FIG. 1A

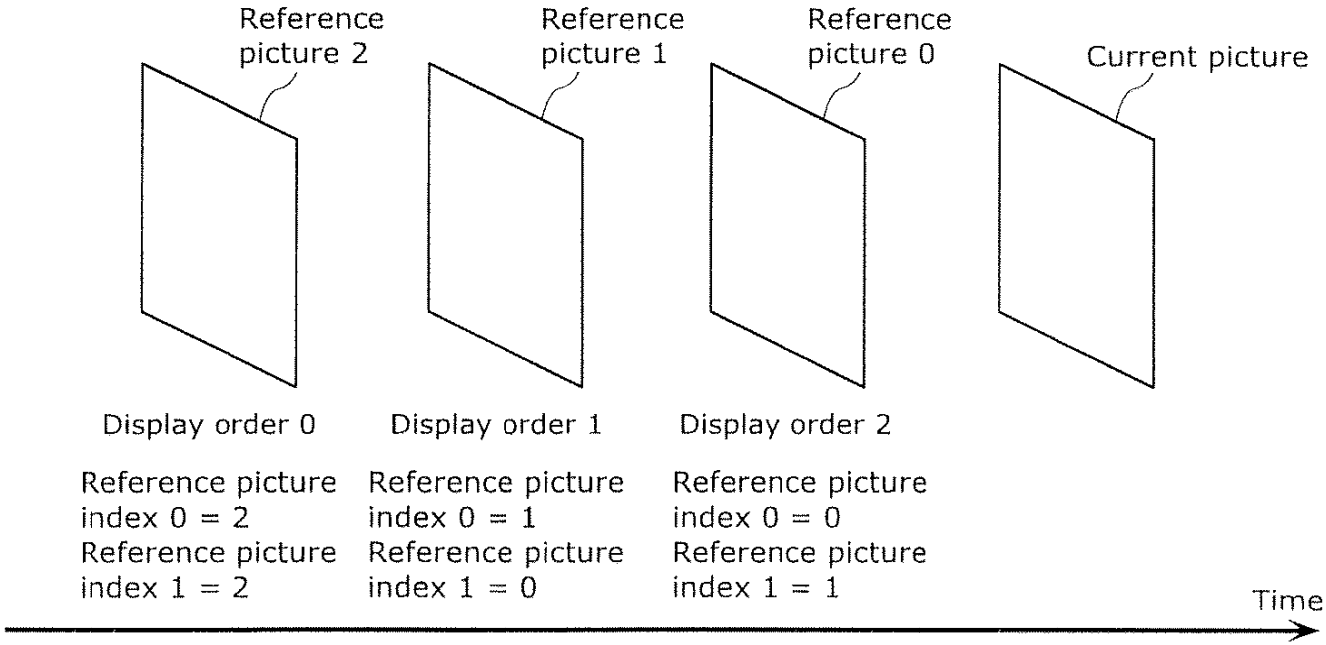

Reference picture 2
Reference picture 1
Reference picture 0
Current picture
Display order 0
Display order 1
Display order 2
Reference picture index 0 = 2
Reference picture index 1 = 2
Reference picture index 0 = 1
Reference picture index 1 = 0
Reference picture index 0 = 0
Reference picture index 1 = 1
Time

FIG. 1B

Reference picture list 0

Reference picture index 0	Display order
0	2
1	1
2	0

FIG. 1C

Reference picture list 1

Reference picture index 1	Display order
0	1
1	2
2	0

FIG. 2

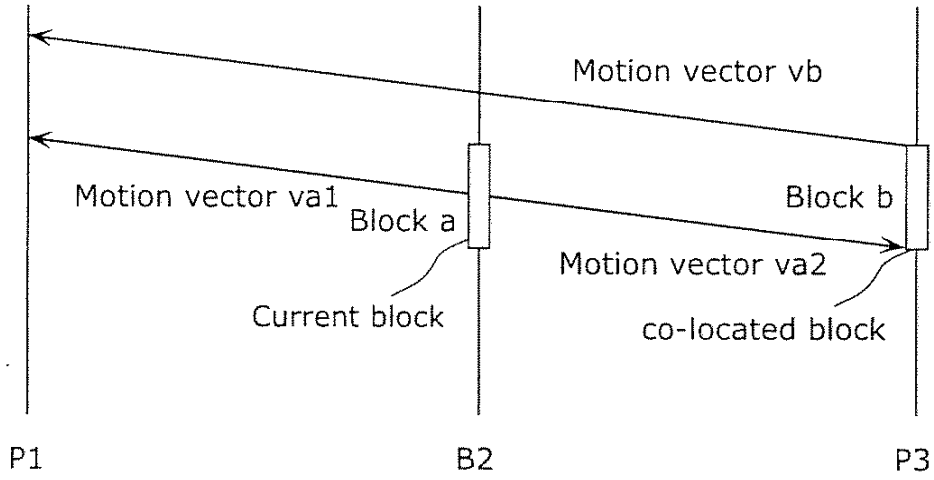

Motion vector vb
Motion vector va1
Block a
Block b
Motion vector va2
Current block
co-located block
P1
B2
P3

FIG. 3

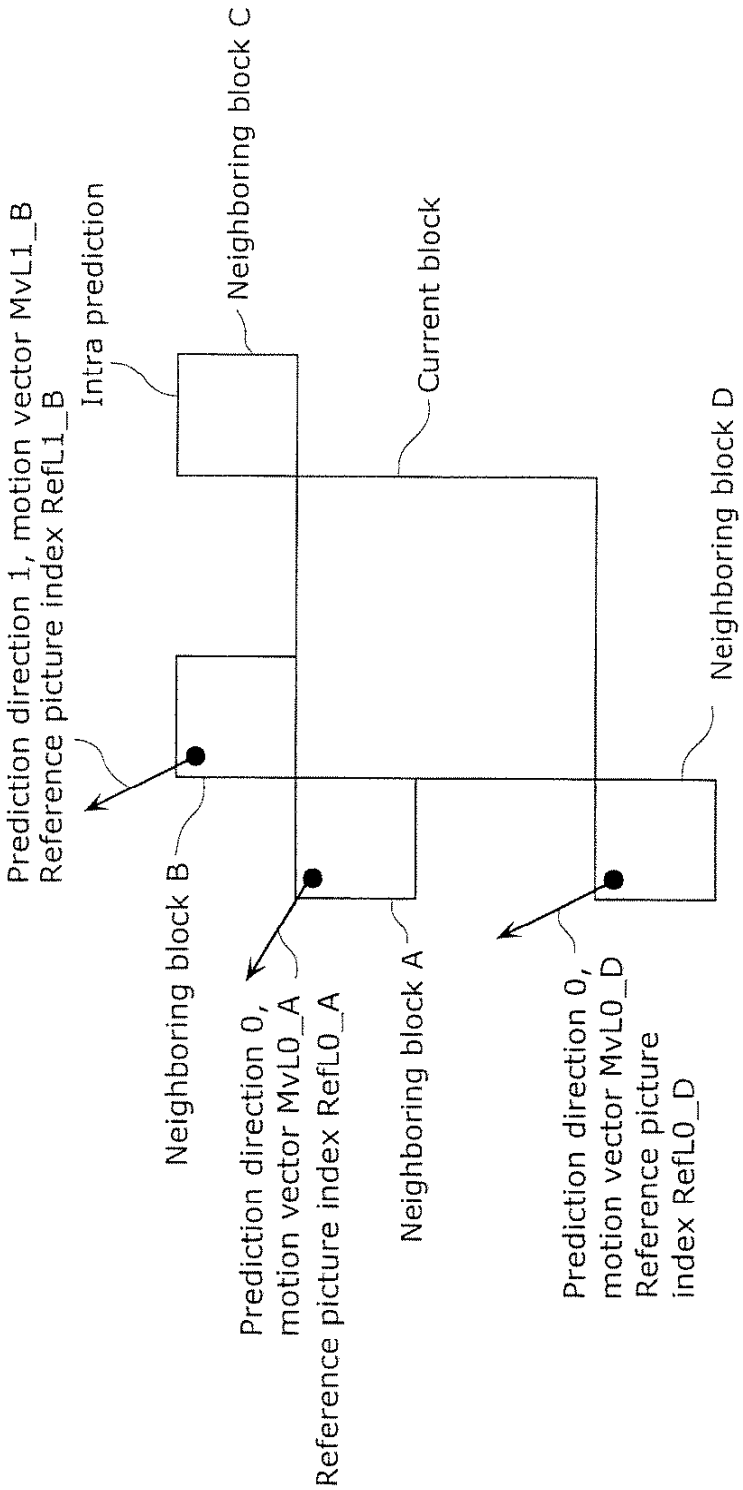

Prediction direction 1, motion vector MvL1_B
Reference picture index RefL1_B
Intra prediction
Neighboring block C
Current block
Neighboring block D
Neighboring block B
Prediction direction 0,
motion vector MvL0_A
Reference picture index RefL0_A
Neighboring block A
Prediction direction 0,
motion vector MvL0_D
Reference picture
index RefL0_D

FIG. 4

Merging block candidate index	Merging block candidate
0	Neighboring block A (Prediction direction 0, (MvL0_A, RefL0_A))
1	Neighboring block B (Prediction direction 1, (MvL1_B, RefL1_B))
2	co-located merging block (Bi-directional prediction, (MvL0_Col, RefL0_Col), (MvL1_Col, RefL1_Col))
3	Unusable-for-merging candidate (Neighboring block C, intra prediction)
4	Neighboring block D (Prediction direction 0, (MvL0_D, RefL0_V))

When MvL0_A = MvL0_D and RefL0_A = RefL0_D, remove one of neighboring blocks A and D

Remove identical candidate and unusable-for-merging candidate

Merging block candidate index	Merging block candidate
0	Neighboring block A (Prediction direction 0, (MvL0_A, RefL0_A))
1	Neighboring block B (Prediction direction 1, (MvL1_B, RefL1_B))
2	co-located merge block (Bi-directional prediction, (MvL0_Col, RefL0_Col), (MvL1_Col, RefL1_Col))

Total number of merging block candidates = 3

FIG. 5

Size of merging block candidate list = 2

Merging block candidate index	Assigned bit sequence
0	0
1	1

Size of merging block candidate list = 3

Merging block candidate index	Assigned bit sequence
0	0
1	10
2	11

Size of merging block candidate list = 4

Merging block candidate index	Assigned bit sequence
0	0
1	10
2	110
3	111

Size of merging block candidate list = 5

Merging block candidate index	Assigned bit sequence
0	0
1	10
2	110
3	1110
4	1111

FIG. 6

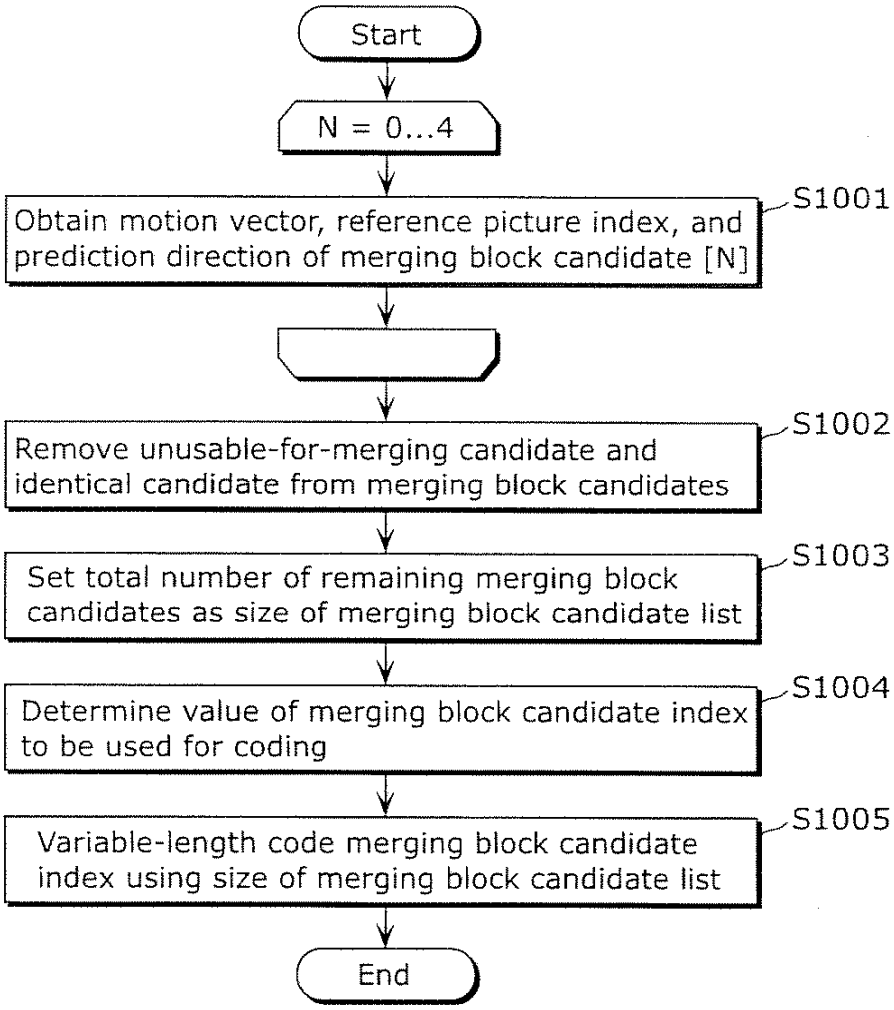

Start
N = 0...4
Obtain motion vector, reference picture index, and prediction direction of merging block candidate [N]
S1001
Remove unusable-for-merging candidate and identical candidate from merging block candidates
S1002
Set total number of remaining merging block candidates as size of merging block candidate list
S1003
Determine value of merging block candidate index to be used for coding
S1004
Variable-length code merging block candidate index using size of merging block candidate list
S1005
End

FIG. 7

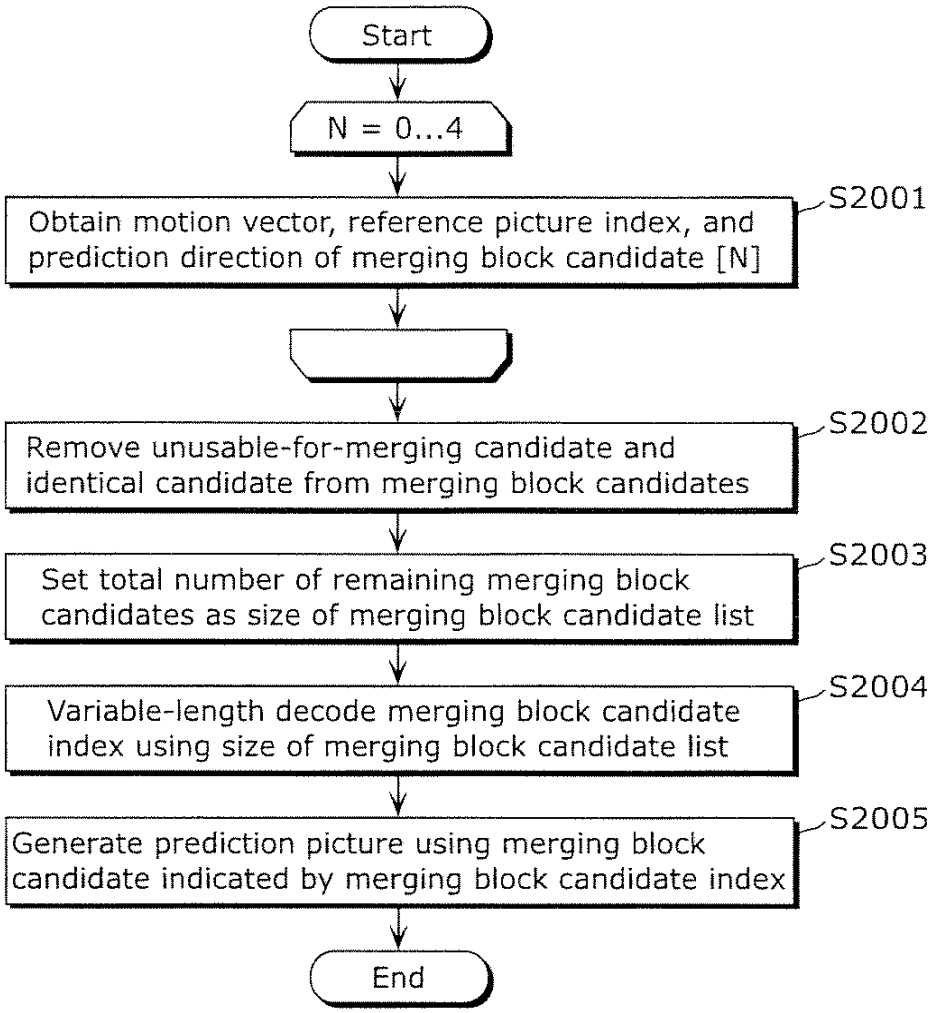
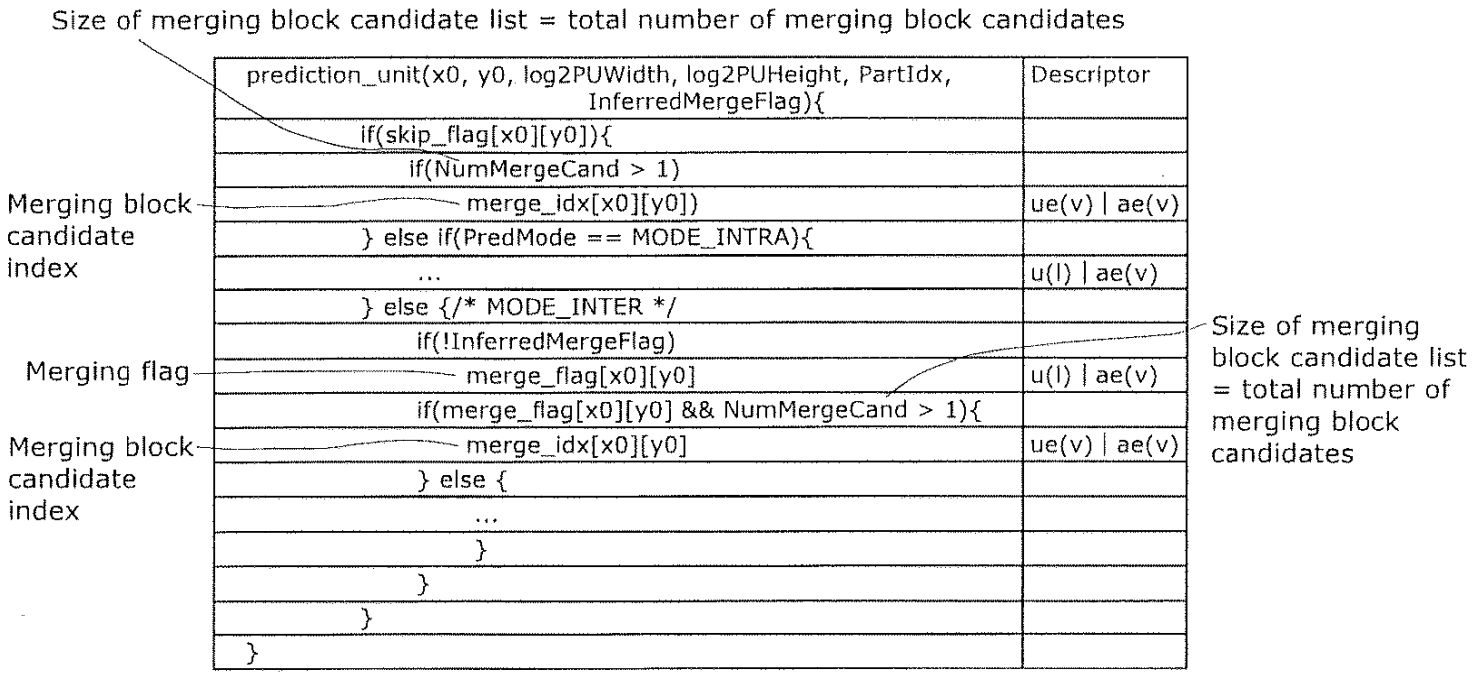

Start
N = 0...4
Obtain motion vector, reference picture index, and prediction direction of merging block candidate [N]
S2001
Remove unusable-for-merging candidate and identical candidate from merging block candidates
S2002
Set total number of remaining merging block candidates as size of merging block candidate list
S2003
Variable-length decode merging block candidate index using size of merging block candidate list
S2004
Generate prediction picture using merging block candidate indicated by merging block candidate index
S2005
End

FIG. 8



prediction_unit(x0, y0, log2PUWidth, log2PUHeight, PartIdx, InferredMergeFlag){	Descriptor
if(skip_flag[x0][y0]){	
if(NumMergeCand > 1)	
merge_idx[x0][y0])	ue(v) | ae(v)
} else if(PredMode == MODE_INTRA){	
...	u(l) | ae(v)
} else {/* MODE_INTER */	
if(!InferredMergeFlag)	
merge_flag[x0][y0]	u(l) | ae(v)
if(merge_flag[x0][y0] && NumMergeCand > 1){	
merge_idx[x0][y0]	ue(v) | ae(v)
} else {	
...	
}	
}	
}	
}	

FIG. 9

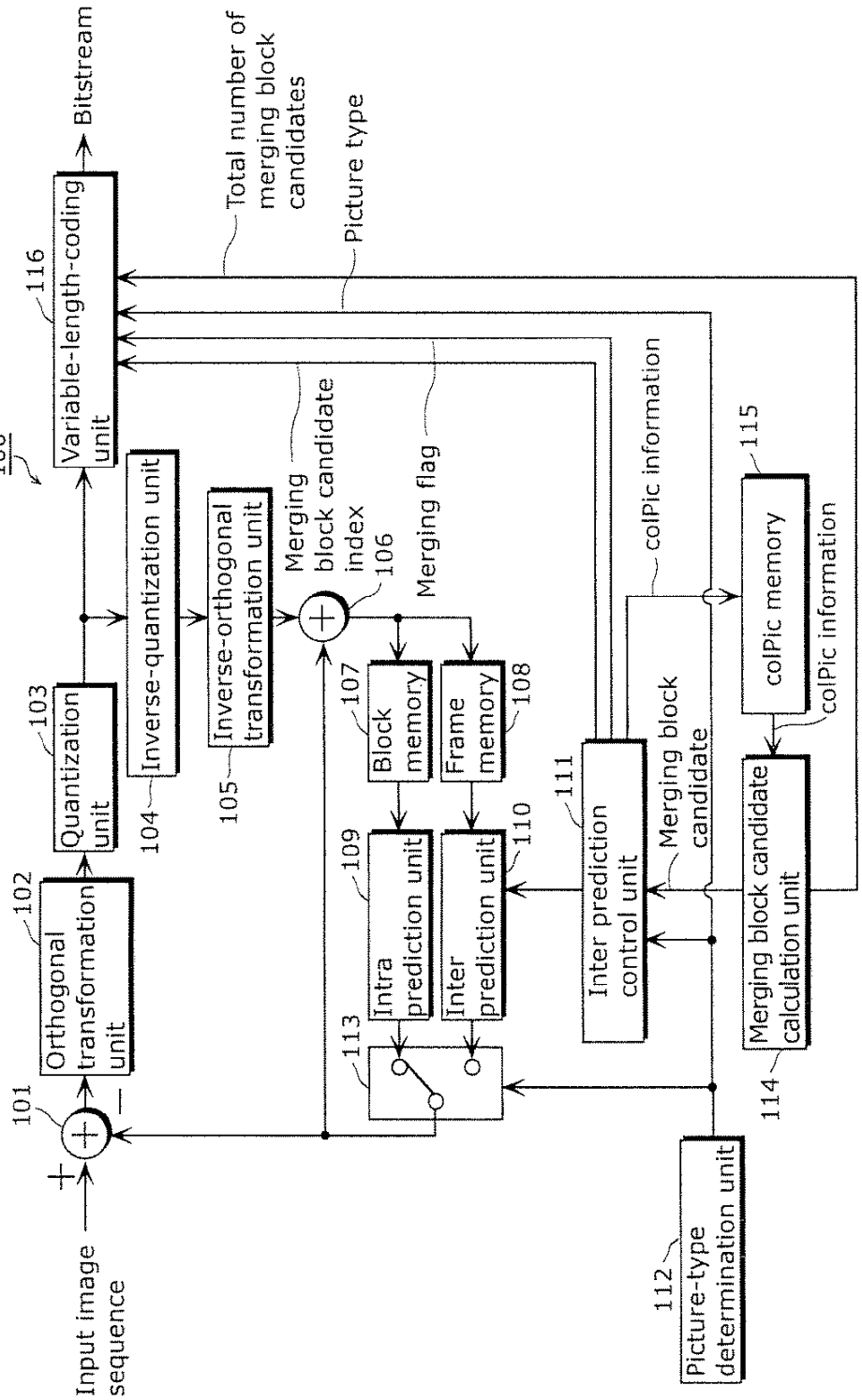

100
Input image sequence
101
Orthogonal transformation unit
102
Quantization unit
103
Inverse-quantization unit
104
Inverse-orthogonal transformation unit
105
Merging block candidate index
106
Block memory
107
Frame memory
108
Intra prediction unit
109
Inter prediction unit
110
Inter prediction control unit
111
Picture-type determination unit
112
Merging block candidate calculation unit
114
colPic memory
115
Variable-length-coding unit
116
Bitstream
Total number of merging block candidates
Picture type
Merging flag
colPic information
Merging block candidate
colPic information

FIG. 10

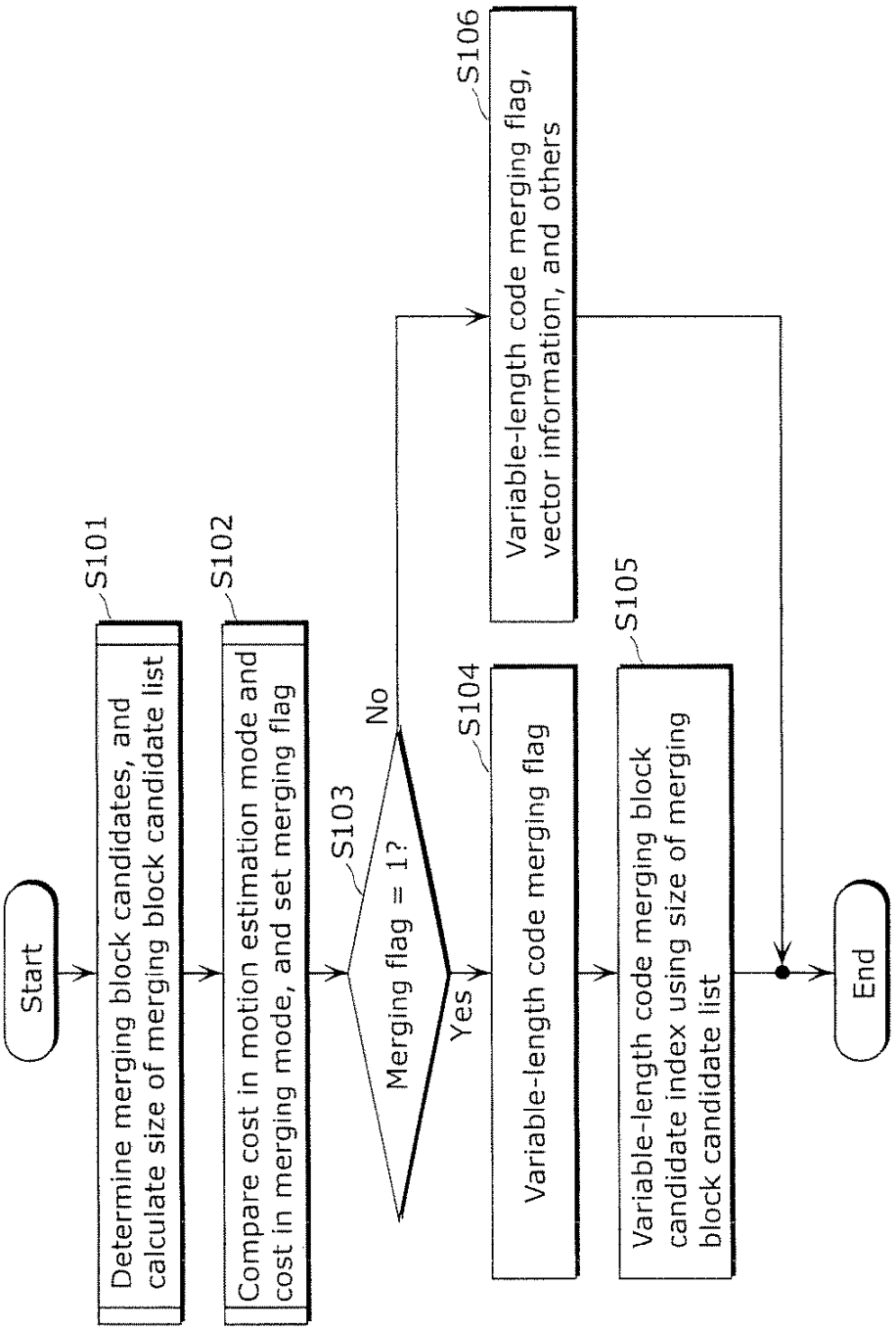

Start
S101
Determine merging block candidates, and calculate size of merging block candidate list
S102
Compare cost in motion estimation mode and cost in merging mode, and set merging flag
S103
Merging flag = 1?
Yes
No
S104
Variable-length code merging flag
S105
Variable-length code merging block candidate index using size of merging block candidate list
S106
Variable-length code merging flag, vector information, and others
End

FIG. 11

(a)

Merging block candidate index	Merging block candidate
0	Neighboring block A (Prediction direction 0, (MvL0_A, RefL0_A))
1	Neighboring block B (Prediction direction 1, (MvL1_B, RefL1_B))
2	co-located merging block (Bi-directional prediction, (MvL0_Col, RefL0_Col), (MvL1_Col, RefL1_Col))
3	Unusable-for-merging candidate (Neighboring block C, intra prediction)
4	Neighboring block D (Prediction direction 0, (MvL0_D, RefL0_V))

When MvL0_A = MvL0_D and RefL0_A = RefL0_D, remove one of neighboring blocks A and D

- Remove unusable-for-merging candidate and identical candidate
- Add new combined merging block candidate when maximum number of merging block candidates - total number of merging blcok candidates > 0, and there is a new combined merging block candidate

(b)

Merging block candidate index	Merging block candidate
0	Neighboring block A (Prediction direction 0 (MvL0_A, RefL0_A))
1	Neighboring block B (Prediction direction 1 (MvL1_B, RefL1_B))
2	co-located merging block (Bi-directional prediction, (MvL0_Col, RefL0_Col), (MvL1_Col, RefL1_Col))
3	combined merging block (Bi-directional prediction, (MvL0_A, RefL0_A), (MvL1_B, RefL1_B))
4	combined merging block (Bi-directional prediction, (MvL0_A, RefL0_A), (MvL1_Col, RefL1_Col))

Total number of merging block candidates = 5

FIG. 12

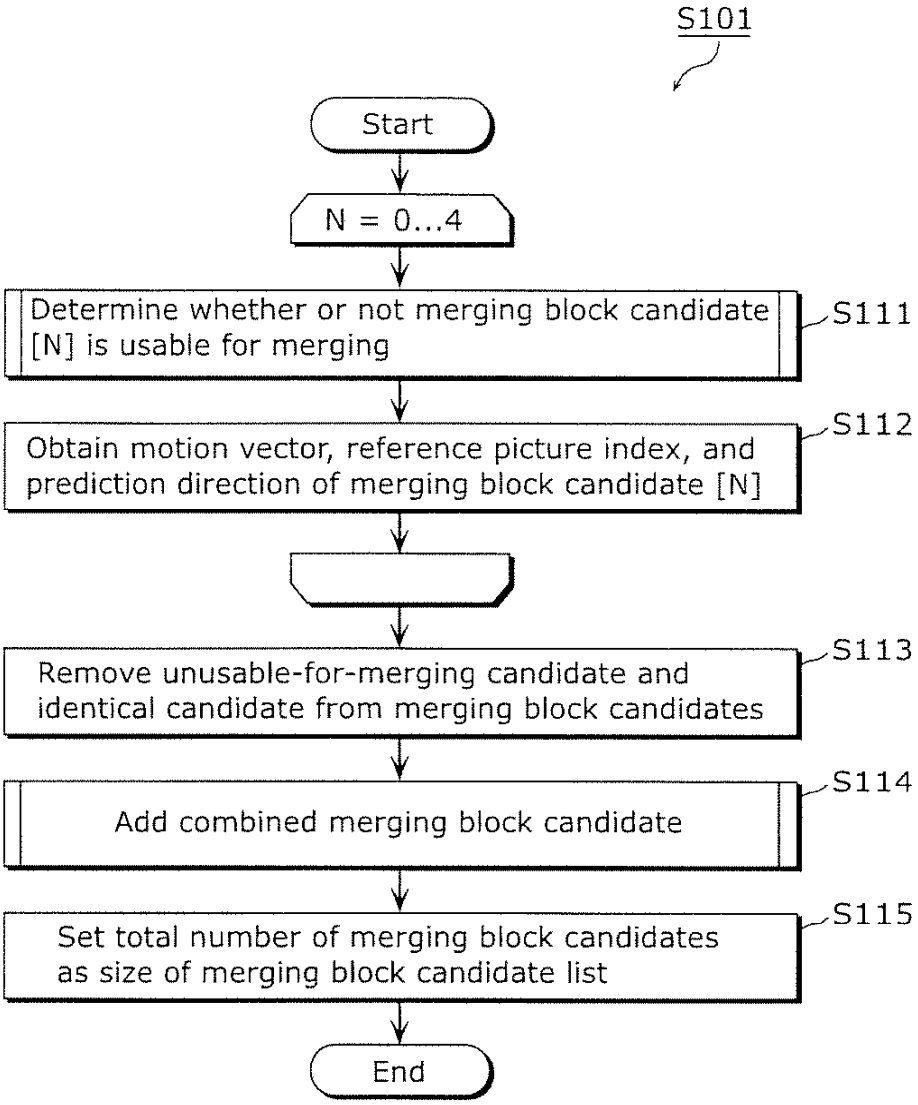

S101
Start
N = 0...4
Determine whether or not merging block candidate [N] is usable for merging
S111
Obtain motion vector, reference picture index, and prediction direction of merging block candidate [N]
S112
Remove unusable-for-merging candidate and identical candidate from merging block candidates
S113
Add combined merging block candidate
S114
Set total number of merging block candidates as size of merging block candidate list
S115
End

FIG. 13

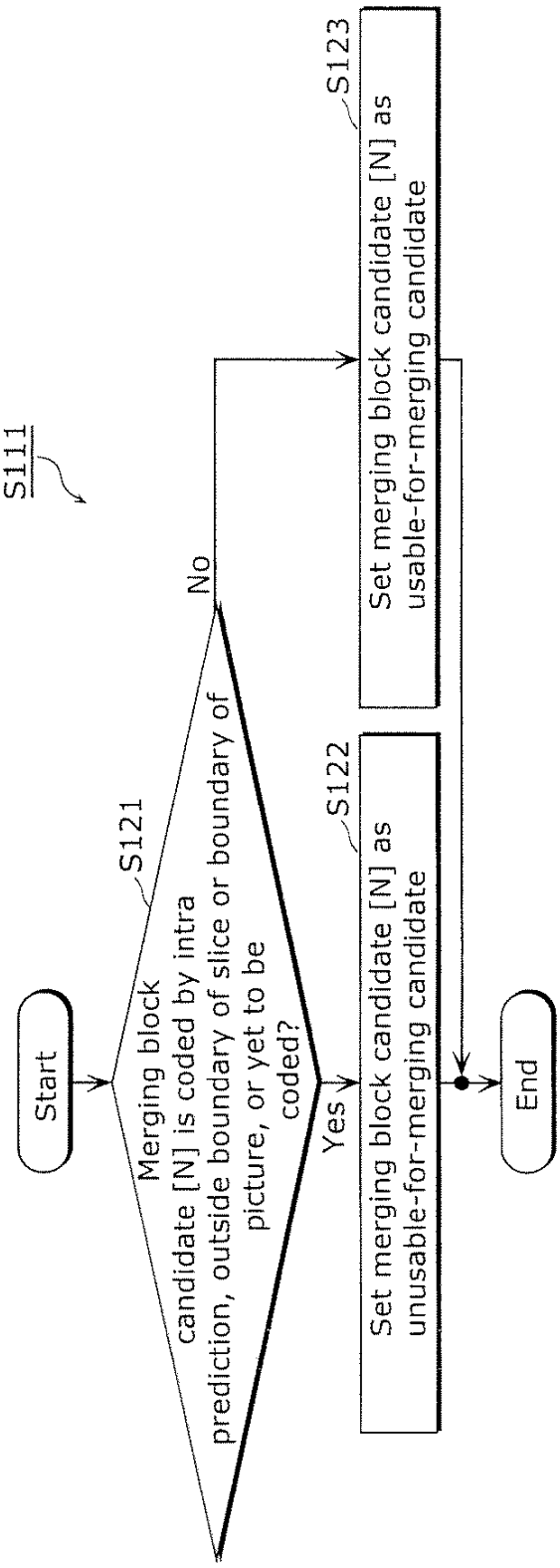

S111
Start
S121
Merging block candidate [N] is coded by intra prediction, outside boundary of slice or boundary of picture, or yet to be coded?
No
Yes
S122
Set merging block candidate [N] as unusable-for-merging candidate
S123
Set merging block candidate [N] as usable-for-merging candidate
End

FIG. 14

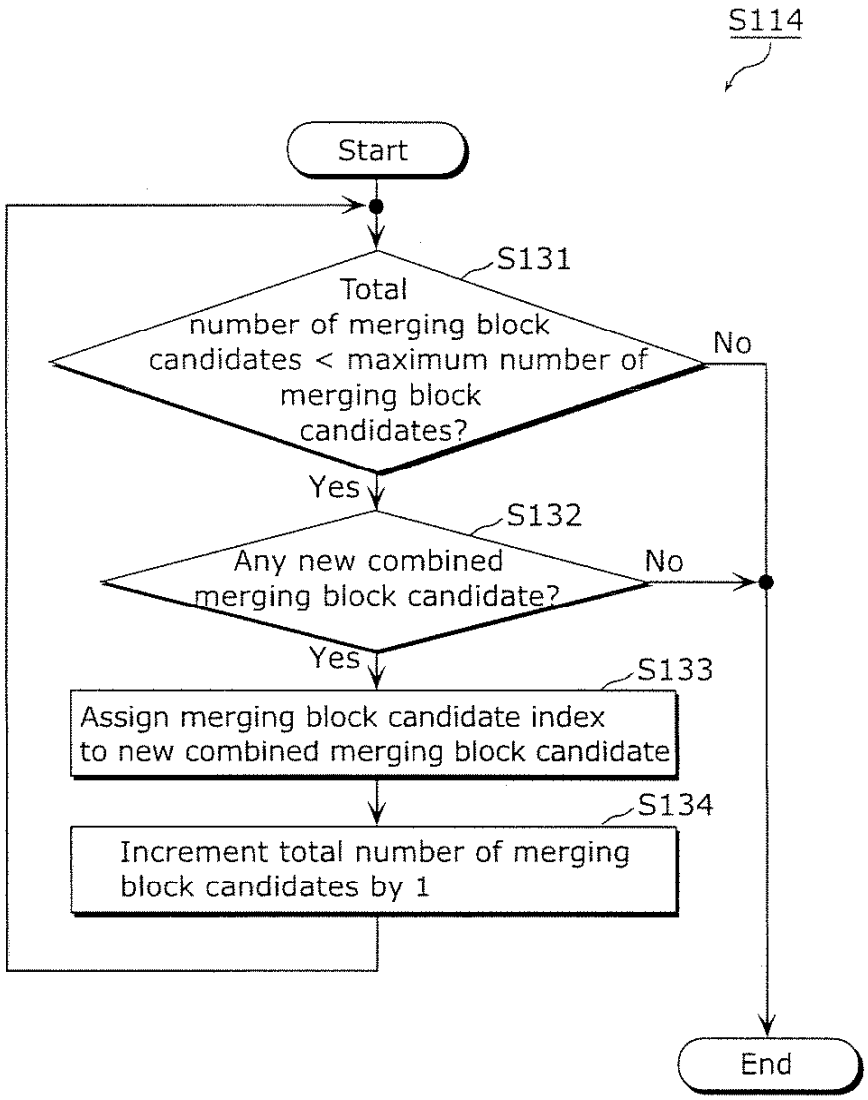

S114
Start
S131
Total number of merging block candidates < maximum number of merging block candidates?
No
Yes
S132
Any new combined merging block candidate?
No
Yes
S133
Assign merging block candidate index to new combined merging block candidate
S134
Increment total number of merging block candidates by 1
End

FIG. 15

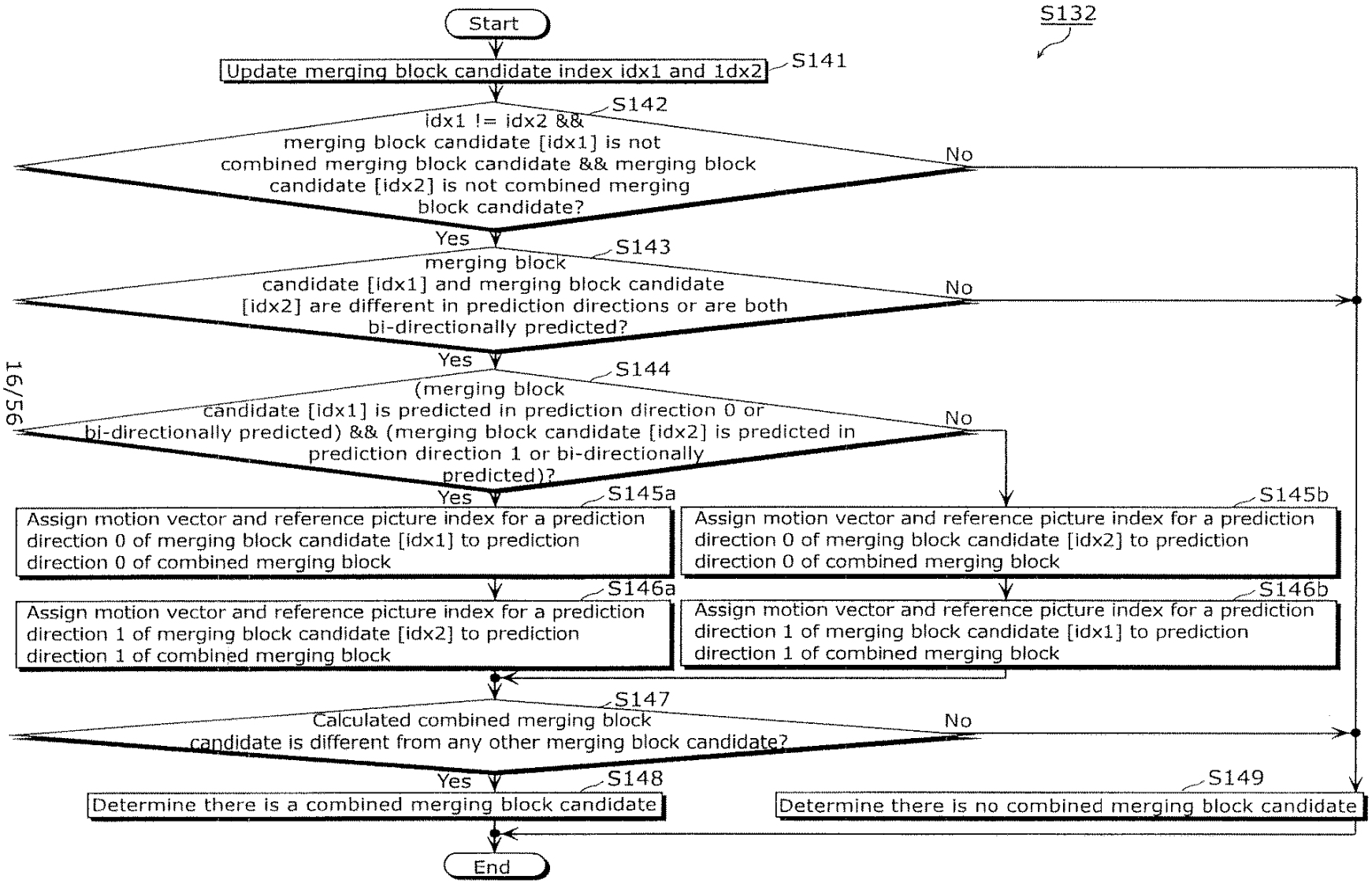

S132
Start
Update merging block candidate index idx1 and 1dx2
S141
idx1 != idx2 && merging block candidate [idx1] is not combined merging block candidate && merging block candidate [idx2] is not combined merging block candidate?
S142
No
Yes
merging block candidate [idx1] and merging block candidate [idx2] are different in prediction directions or are both bi-directionally predicted?
S143
No
Yes
(merging block candidate [idx1] is predicted in prediction direction 0 or bi-directionally predicted) && (merging block candidate [idx2] is predicted in prediction direction 1 or bi-directionally predicted)?
S144
No
Yes
Assign motion vector and reference picture index for a prediction direction 0 of merging block candidate [idx1] to prediction direction 0 of combined merging block
S145a
Assign motion vector and reference picture index for a prediction direction 0 of merging block candidate [idx2] to prediction direction 0 of combined merging block
S145b
Assign motion vector and reference picture index for a prediction direction 1 of merging block candidate [idx2] to prediction direction 1 of combined merging block
S146a
Assign motion vector and reference picture index for a prediction direction 1 of merging block candidate [idx1] to prediction direction 1 of combined merging block
S146b
Calculated combined merging block candidate is different from any other merging block candidate?
S147
No
Yes
Determine there is a combined merging block candidate
S148
Determine there is no combined merging block candidate
S149
End

FIG. 16

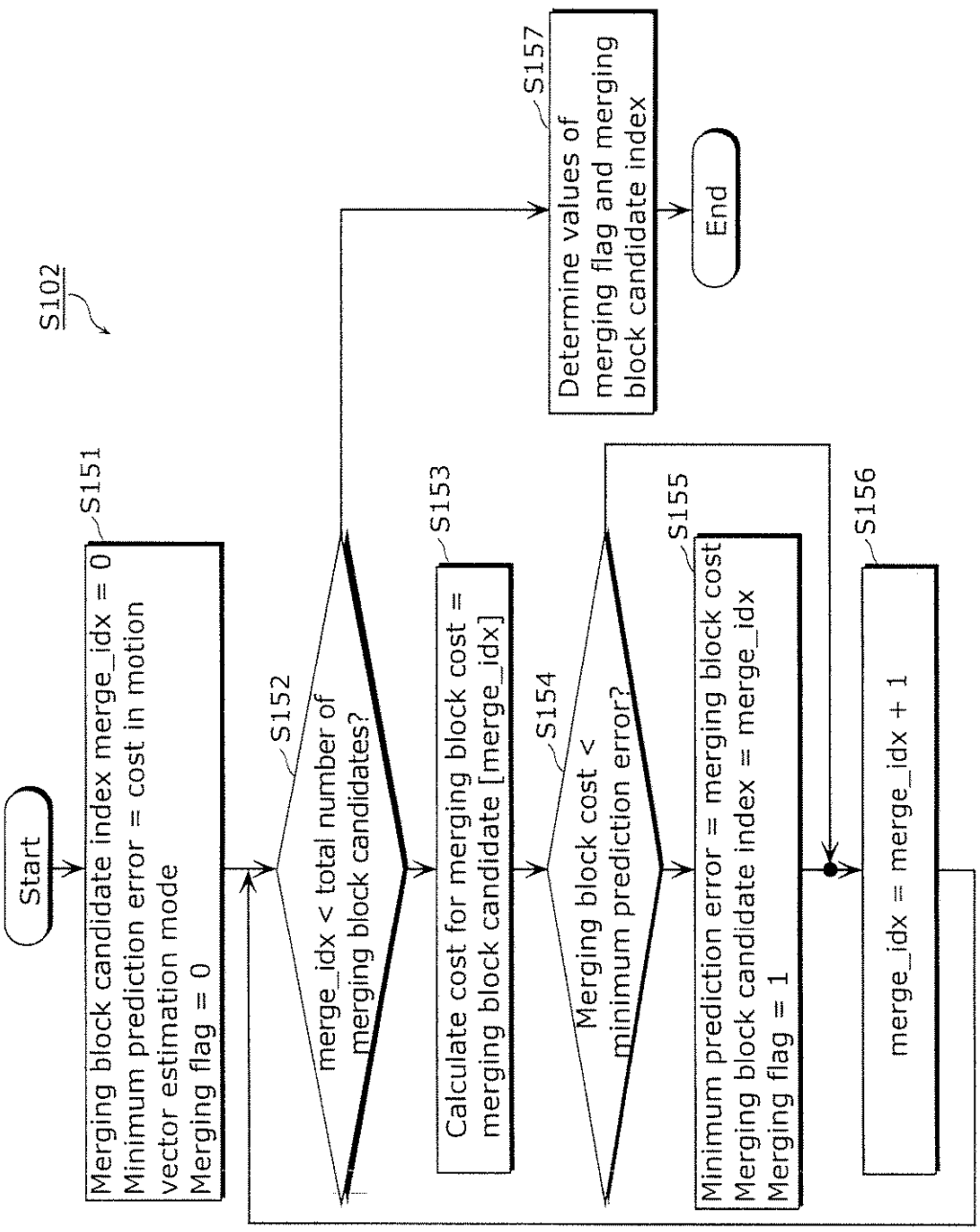

S102
Start
S151
Merging block candidate index merge_idx = 0
Minimum prediction error = cost in motion vector estimation mode
Merging flag = 0
S152
merge_idx < total number of merging block candidates?
S153
Calculate cost for merging block cost = merging block candidate [merge_idx]
S154
Merging block cost < minimum prediction error?
S155
Minimum prediction error = merging block cost
Merging block candidate index = merge_idx
Merging flag = 1
S156
merge_idx = merge_idx + 1
S157
Determine values of merging flag and merging block candidate index
End

FIG. 17

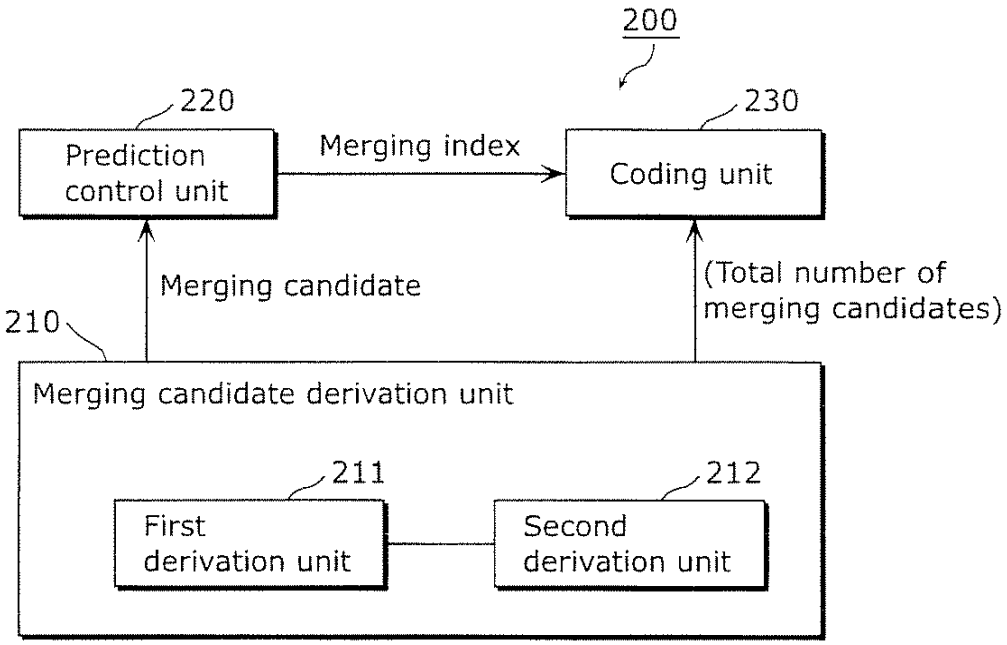

200
220
230
Prediction control unit
Merging index
Coding unit
Merging candidate
(Total number of merging candidates)
210
Merging candidate derivation unit
211
212
First derivation unit
Second derivation unit

FIG. 18

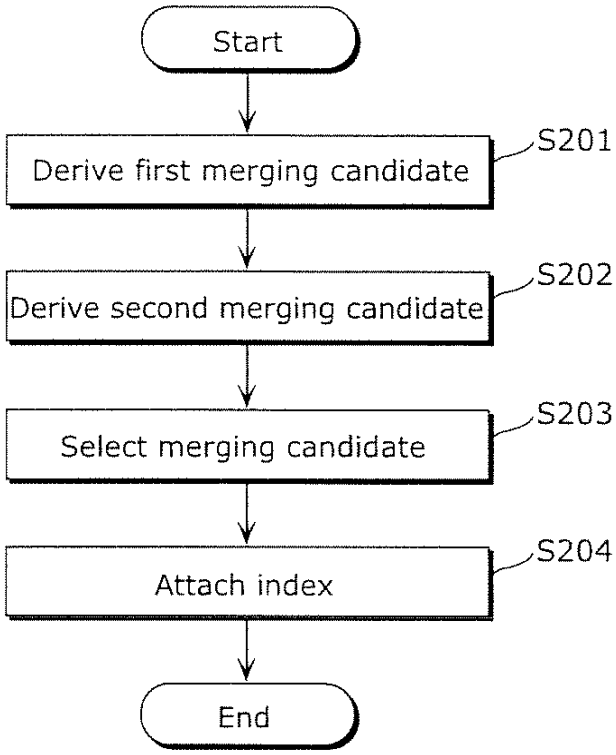

Start
Derive first merging candidate
S201
Derive second merging candidate
S202
Select merging candidate
S203
Attach index
S204
End

FIG. 19

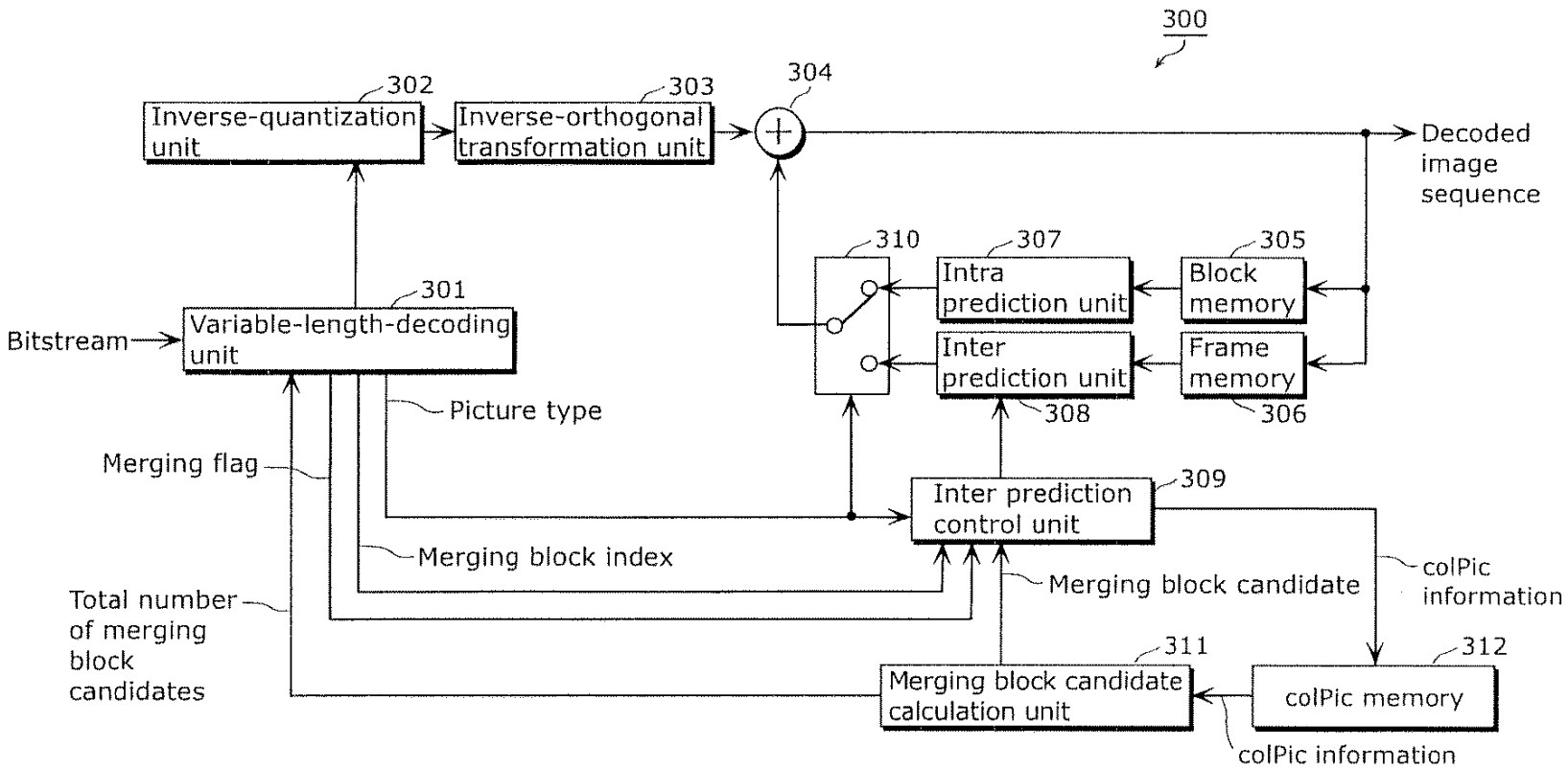

300
302
Inverse-quantization unit
303
Inverse-orthogonal transformation unit
304
Decoded image sequence
310
307
Intra prediction unit
305
Block memory
Inter prediction unit
Frame memory
308
306
301
Bitstream
Variable-length-decoding unit
Picture type
Merging flag
309
Inter prediction control unit
Merging block index
Merging block candidate
colPic information
Total number of merging block candidates
311
312
Merging block candidate calculation unit
colPic memory
colPic information

FIG. 20

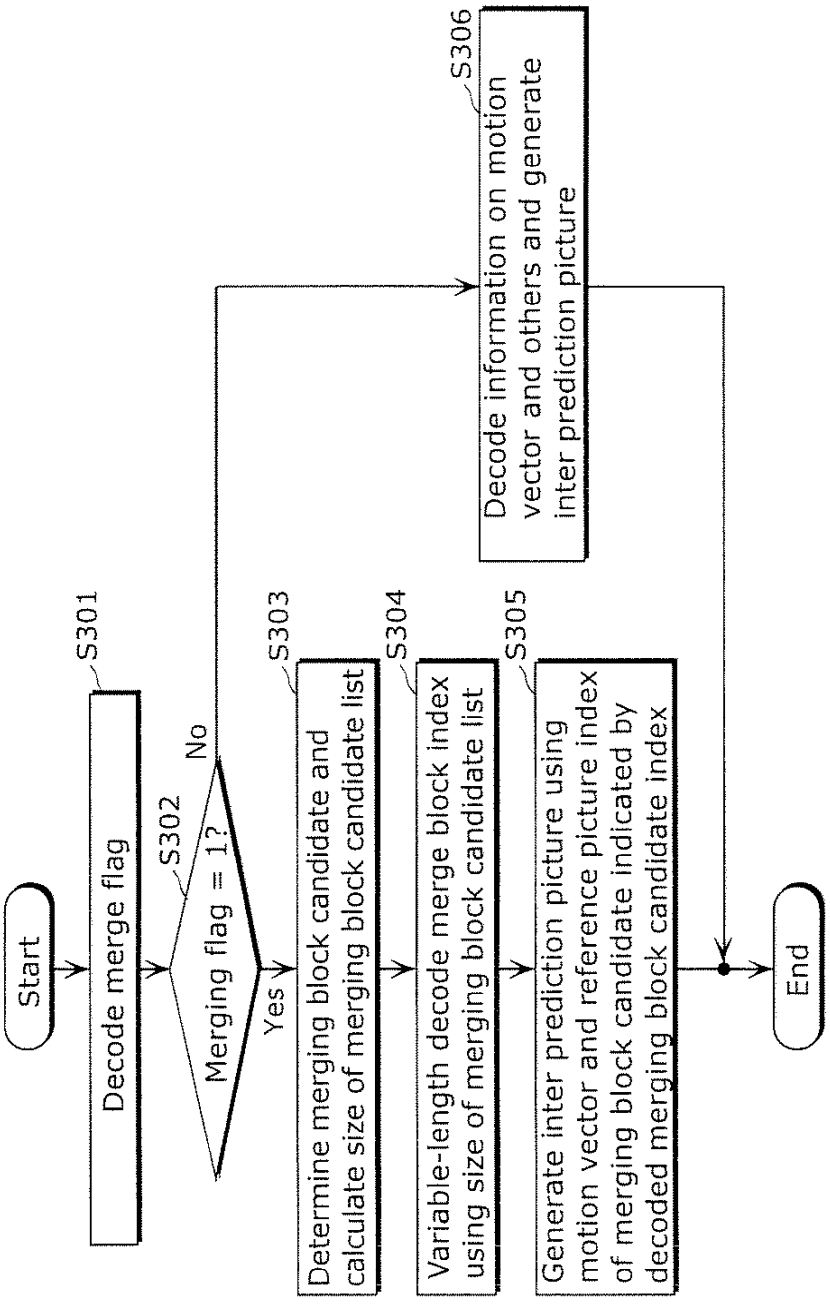

Start
Decode merge flag
S301
Merging flag = 1?
S302
No
Yes
Determine merging block candidate and calculate size of merging block candidate list
S303
Variable-length decode merge block index using size of merging block candidate list
S304
Generate inter prediction picture using motion vector and reference picture index of merging block candidate indicated by decoded merging block candidate index
S305
Decode information on motion vector and others and generate inter prediction picture
S306
End

FIG. 21

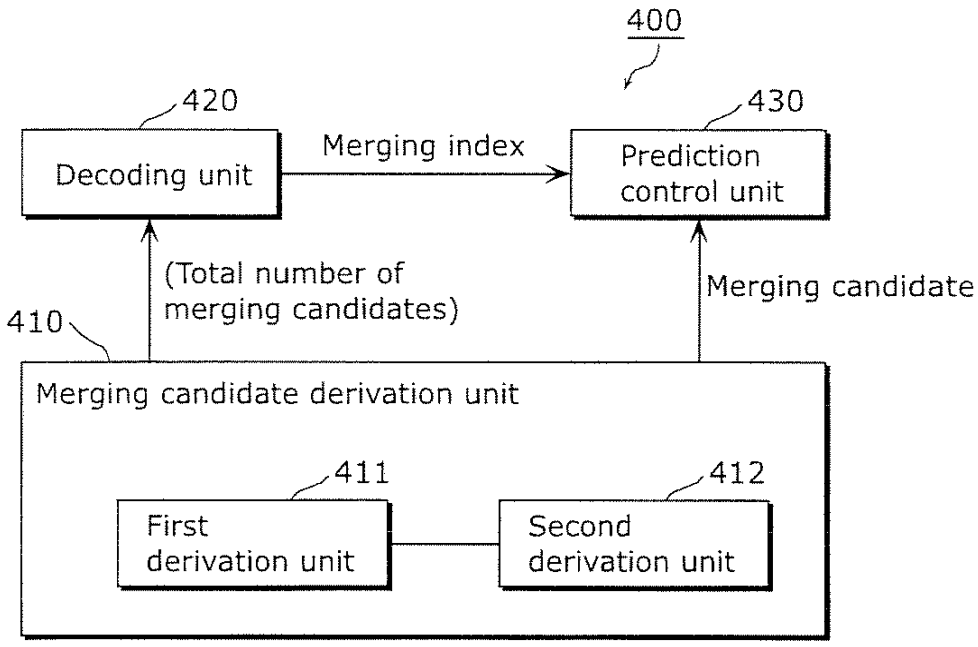

400
420
430
Decoding unit
Merging index
Prediction control unit
(Total number of merging candidates)
Merging candidate
410
Merging candidate derivation unit
411
412
First derivation unit
Second derivation unit

FIG. 22

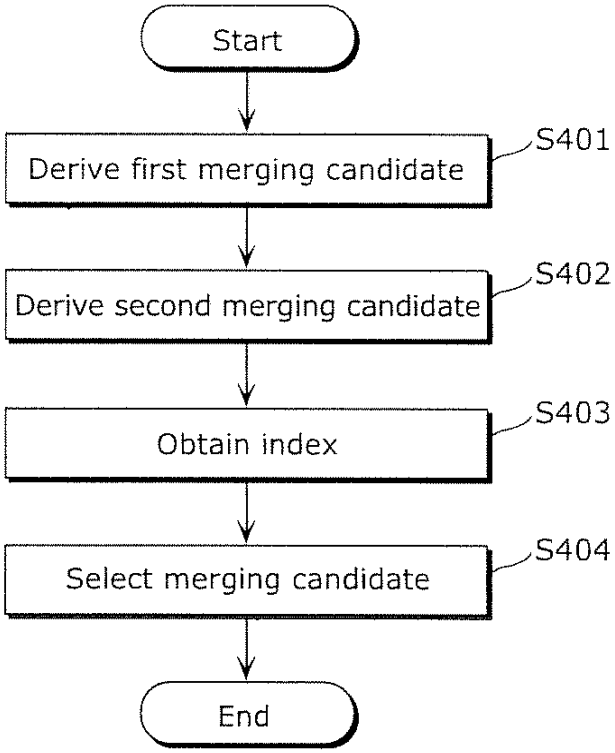

Start
Derive first merging candidate
S401
Derive second merging candidate
S402
Obtain index
S403
Select merging candidate
S404
End

FIG. 23

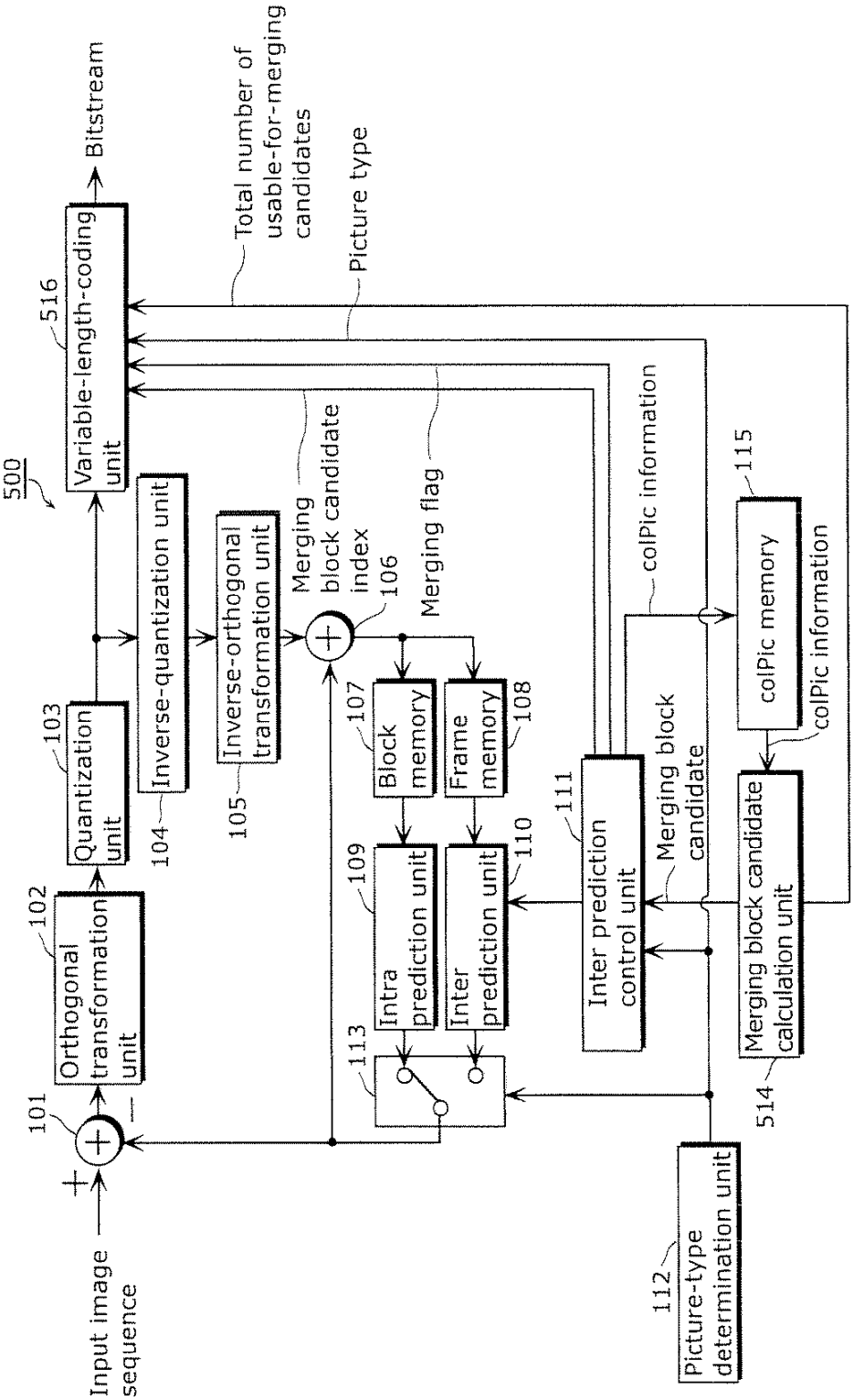

500
Input image sequence
101
Orthogonal transformation unit
102
Quantization unit
103
Inverse-quantization unit
104
Inverse-orthogonal transformation unit
105
Merging block candidate index
106
Block memory
107
Frame memory
108
Intra prediction unit
109
Inter prediction unit
110
Inter prediction control unit
111
Picture-type determination unit
112
113
Merging flag
Merging block candidate
Merging block candidate calculation unit
514
colPic information
colPic memory
115
Variable-length-coding unit
516
Bitstream
Total number of usable-for-merging candidates
Picture type

FIG. 24

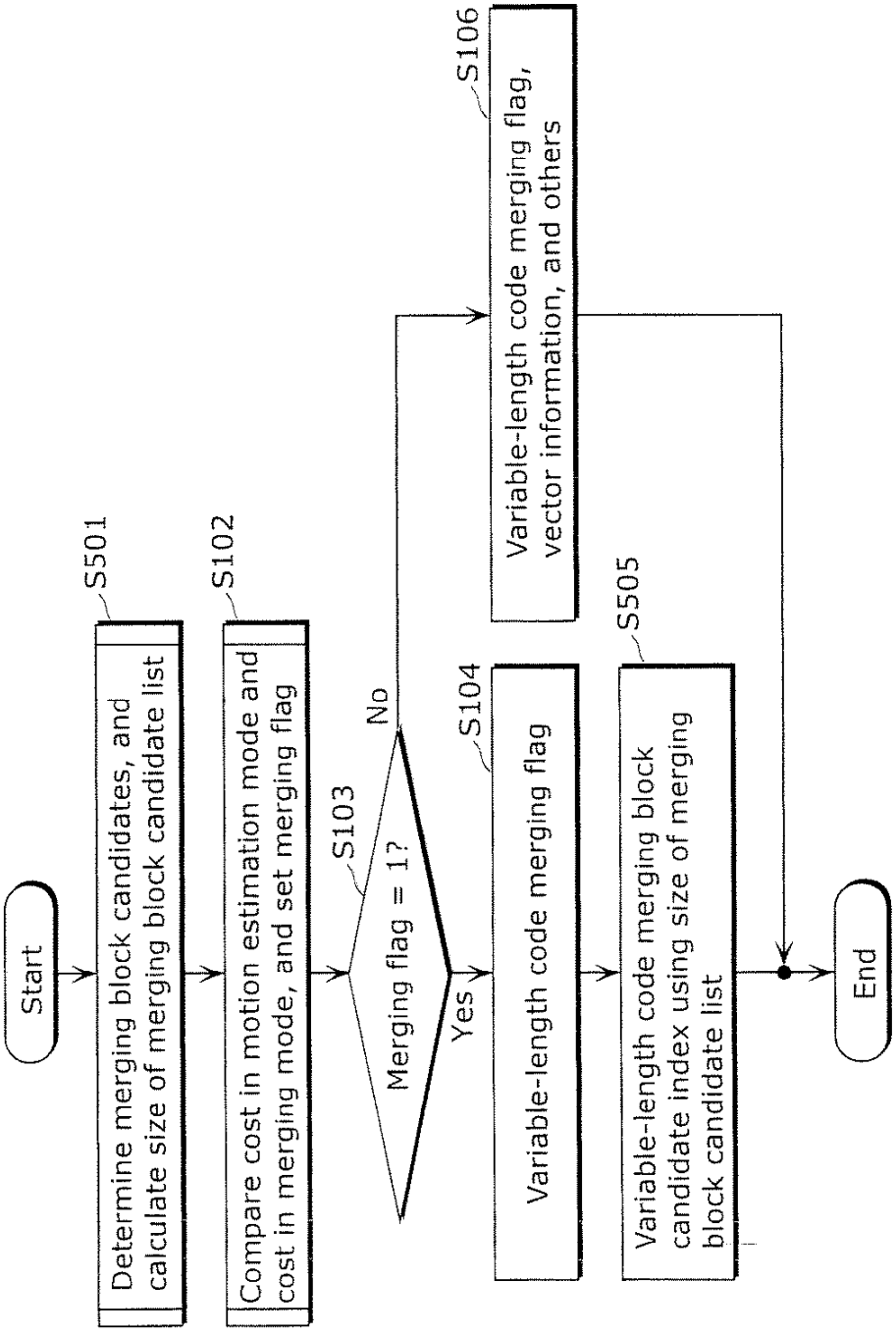

Start
S501
Determine merging block candidates, and calculate size of merging block candidate list
S102
Compare cost in motion estimation mode and cost in merging mode, and set merging flag
S103
Merging flag = 1?
No
Yes
S104
Variable-length code merging flag
S505
Variable-length code merging block candidate index using size of merging block candidate list
S106
Variable-length code merging flag, vector information, and others
End

FIG. 25

(a)

Merging block candidate index	Merging block candidate
0	Neighboring block A (Prediction direction 0, (MvL0_A, RefL0_A))
1	Neighboring block B (Prediction direction 1, (MvL1_B, RefL1_B))
2	co-located merge block (Bi-directional prediction, (MvL0_Col, RefL0_Col), (MvL1_Col, RefL1_Col))
3	Unusable-for-merging candidate (Neighboring block C, intra picture prediction)
4	Neighboring block D (Prediction direction 0, (MvL0_D, RefL0_V))

When MvL0_A = MvL0_D and RefL0_A = RefL0_D, remove one of neighboring blocks A and D

- Remove identical candidate and unusable-for-merging candidate
- Add new candidate and increment total number of merging block candidate by 1 when total number of usable-for-merging candidates - total number of merging block candidates > 0

(b)

Merging block candidate index	Merging block candidate
0	Neighboring block A (Prediction direction 0 (MvL0_A, RefL0_A))
1	Neighboring block B (Prediction direction 1 (MvL1_B, RefL1_B))
2	co-located merging block (Bi-directional prediction, (MvL0_Col, RefL0_Col), (MvL1_Col, RefL1_Col))
3	New candidate

Total number of merging block candidates = 4

FIG. 26

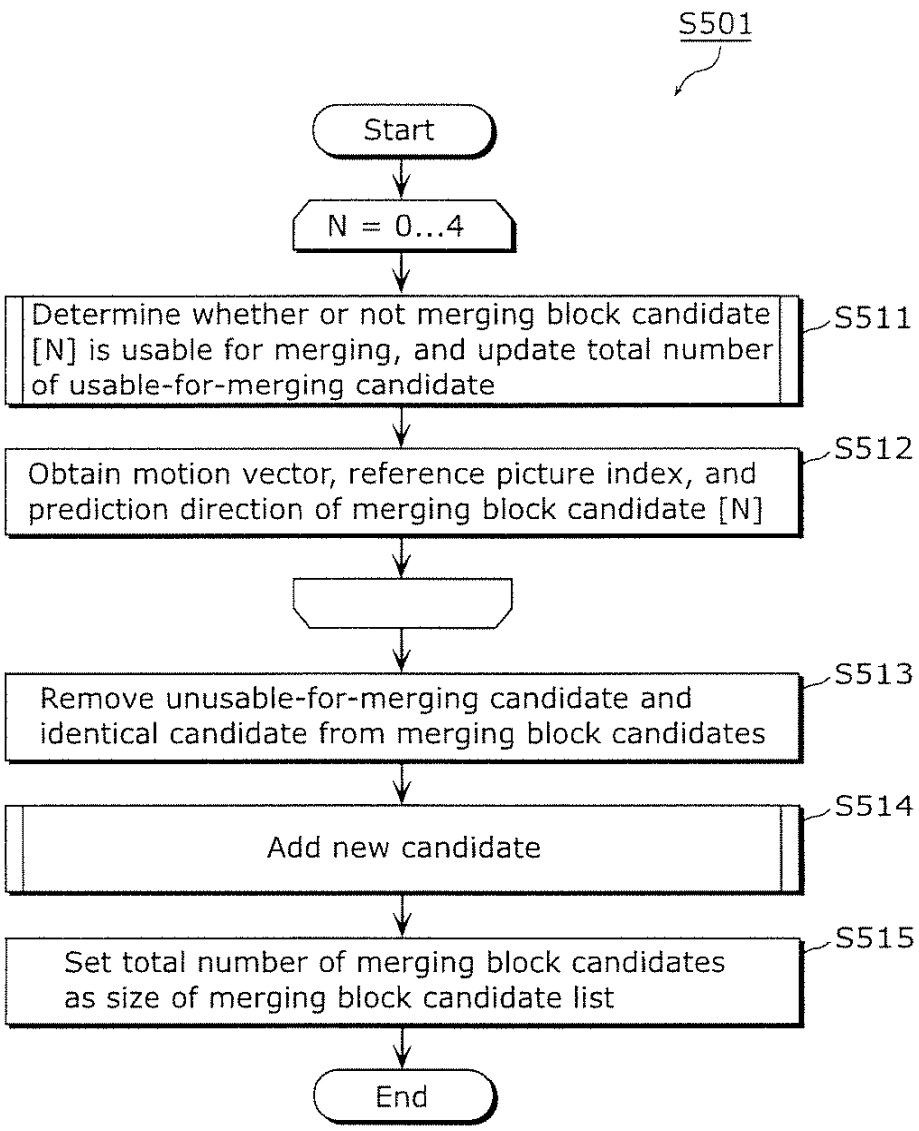

S501
Start
N = 0...4
Determine whether or not merging block candidate [N] is usable for merging, and update total number of usable-for-merging candidate
S511
Obtain motion vector, reference picture index, and prediction direction of merging block candidate [N]
S512
Remove unusable-for-merging candidate and identical candidate from merging block candidates
S513
Add new candidate
S514
Set total number of merging block candidates as size of merging block candidate list
S515
End

FIG. 27

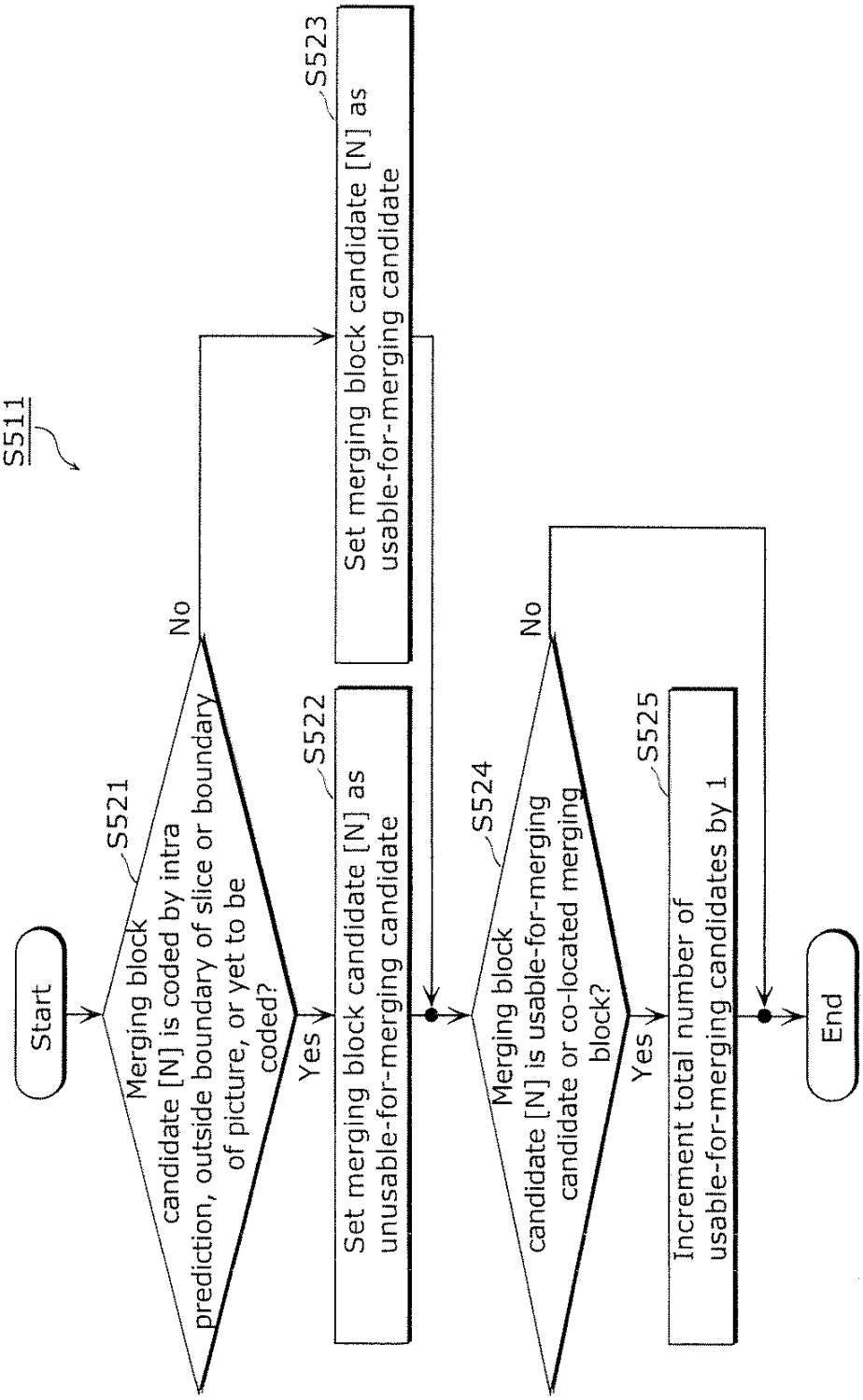

S511
Start
S521
Merging block candidate [N] is coded by intra prediction, outside boundary of slice or boundary of picture, or yet to be coded?
No
Yes
S522
Set merging block candidate [N] as unusable-for-merging candidate
S523
Set merging block candidate [N] as usable-for-merging candidate
S524
Merging block candidate [N] is usable-for-merging candidate or co-located merging block?
No
Yes
S525
Increment total number of usable-for-merging candidates by 1
End

FIG. 28

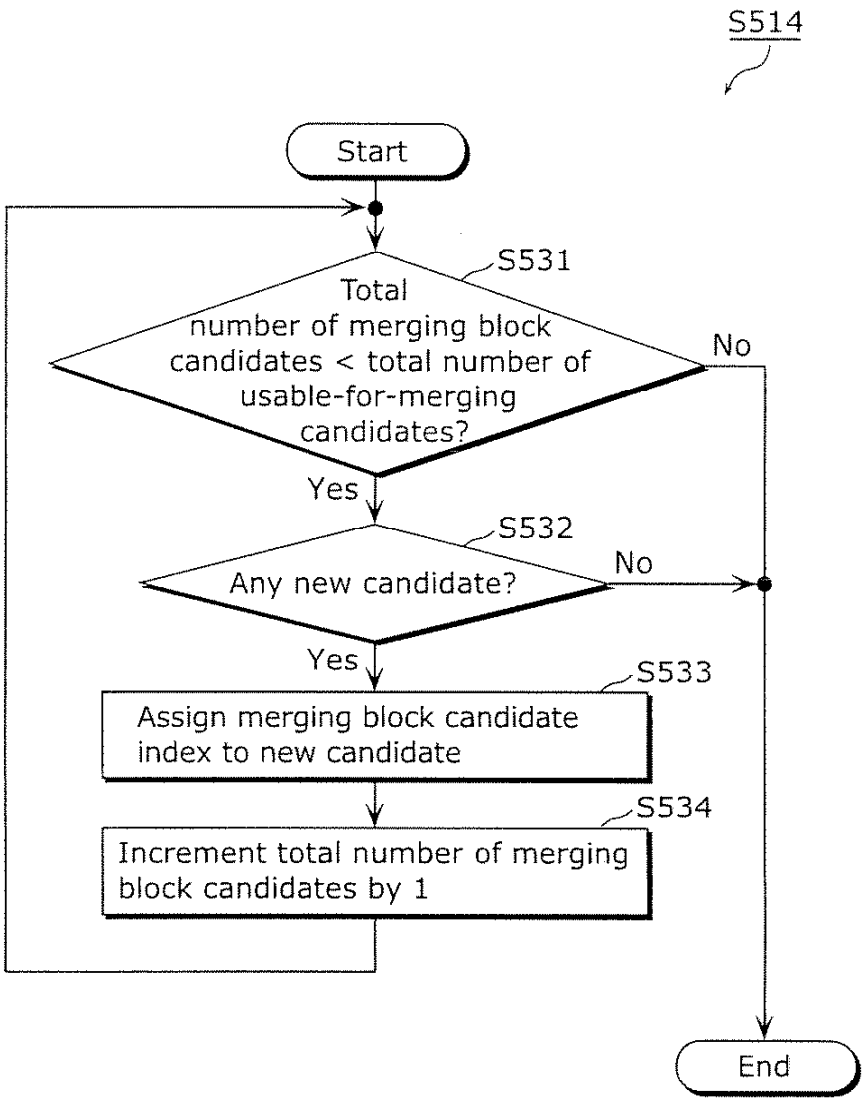

S514
Start
S531
Total number of merging block candidates < total number of usable-for-merging candidates?
No
Yes
S532
Any new candidate?
No
Yes
S533
Assign merging block candidate index to new candidate
S534
Increment total number of merging block candidates by 1
End

FIG. 29

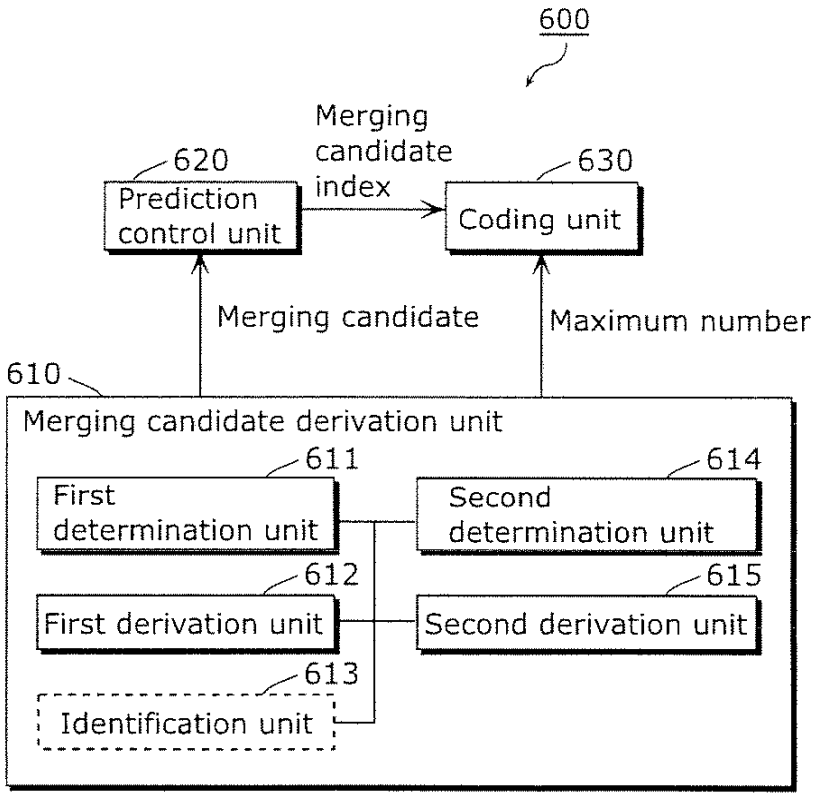

600
Merging candidate index
620
Prediction control unit
630
Coding unit
Merging candidate
Maximum number
610
Merging candidate derivation unit
611
First determination unit
614
Second determination unit
612
First derivation unit
615
Second derivation unit
613
Identification unit

FIG. 30

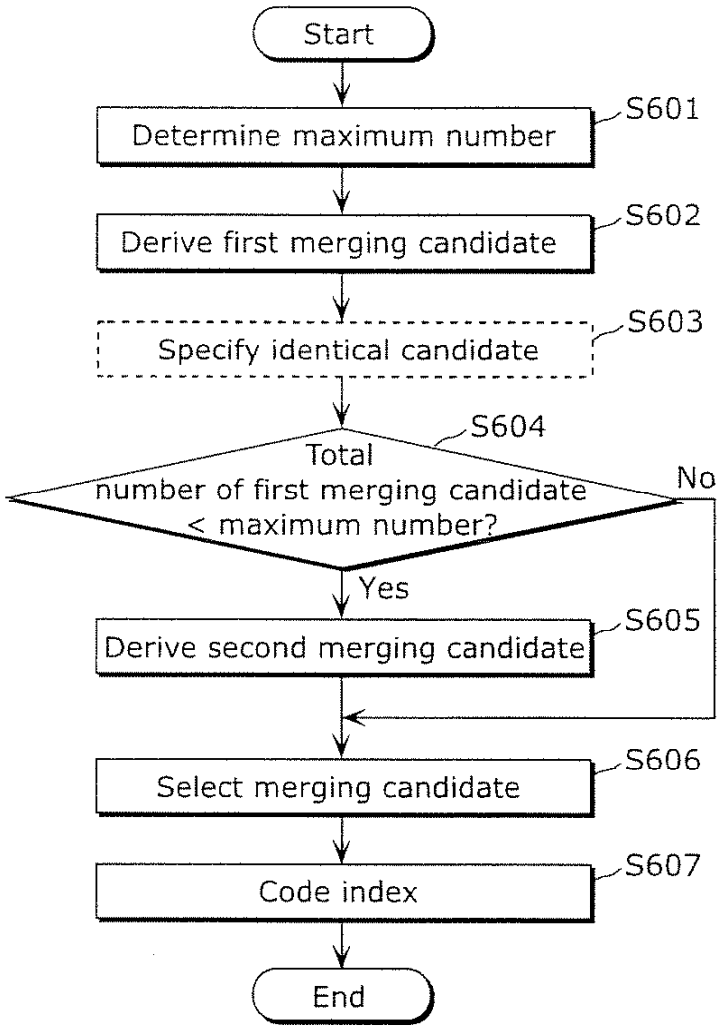

Start
Determine maximum number
S601
Derive first merging candidate
S602
Specify identical candidate
S603
S604
Total number of first merging candidate < maximum number?
No
Yes
Derive second merging candidate
S605
Select merging candidate
S606
Code index
S607
End

FIG. 31

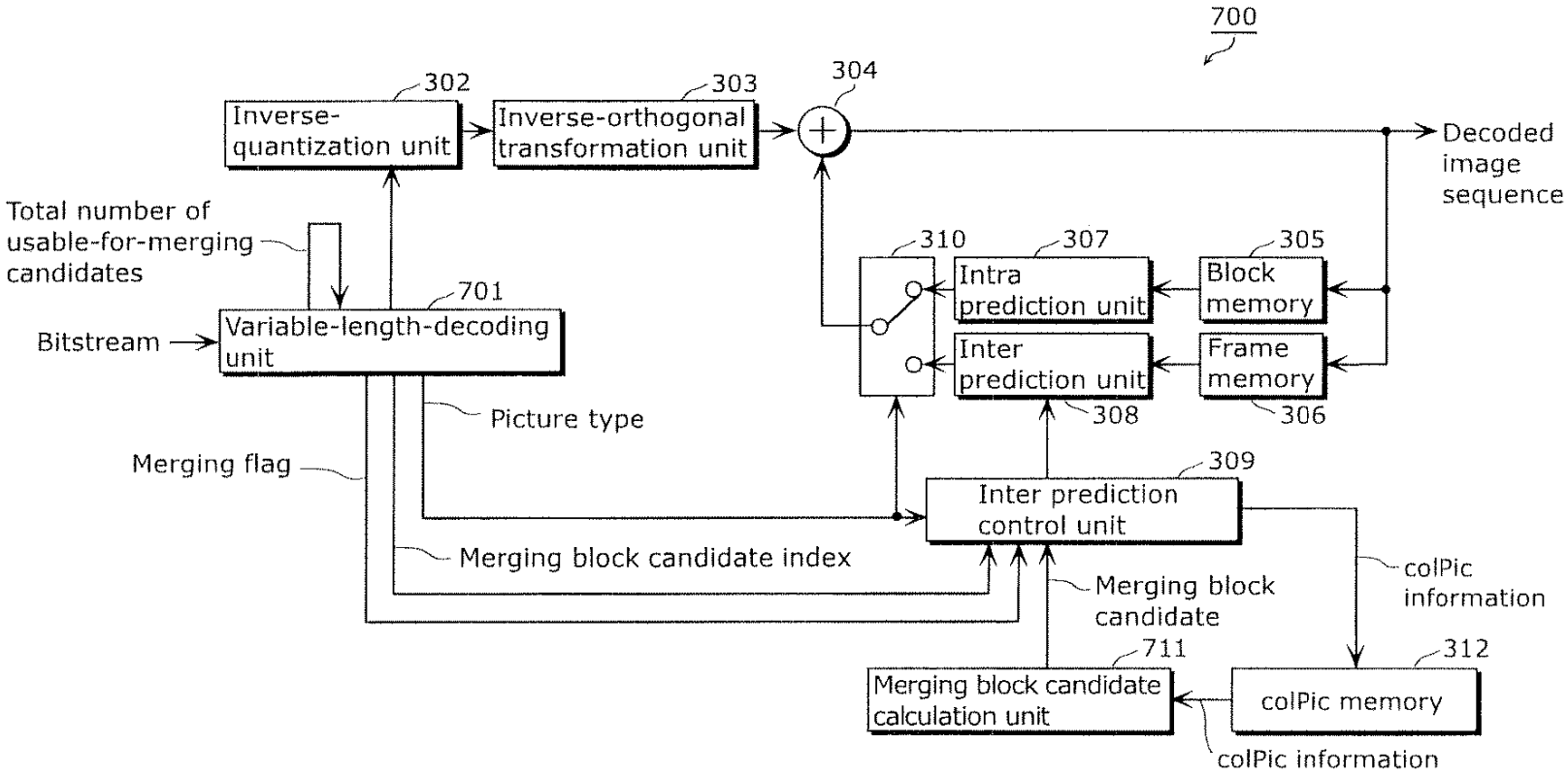

700
302
Inverse-quantization unit
303
Inverse-orthogonal transformation unit
304
Decoded image sequence
Total number of usable-for-merging candidates
310
307
Intra prediction unit
305
Block memory
701
Bitstream
Variable-length-decoding unit
Inter prediction unit
Frame memory
308
306
Picture type
Merging flag
309
Inter prediction control unit
Merging block candidate index
colPic information
Merging block candidate
711
312
Merging block candidate calculation unit
colPic memory
colPic information

FIG. 32

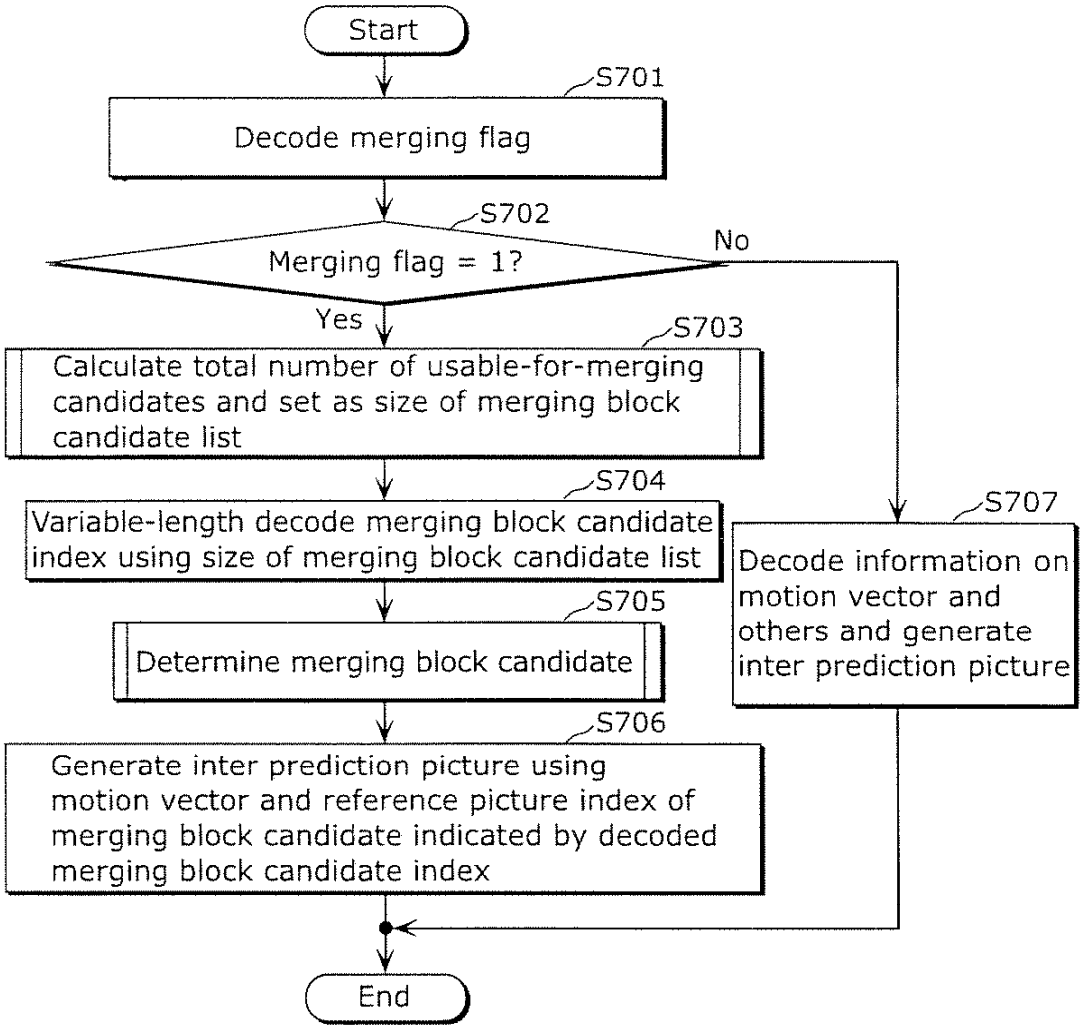

Start
S701
Decode merging flag
S702
Merging flag = 1?
No
Yes
S703
Calculate total number of usable-for-merging candidates and set as size of merging block candidate list
S704
Variable-length decode merging block candidate index using size of merging block candidate list
S705
Determine merging block candidate
S706
Generate inter prediction picture using motion vector and reference picture index of merging block candidate indicated by decoded merging block candidate index
S707
Decode information on motion vector and others and generate inter prediction picture
End

FIG. 33

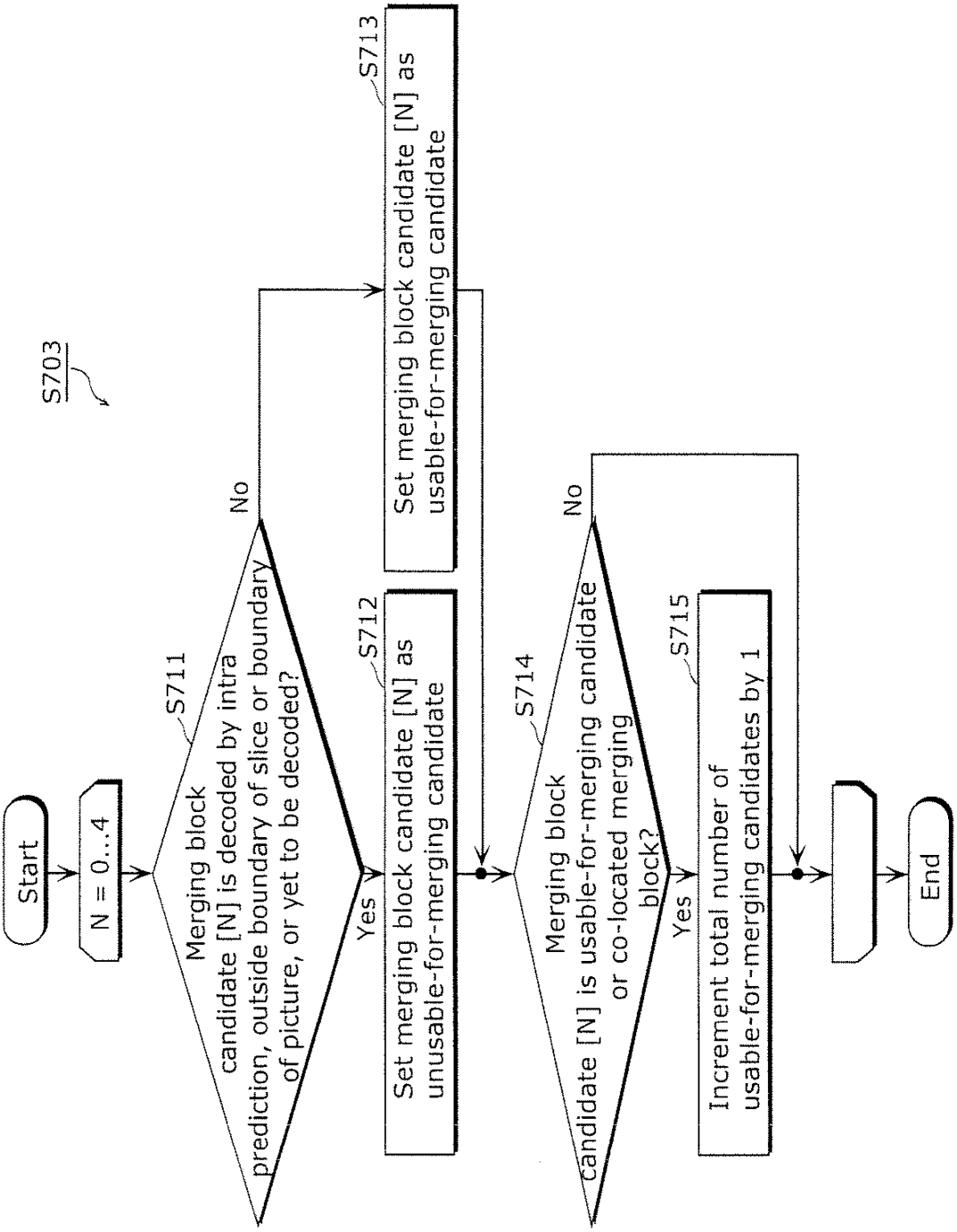

S703
Start
N = 0...4
S711
Merging block candidate [N] is decoded by intra prediction, outside boundary of slice or boundary of picture, or yet to be decoded?
No
Yes
S712
Set merging block candidate [N] as unusable-for-merging candidate
S713
Set merging block candidate [N] as usable-for-merging candidate
S714
Merging block candidate [N] is usable-for-merging candidate or co-located merging block?
No
Yes
S715
Increment total number of usable-for-merging candidates by 1
End

FIG. 34

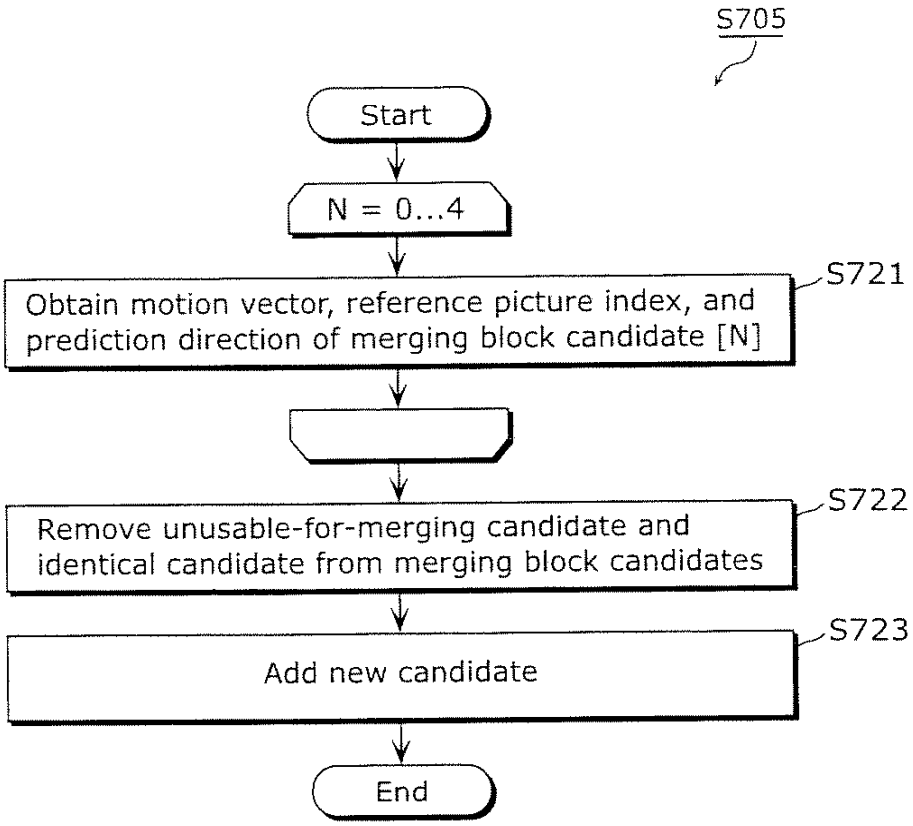
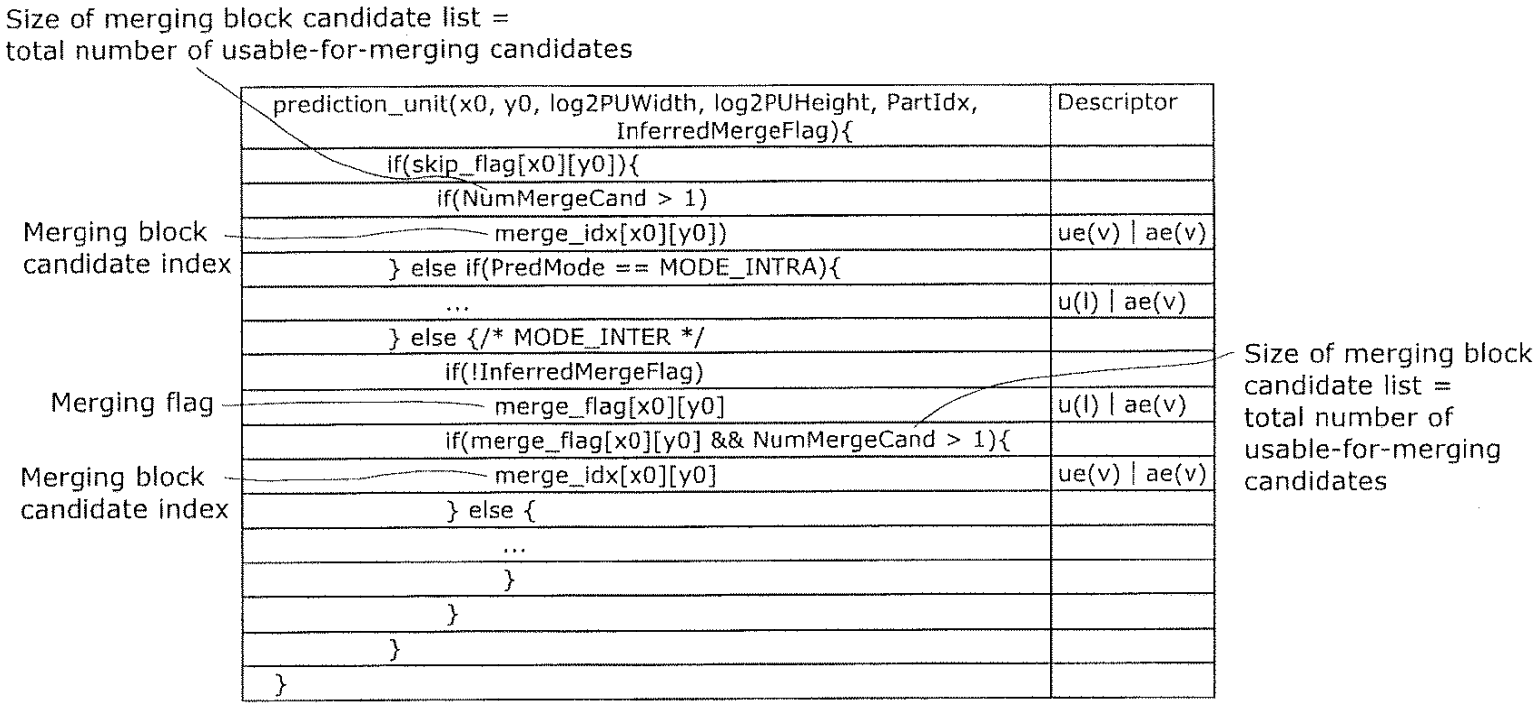
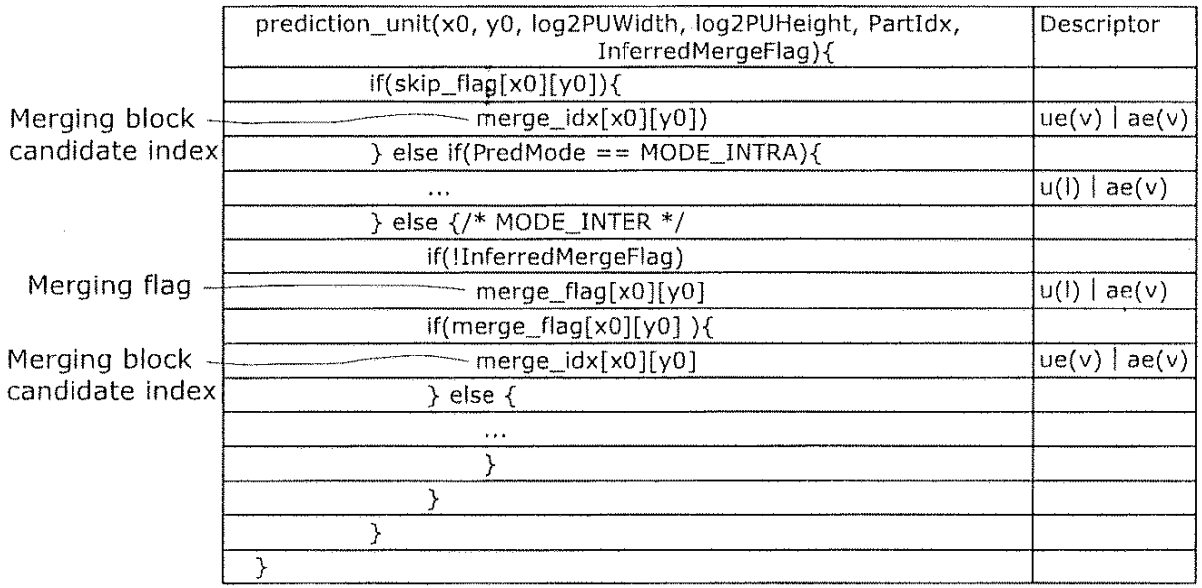

S705
Start
N = 0...4
Obtain motion vector, reference picture index, and prediction direction of merging block candidate [N]
S721
Remove unusable-for-merging candidate and identical candidate from merging block candidates
S722
Add new candidate
S723
End

FIG. 35



prediction_unit(x0, y0, log2PUWidth, log2PUHeight, PartIdx, InferredMergeFlag){	Descriptor
if(skip_flag[x0][y0]){	
if(NumMergeCand > 1)	
merge_idx[x0][y0])	ue(v) | ae(v)
} else if(PredMode == MODE_INTRA){	
...	u(l) | ae(v)
} else {/* MODE_INTER */	
if(!InferredMergeFlag)	
merge_flag[x0][y0]	u(l) | ae(v)
if(merge_flag[x0][y0] && NumMergeCand > 1){	
merge_idx[x0][y0]	ue(v) | ae(v)
} else {	
...	
}	
}	
}	
}	

FIG. 36



prediction_unit(x0, y0, log2PUWidth, log2PUHeight, PartIdx, InferredMergeFlag){	Descriptor
if(skip_flag[x0][y0]){	
merge_idx[x0][y0])	ue(v) | ae(v)
} else if(PredMode == MODE_INTRA){	
...	u(l) | ae(v)
} else {/* MODE_INTER */	
if(!InferredMergeFlag)	
merge_flag[x0][y0]	u(l) | ae(v)
if(merge_flag[x0][y0]){	
merge_idx[x0][y0]	ue(v) | ae(v)
} else {	
...	
}	
}	
}	
}	

FIG. 37

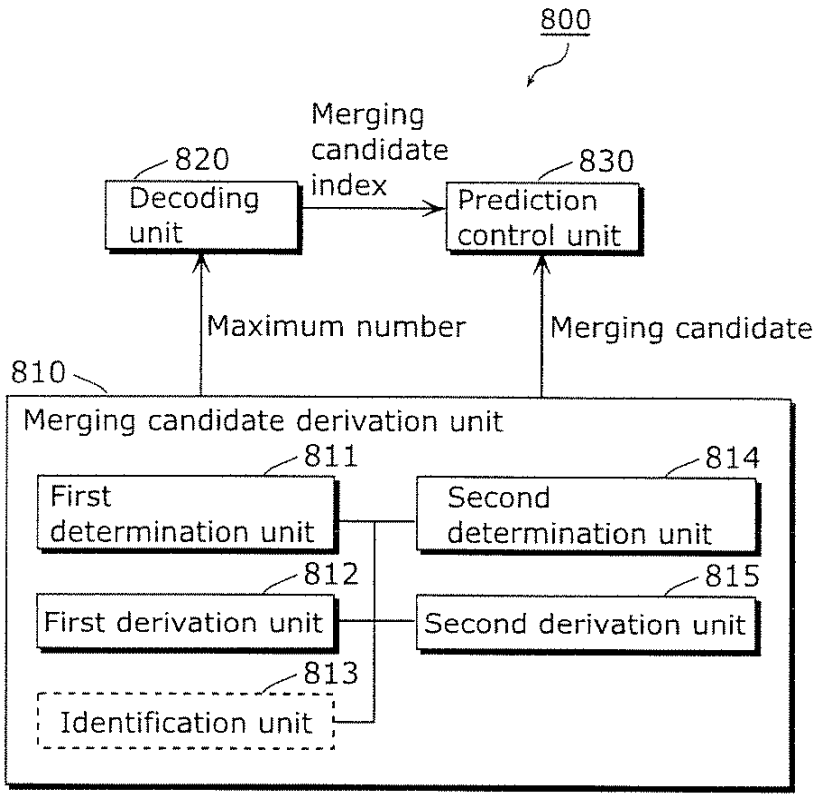

800
Merging candidate index
820
Decoding unit
830
Prediction control unit
Maximum number
Merging candidate
810
Merging candidate derivation unit
811
First determination unit
814
Second determination unit
812
First derivation unit
815
Second derivation unit
813
Identification unit

FIG. 38

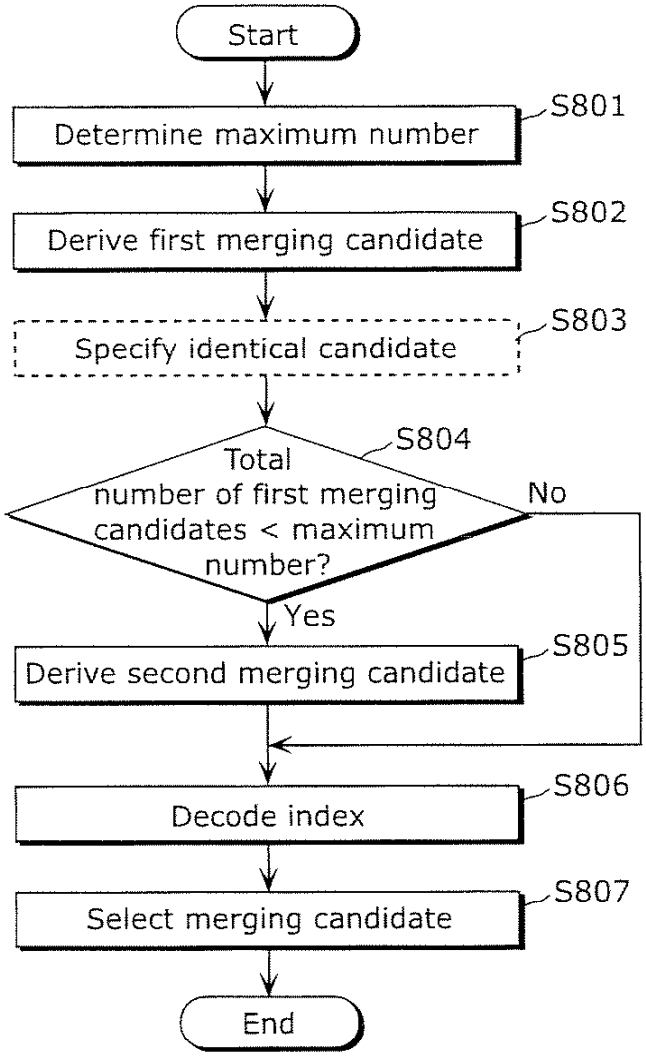

Start
Determine maximum number
S801
Derive first merging candidate
S802
Specify identical candidate
S803
Total number of first merging candidates < maximum number?
S804
No
Yes
Derive second merging candidate
S805
Decode index
S806
Select merging candidate
S807
End

FIG. 39

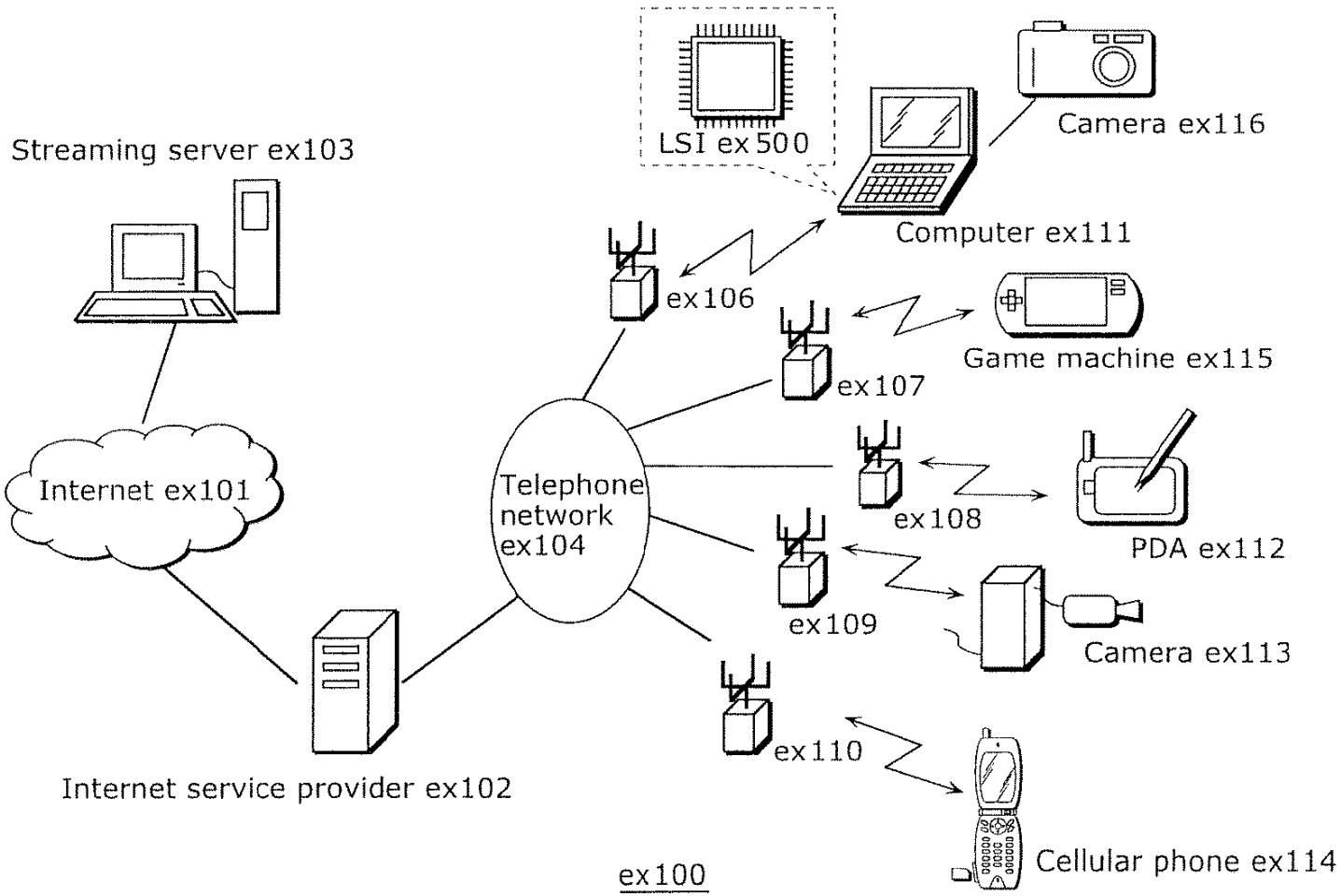

LSI ex500
Camera ex116
Streaming server ex103
Computer ex111
ex106
Game machine ex115
ex107
Internet ex101
Telephone network ex104
ex108
PDA ex112
ex109
Camera ex113
ex110
Internet service provider ex102
Cellular phone ex114
ex100

FIG. 40

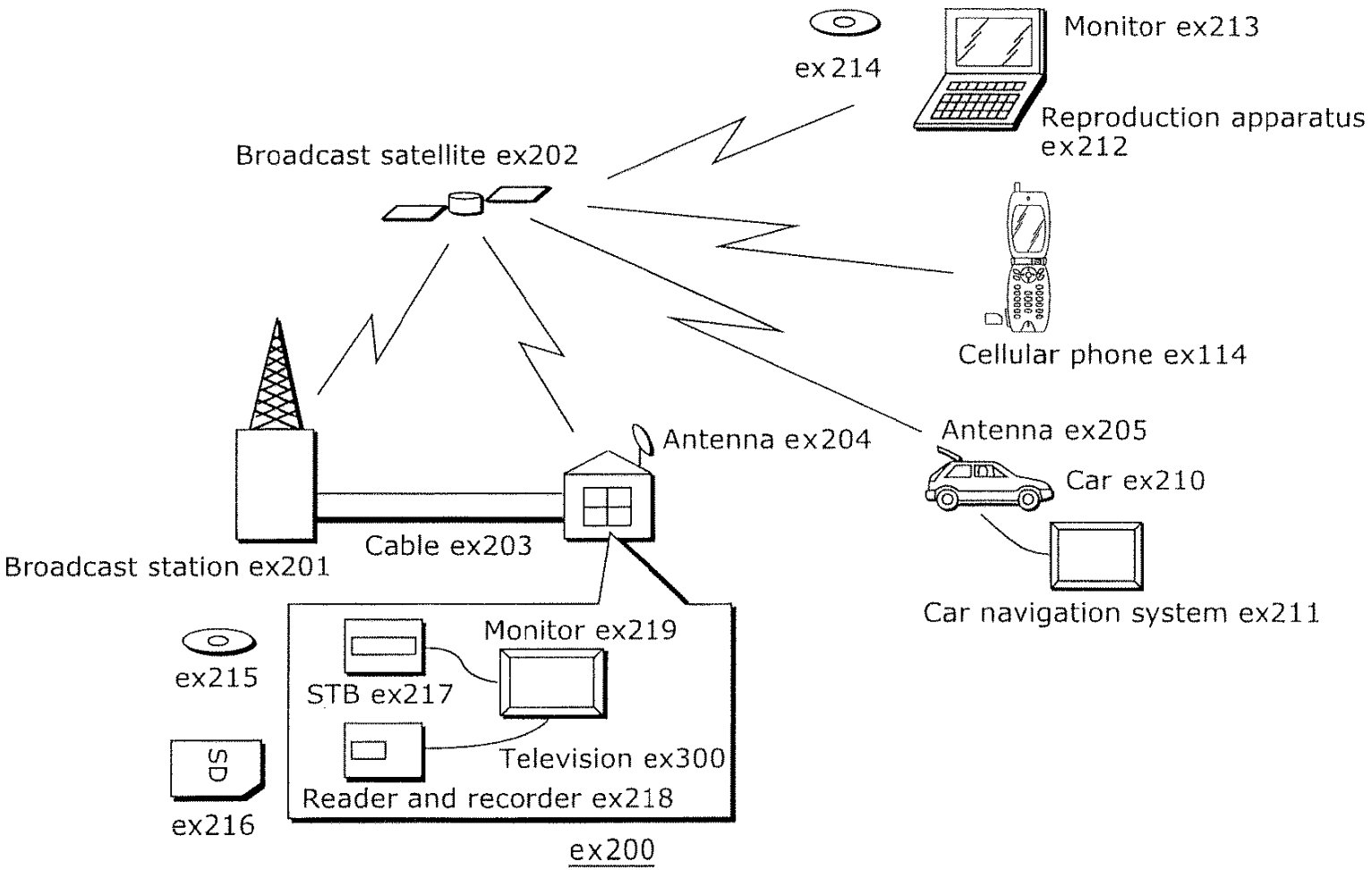

ex214
Monitor ex213
Reproduction apparatus ex212
Broadcast satellite ex202
Cellular phone ex114
Antenna ex204
Antenna ex205
Car ex210
Cable ex203
Broadcast station ex201
Car navigation system ex211
Monitor ex219
ex215
STB ex217
Television ex300
SD
Reader and recorder ex218
ex216
ex200

FIG. 41

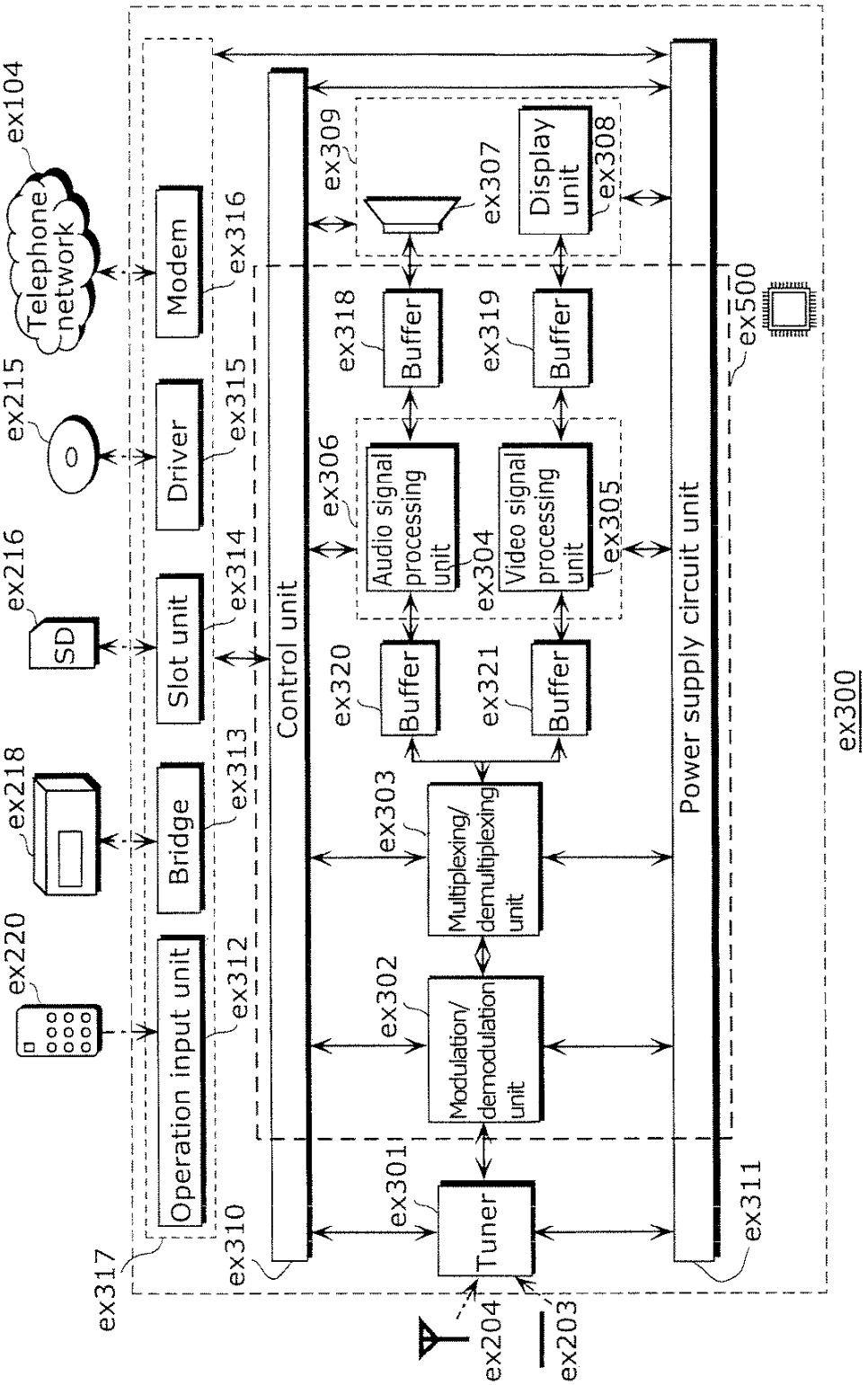

ex104
Telephone network
ex215
ex216
SD
ex218
ex220
ex317
Operation input unit
ex312
Bridge
ex313
Slot unit
ex314
Driver
ex315
Modem
ex316
Control unit
ex310
ex309
ex307
Display unit
ex308
ex318
Buffer
ex319
Buffer
ex306
Audio signal processing unit
ex304
Video signal processing unit
ex305
ex320
Buffer
ex321
Buffer
ex303
Multiplexing/ demultiplexing unit
ex302
Modulation/ demodulation unit
ex301
Tuner
ex204
ex203
Power supply circuit unit
ex311
ex500
ex300

FIG. 42

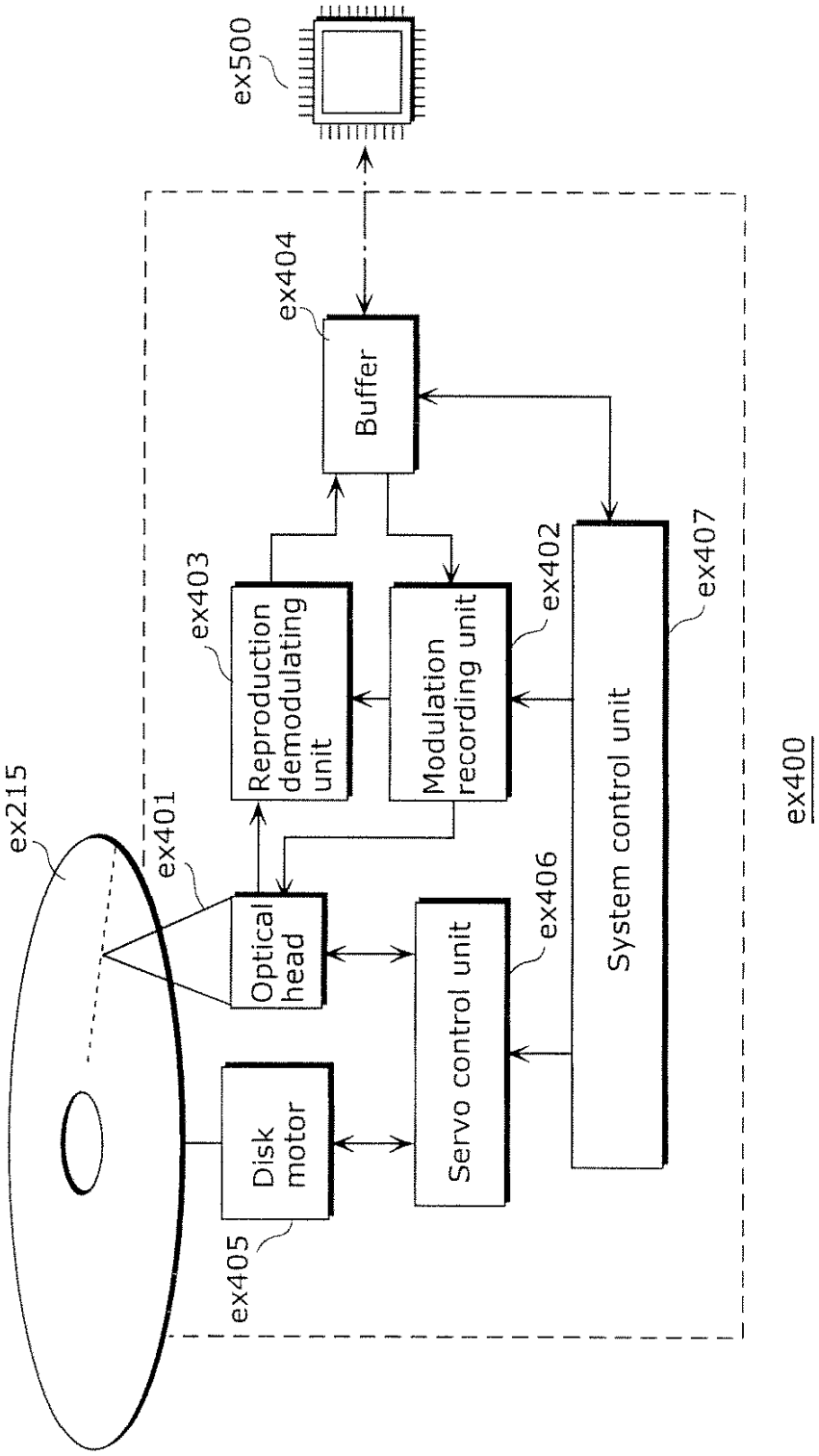

ex500
ex404
Buffer
ex403
Reproduction demodulating unit
Modulation recording unit
ex402
ex407
System control unit
ex215
ex401
Optical head
ex406
Servo control unit
Disk motor
ex405
ex400

FIG. 43

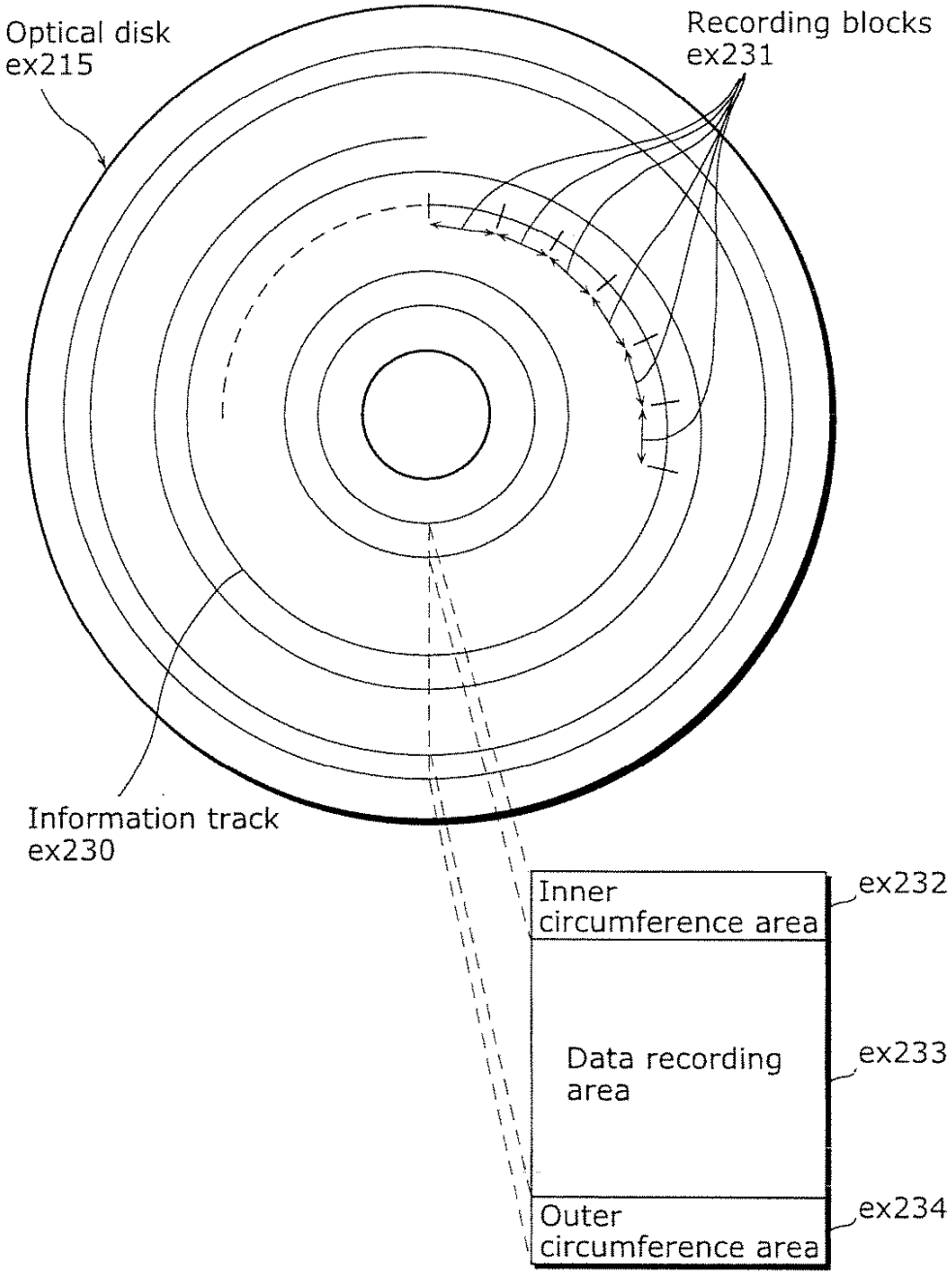

Optical disk
ex215
Recording blocks
ex231
Information track
ex230
Inner
circumference area
ex232
Data recording
area
ex233
Outer
circumference area
ex234

FIG. 44A

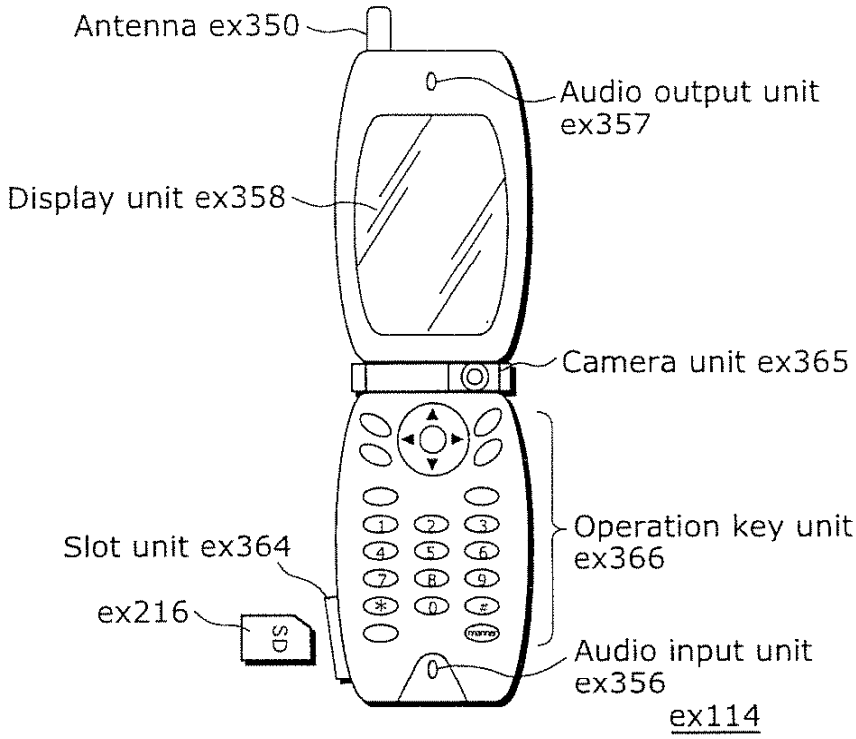


FIG. 44B

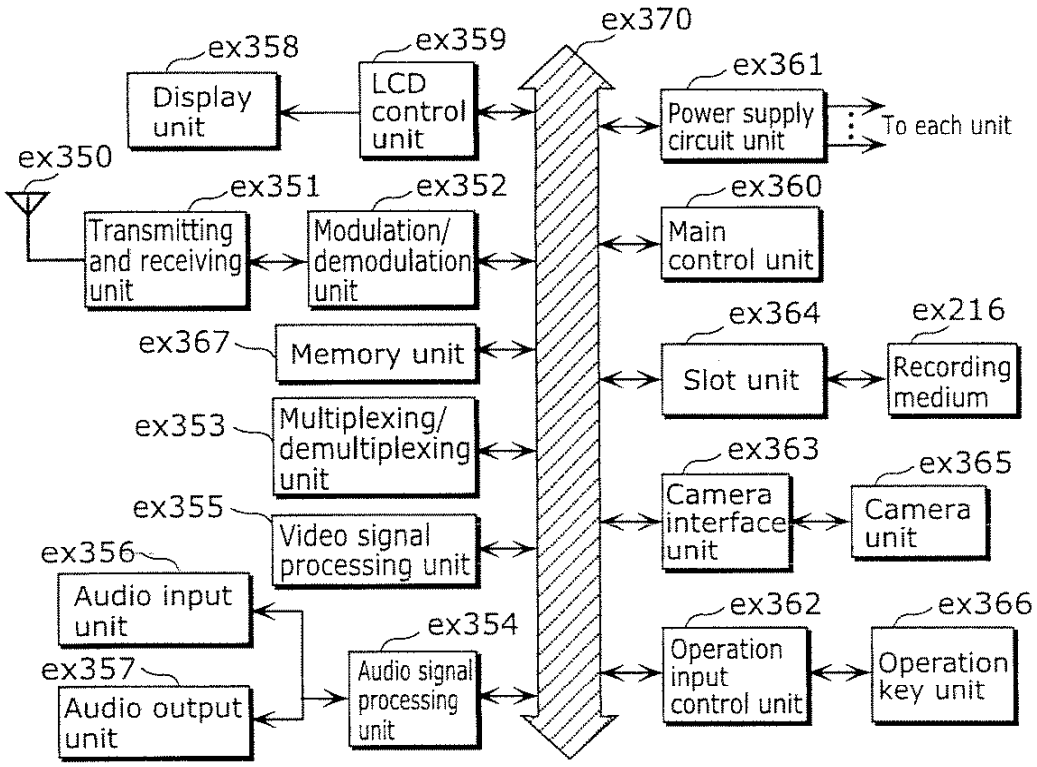


FIG. 45

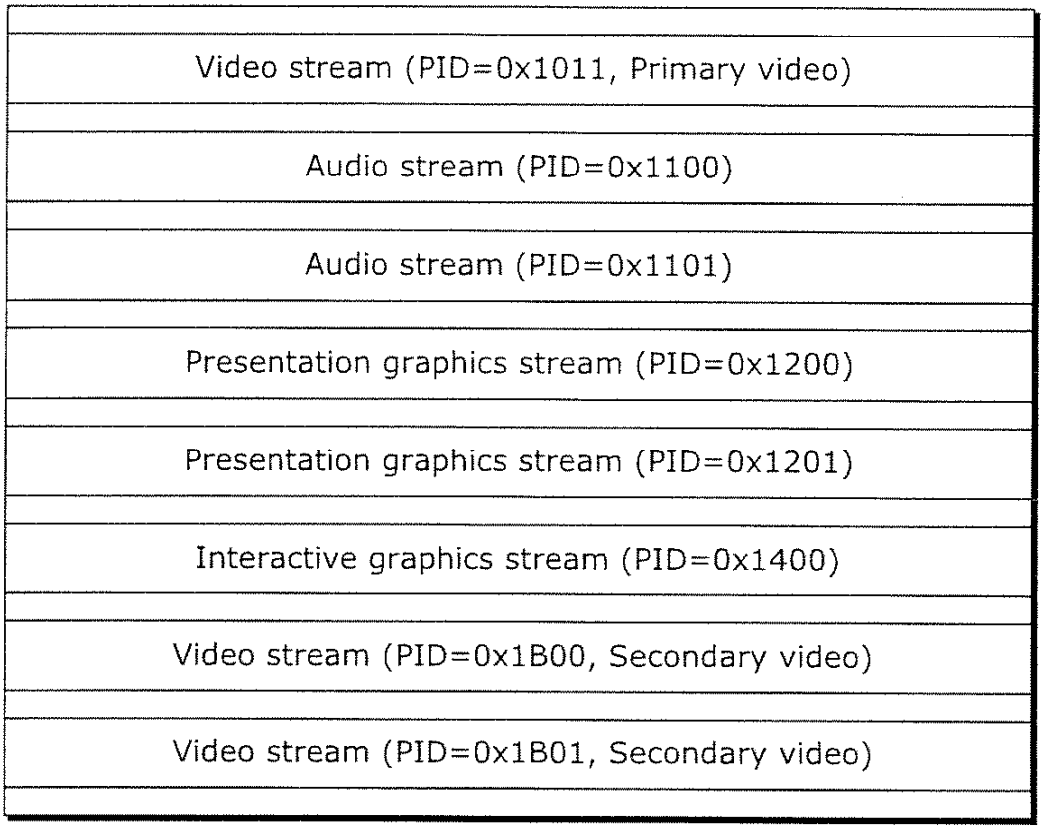

Video stream (PID=0x1011, Primary video)
Audio stream (PID=0x1100)
Audio stream (PID=0x1101)
Presentation graphics stream (PID=0x1200)
Presentation graphics stream (PID=0x1201)
Interactive graphics stream (PID=0x1400)
Video stream (PID=0x1B00, Secondary video)
Video stream (PID=0x1B01, Secondary video)

FIG. 46

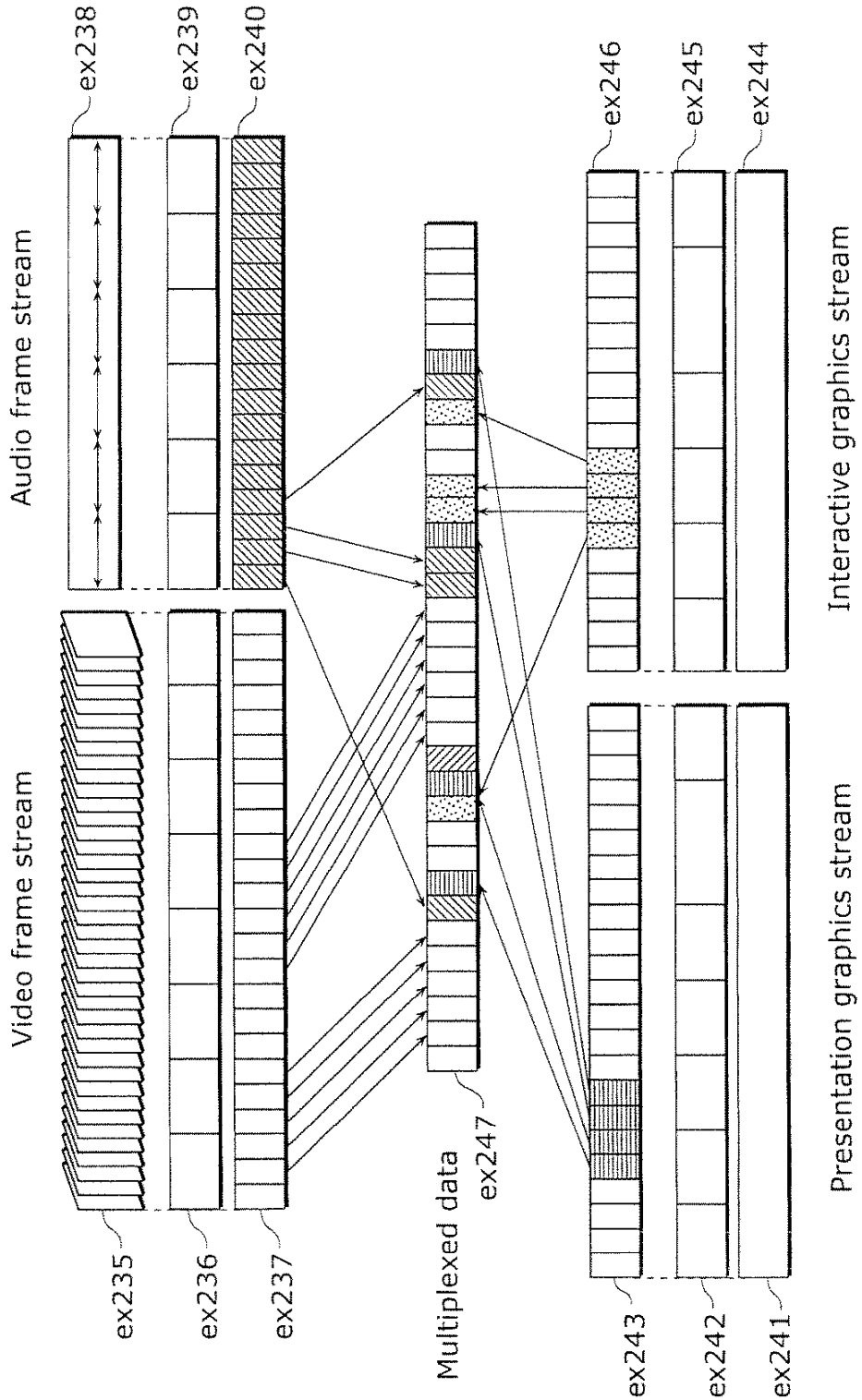

Video frame stream
Audio frame stream
Multiplexed data
Interactive graphics stream
Presentation graphics stream
ex235
ex236
ex237
ex238
ex239
ex240
ex241
ex242
ex243
ex244
ex245
ex246
ex247

FIG. 47

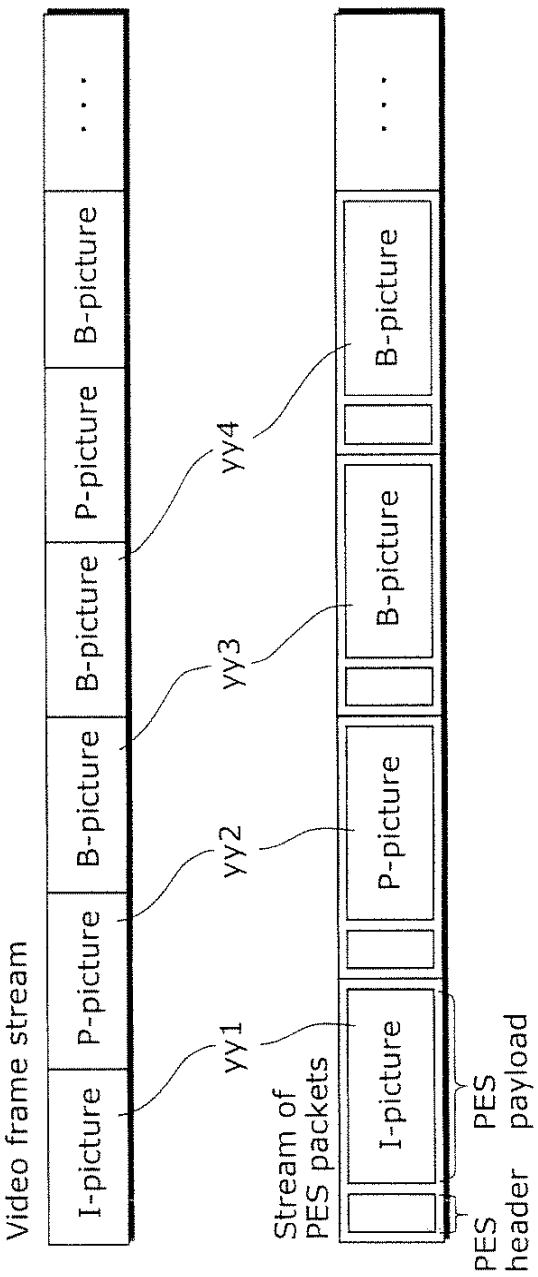

Video frame stream
I-picture
P-picture
B-picture
B-picture
P-picture
B-picture
. . .
yy1
yy2
yy3
yy4
Stream of PES packets
I-picture
P-picture
B-picture
B-picture
. . .
PES header
PES payload

FIG. 48

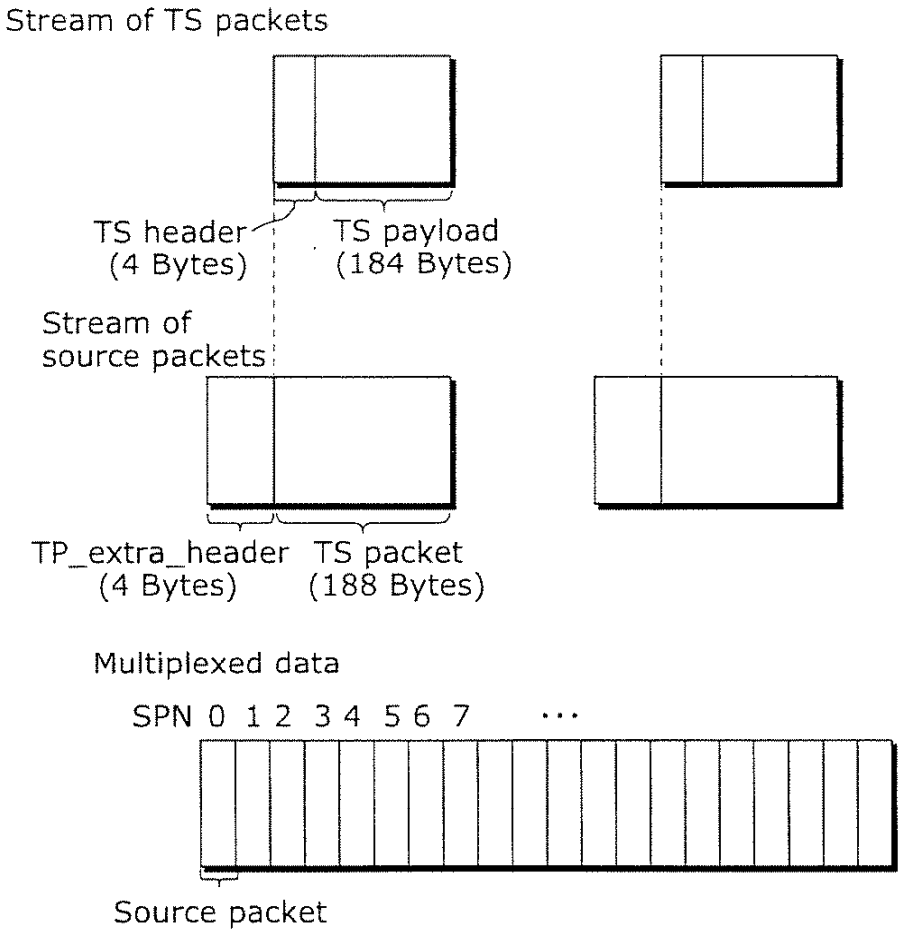

Stream of TS packets
TS header
(4 Bytes)
TS payload
(184 Bytes)
Stream of
source packets
TP_extra_header
(4 Bytes)
TS packet
(188 Bytes)
Multiplexed data
SPN 0 1 2 3 4 5 6 7 ...
Source packet

FIG. 49

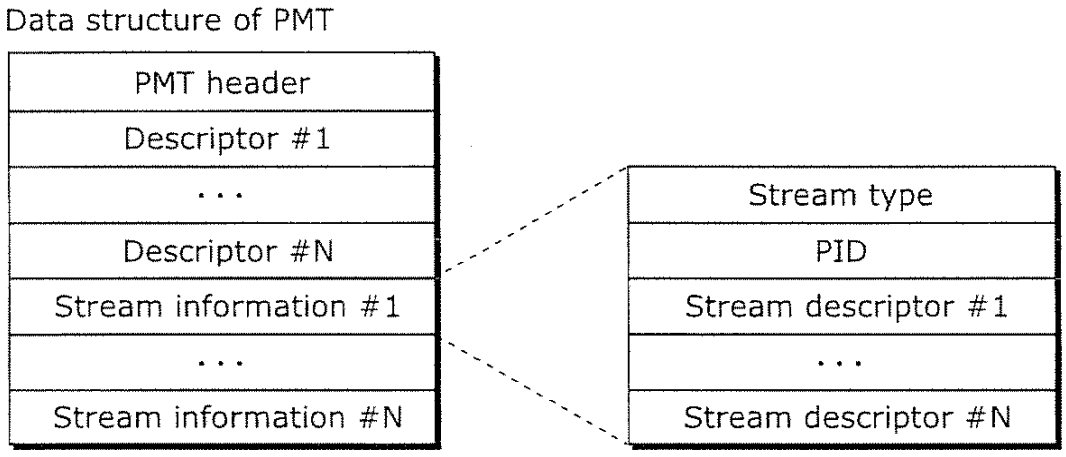

Data structure of PMT
PMT header
Descriptor #1
...
Descriptor #N
Stream information #1
...
Stream information #N
Stream type
PID
Stream descriptor #1
...
Stream descriptor #N

FIG. 50

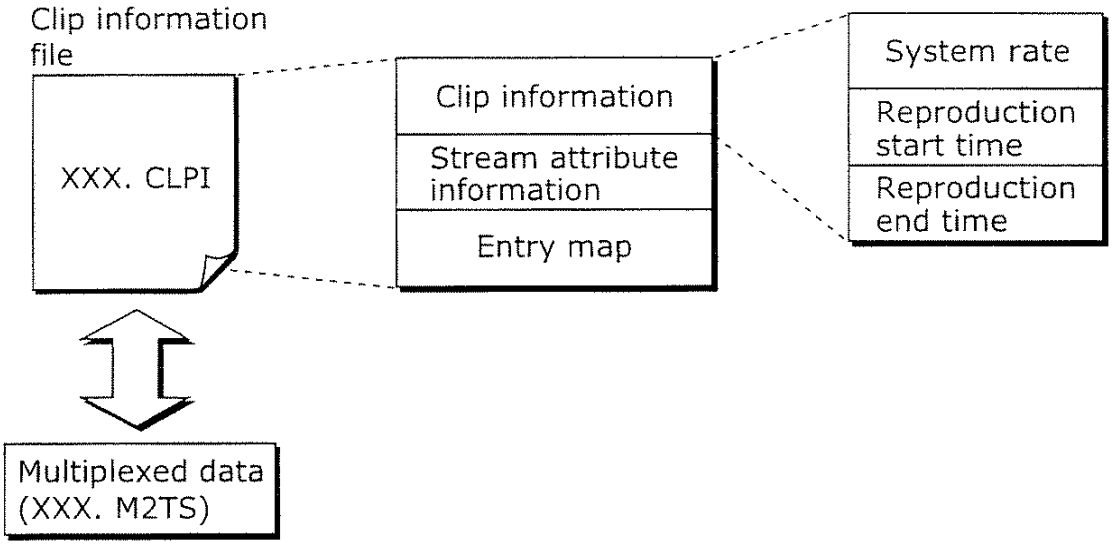

Clip information file
XXX. CLPI
Clip information
Stream attribute information
Entry map
System rate
Reproduction start time
Reproduction end time
Multiplexed data (XXX. M2TS)

FIG. 51

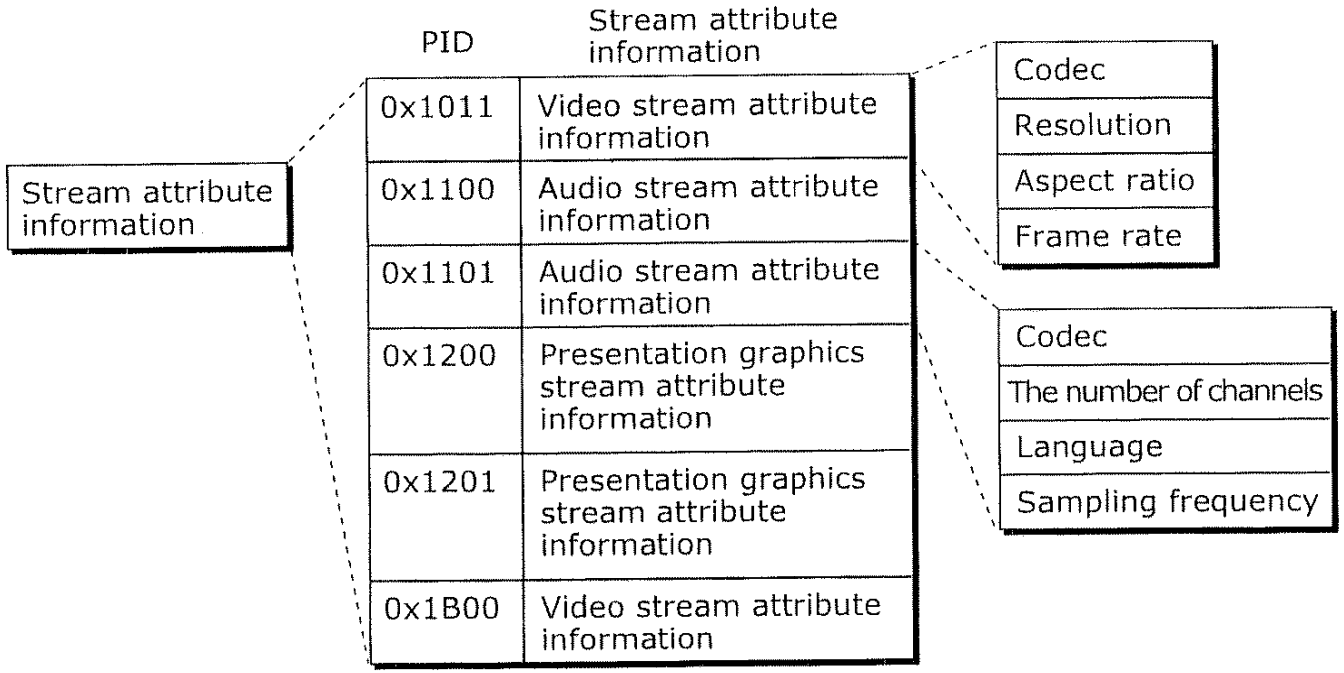

Stream attribute information
PID
Stream attribute information
0x1011
Video stream attribute information
0x1100
Audio stream attribute information
0x1101
Audio stream attribute information
0x1200
Presentation graphics stream attribute information
0x1201
Presentation graphics stream attribute information
0x1B00
Video stream attribute information
Codec
Resolution
Aspect ratio
Frame rate
Codec
The number of channels
Language
Sampling frequency

FIG. 52

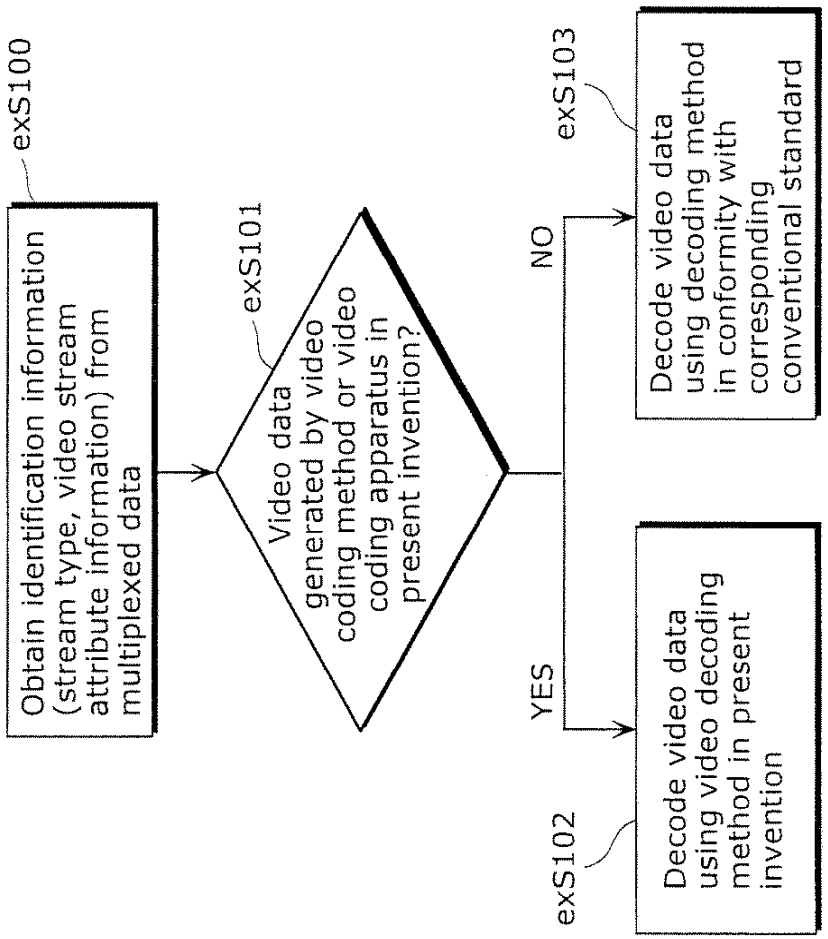

exS100
Obtain identification information (stream type, video stream attribute information) from multiplexed data
exS101
Video data generated by video coding method or video coding apparatus in present invention?
YES
NO
exS102
Decode video data using video decoding method in present invention
exS103
Decode video data using decoding method in conformity with corresponding conventional standard

FIG. 53

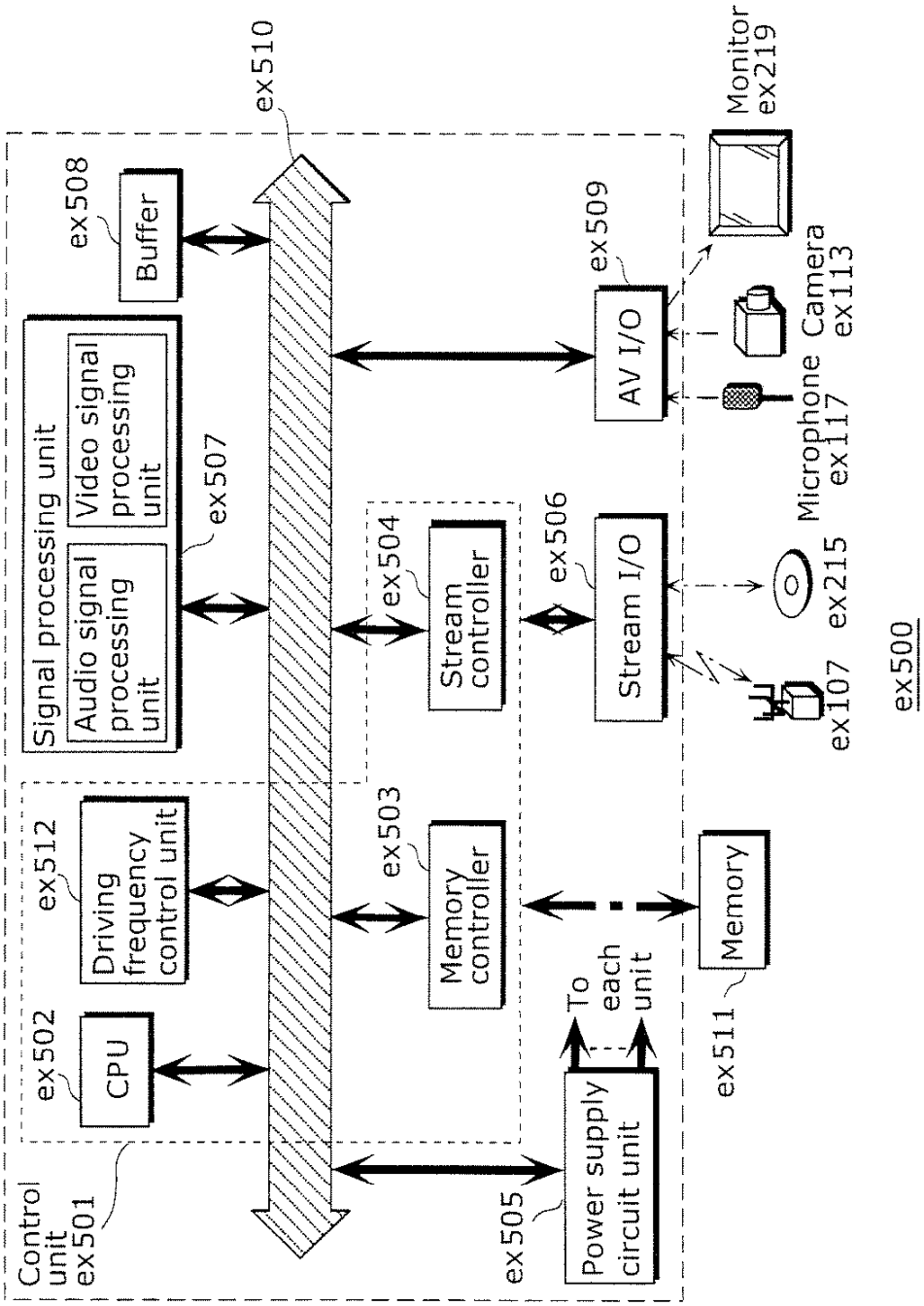
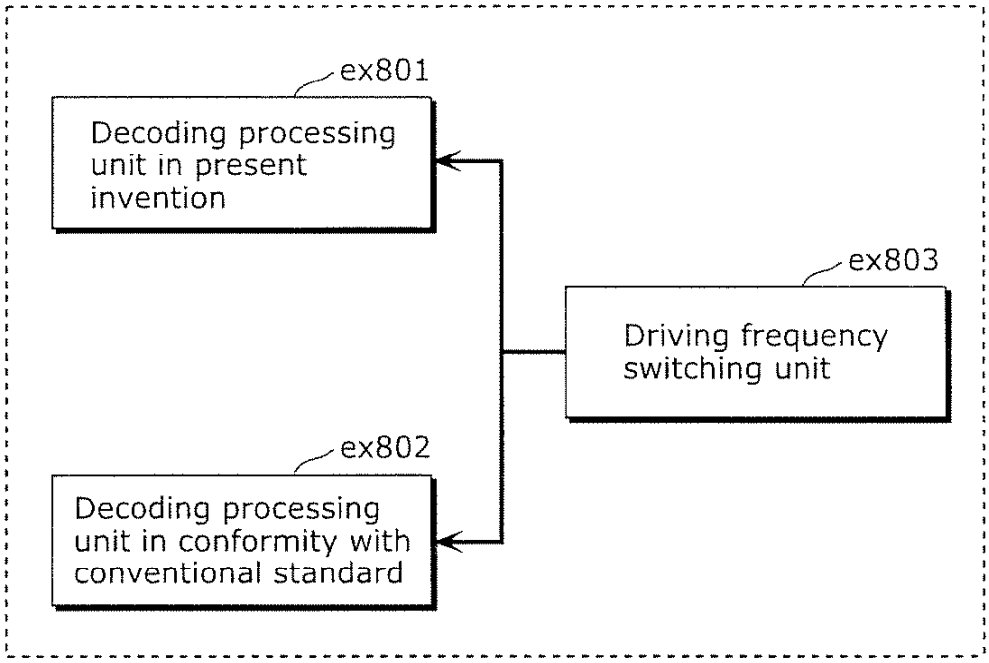

Control unit ex501
CPU ex502
Driving frequency control unit ex512
Signal processing unit
Audio signal processing unit
Video signal processing unit ex507
Buffer ex508
Memory controller ex503
Stream controller ex504
Power supply circuit unit ex505
Stream I/O ex506
AV I/O ex509
ex510
Memory ex511
To each unit
Monitor ex219
Camera ex113
Microphone ex117
ex215
ex107
ex500

FIG. 54


ex801
Decoding processing unit in present invention
ex803
Driving frequency switching unit
ex802
Decoding processing unit in conformity with conventional standard

ex800

FIG. 55

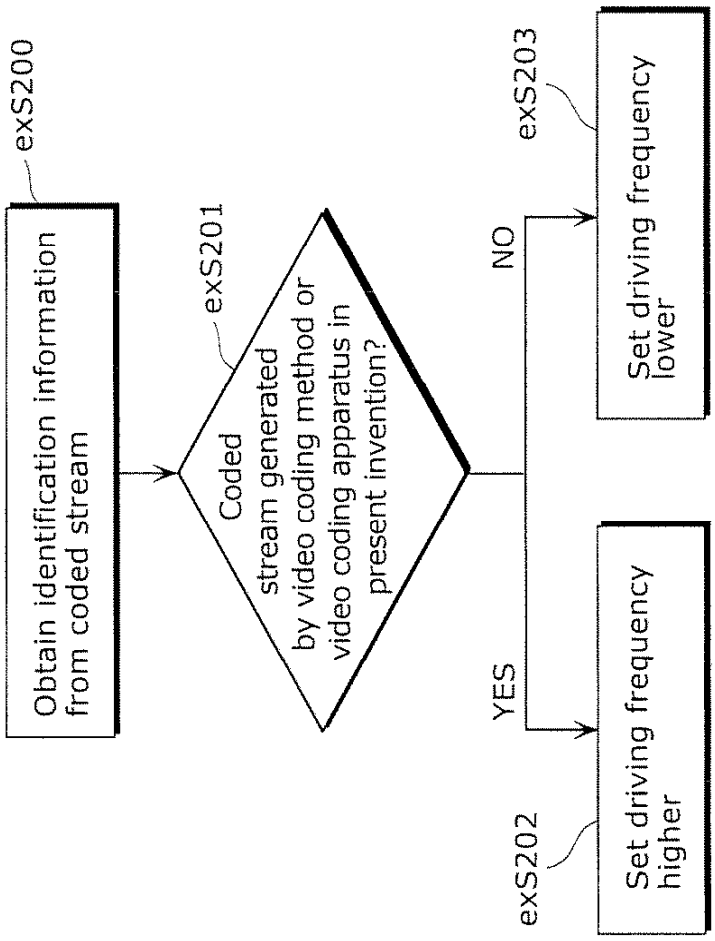

exS200
Obtain identification information from coded stream
exS201
Coded stream generated by video coding method or video coding apparatus in present invention?
YES
NO
exS202
Set driving frequency higher
exS203
Set driving frequency lower

FIG. 56

Corresponding standard	Driving frequency
MPEG-4 AVC	500 MHz
MPEG-2	350 MHz
⋮	⋮

FIG. 57A

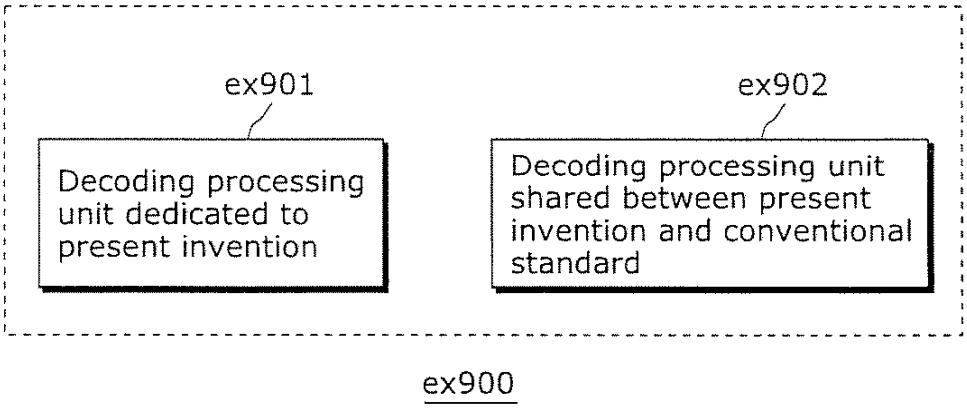


FIG. 57B

