United States Patent [19]

Keith

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[54] **MULTIPLYLESS DISCRETE COSINE TRANSFORM**

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[73] Assignee: **Intel Corporation**, Santa Clara, Calif.

[56] **References Cited**

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Primary Examiner—Tan V. Mai
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[57] **ABSTRACT**

A method is disclosed for performing a discrete cosine transform on a transform input value wherein the discrete cosine transform has a plurality of predetermined transform coefficients. A number N_1 of shift operations is determined independently of the transform input value in order to provide a set of N_1 of shift operations. A number N_2 of add operations is determined independently of the transform input value in order to provide a set of N_2 add operations. The transform input value is operated upon only by the N_1 shift operations and the N_2 add operations to provide a discrete cosine transform output value without any multiplication. This method may be applied to both forward and inverse discrete cosine transforms. The transform coefficients are simplified coefficients which are provided by truncating and modifying prior art transform coefficients. This simplification is adapted to provide coefficients which require fewer than a predetermined number of shift and add operations in order to determine an approximation of the product which would result from a multiplication by the coefficient. The simplification of the coefficients causes degradation of a video image transformed using the simplified coefficients. Therefore the simplification is constrained to cause an acceptable amount of image degradation.
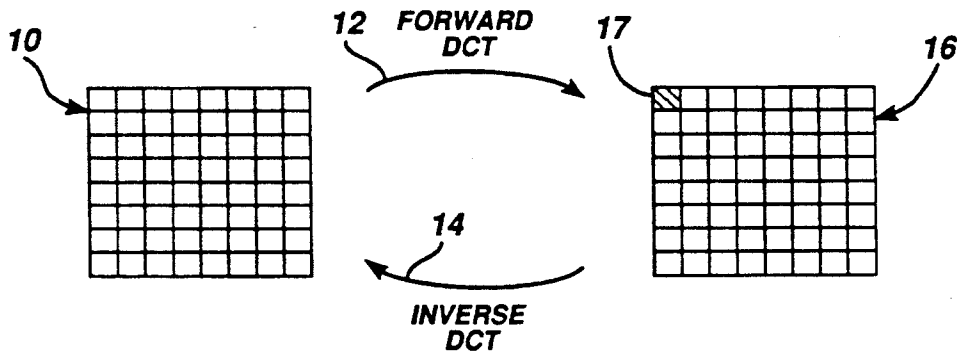
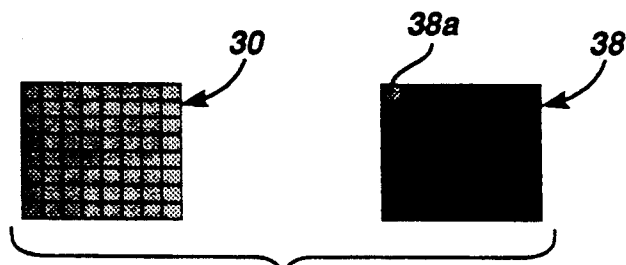**20 Claims, 5 Drawing Sheets**
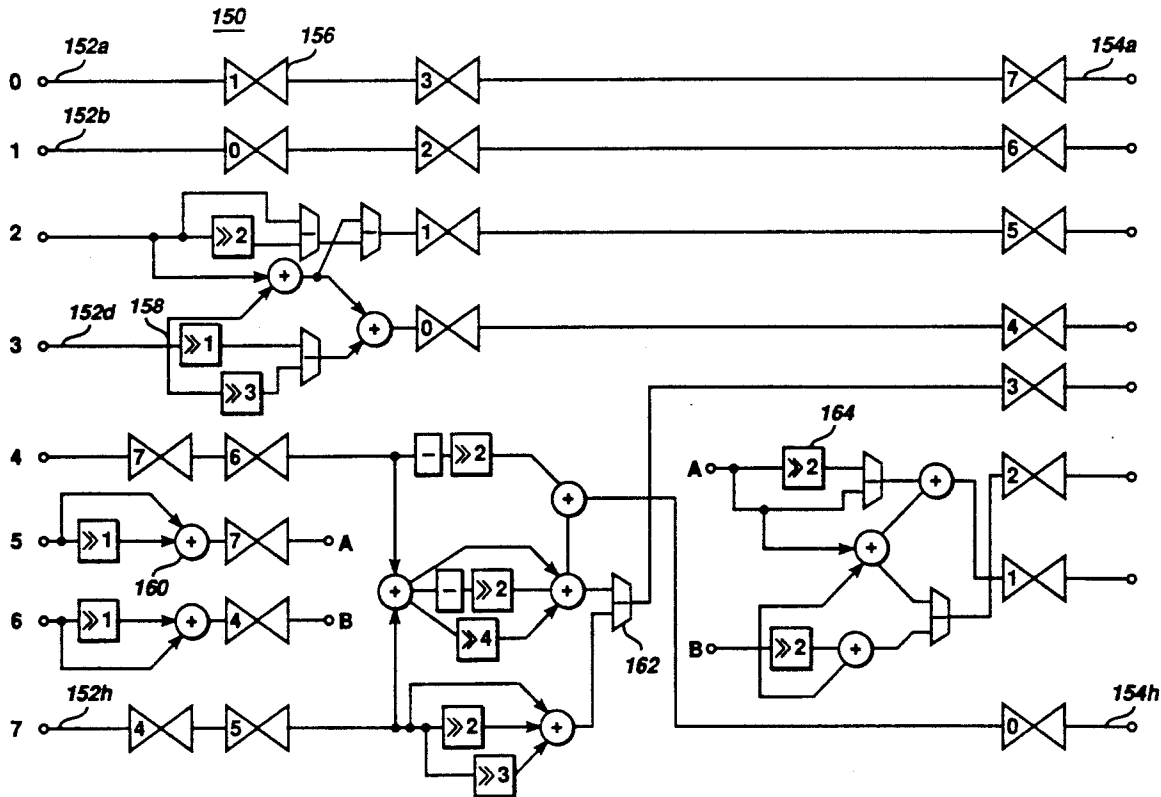
FIG. 1
Prior Art

FIG. 2A
Prior Art

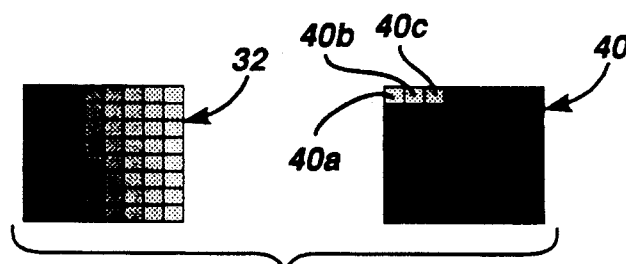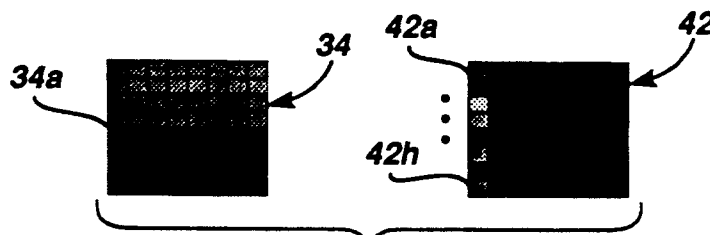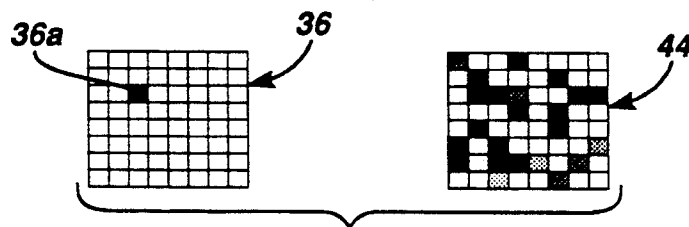FIG. 2B
Prior Art

FIG. 2C
Prior Art

FIG. 2D
Prior Art

<u>50</u>

START *54*

58
$i \leftarrow 1$

62
$X \leftarrow RND\ UP\ [CONST\ I]$
$Y \leftarrow RND\ DN\ [CONST\ I]$

66

64
TEST
[X, Y]

TRUE *72*

FALSE *68*

76
$X \leftarrow RND\ UP\ [X]$
$Y \leftarrow RND\ DN\ [Y]$

80
OUT
OF RANGE
?

N

Y

84
NO NEWCONST
FOUND

88
ERROR

DONE *92*

N *96*
$i \leq 11$
?

Y

100
$i \leftarrow i + 1$

104
NEWCONST I $\leftarrow$ X OR Y

FIG. 3

FIG. 4

DOCKET ALARM
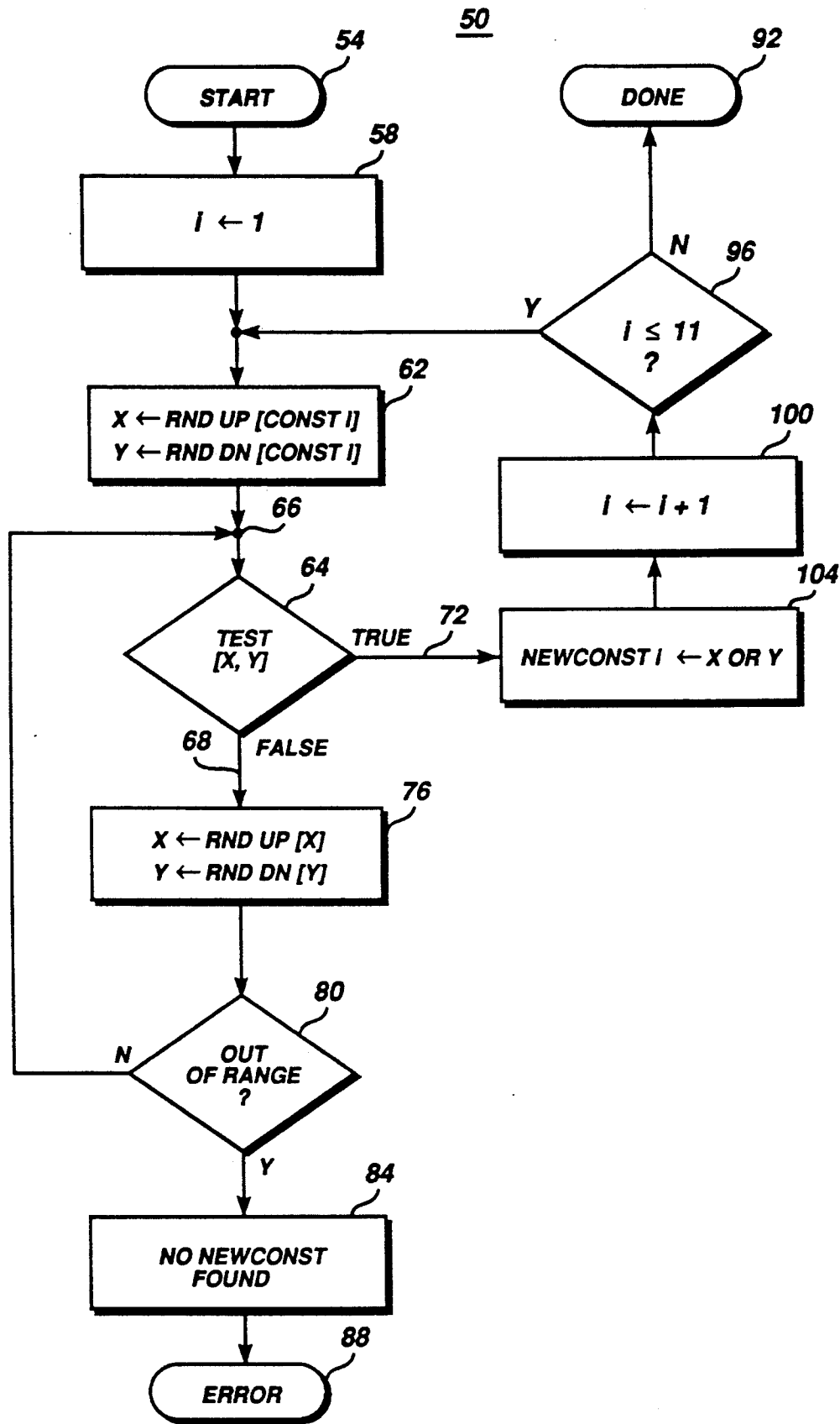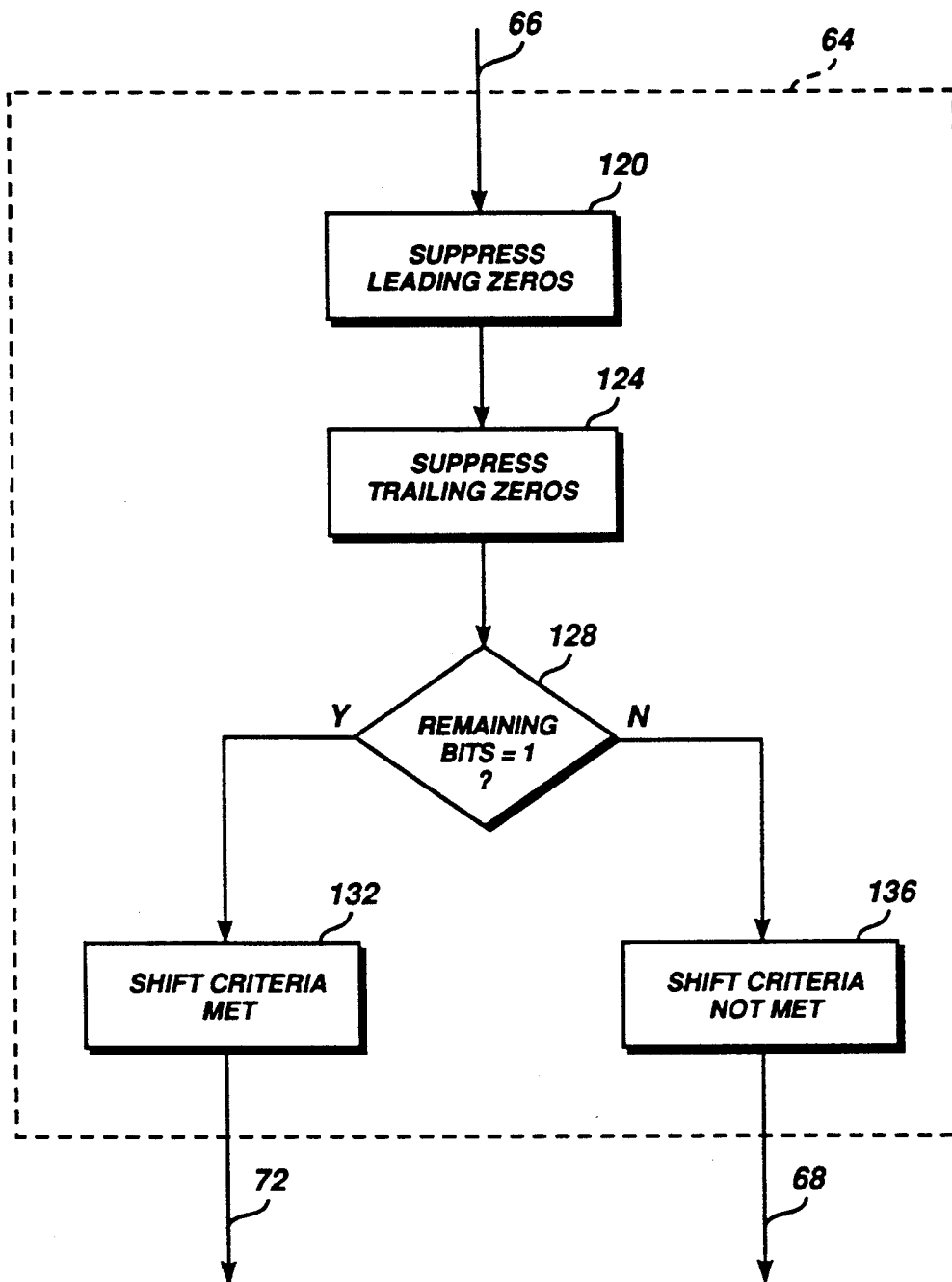
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