAIN**

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[73] Assignee: **Hewlett-Packard Co.**, Palo Alto, Calif.

[21] Appl. No.: **940,695**

[22] Filed: **Sep. 30, 1997**

Related U.S. Application Data

[63] Continuation of Ser. No. 411,369, Mar. 27, 1995, abandoned.

[51] **Int. Cl.**[6] **G06K 9/36**

[52] **U.S. Cl.** **382/250**; 382/251; 382/239; 358/432; 348/404

[58] **Field of Search** 382/298, 233, 382/251, 244, 232, 253, 250, 274, 252, 238, 236, 166, 280, 270; 358/427, 426, 432, 261.3, 448, 261.1, 433, 261.2, 430, 458; 348/404, 432, 405, 433, 403, 391, 384, 422, 393, 430, 394, 409, 395, 390

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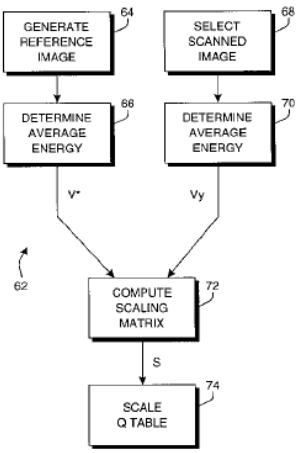
(List continued on next page.)

Primary Examiner—Jose L. Couso
Assistant Examiner—Matthew C. Bella

[57] **ABSTRACT**

The text and image enhancing technique according to the invention is integrated into the decoding or inverse quantization step that is necessarily required by the JPEG standard. The invention integrates the two by using two different quantization tables: a first quantization table (Q_E) for use in quantizing the image data during the compression step and a second quantization table used during the decode or inverse quantization during the decompression process. The second quantization table Q_D is related to the first quantization table according to a predetermined function of the energy in a reference image and the energy in a scanned image. The energy of the reference image lost during the scanning process, as represented by the energy in the scanned image, is restored during the decompression process by appropriately scaling the second quantization table according to the predetermined function. The difference between the two tables, in particular the ratio of the two tables, determines the amount of image enhancing that is done in the two steps. By integrating the image enhancing and inverse quantization steps the method does not require any additional computations than already required for the compression and decompression processes.

35 Claims, 7 Drawing Sheets



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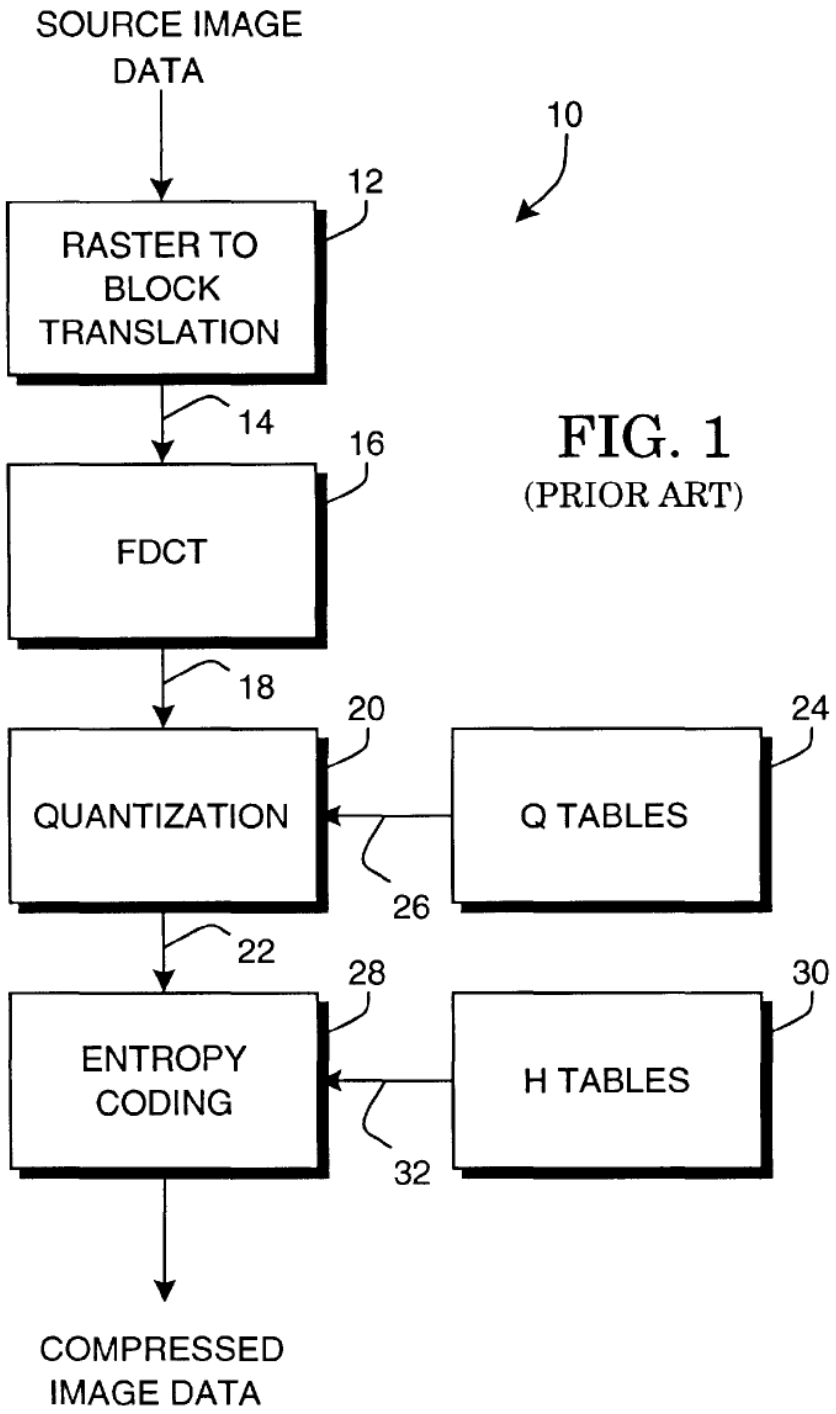

FIG. 1
(PRIOR ART)

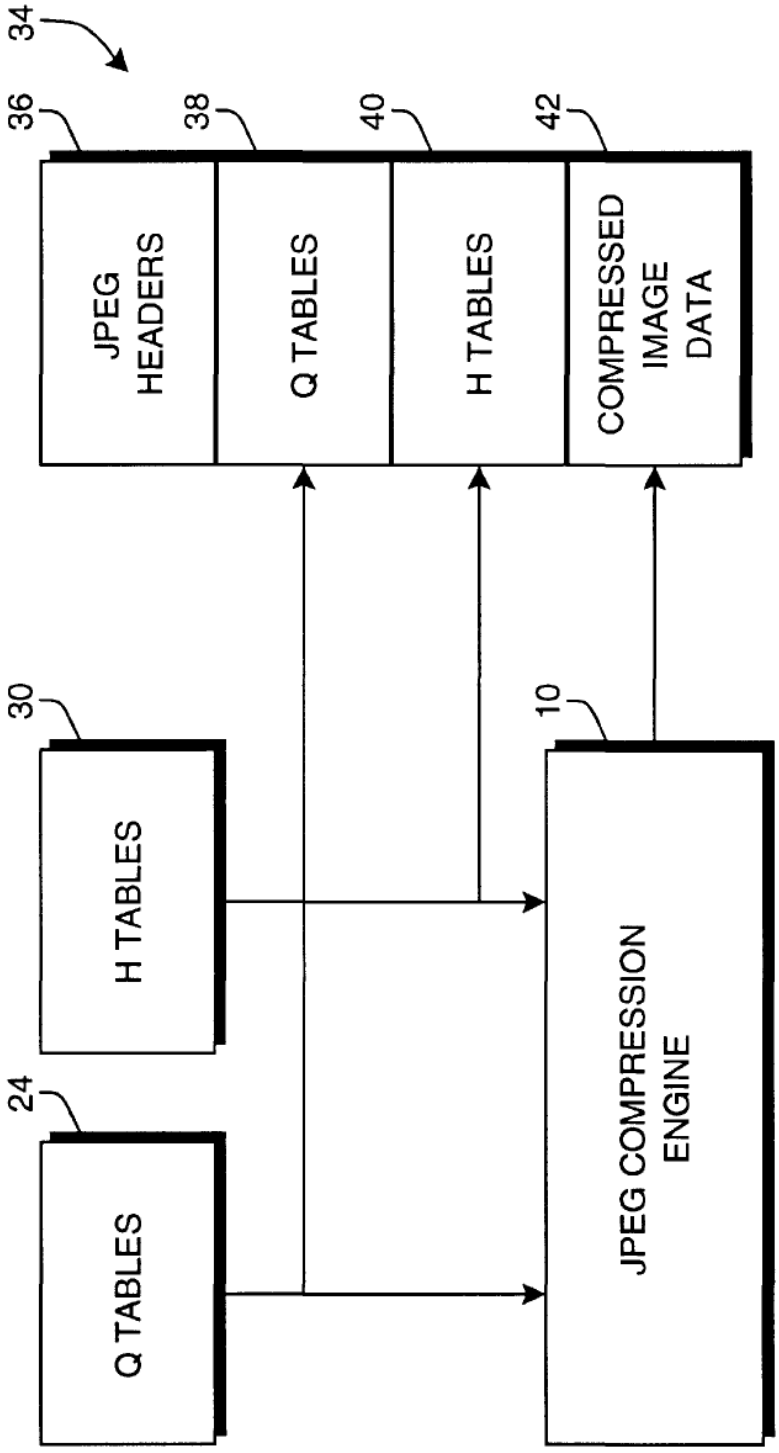

FIG. 2
(PRIOR ART)

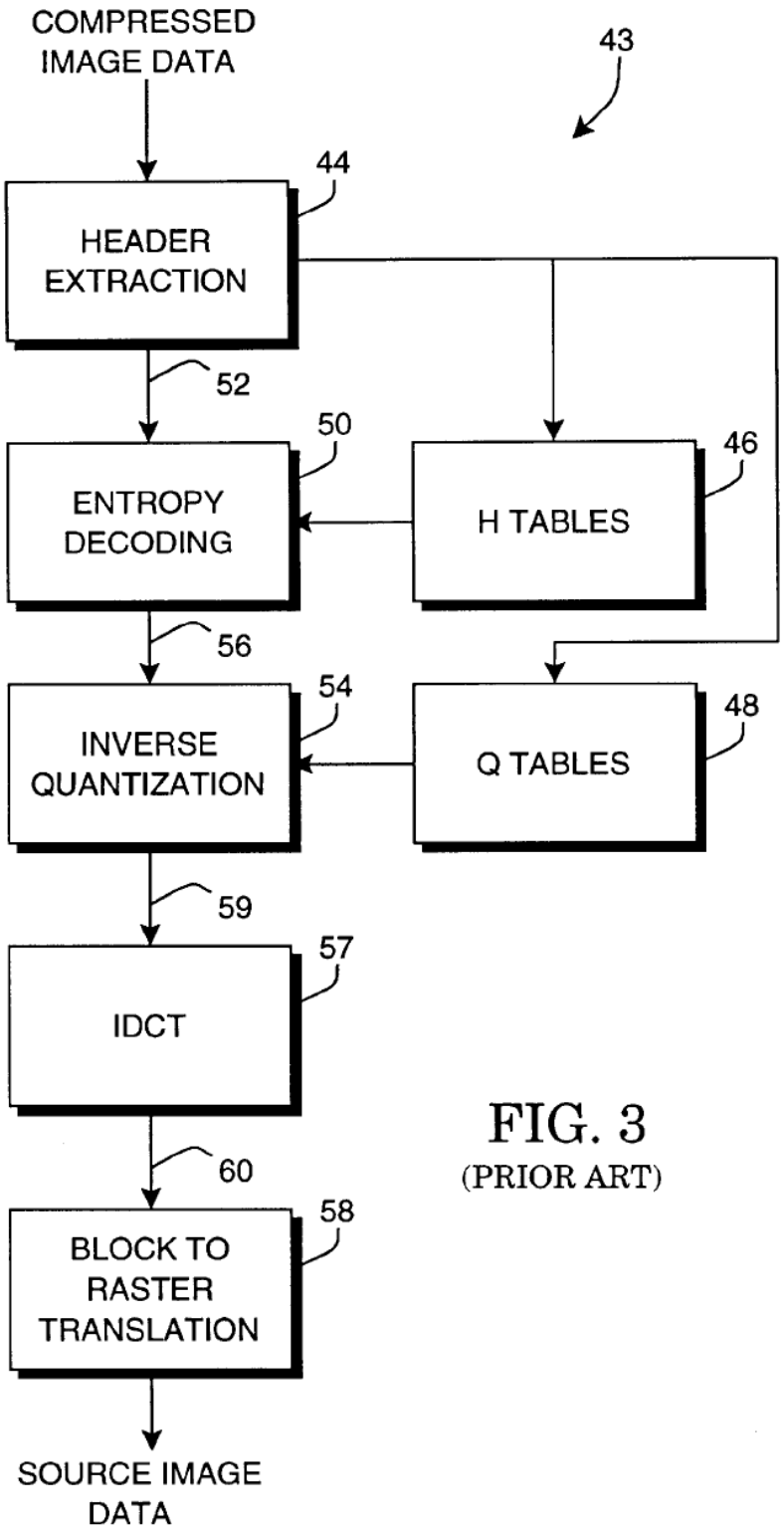

FIG. 3
(PRIOR ART)

DOCKET ALARM

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