FIG. 1

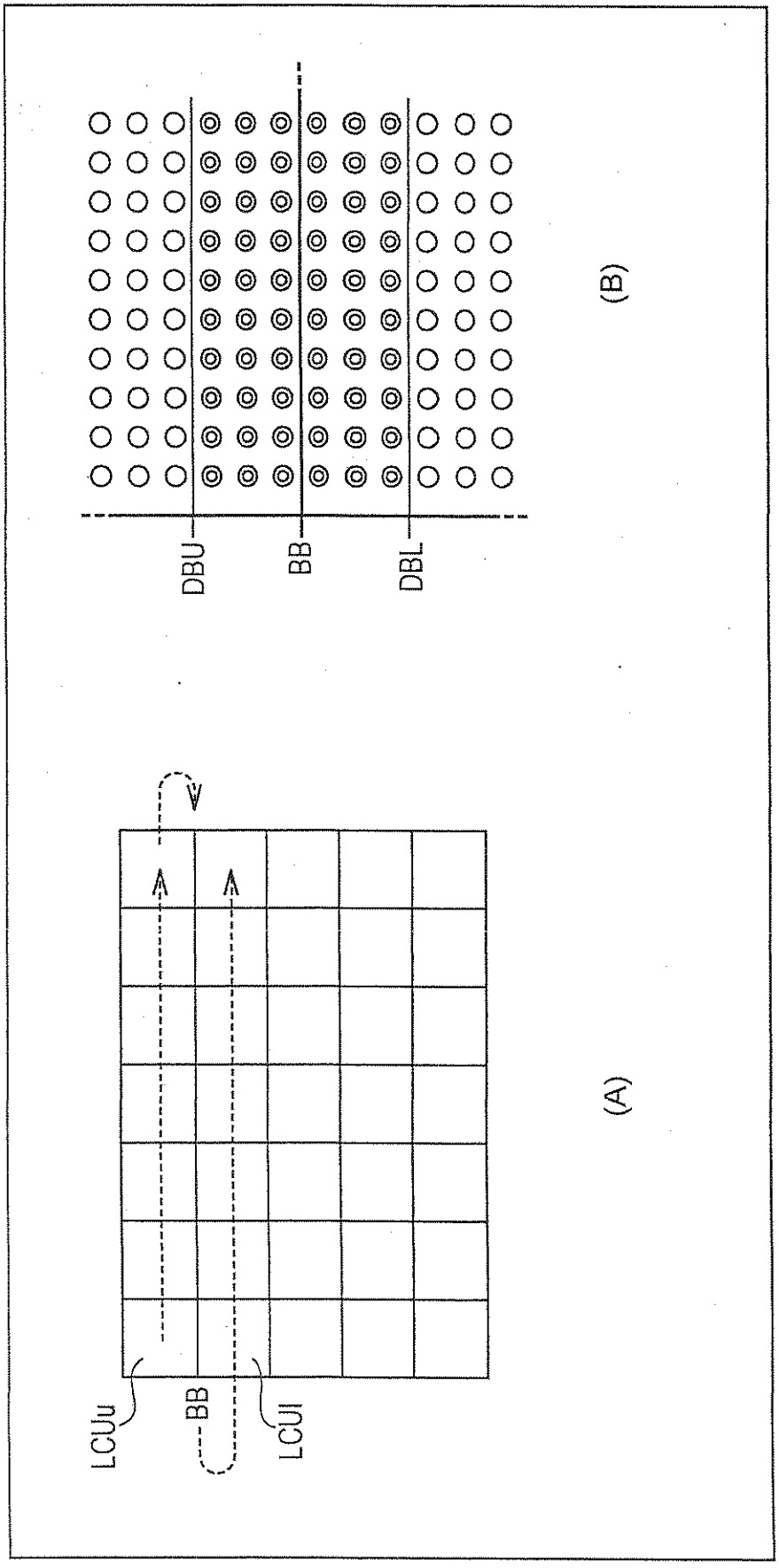


FIG. 2

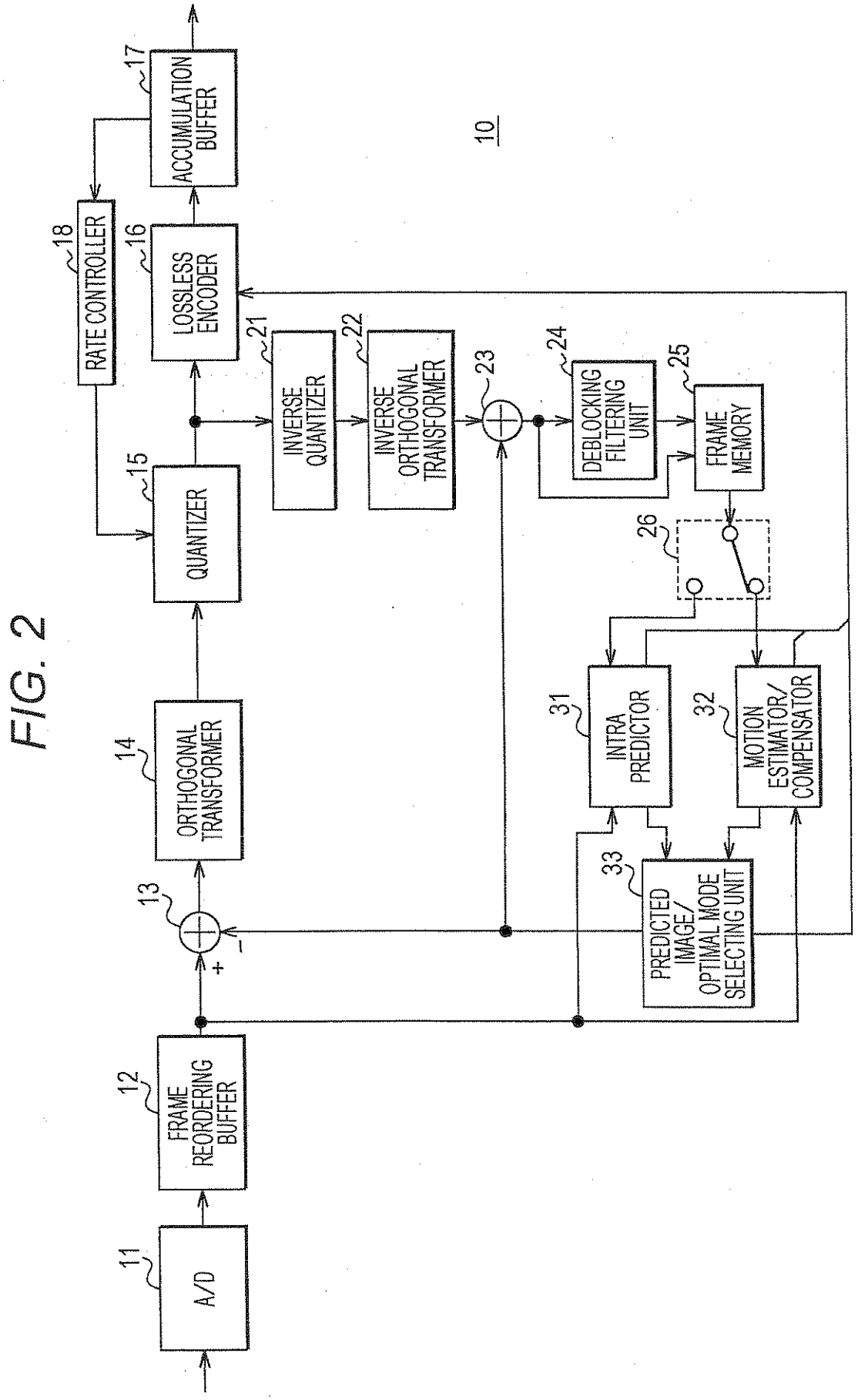

10
11
A/D
12
FRAME REORDERING BUFFER
13
14
ORTHOGONAL TRANSFORMER
15
QUANTIZER
16
LOSSLESS ENCODER
17
ACCUMULATION BUFFER
18
RATE CONTROLLER
21
INVERSE QUANTIZER
22
INVERSE ORTHOGONAL TRANSFORMER
23
24
DEBLOCKING FILTERING UNIT
25
FRAME MEMORY
26
31
INTRA PREDICTOR
32
MOTION ESTIMATOR/ COMPENSATOR
33
PREDICTED IMAGE/ OPTIMAL MODE SELECTING UNIT
+
-

FIG. 3

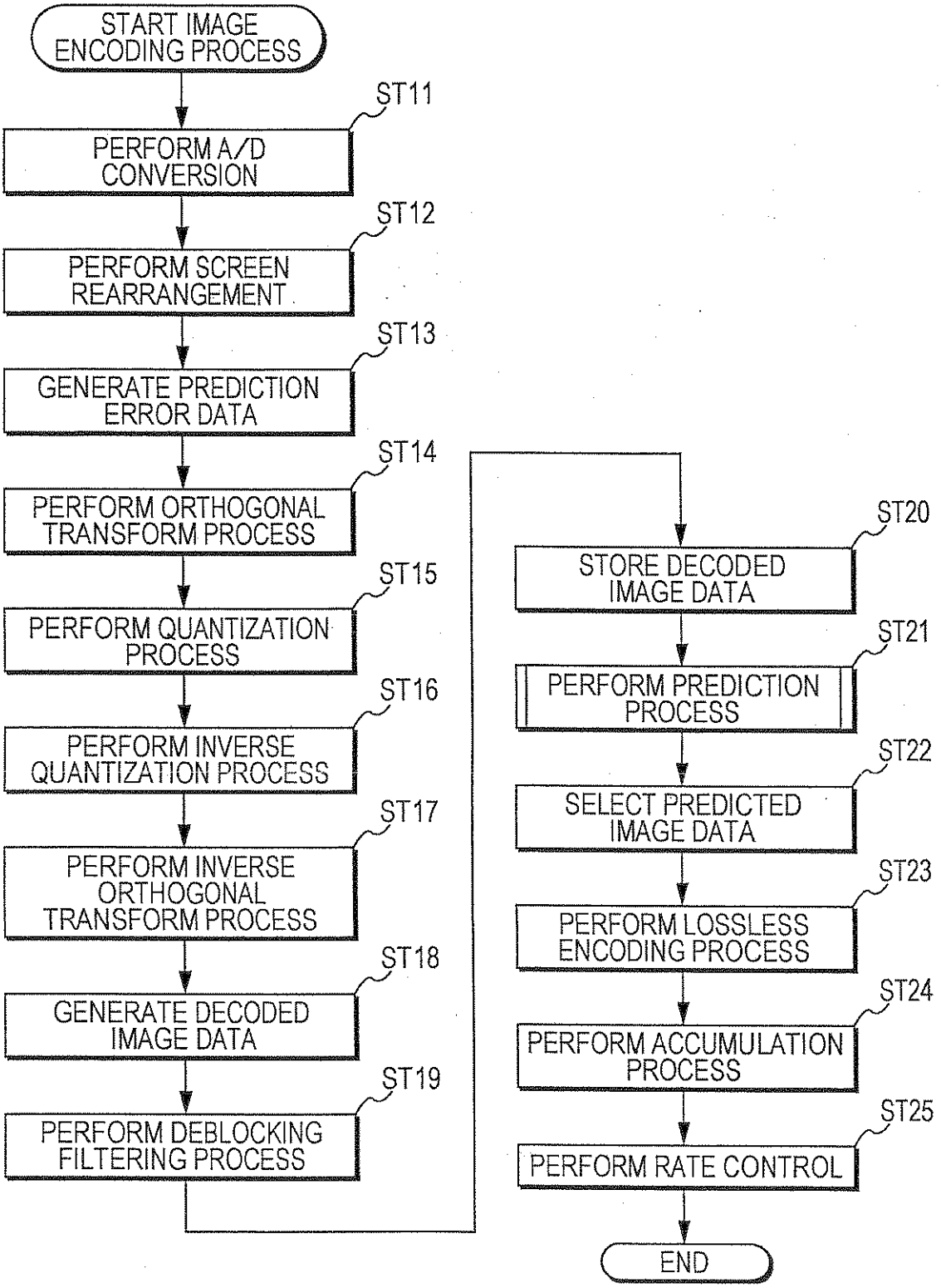

START IMAGE ENCODING PROCESS
ST11
PERFORM A/D CONVERSION
ST12
PERFORM SCREEN REARRANGEMENT
ST13
GENERATE PREDICTION ERROR DATA
ST14
PERFORM ORTHOGONAL TRANSFORM PROCESS
ST15
PERFORM QUANTIZATION PROCESS
ST16
PERFORM INVERSE QUANTIZATION PROCESS
ST17
PERFORM INVERSE ORTHOGONAL TRANSFORM PROCESS
ST18
GENERATE DECODED IMAGE DATA
ST19
PERFORM DEBLOCKING FILTERING PROCESS
ST20
STORE DECODED IMAGE DATA
ST21
PERFORM PREDICTION PROCESS
ST22
SELECT PREDICTED IMAGE DATA
ST23
PERFORM LOSSLESS ENCODING PROCESS
ST24
PERFORM ACCUMULATION PROCESS
ST25
PERFORM RATE CONTROL
END

FIG. 4

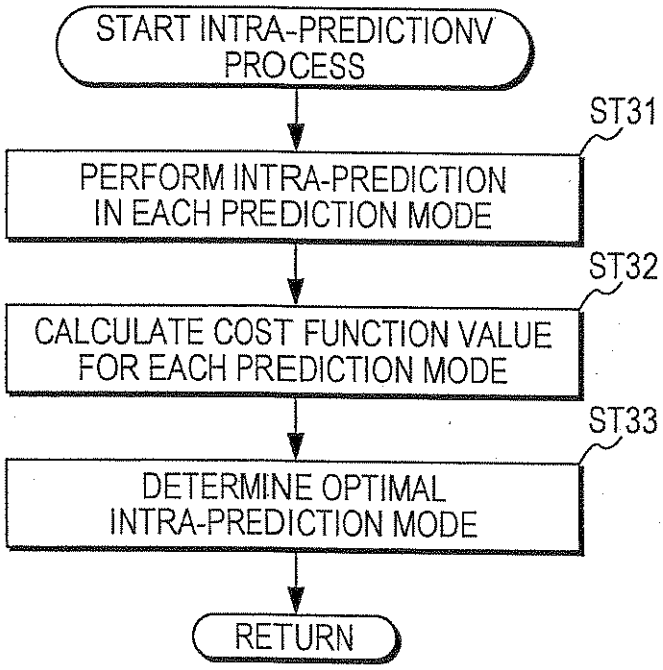

START INTRA-PREDICTIONV PROCESS
ST31
PERFORM INTRA-PREDICTION IN EACH PREDICTION MODE
ST32
CALCULATE COST FUNCTION VALUE FOR EACH PREDICTION MODE
ST33
DETERMINE OPTIMAL INTRA-PREDICTION MODE
RETURN

FIG. 5

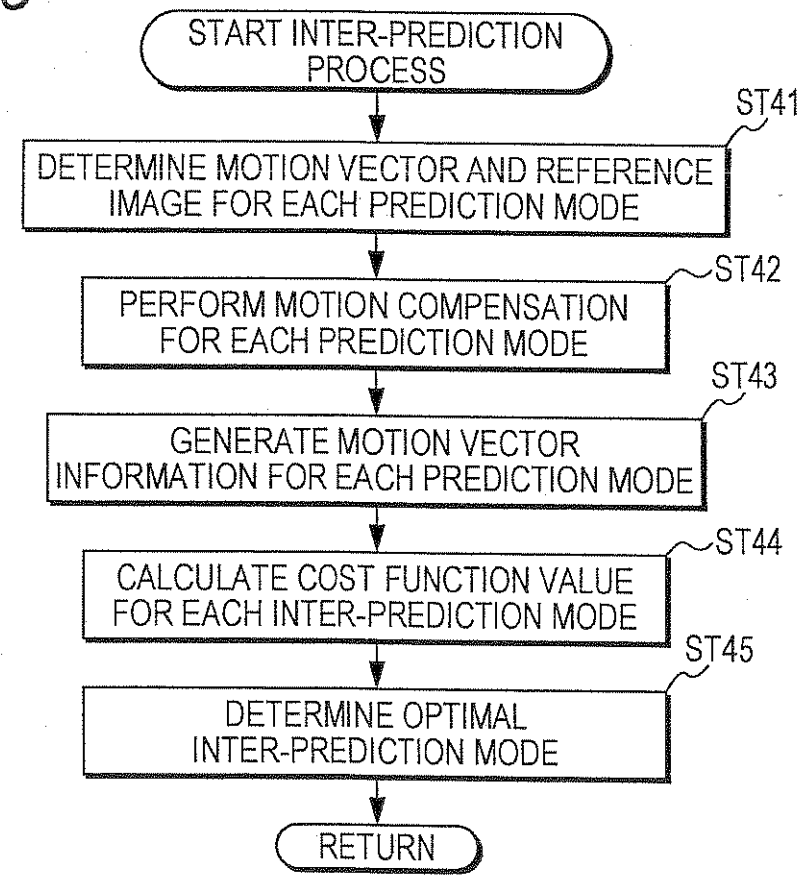

START INTER-PREDICTION PROCESS
ST41
DETERMINE MOTION VECTOR AND REFERENCE IMAGE FOR EACH PREDICTION MODE
ST42
PERFORM MOTION COMPENSATION FOR EACH PREDICTION MODE
ST43
GENERATE MOTION VECTOR INFORMATION FOR EACH PREDICTION MODE
ST44
CALCULATE COST FUNCTION VALUE FOR EACH INTER-PREDICTION MODE
ST45
DETERMINE OPTIMAL INTER-PREDICTION MODE
RETURN

FIG. 6

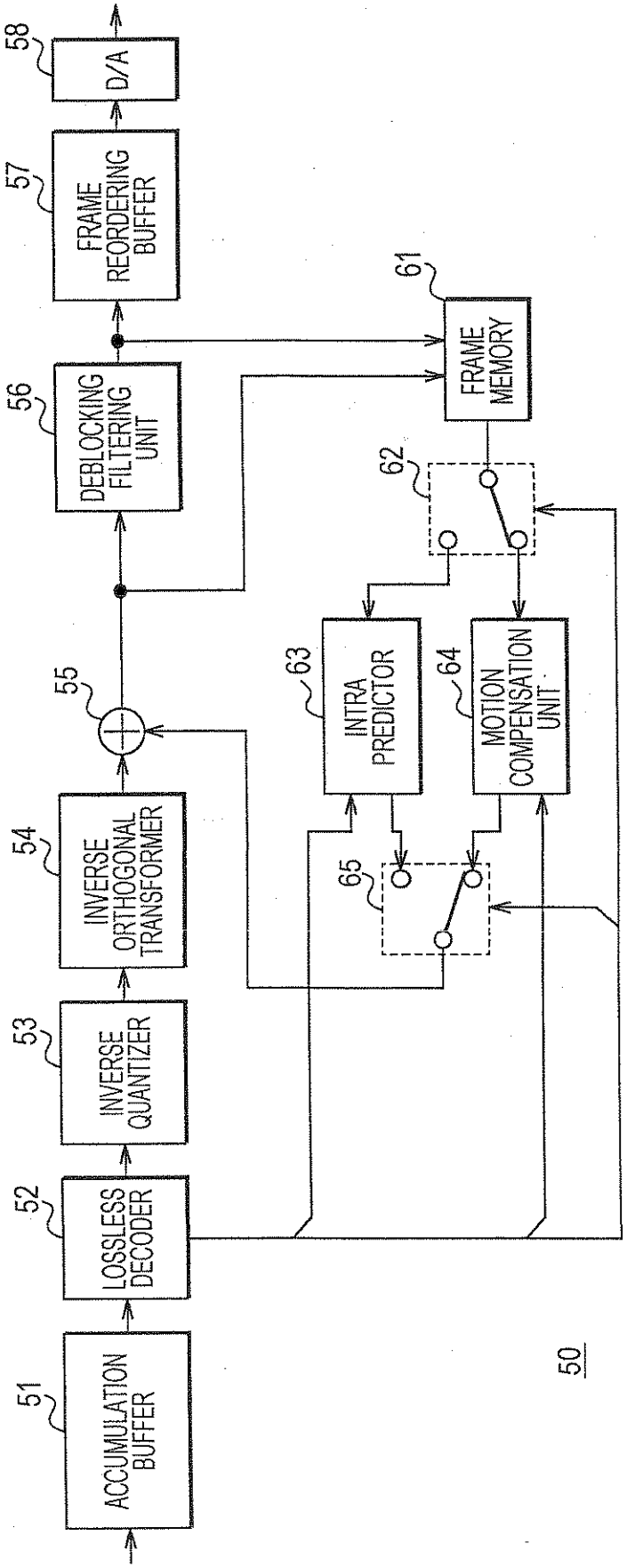

ACCUMULATION BUFFER
51
LOSSLESS DECODER
52
INVERSE QUANTIZER
53
INVERSE ORTHOGONAL TRANSFORMER
54
55
DEBLOCKING FILTERING UNIT
56
FRAME REORDERING BUFFER
57
D/A
58
FRAME MEMORY
61
62
INTRA PREDICTOR
63
MOTION COMPENSATION UNIT
64
65
50

FIG. 7

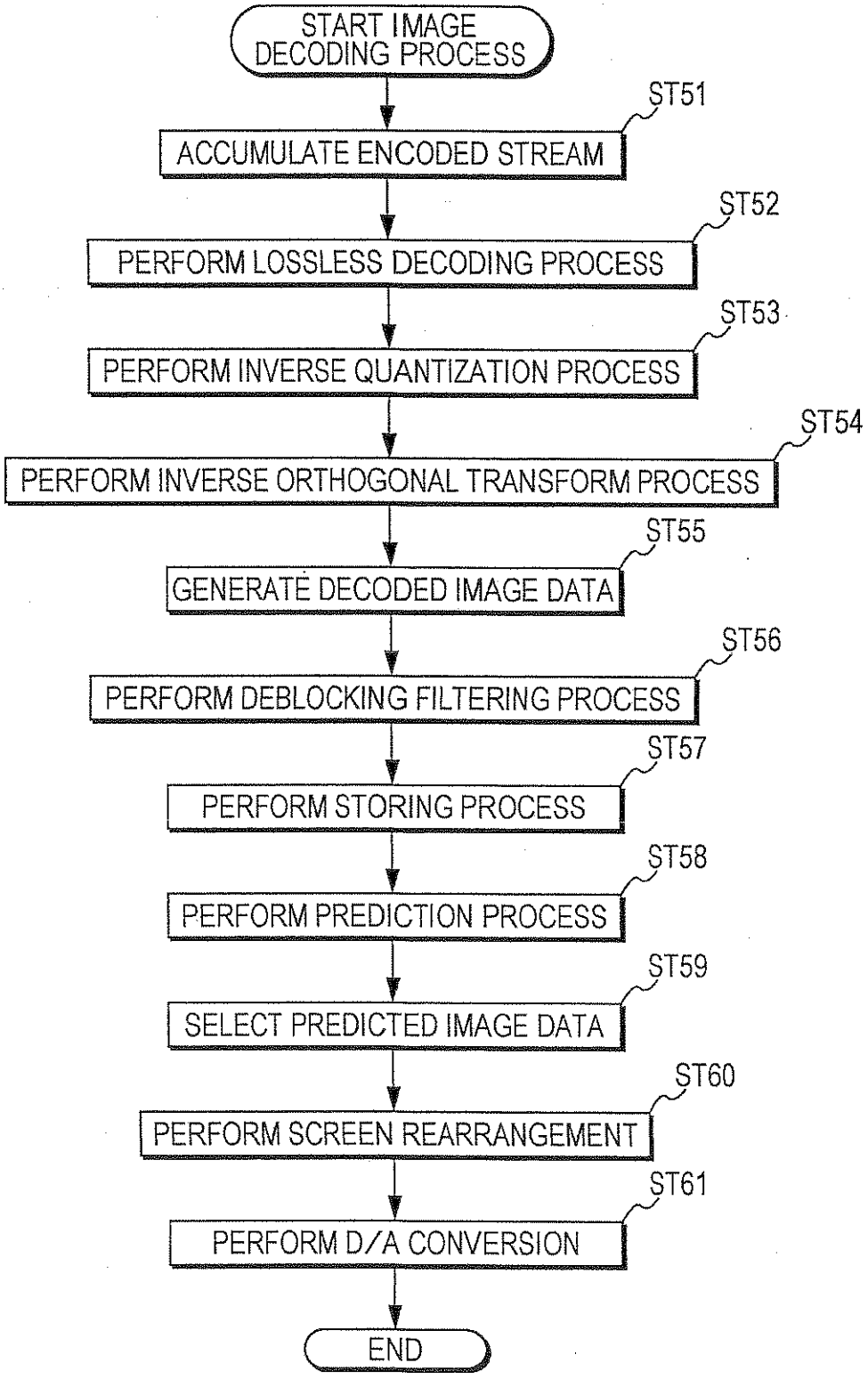

START IMAGE DECODING PROCESS
ST51
ACCUMULATE ENCODED STREAM
ST52
PERFORM LOSSLESS DECODING PROCESS
ST53
PERFORM INVERSE QUANTIZATION PROCESS
ST54
PERFORM INVERSE ORTHOGONAL TRANSFORM PROCESS
ST55
GENERATE DECODED IMAGE DATA
ST56
PERFORM DEBLOCKING FILTERING PROCESS
ST57
PERFORM STORING PROCESS
ST58
PERFORM PREDICTION PROCESS
ST59
SELECT PREDICTED IMAGE DATA
ST60
PERFORM SCREEN REARRANGEMENT
ST61
PERFORM D/A CONVERSION
END

FIG. 8

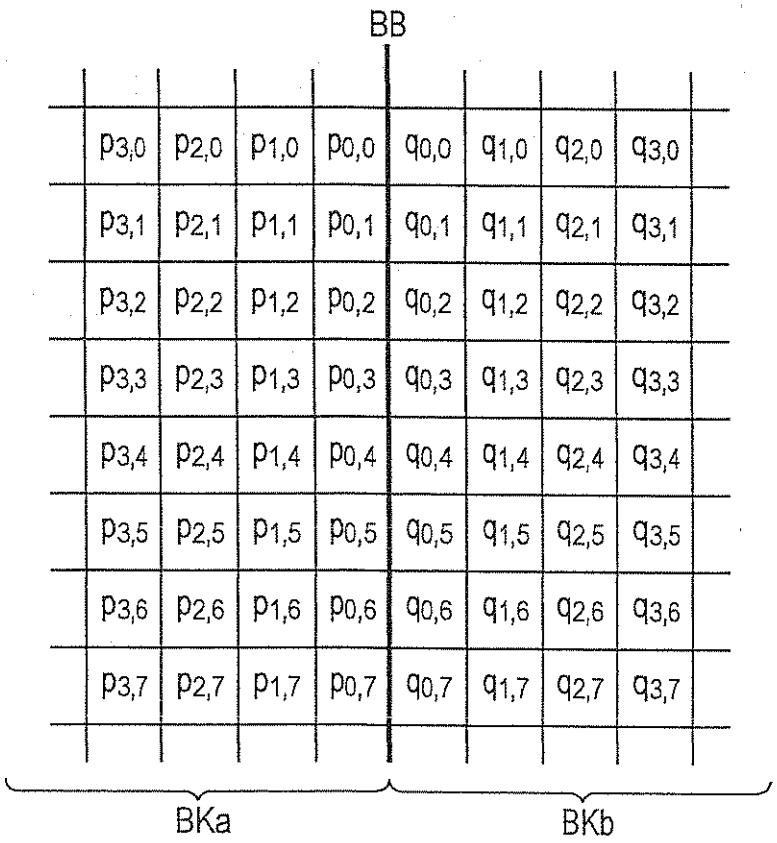

BB
p3,0 p2,0 p1,0 p0,0 q0,0 q1,0 q2,0 q3,0
p3,1 p2,1 p1,1 p0,1 q0,1 q1,1 q2,1 q3,1
p3,2 p2,2 p1,2 p0,2 q0,2 q1,2 q2,2 q3,2
p3,3 p2,3 p1,3 p0,3 q0,3 q1,3 q2,3 q3,3
p3,4 p2,4 p1,4 p0,4 q0,4 q1,4 q2,4 q3,4
p3,5 p2,5 p1,5 p0,5 q0,5 q1,5 q2,5 q3,5
p3,6 p2,6 p1,6 p0,6 q0,6 q1,6 q2,6 q3,6
p3,7 p2,7 p1,7 p0,7 q0,7 q1,7 q2,7 q3,7
BKa
BKb

FIG. 9

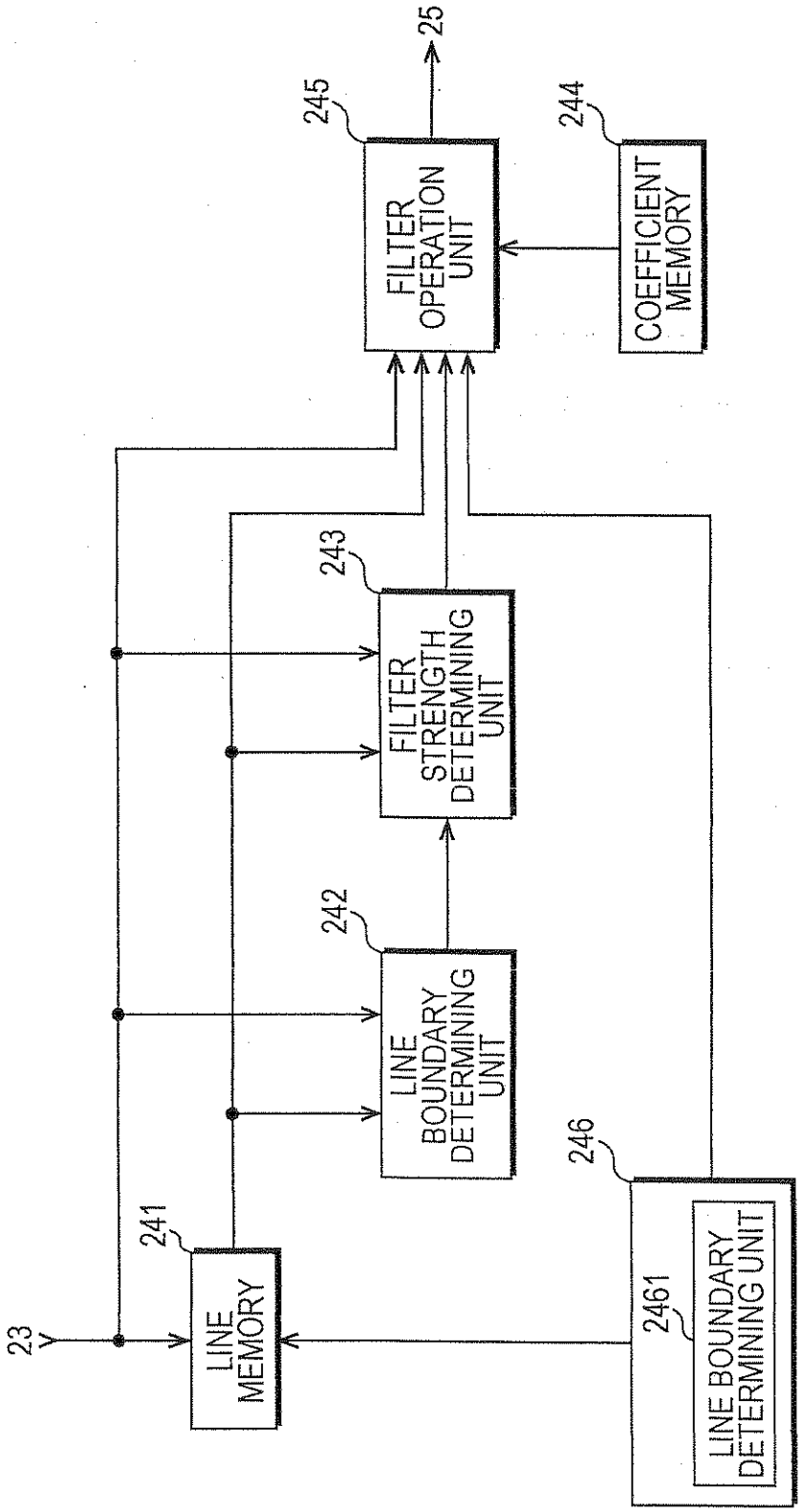

23
241
LINE MEMORY
242
LINE BOUNDARY DETERMINING UNIT
243
FILTER STRENGTH DETERMINING UNIT
245
FILTER OPERATION UNIT
244
COEFFICIENT MEMORY
25
246
2461
LINE BOUNDARY DETERMINING UNIT

FIG. 10

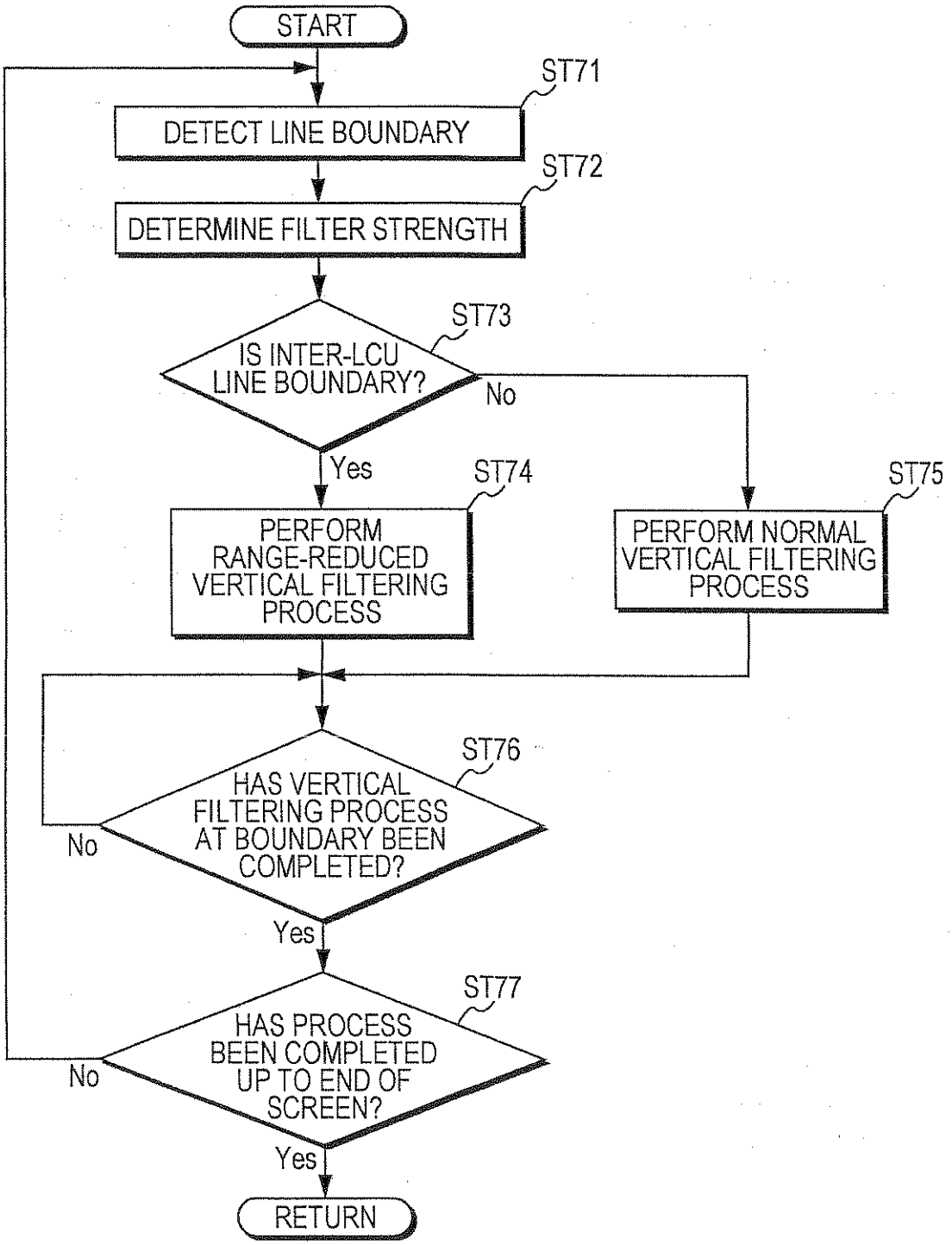

START
ST71
DETECT LINE BOUNDARY
ST72
DETERMINE FILTER STRENGTH
ST73
IS INTER-LCU LINE BOUNDARY?
No
Yes
ST74
PERFORM RANGE-REDUCED VERTICAL FILTERING PROCESS
ST75
PERFORM NORMAL VERTICAL FILTERING PROCESS
ST76
HAS VERTICAL FILTERING PROCESS AT BOUNDARY BEEN COMPLETED?
No
Yes
ST77
HAS PROCESS BEEN COMPLETED UP TO END OF SCREEN?
No
Yes
RETURN

FIG. 11

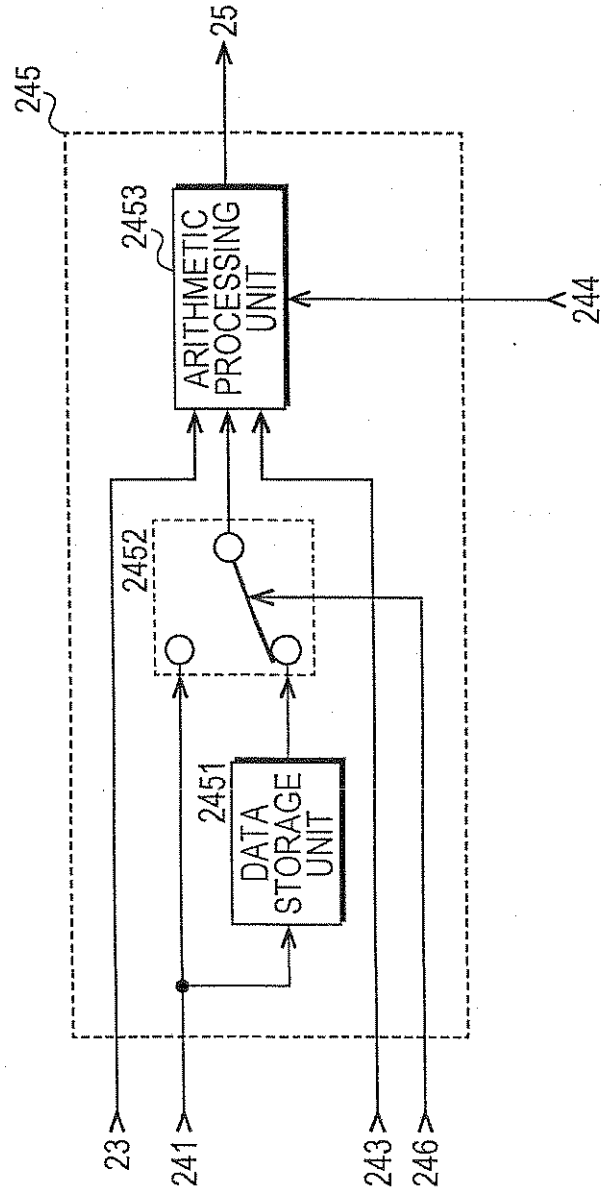

245
25
2453
ARITHMETIC PROCESSING UNIT
244
2452
2451
DATA STORAGE UNIT
23
241
243
246

FIG. 12

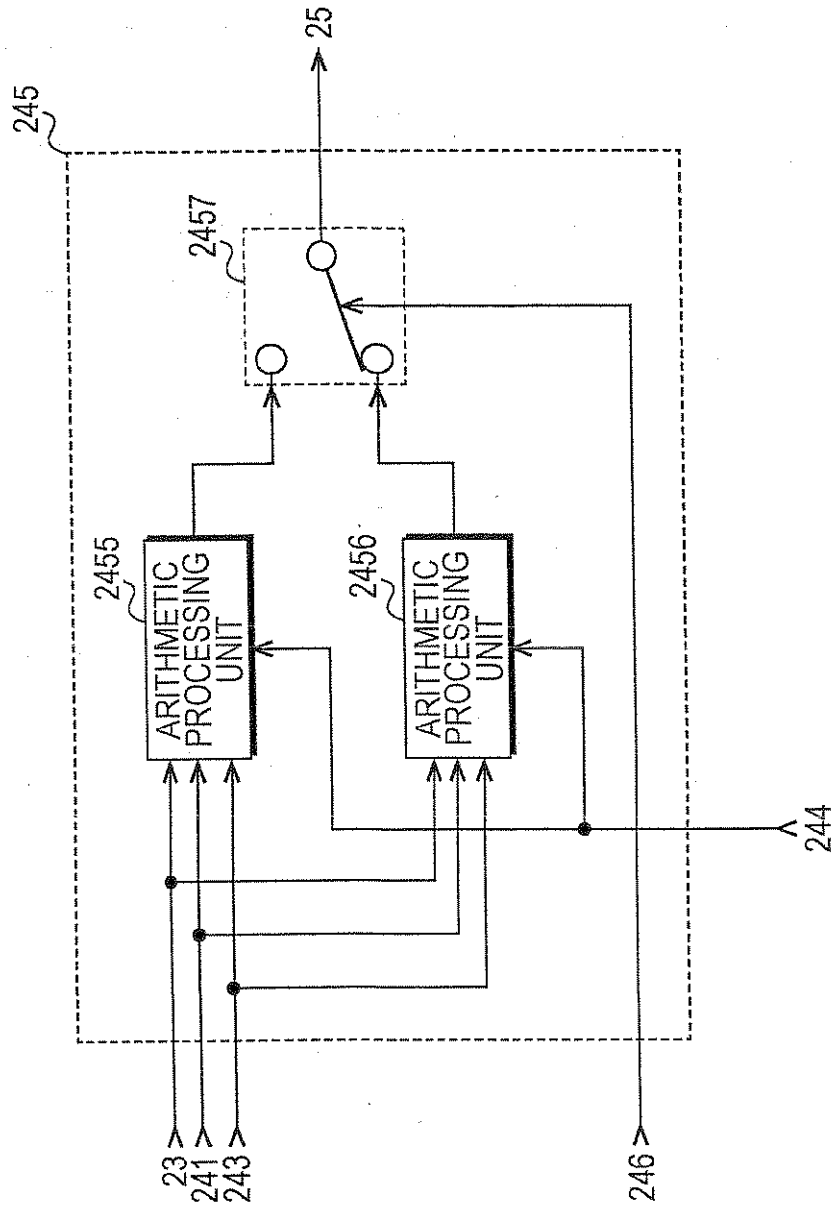

245
25
2457
2455
ARITHMETIC PROCESSING UNIT
2456
ARITHMETIC PROCESSING UNIT
244
23
241
243
246

FIG. 13

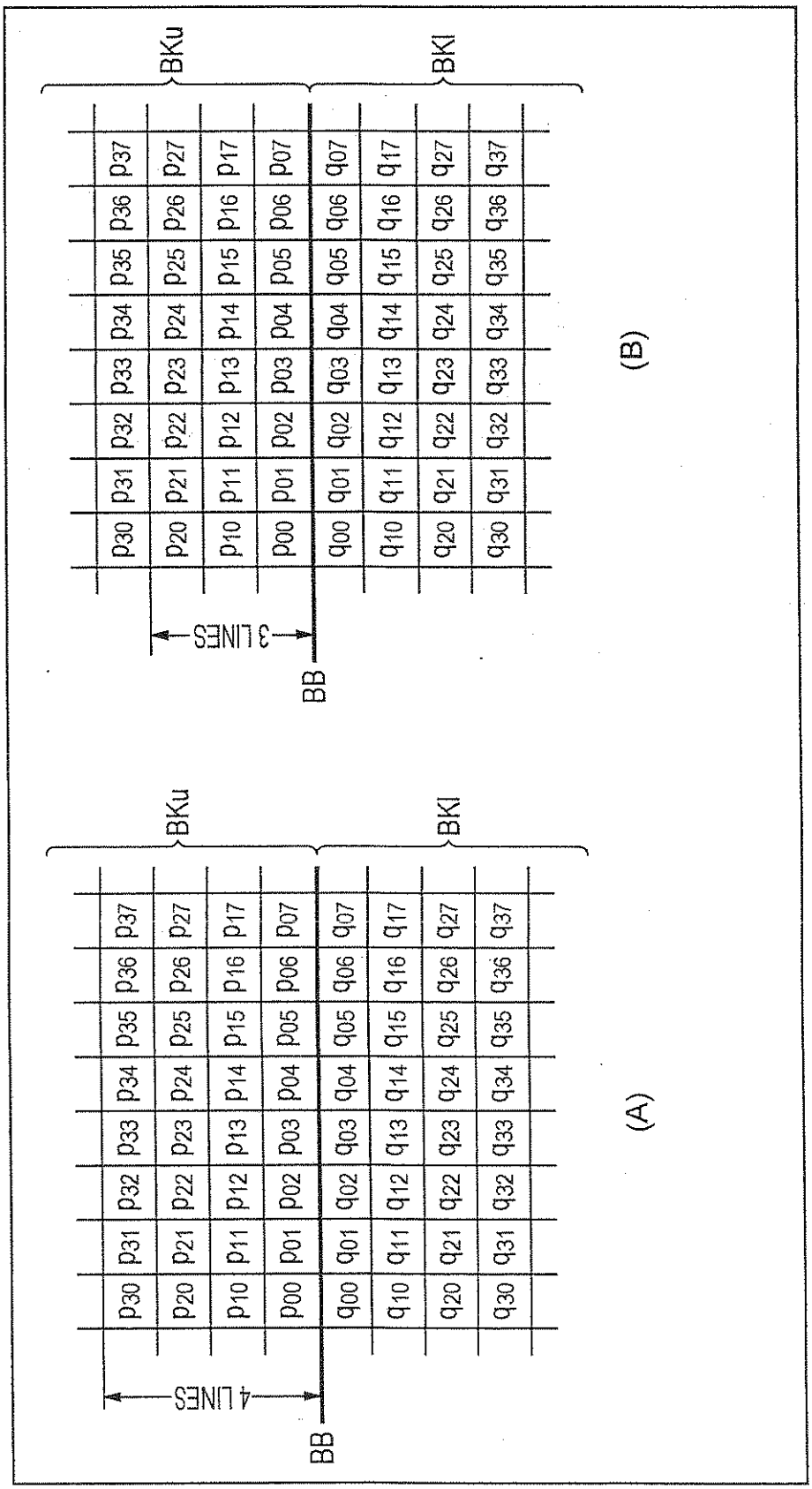


FIG. 14

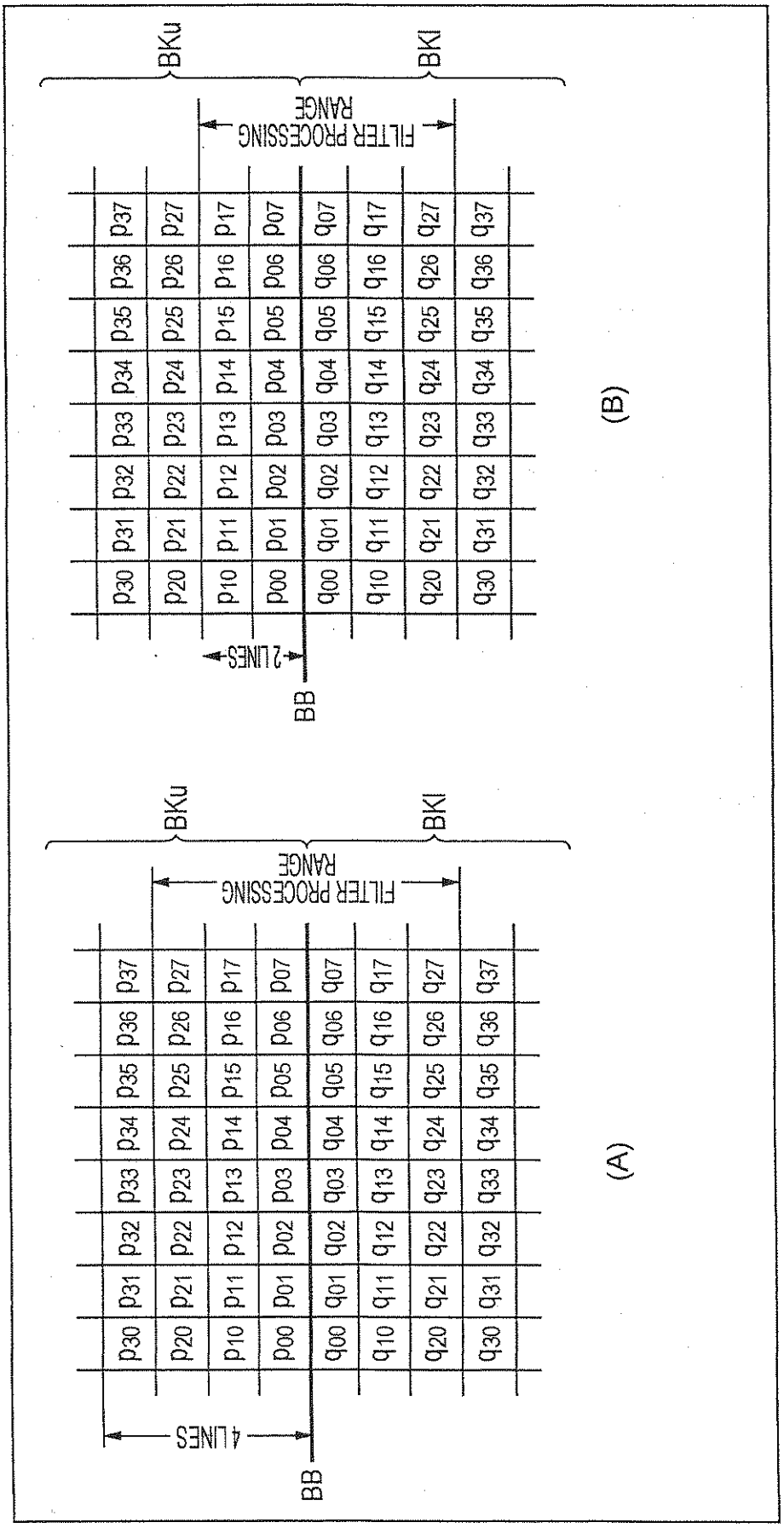

BKu
BKl
FILTER PROCESSING RANGE
4 LINES
BB
(A)
BKu
BKl
FILTER PROCESSING RANGE
2 LINES
BB
(B)

FIG. 15

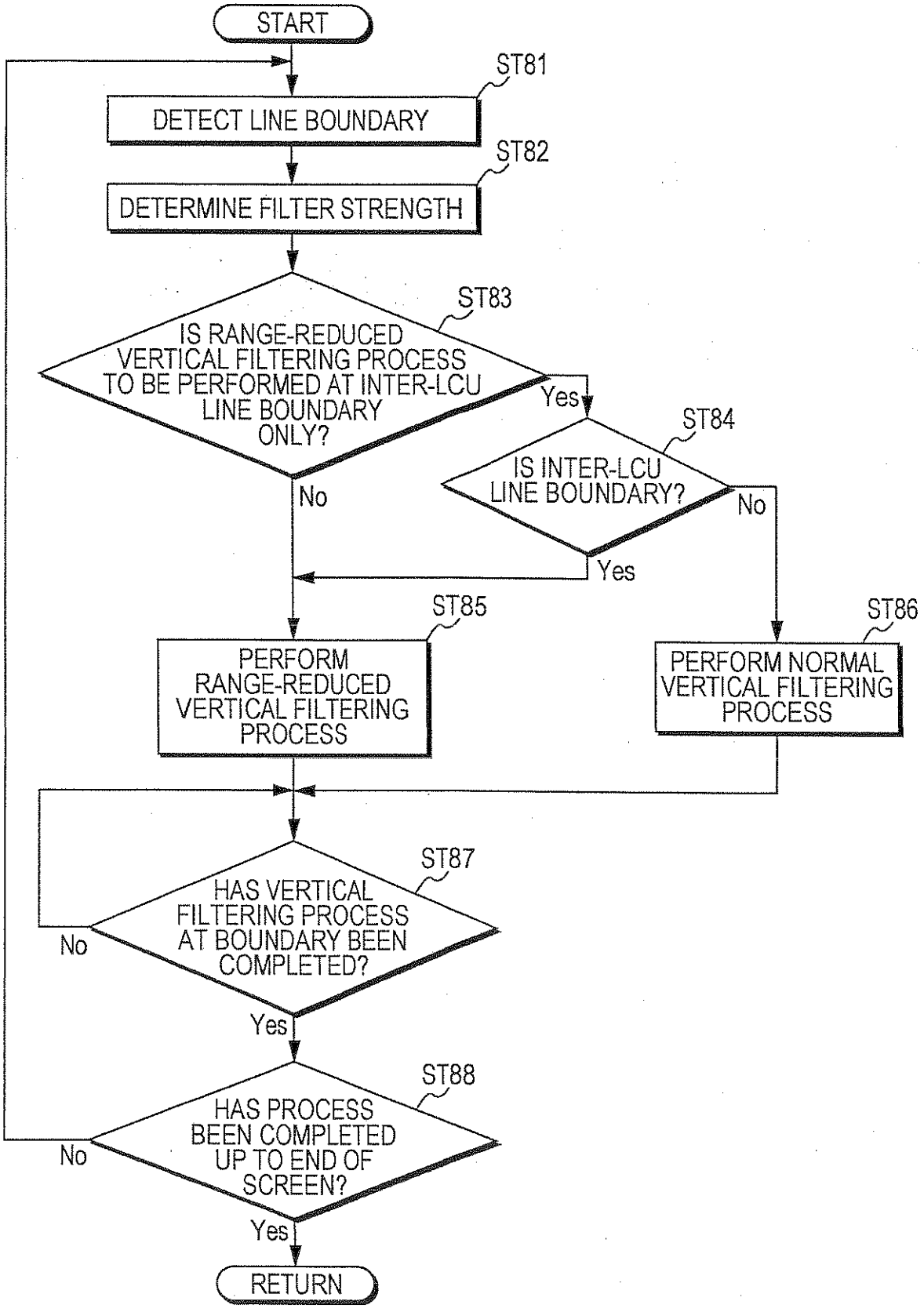

START
ST81
DETECT LINE BOUNDARY
ST82
DETERMINE FILTER STRENGTH
ST83
IS RANGE-REDUCED VERTICAL FILTERING PROCESS TO BE PERFORMED AT INTER-LCU LINE BOUNDARY ONLY?
Yes
No
ST84
IS INTER-LCU LINE BOUNDARY?
No
Yes
ST85
PERFORM RANGE-REDUCED VERTICAL FILTERING PROCESS
ST86
PERFORM NORMAL VERTICAL FILTERING PROCESS
ST87
HAS VERTICAL FILTERING PROCESS AT BOUNDARY BEEN COMPLETED?
No
Yes
ST88
HAS PROCESS BEEN COMPLETED UP TO END OF SCREEN?
No
Yes
RETURN

FIG. 16

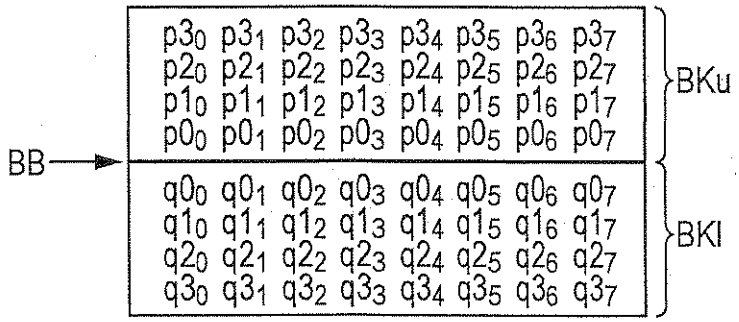

p3₀ p3₁ p3₂ p3₃ p3₄ p3₅ p3₆ p3₇
p2₀ p2₁ p2₂ p2₃ p2₄ p2₅ p2₆ p2₇
p1₀ p1₁ p1₂ p1₃ p1₄ p1₅ p1₆ p1₇
p0₀ p0₁ p0₂ p0₃ p0₄ p0₅ p0₆ p0₇
BKu
BB
q0₀ q0₁ q0₂ q0₃ q0₄ q0₅ q0₆ q0₇
q1₀ q1₁ q1₂ q1₃ q1₄ q1₅ q1₆ q1₇
q2₀ q2₁ q2₂ q2₃ q2₄ q2₅ q2₆ q2₇
q3₀ q3₁ q3₂ q3₃ q3₄ q3₅ q3₆ q3₇
BKl

FIG. 17

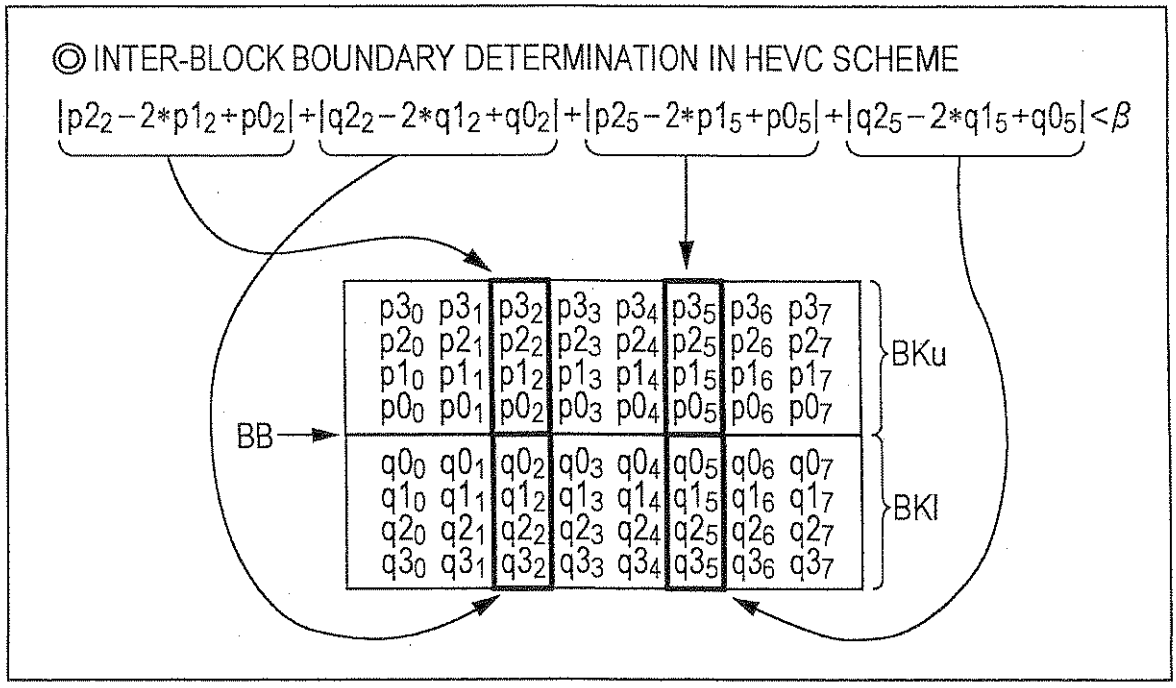

◎ INTER-BLOCK BOUNDARY DETERMINATION IN HEVC SCHEME
|p2₂ − 2*p1₂ + p0₂| + |q2₂ − 2*q1₂ + q0₂| + |p2₅ − 2*p1₅ + p0₅| + |q2₅ − 2*q1₅ + q0₅| < β
p3₀ p3₁ p3₂ p3₃ p3₄ p3₅ p3₆ p3₇
p2₀ p2₁ p2₂ p2₃ p2₄ p2₅ p2₆ p2₇
p1₀ p1₁ p1₂ p1₃ p1₄ p1₅ p1₆ p1₇
p0₀ p0₁ p0₂ p0₃ p0₄ p0₅ p0₆ p0₇
BKu
BB
q0₀ q0₁ q0₂ q0₃ q0₄ q0₅ q0₆ q0₇
q1₀ q1₁ q1₂ q1₃ q1₄ q1₅ q1₆ q1₇
q2₀ q2₁ q2₂ q2₃ q2₄ q2₅ q2₆ q2₇
q3₀ q3₁ q3₂ q3₃ q3₄ q3₅ q3₆ q3₇
BKl

FIG. 18

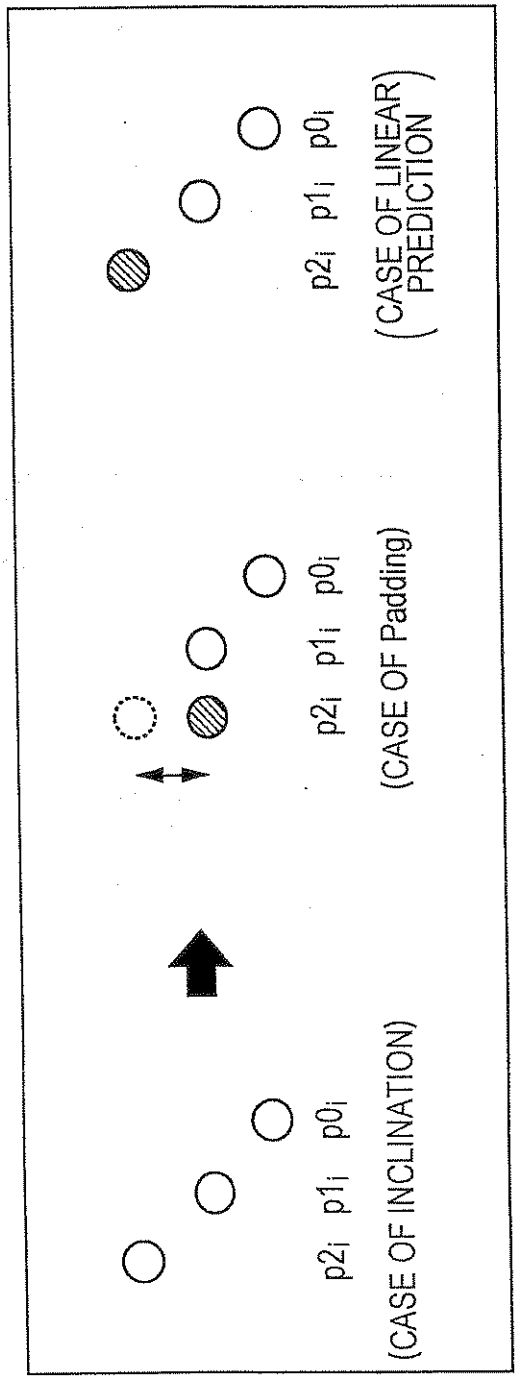

p2i p1i p0i
(CASE OF LINEAR PREDICTION)
p2i p1i p0i
(CASE OF Padding)
p2i p1i p0i
(CASE OF INCLINATION)

FIG. 19

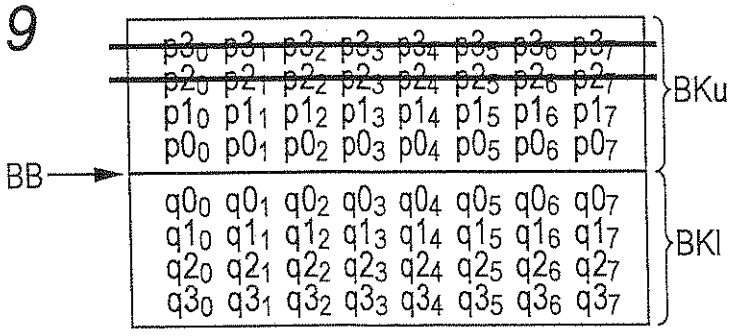

p3₀ p3₁ p3₂ p3₃ p3₄ p3₅ p3₆ p3₇
p2₀ p2₁ p2₂ p2₃ p2₄ p2₅ p2₆ p2₇
p1₀ p1₁ p1₂ p1₃ p1₄ p1₅ p1₆ p1₇
p0₀ p0₁ p0₂ p0₃ p0₄ p0₅ p0₆ p0₇
BKu
BB
q0₀ q0₁ q0₂ q0₃ q0₄ q0₅ q0₆ q0₇
q1₀ q1₁ q1₂ q1₃ q1₄ q1₅ q1₆ q1₇
q2₀ q2₁ q2₂ q2₃ q2₄ q2₅ q2₆ q2₇
q3₀ q3₁ q3₂ q3₃ q3₄ q3₅ q3₆ q3₇
BKl

FIG. 20

	AI_HE				RA_HE				LB_HE				LP_HE			
	22	27	32	37	22	27	32	37	22	27	32	37	22	27	32	37
Class A	16	25	23	29	12	19	19	18								
Class B	9	37	42	50	15	29	25	84	9	55	53	73	12	38	50	82
Class C	29	40	54	109	9	28	34	35	27	15	34	44	5	24	34	49
Class D	7	13	57	54	6	9	40	42	3	8	20	22	4	8	18	20
Class E	15	16	20	28					5	7	15	17	6	11	16	20
Class F	190	190	190	191	178	189	191	190	191	188	189	182	191	188	181	169

FIG. 21

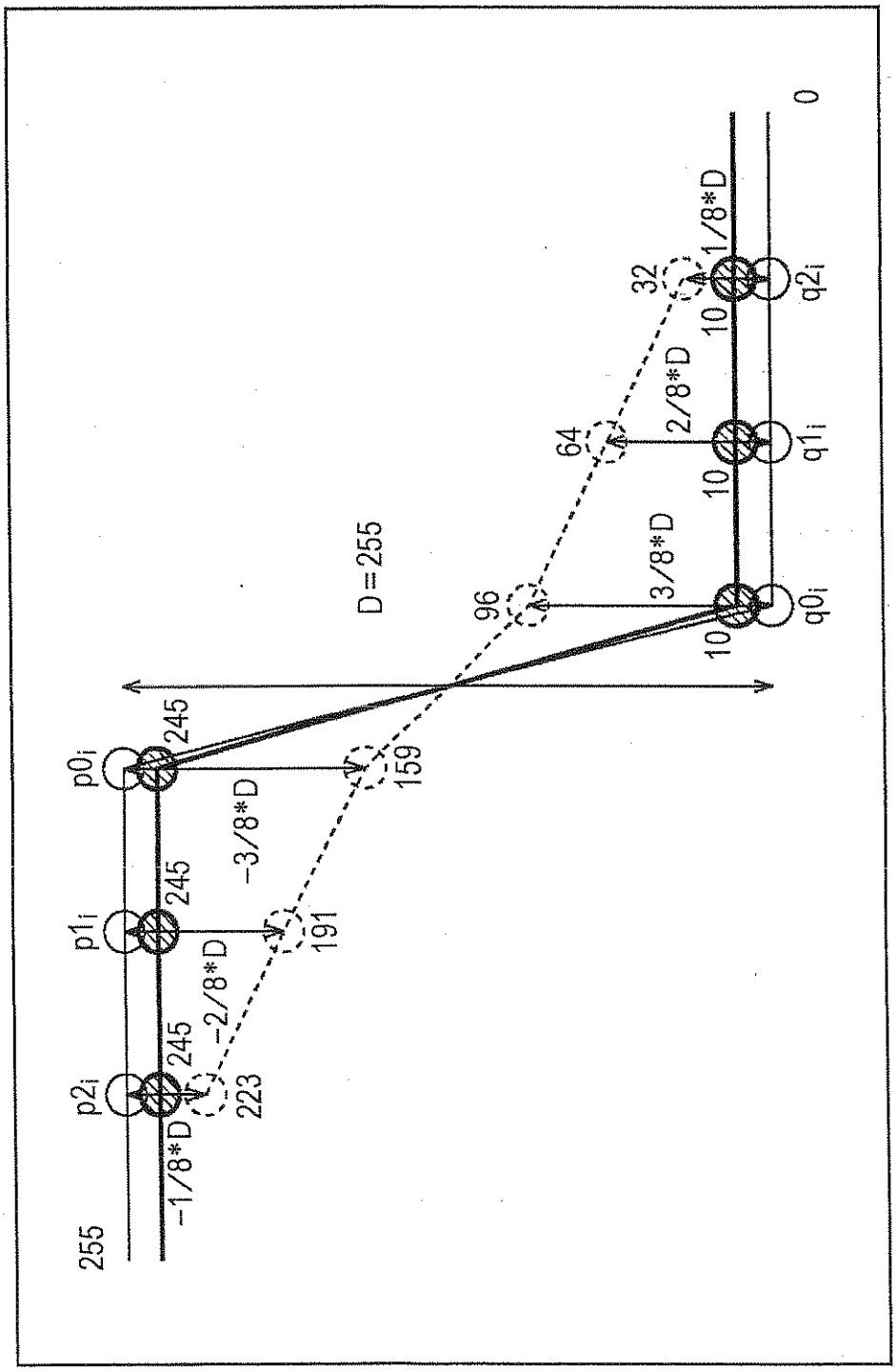

255
p2i
p1i
p0i
245
245
245
−1/8*D
−2/8*D
−3/8*D
223
191
159
D=255
96
64
32
3/8*D
2/8*D
1/8*D
10
10
10
q0i
q1i
q2i
0

FIG. 22

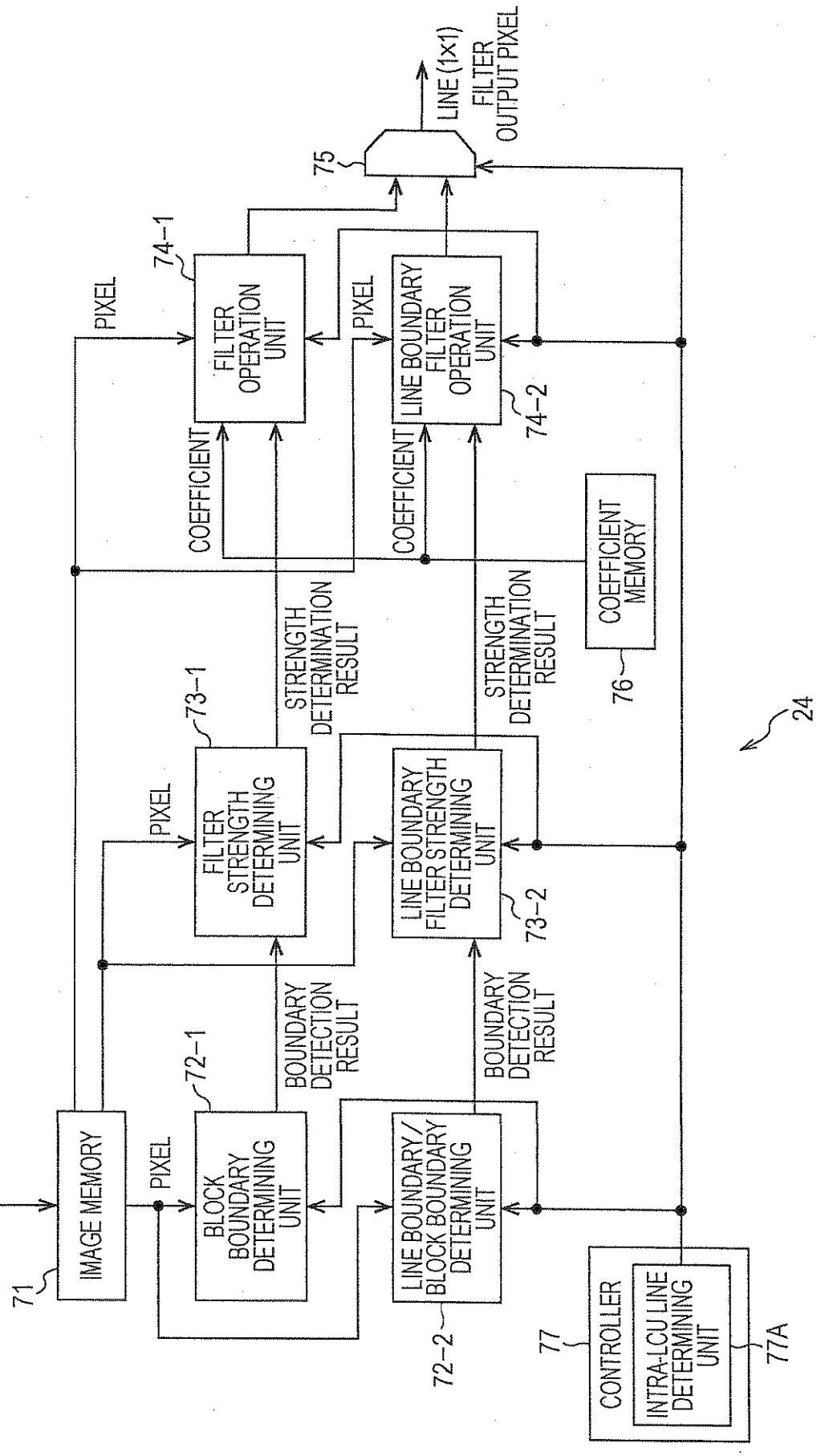

IMAGE MEMORY
71
PIXEL
BLOCK BOUNDARY DETERMINING UNIT
72-1
LINE BOUNDARY/ BLOCK BOUNDARY DETERMINING UNIT
72-2
BOUNDARY DETECTION RESULT
BOUNDARY DETECTION RESULT
FILTER STRENGTH DETERMINING UNIT
73-1
LINE BOUNDARY FILTER STRENGTH DETERMINING UNIT
73-2
STRENGTH DETERMINATION RESULT
STRENGTH DETERMINATION RESULT
FILTER OPERATION UNIT
74-1
LINE BOUNDARY FILTER OPERATION UNIT
74-2
PIXEL
PIXEL
COEFFICIENT
COEFFICIENT
COEFFICIENT MEMORY
76
75
LINE (1x1) FILTER OUTPUT PIXEL
CONTROLLER
77
INTRA-LCU LINE DETERMINING UNIT
77A
24

FIG. 23

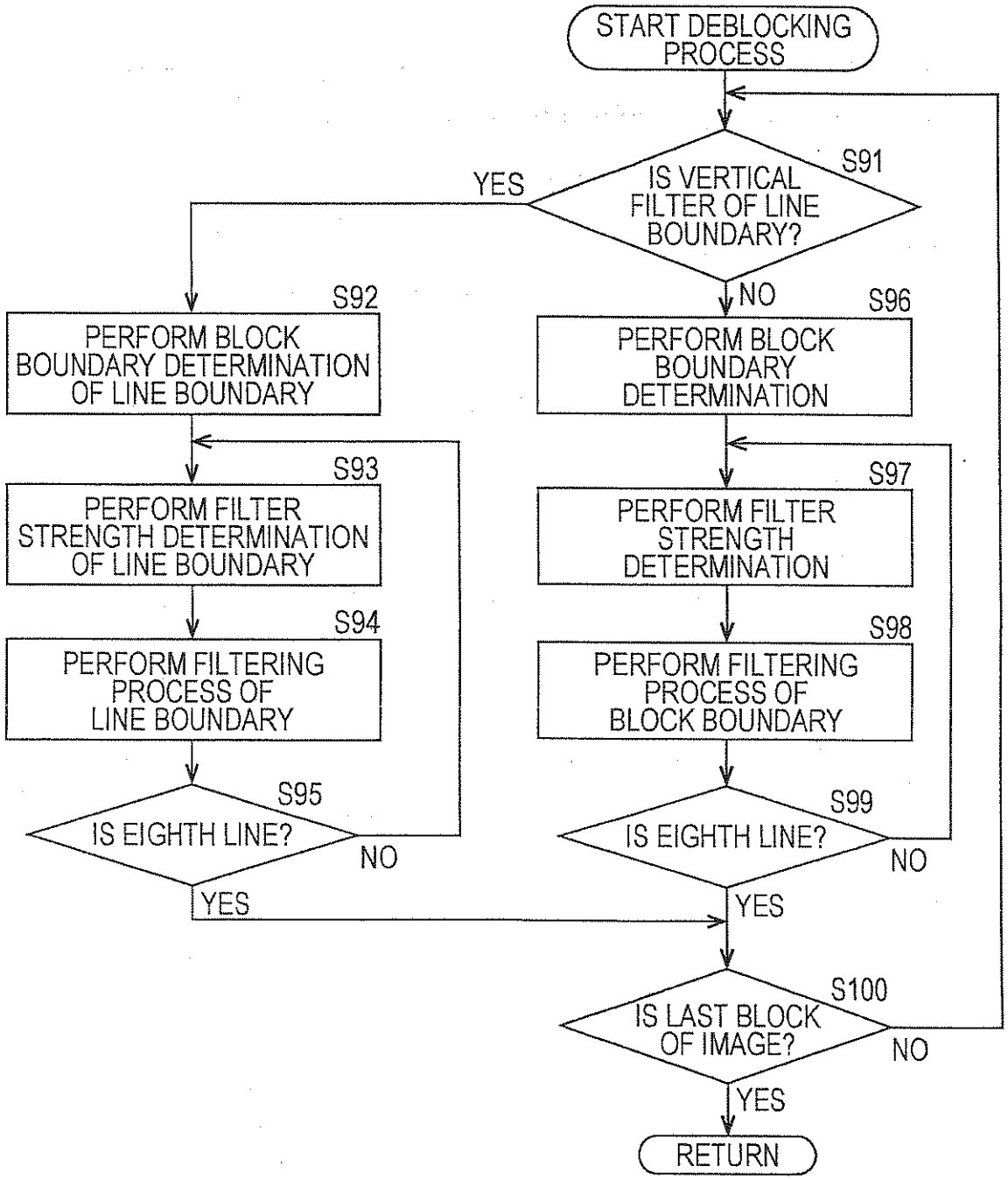

START DEBLOCKING PROCESS
S91
IS VERTICAL FILTER OF LINE BOUNDARY?
YES
NO
S92
PERFORM BLOCK BOUNDARY DETERMINATION OF LINE BOUNDARY
S93
PERFORM FILTER STRENGTH DETERMINATION OF LINE BOUNDARY
S94
PERFORM FILTERING PROCESS OF LINE BOUNDARY
S95
IS EIGHTH LINE?
NO
YES
S96
PERFORM BLOCK BOUNDARY DETERMINATION
S97
PERFORM FILTER STRENGTH DETERMINATION
S98
PERFORM FILTERING PROCESS OF BLOCK BOUNDARY
S99
IS EIGHTH LINE?
NO
YES
S100
IS LAST BLOCK OF IMAGE?
NO
YES
RETURN

FIG. 24

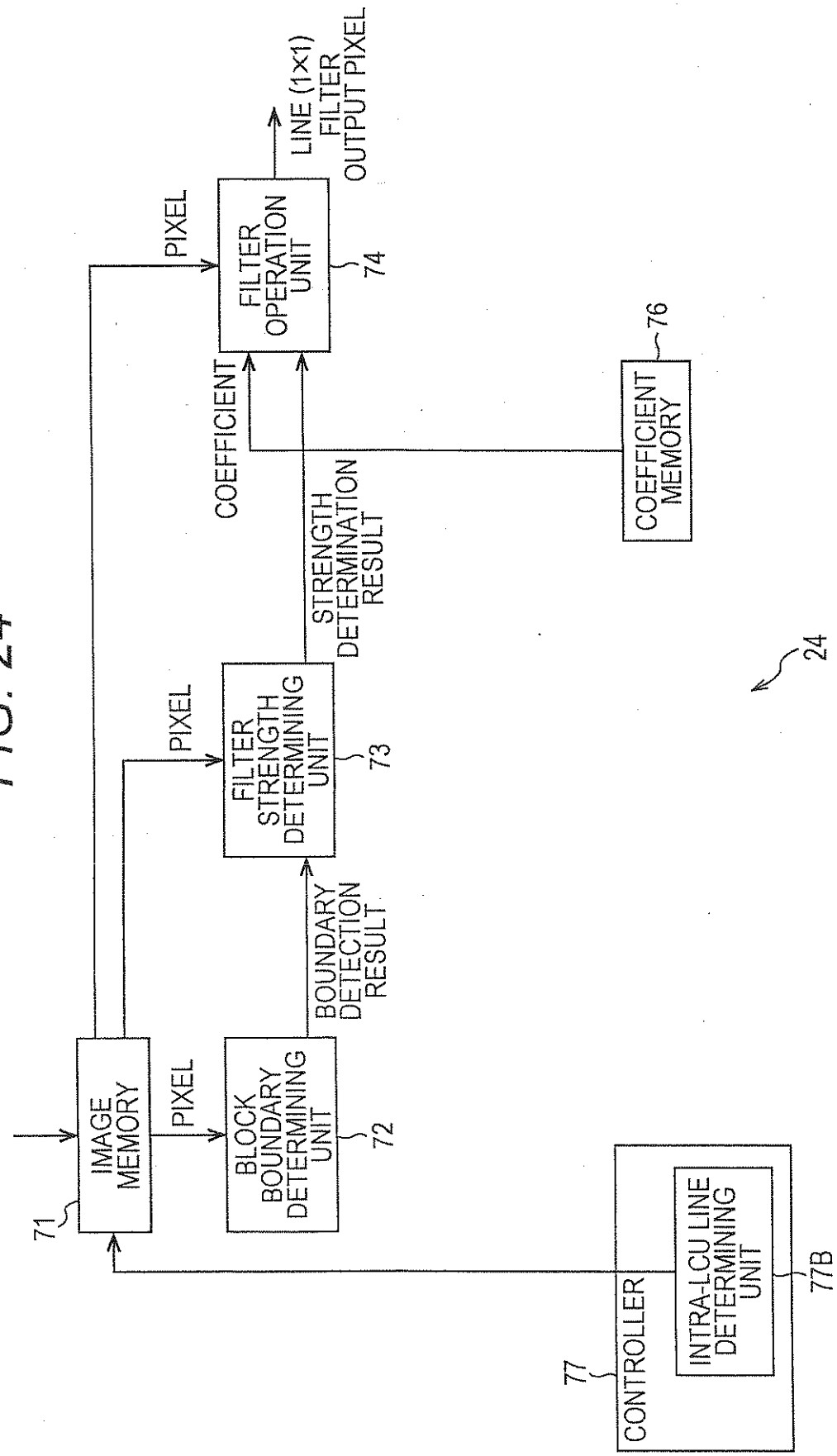

IMAGE MEMORY
71
PIXEL
BLOCK BOUNDARY DETERMINING UNIT
72
BOUNDARY DETECTION RESULT
FILTER STRENGTH DETERMINING UNIT
73
PIXEL
STRENGTH DETERMINATION RESULT
FILTER OPERATION UNIT
74
PIXEL
LINE (1×1) FILTER OUTPUT PIXEL
COEFFICIENT
COEFFICIENT MEMORY
76
24
CONTROLLER
77
INTRA-LCU LINE DETERMINING UNIT
77B

FIG. 25

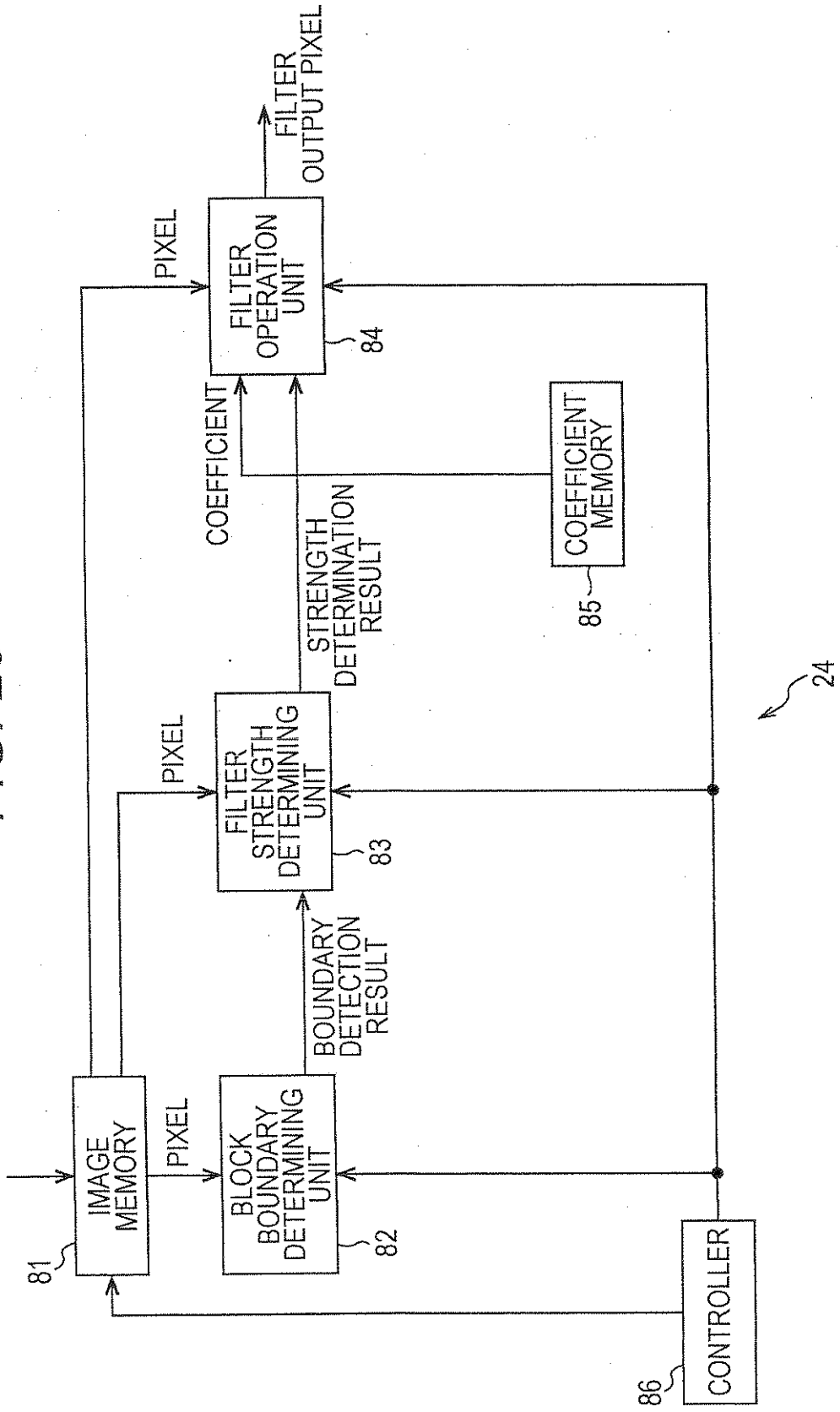

IMAGE MEMORY
81
PIXEL
BLOCK BOUNDARY DETERMINING UNIT
82
BOUNDARY DETECTION RESULT
FILTER STRENGTH DETERMINING UNIT
83
PIXEL
STRENGTH DETERMINATION RESULT
COEFFICIENT MEMORY
85
COEFFICIENT
FILTER OPERATION UNIT
84
PIXEL
FILTER OUTPUT PIXEL
CONTROLLER
86
24

FIG. 26

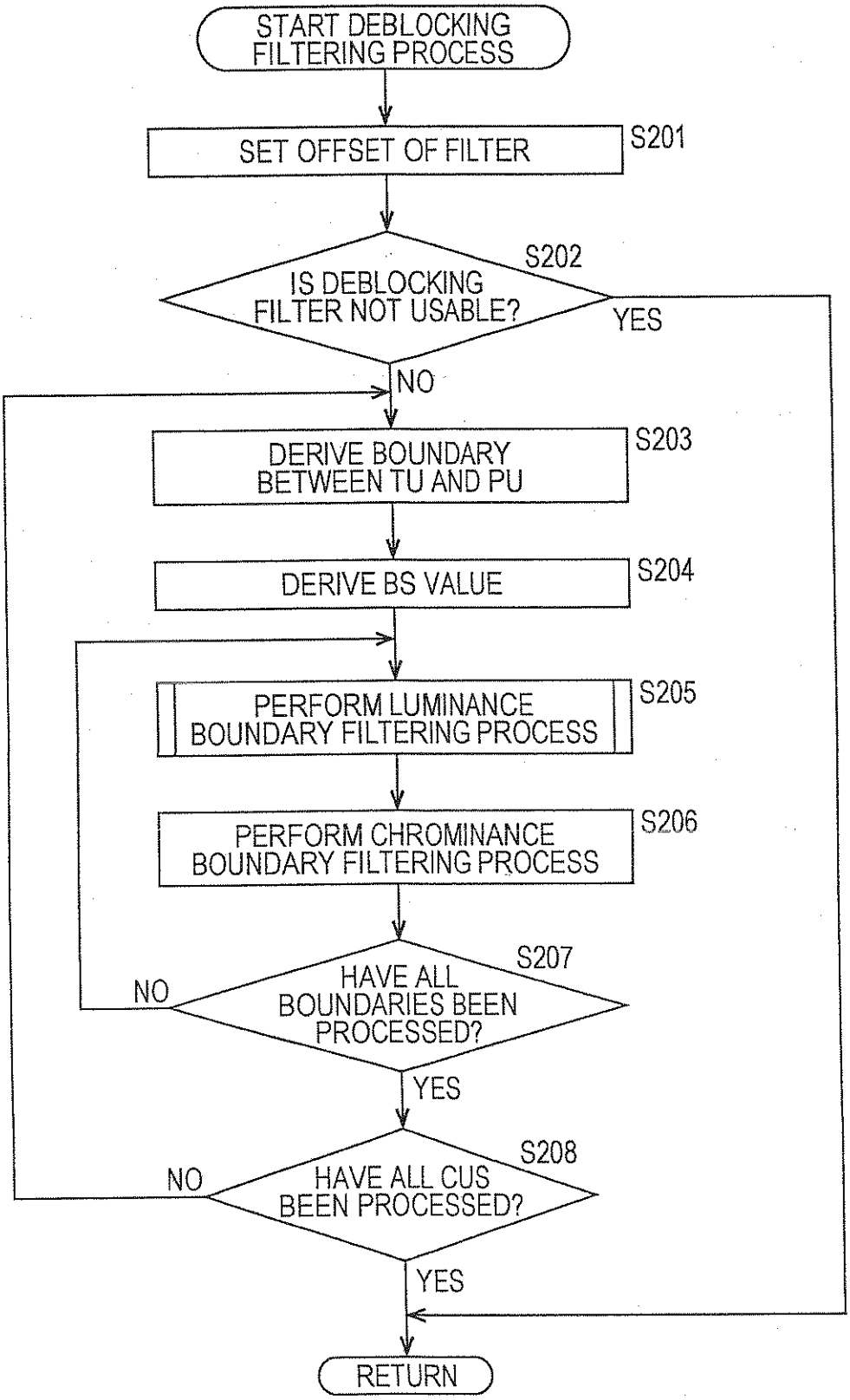

START DEBLOCKING FILTERING PROCESS
SET OFFSET OF FILTER
S201
IS DEBLOCKING FILTER NOT USABLE?
S202
YES
NO
DERIVE BOUNDARY BETWEEN TU AND PU
S203
DERIVE BS VALUE
S204
PERFORM LUMINANCE BOUNDARY FILTERING PROCESS
S205
PERFORM CHROMINANCE BOUNDARY FILTERING PROCESS
S206
HAVE ALL BOUNDARIES BEEN PROCESSED?
S207
NO
YES
HAVE ALL CUS BEEN PROCESSED?
S208
NO
YES
RETURN

FIG. 27

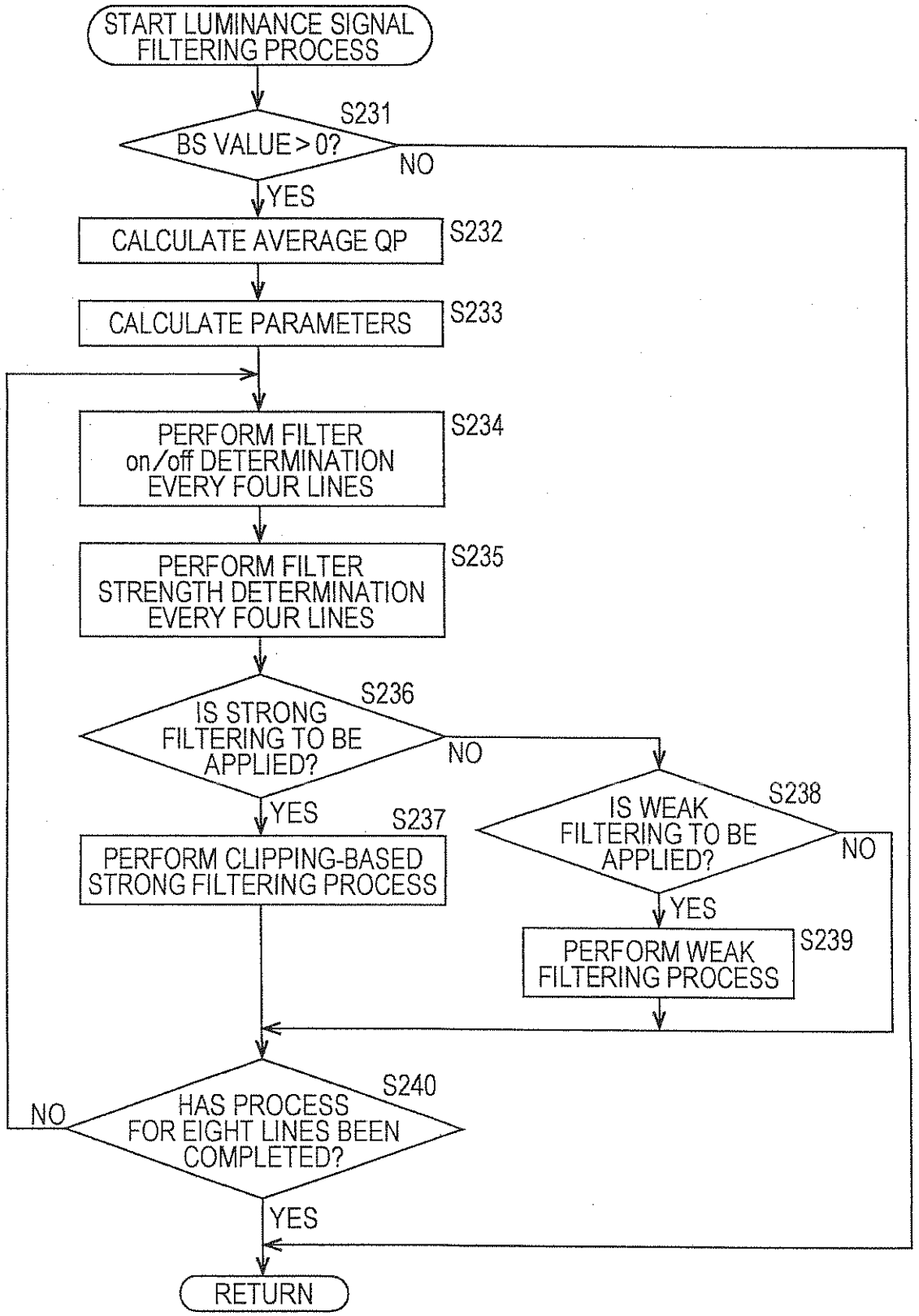

START LUMINANCE SIGNAL FILTERING PROCESS
S231
BS VALUE > 0?
NO
YES
CALCULATE AVERAGE QP
S232
CALCULATE PARAMETERS
S233
PERFORM FILTER on/off DETERMINATION EVERY FOUR LINES
S234
PERFORM FILTER STRENGTH DETERMINATION EVERY FOUR LINES
S235
S236
IS STRONG FILTERING TO BE APPLIED?
NO
YES
S237
PERFORM CLIPPING-BASED STRONG FILTERING PROCESS
S238
IS WEAK FILTERING TO BE APPLIED?
NO
YES
S239
PERFORM WEAK FILTERING PROCESS
S240
NO
HAS PROCESS FOR EIGHT LINES BEEN COMPLETED?
YES
RETURN

FIG. 28

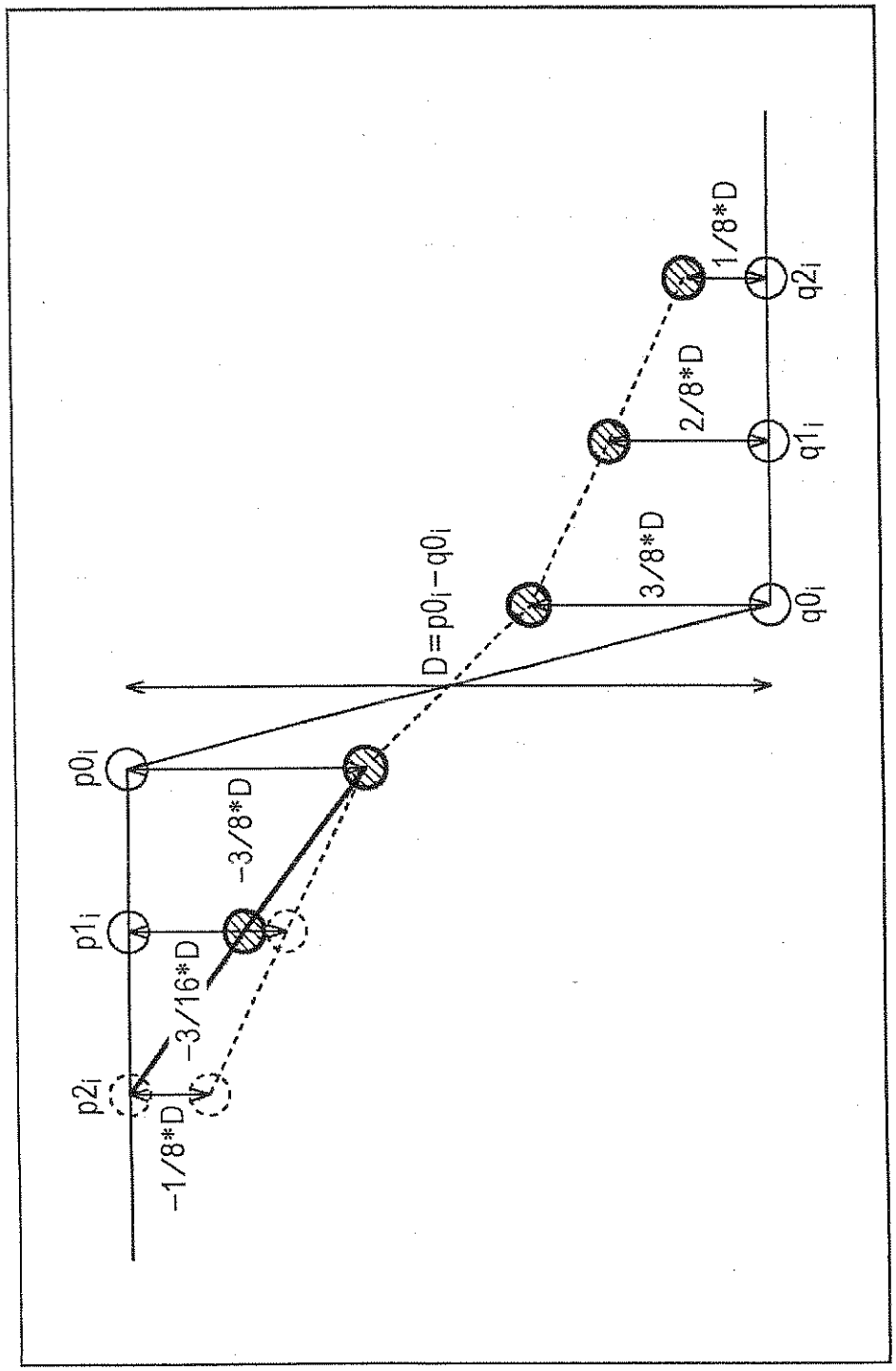


FIG. 29

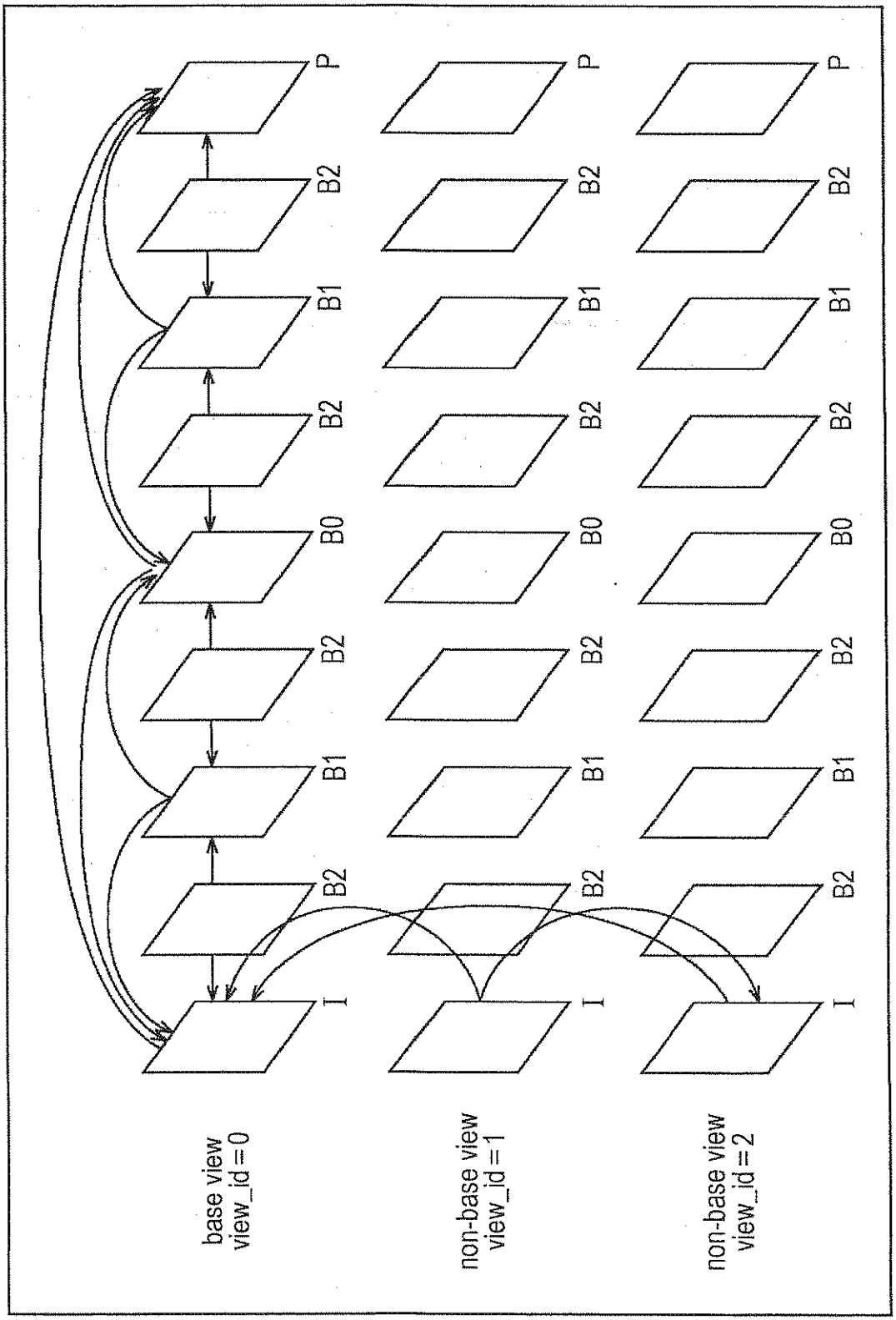

P
B2
B1
B2
B0
B2
B1
B2
I
base view
view_id = 0
non-base view
view_id = 1
non-base view
view_id = 2

FIG. 30

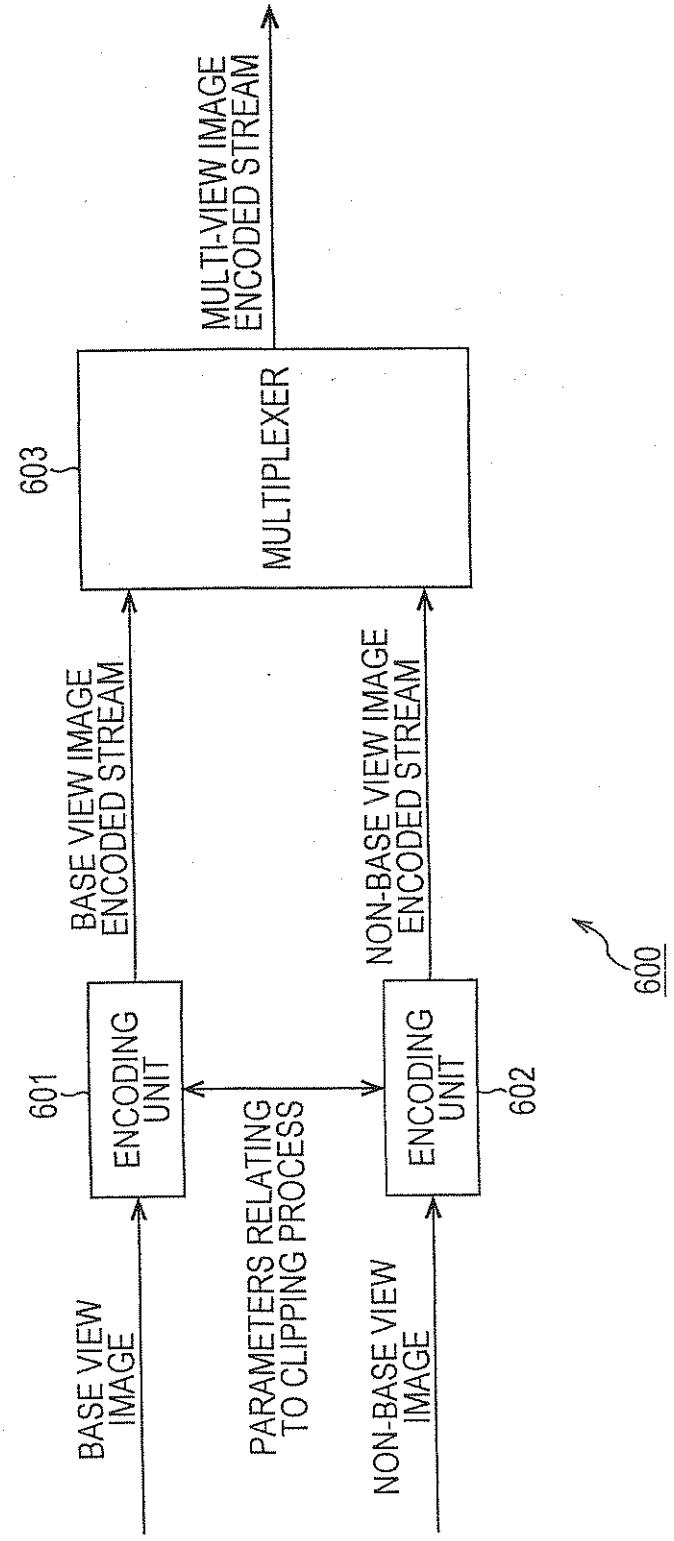

MULTI-VIEW IMAGE ENCODED STREAM
603
MULTIPLEXER
BASE VIEW IMAGE ENCODED STREAM
NON-BASE VIEW IMAGE ENCODED STREAM
601
ENCODING UNIT
602
ENCODING UNIT
PARAMETERS RELATING TO CLIPPING PROCESS
BASE VIEW IMAGE
NON-BASE VIEW IMAGE
600

FIG. 31

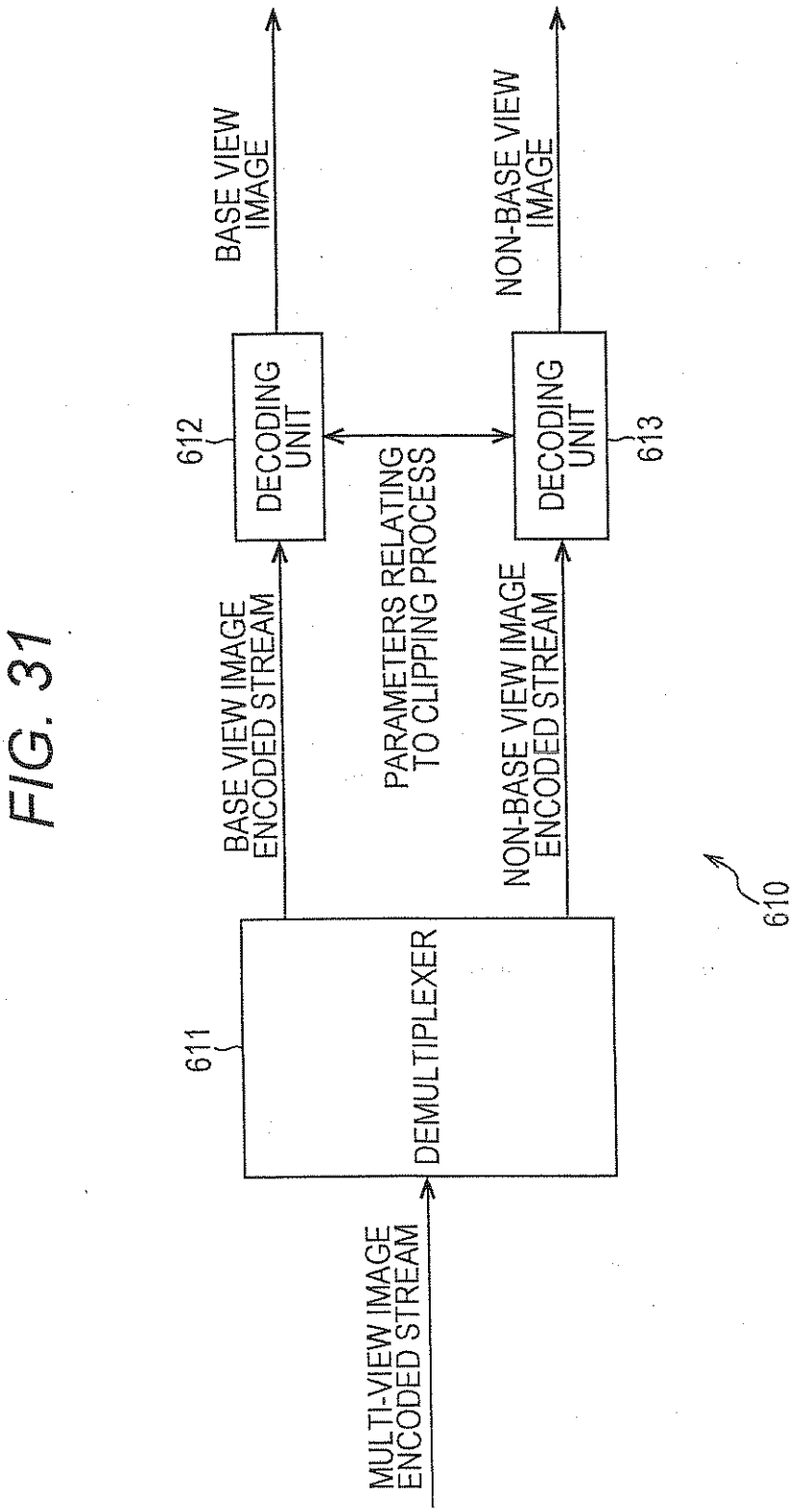

MULTI-VIEW IMAGE ENCODED STREAM
611
DEMULTIPLEXER
BASE VIEW IMAGE ENCODED STREAM
NON-BASE VIEW IMAGE ENCODED STREAM
PARAMETERS RELATING TO CLIPPING PROCESS
612
DECODING UNIT
613
DECODING UNIT
BASE VIEW IMAGE
NON-BASE VIEW IMAGE
610

FIG. 32

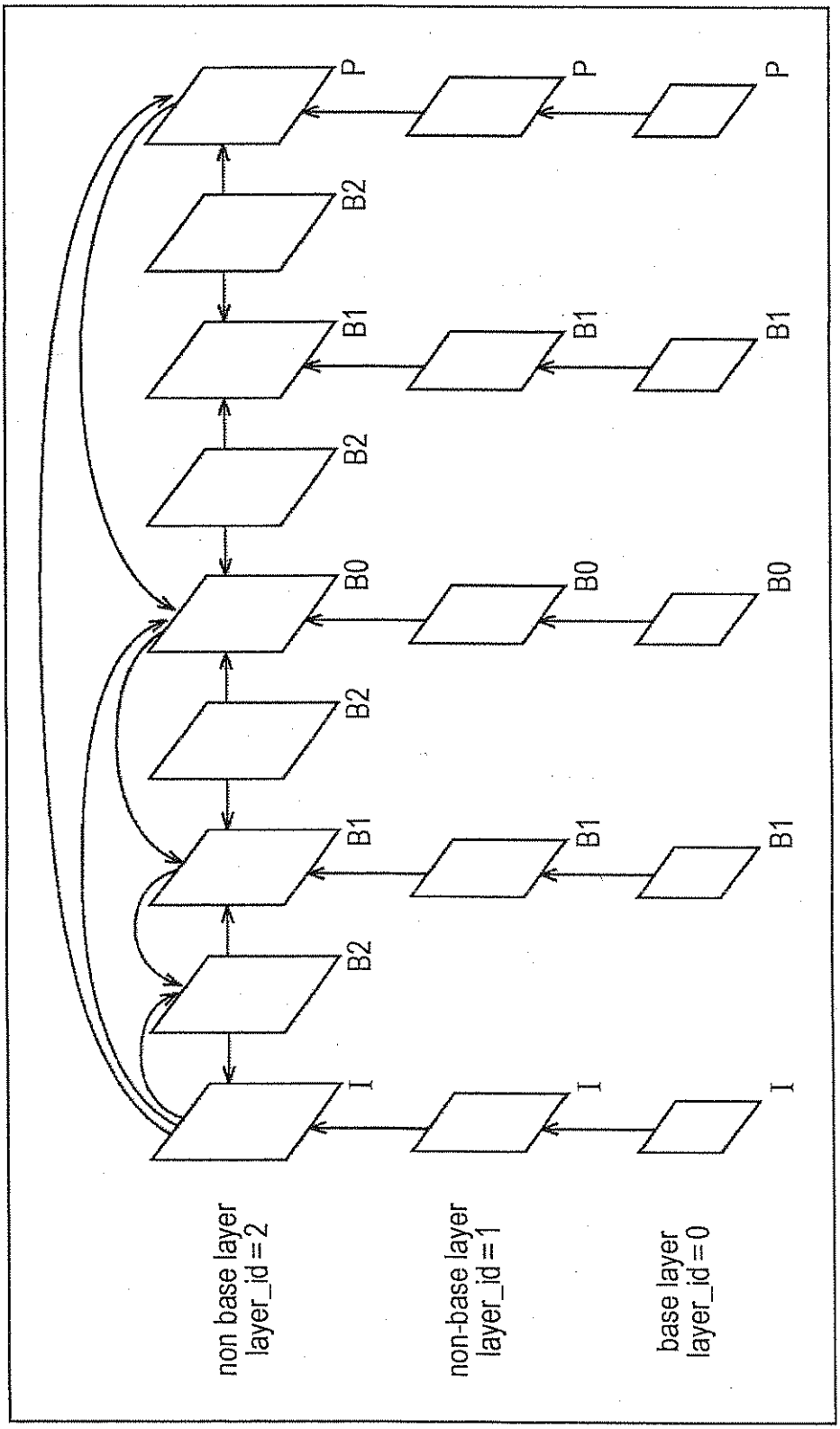

P
B2
B1
B2
B0
B2
B1
B2
I
non base layer
layer_id=2
non-base layer
layer_id=1
base layer
layer_id=0

FIG. 33

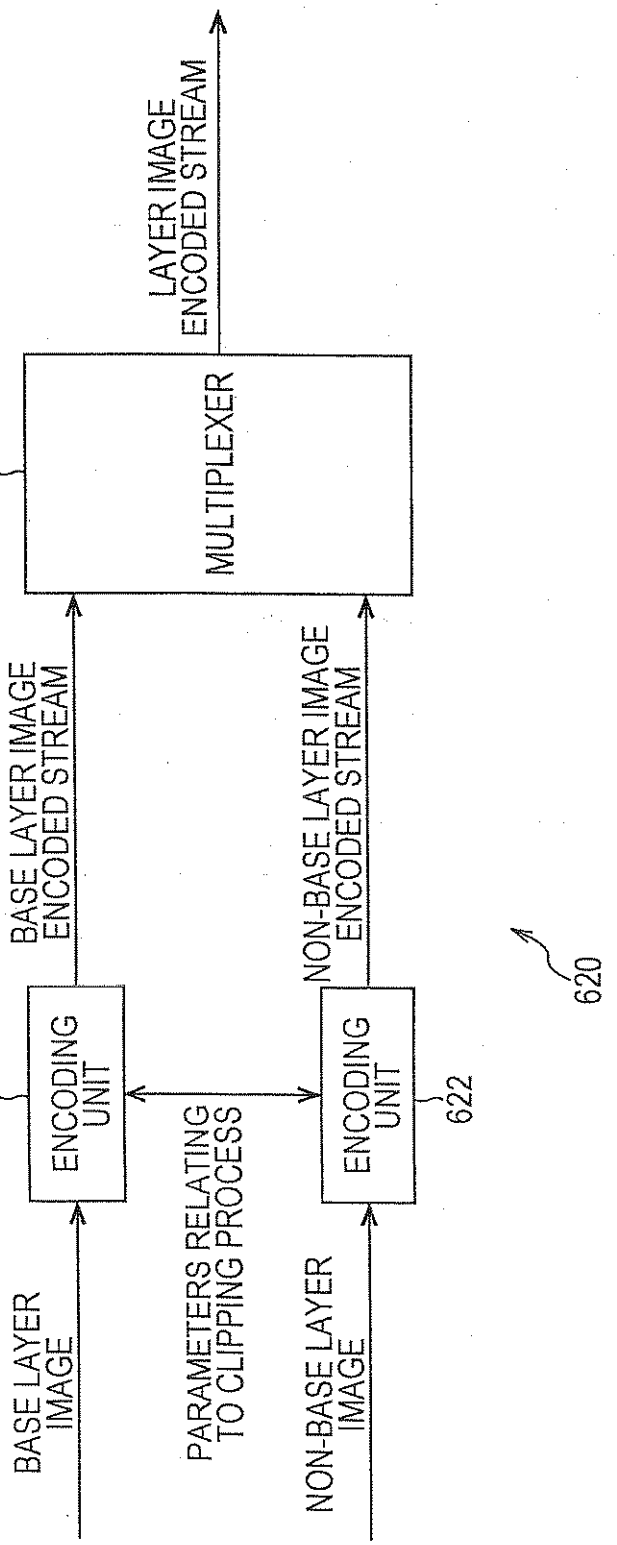

BASE LAYER IMAGE
NON-BASE LAYER IMAGE
PARAMETERS RELATING TO CLIPPING PROCESS
621
ENCODING UNIT
622
ENCODING UNIT
BASE LAYER IMAGE ENCODED STREAM
NON-BASE LAYER IMAGE ENCODED STREAM
623
MULTIPLEXER
LAYER IMAGE ENCODED STREAM
620

FIG. 34

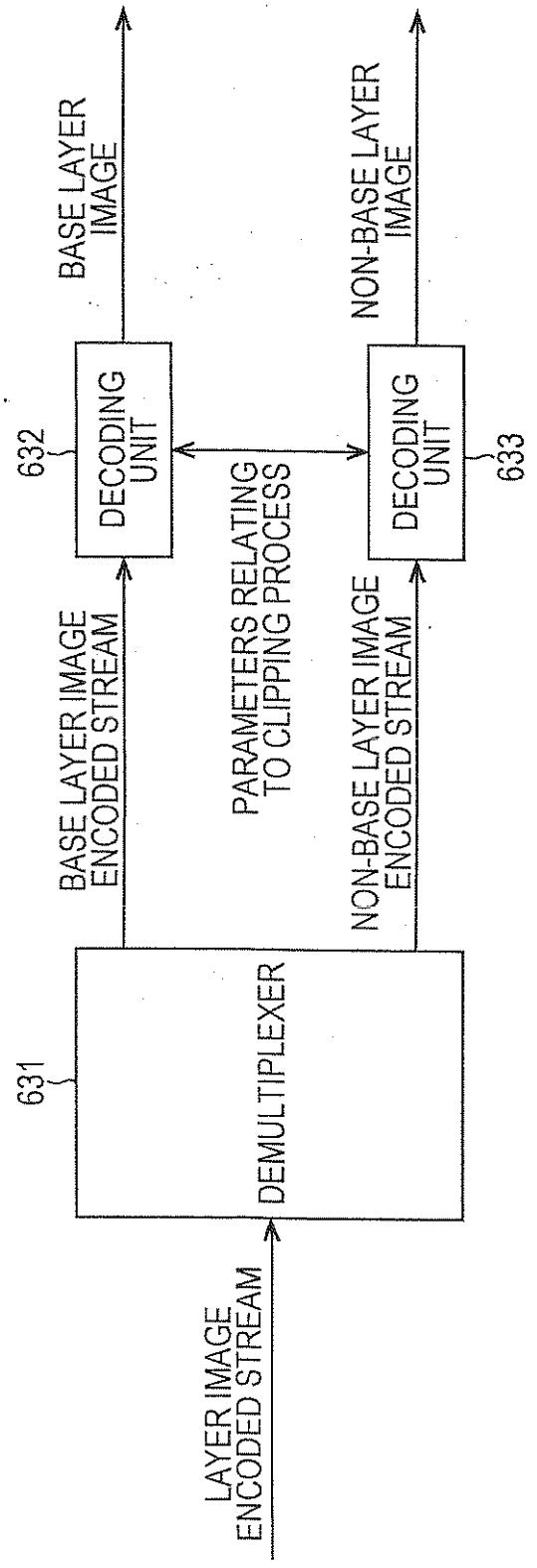

LAYER IMAGE ENCODED STREAM
631
DEMULTIPLEXER
BASE LAYER IMAGE ENCODED STREAM
NON-BASE LAYER IMAGE ENCODED STREAM
PARAMETERS RELATING TO CLIPPING PROCESS
632
DECODING UNIT
633
DECODING UNIT
BASE LAYER IMAGE
NON-BASE LAYER IMAGE
630

FIG. 35

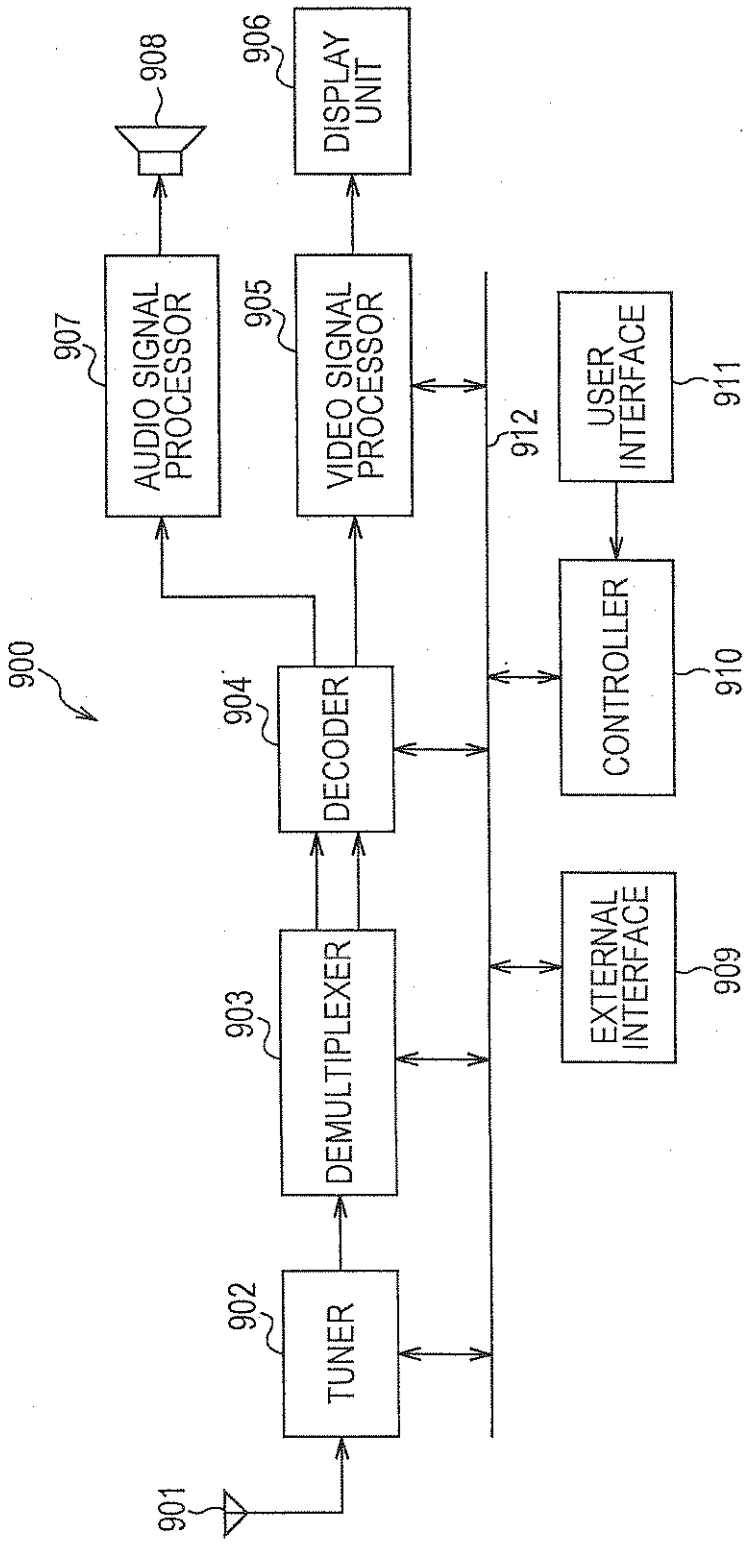

900
901
902
TUNER
903
DEMULTIPLEXER
904
DECODER
905
VIDEO SIGNAL PROCESSOR
906
DISPLAY UNIT
907
AUDIO SIGNAL PROCESSOR
908
909
EXTERNAL INTERFACE
910
CONTROLLER
911
USER INTERFACE
912

FIG. 36

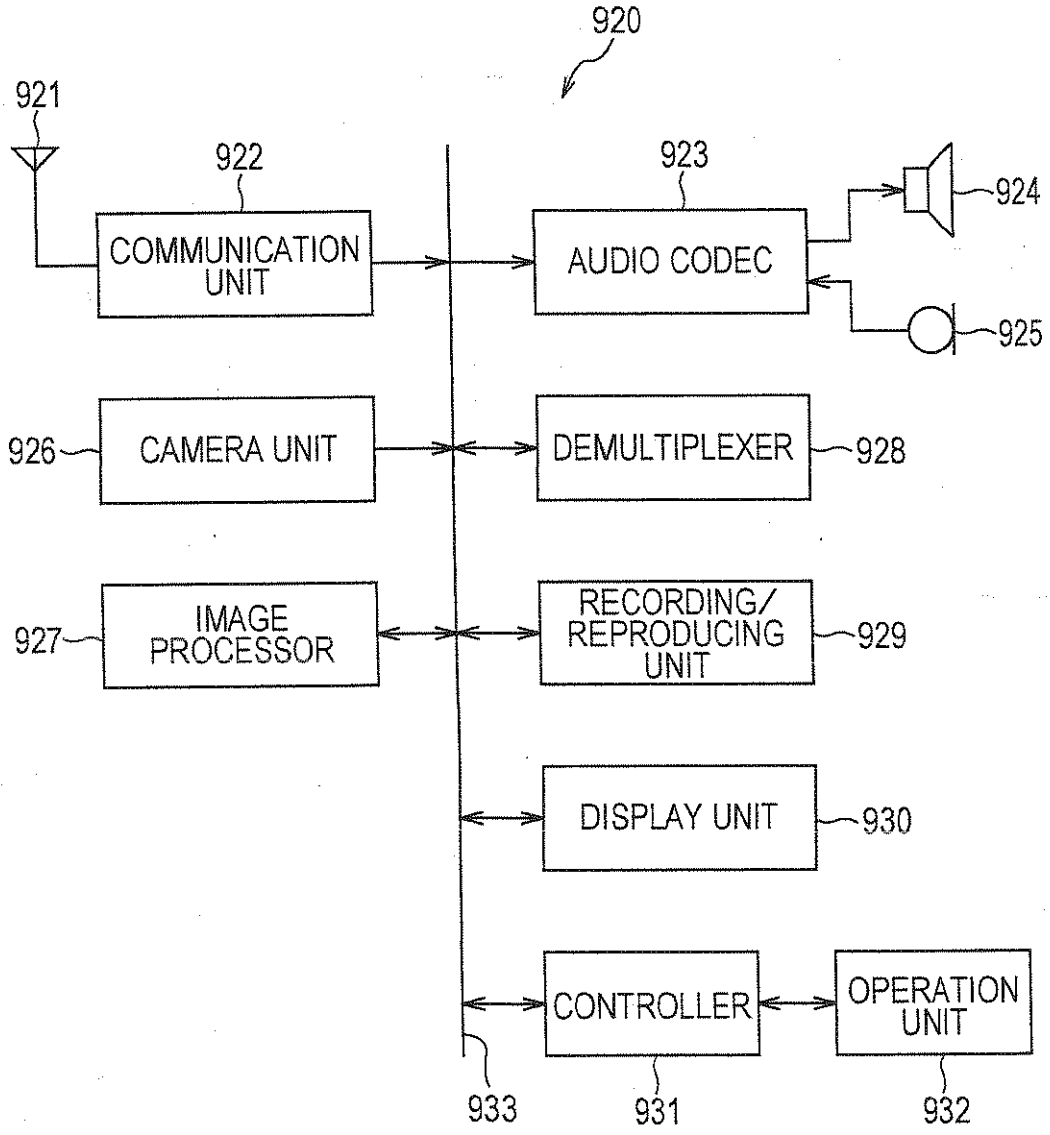

920
921
922
923
924
925
926
927
928
929
930
931
932
933
COMMUNICATION UNIT
AUDIO CODEC
CAMERA UNIT
DEMULTIPLEXER
IMAGE PROCESSOR
RECORDING/ REPRODUCING UNIT
DISPLAY UNIT
CONTROLLER
OPERATION UNIT

FIG. 37

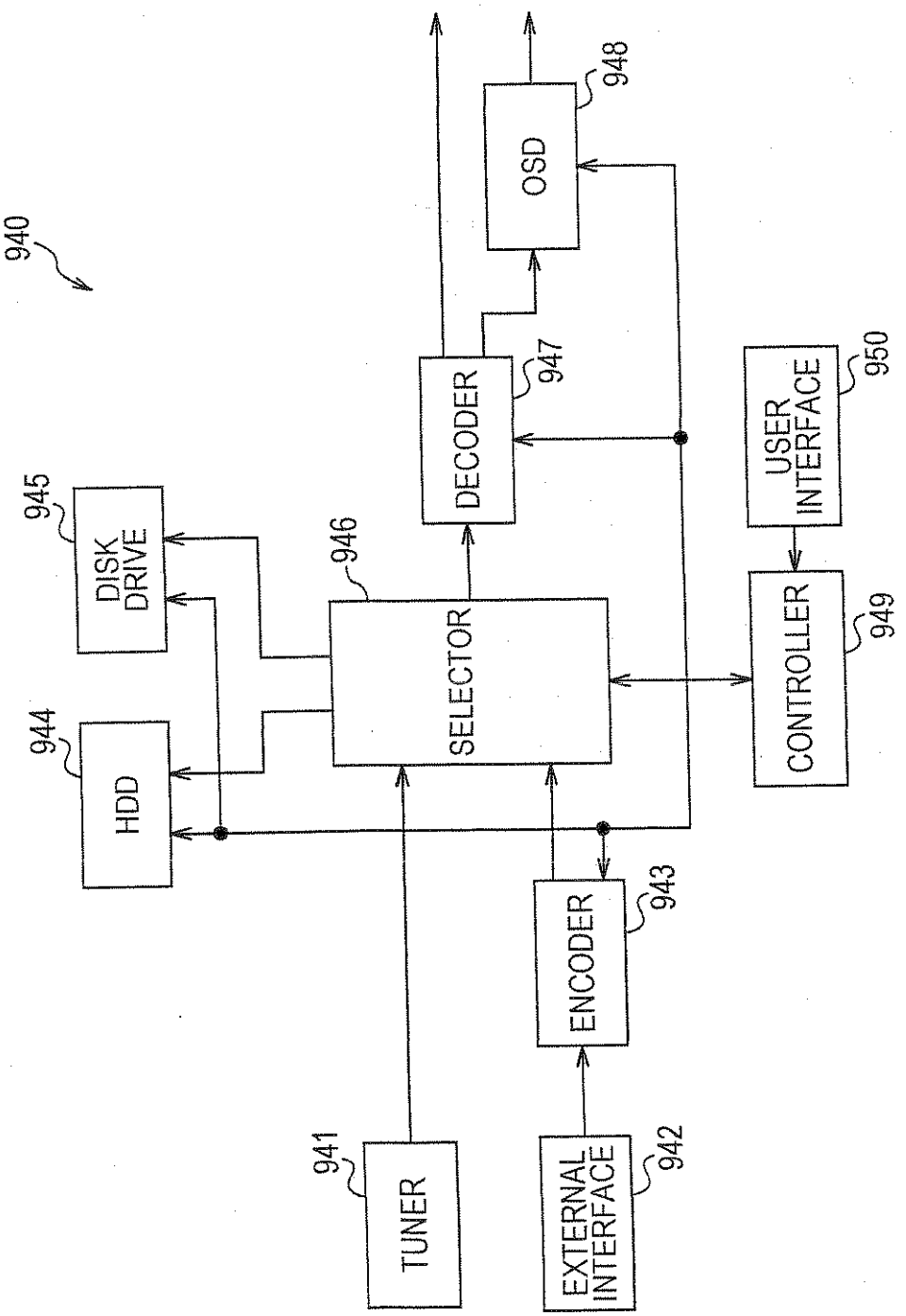
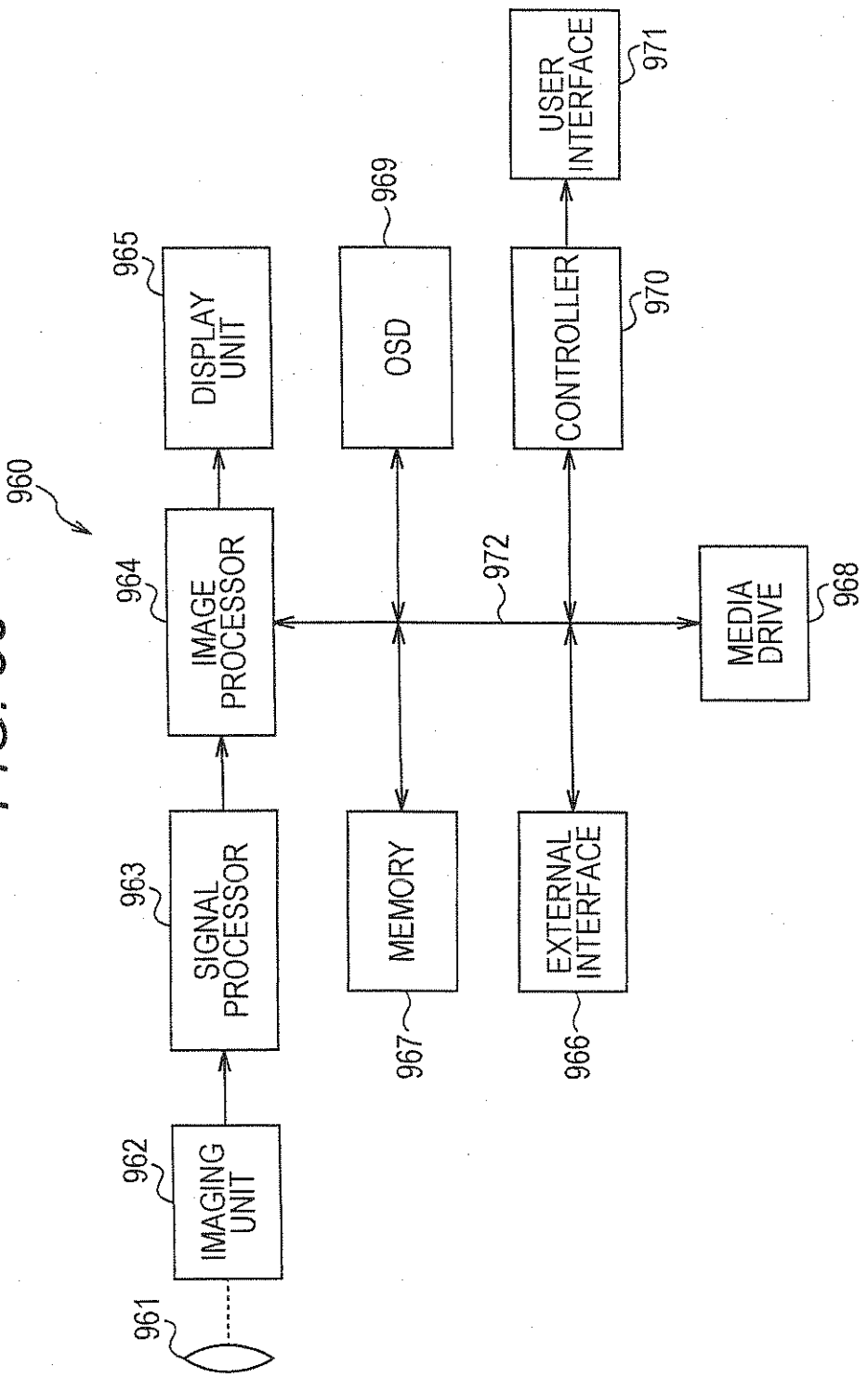

940
941
TUNER
942
EXTERNAL INTERFACE
943
ENCODER
944
HDD
945
DISK DRIVE
946
SELECTOR
947
DECODER
948
OSD
949
CONTROLLER
950
USER INTERFACE

FIG. 38


960
961
962
IMAGING UNIT
963
SIGNAL PROCESSOR
964
IMAGE PROCESSOR
965
DISPLAY UNIT
966
EXTERNAL INTERFACE
967
MEMORY
968
MEDIA DRIVE
969
OSD
970
CONTROLLER
971
USER INTERFACE
972