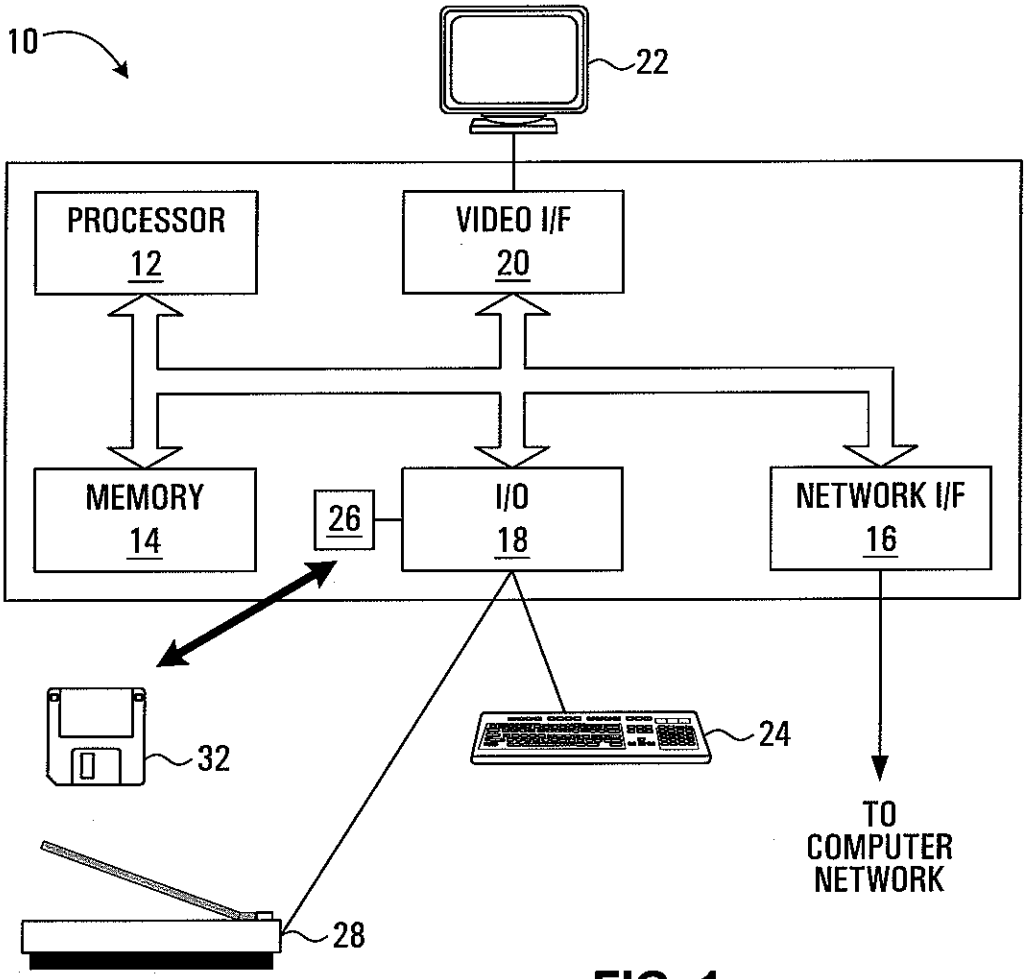

10
22
PROCESSOR
12
VIDEO I/F
20
MEMORY
14
26
I/O
18
NETWORK I/F
16
32
24
TO
COMPUTER
NETWORK
28

FIG. 1

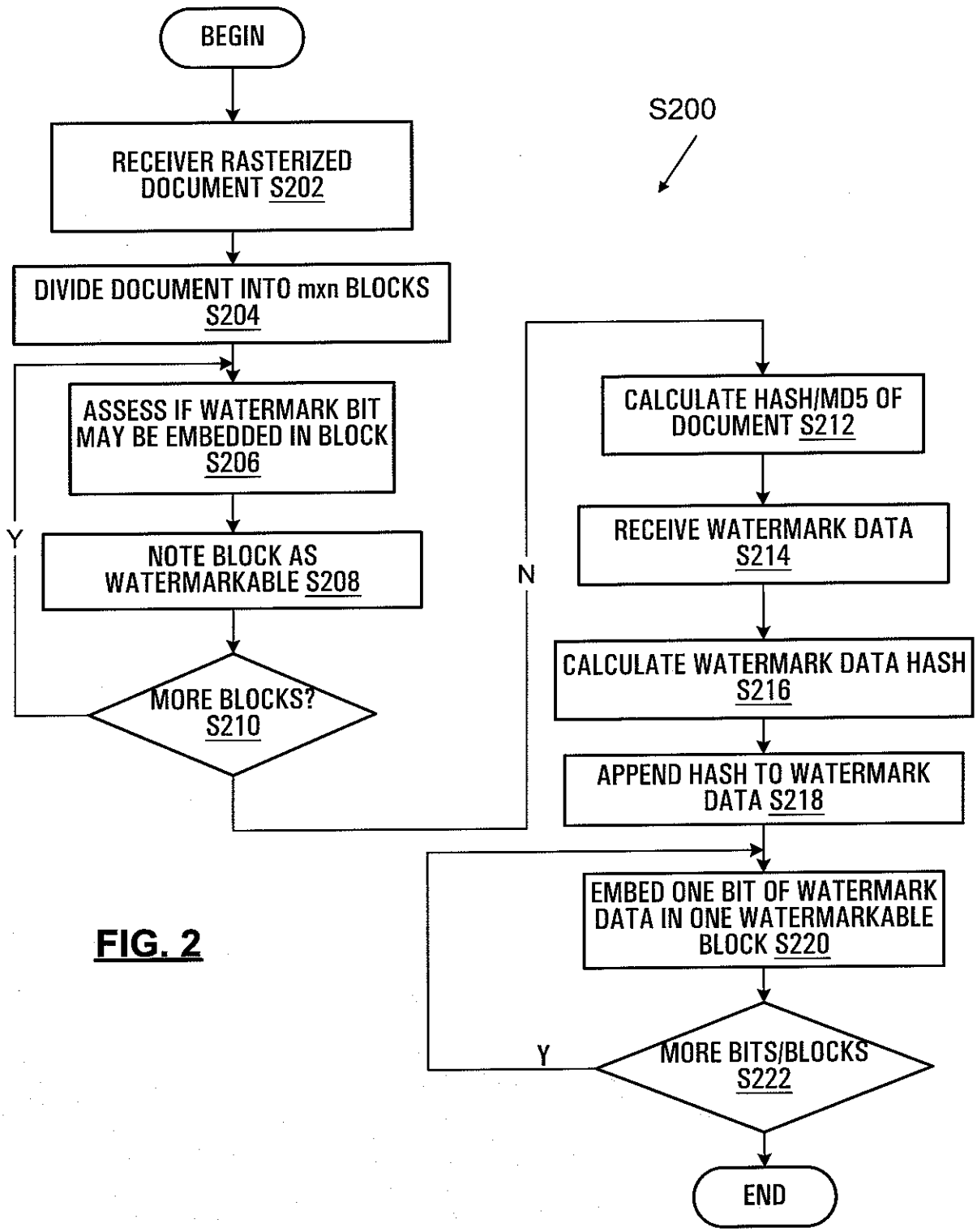

BEGIN
S200
RECEIVER RASTERIZED DOCUMENT S202
DIVIDE DOCUMENT INTO mxn BLOCKS S204
ASSESS IF WATERMARK BIT MAY BE EMBEDDED IN BLOCK S206
NOTE BLOCK AS WATERMARKABLE S208
MORE BLOCKS? S210
Y
N
CALCULATE HASH/MD5 OF DOCUMENT S212
RECEIVE WATERMARK DATA S214
CALCULATE WATERMARK DATA HASH S216
APPEND HASH TO WATERMARK DATA S218
EMBED ONE BIT OF WATERMARK DATA IN ONE WATERMARKABLE BLOCK S220
MORE BITS/BLOCKS S222
Y
END

FIG. 2

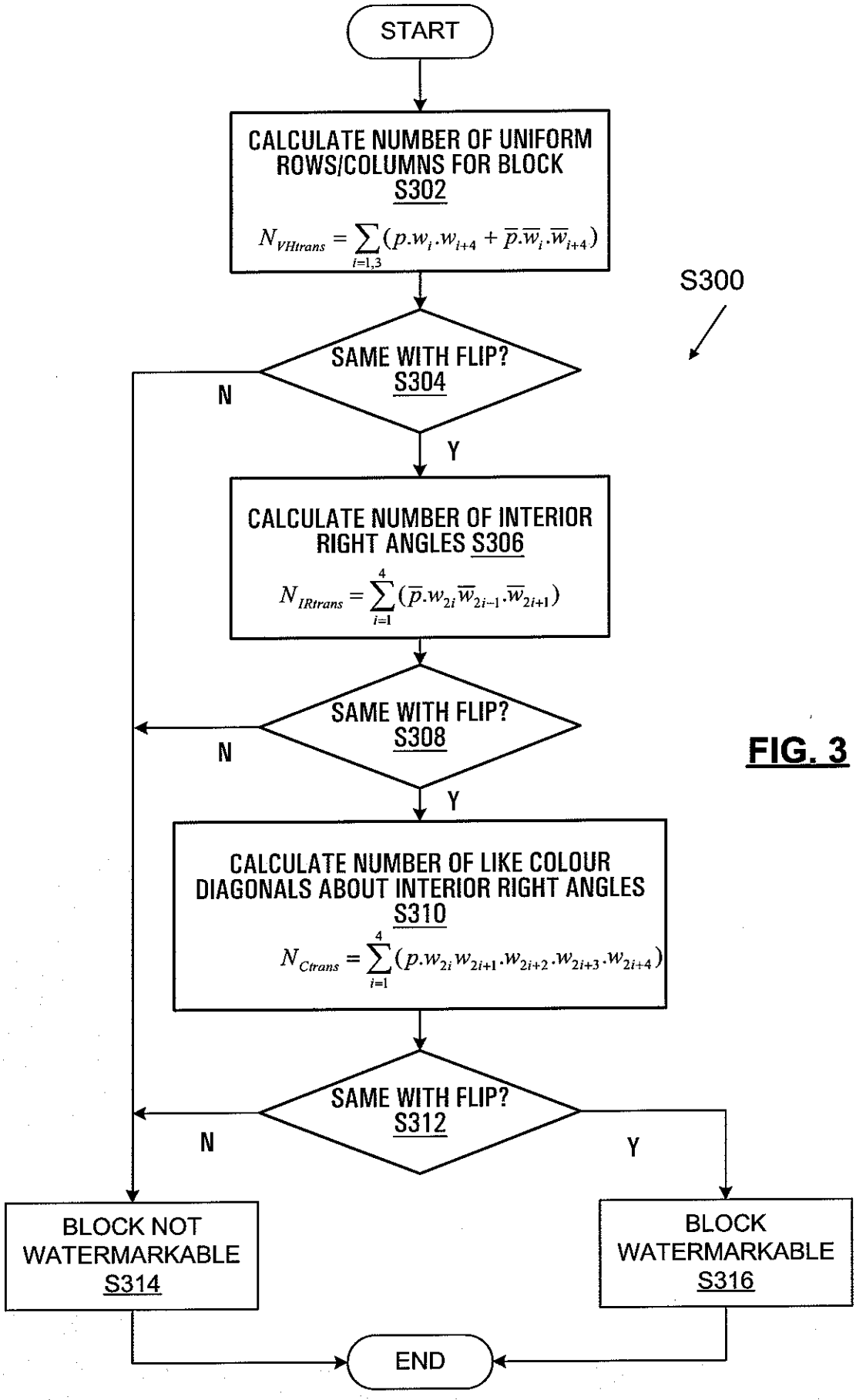

START
CALCULATE NUMBER OF UNIFORM ROWS/COLUMNS FOR BLOCK S302
$N_{VHtrans} = \sum_{i=1,3}(p.w_i.w_{i+4} + \overline{p}.\overline{w}_i.\overline{w}_{i+4})$
S300
SAME WITH FLIP? S304
N
Y
CALCULATE NUMBER OF INTERIOR RIGHT ANGLES S306
$N_{IRtrans} = \sum_{i=1}^{4}(\overline{p}.w_{2i}\overline{w}_{2i-1}.\overline{w}_{2i+1})$
SAME WITH FLIP? S308
N
Y
CALCULATE NUMBER OF LIKE COLOUR DIAGONALS ABOUT INTERIOR RIGHT ANGLES S310
$N_{Ctrans} = \sum_{i=1}^{4}(p.w_{2i}w_{2i+1}.w_{2i+2}.w_{2i+3}.w_{2i+4})$
SAME WITH FLIP? S312
N
Y
BLOCK NOT WATERMARKABLE S314
BLOCK WATERMARKABLE S316
END

FIG. 3

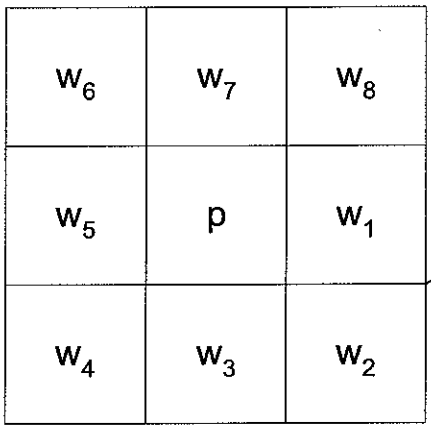


FIG. 4

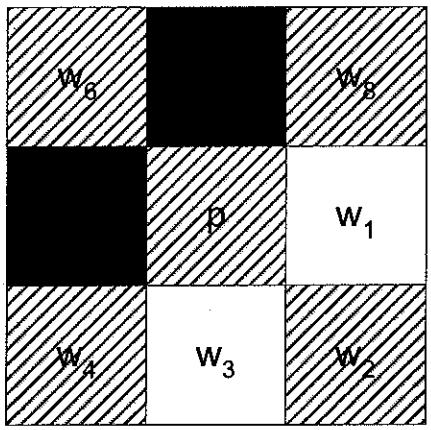


FIG. 5A

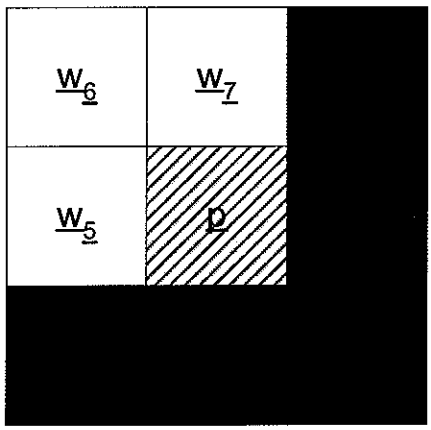
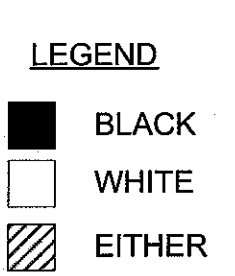


FIG. 5C



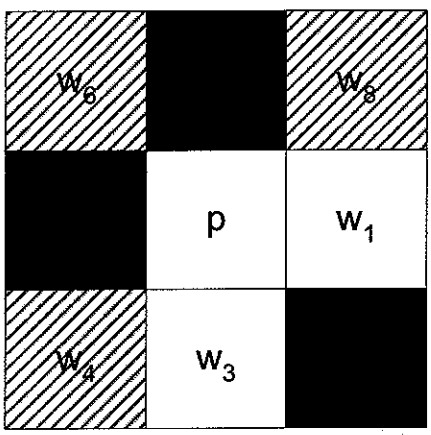


FIG. 5B

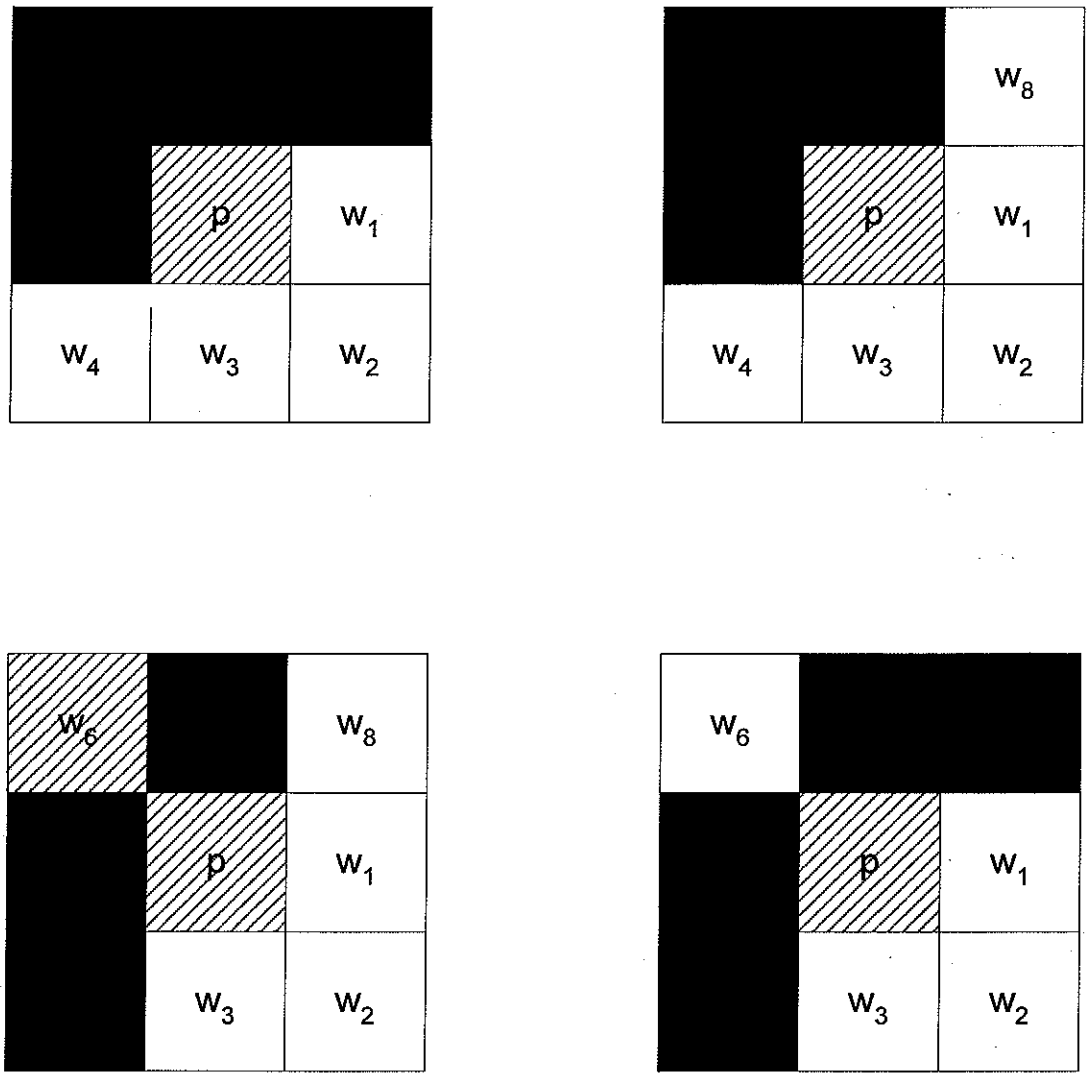


FIG. 5D

LEGEND

BLACK

WHITE

EITHER

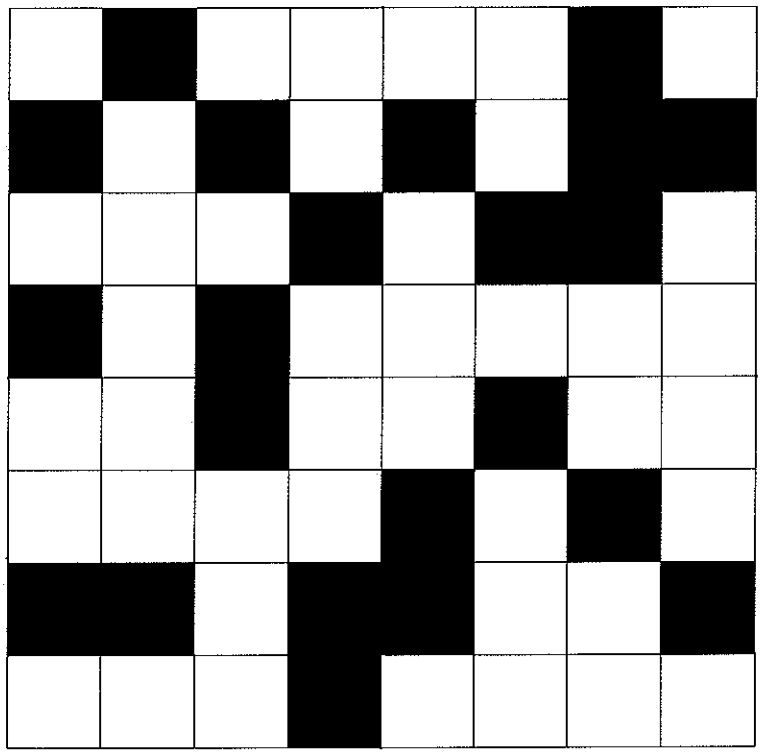
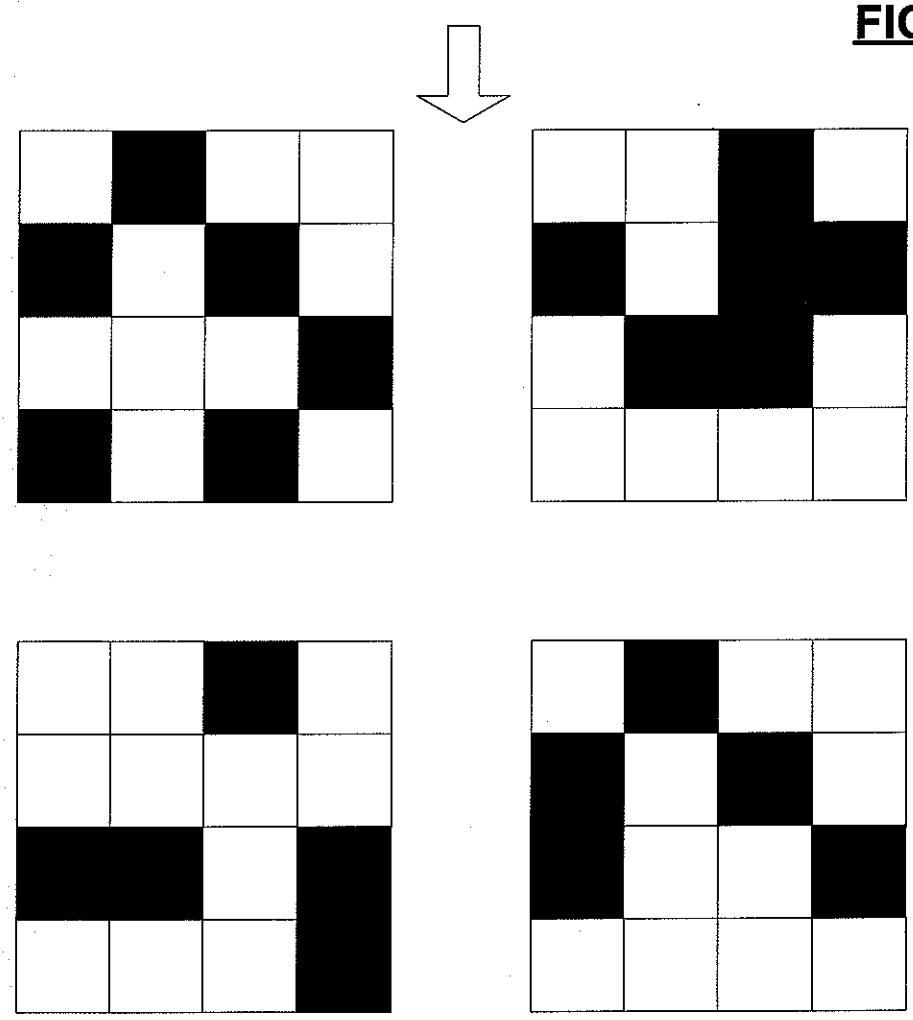


FIG. 6



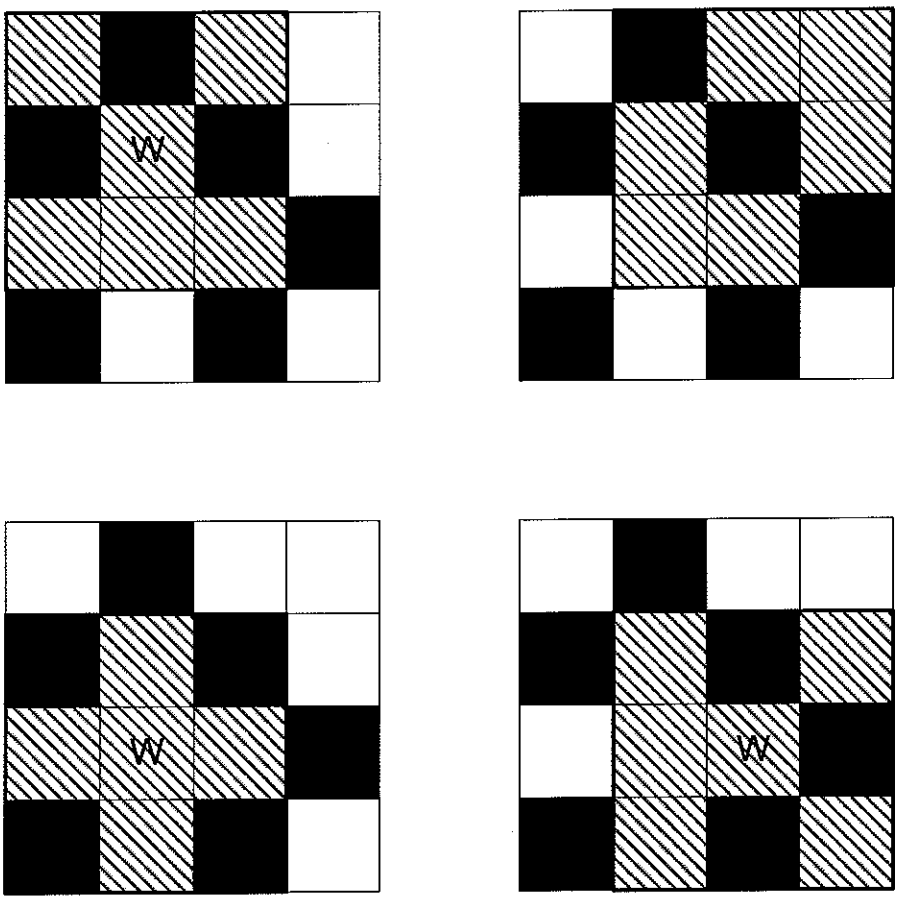


FIG. 7

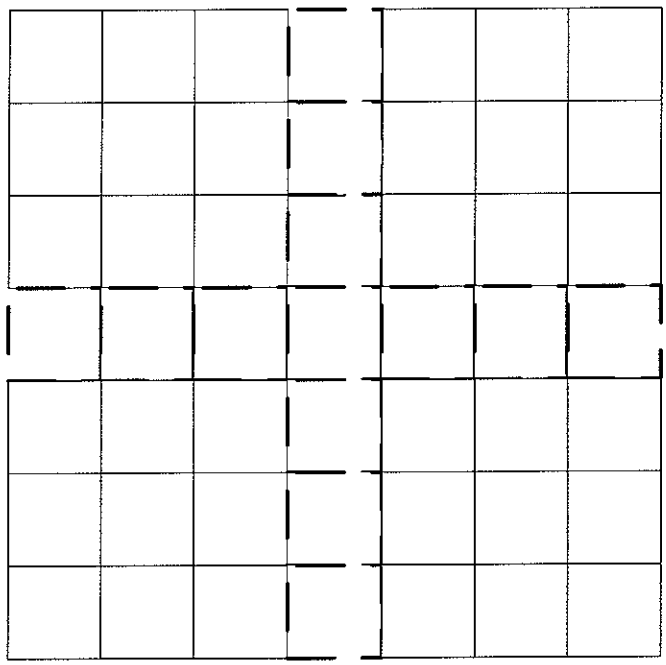


FIG. 8

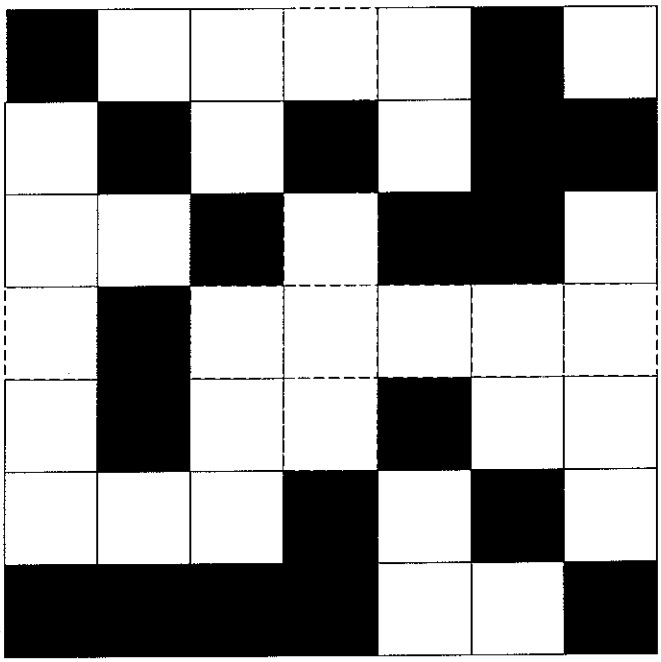


FIG. 9A

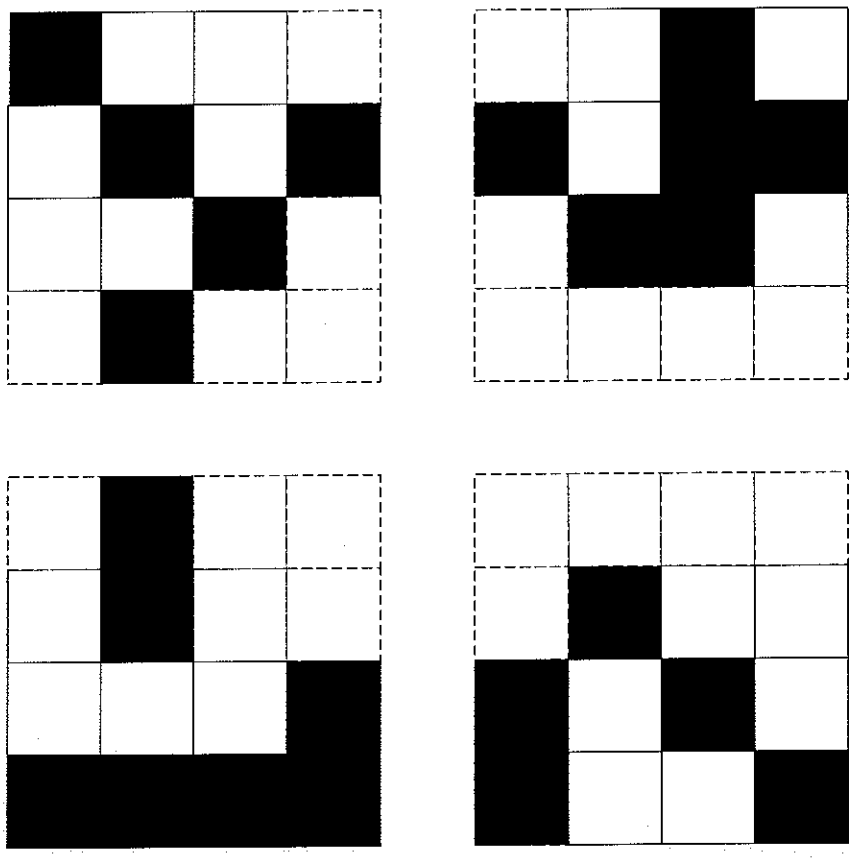


FIG. 9B

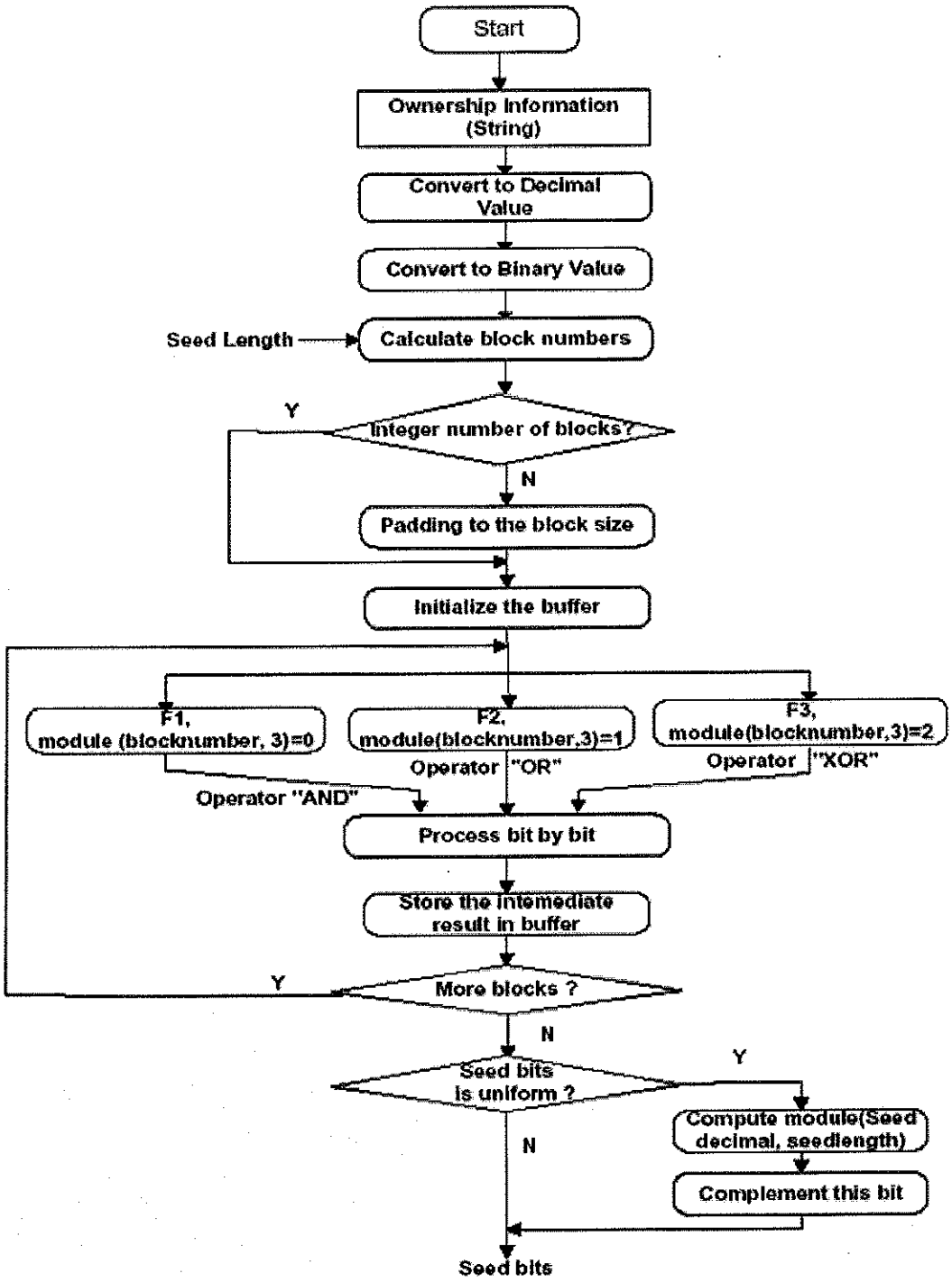

Start
Ownership Information (String)
Convert to Decimal Value
Convert to Binary Value
Seed Length
Calculate block numbers
Y
Integer number of blocks?
N
Padding to the block size
Initialize the buffer
F1, module (blocknumber, 3)=0
F2, module(blocknumber,3)=1
F3, module(blocknumber,3)=2
Operator "OR"
Operator "XOR"
Operator "AND"
Process bit by bit
Store the intemediate result in buffer
Y
More blocks ?
N
Seed bits is uniform ?
Y
N
Compute module(Seed decimal, seedlength)
Complement this bit
Seed bits

FIG. 10

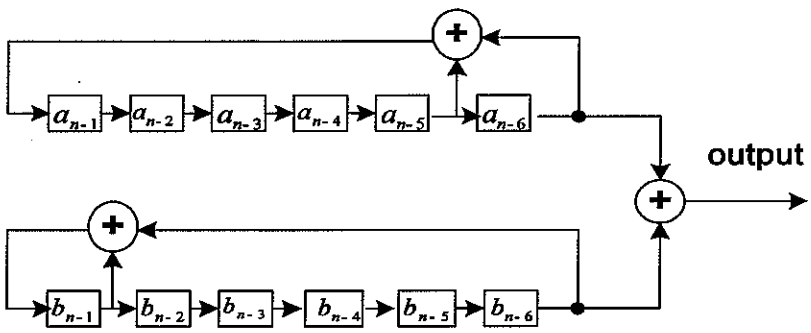


FIG. 11

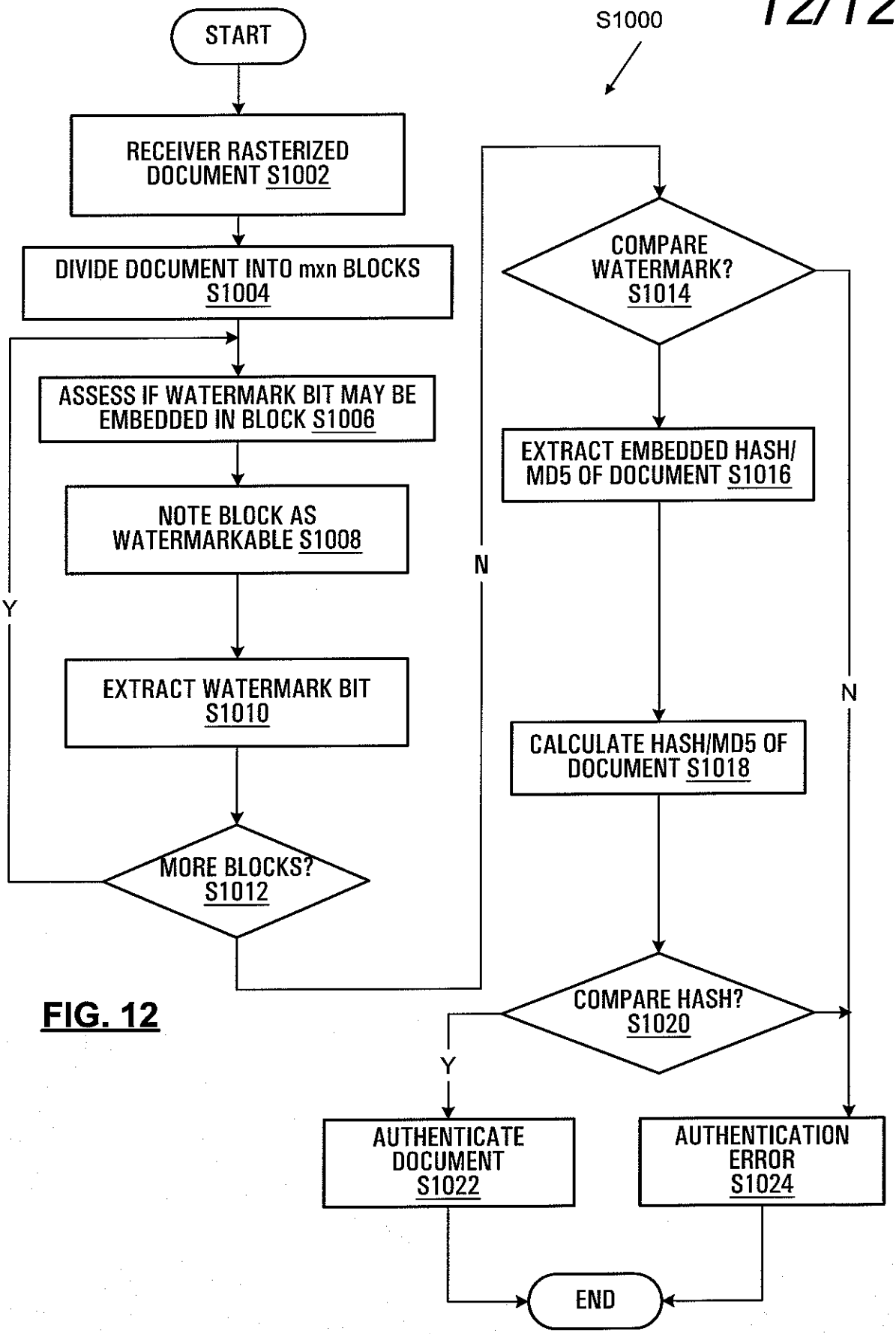

S1000
START
RECEIVER RASTERIZED DOCUMENT S1002
DIVIDE DOCUMENT INTO mxn BLOCKS S1004
ASSESS IF WATERMARK BIT MAY BE EMBEDDED IN BLOCK S1006
NOTE BLOCK AS WATERMARKABLE S1008
EXTRACT WATERMARK BIT S1010
MORE BLOCKS? S1012
Y
N
COMPARE WATERMARK? S1014
EXTRACT EMBEDDED HASH/ MD5 OF DOCUMENT S1016
CALCULATE HASH/MD5 OF DOCUMENT S1018
COMPARE HASH? S1020
Y
N
AUTHENTICATE DOCUMENT S1022
AUTHENTICATION ERROR S1024
END

FIG. 12