FIG. 1

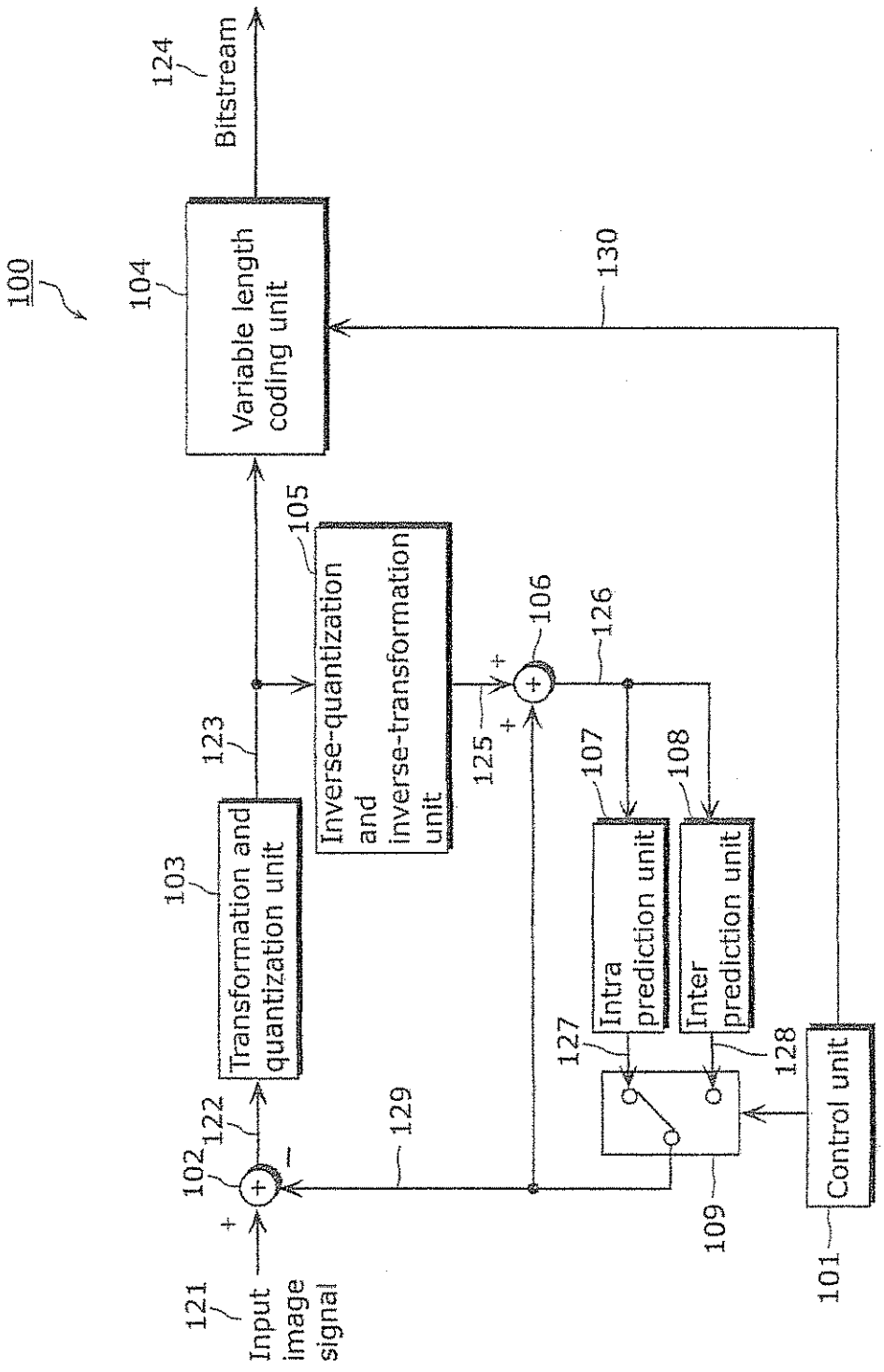
100
104
Variable length coding unit
124
Bitstream
130
105
Inverse-quantization and inverse-transformation unit
106
126
125
123
103
Transformation and quantization unit
107
Intra prediction unit
108
Inter prediction unit
127
128
122
102
129
109
Control unit
101
121
Input image signal

FIG. 2

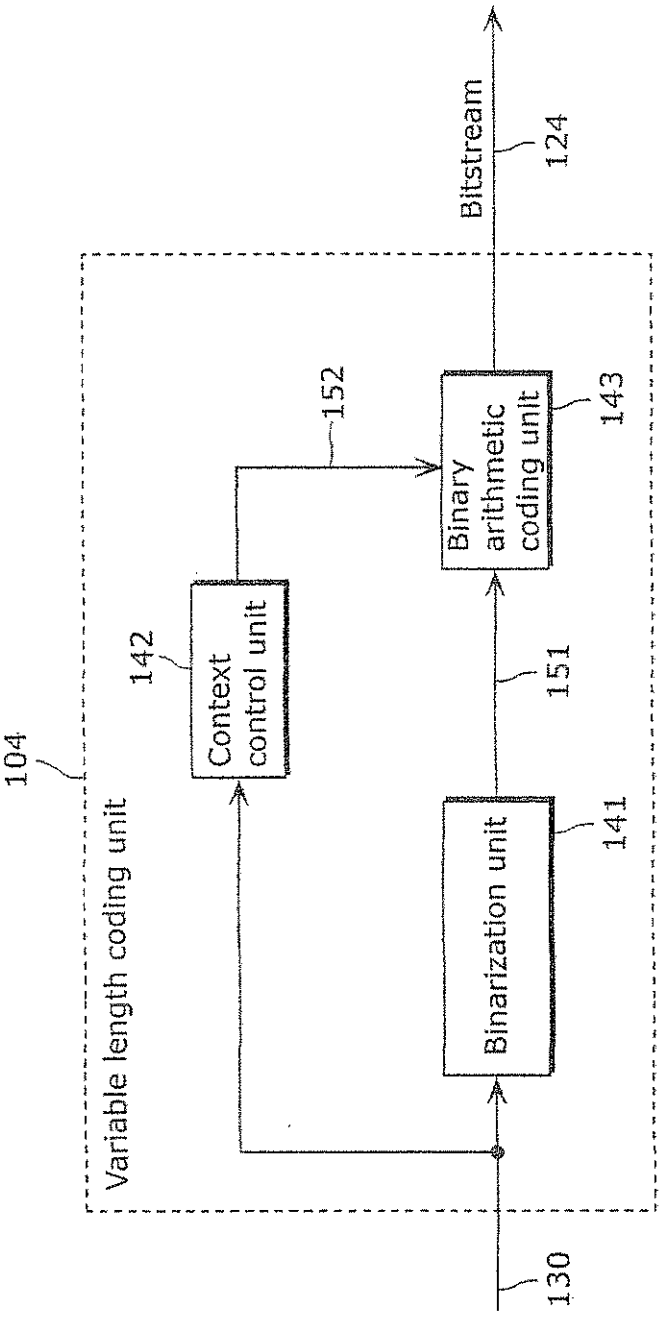
Variable length coding unit
104
Context control unit
142
Binarization unit
141
Binary arithmetic coding unit
143
130
151
152
Bitstream
124

FIG. 3

	c2 Signal type	c3 Binarization scheme	c4 Context model for first element	c5 Left block condition L condL	c6 Upper block condition A condA
s1	split_coding_unit_flag	Fixed length	0, 1, or 2 (condL && availableL) + (condA && availableA)	cuDepth[xL][yL] > cuDepth[xP][yP]	cuDepth[xA][yA] > cuDepth[xP][yP]
s2	skip_flag	Fixed length	0, 1, 2	skip_flag[xL][yL]	skip_flag[xA][yA]
s3	merge_flag	Fixed length	0, 1, 2	merge_flag[xL][yL]	merge_flag[xA][yA]
s4	intra_chroma_pred_mode	Variable length	0, 1, 2	IntraPredMode[xL][yL] == 4	IntraPredMode[xA][yA] == 4
s5	inter_pred_flag	Fixed length	0, 1, 2	inter_pred_flag[xL][yL]	inter_pred_flag[xA][yA]
s6	mvd_lc mvd_l0 mvd_l1	Variable length	0, 1, 2	mvd_lc[xL][yL] > 16 mvd_l0[xL][yL] > 16 mvd_l1[xL][yL] > 16	mvd_lc[xA][yA] > 16 mvd_l0[xA][yA] > 16 mvd_l1[xA][yA] > 16
s7	ref_idx_lc ref_idx_l0 ref_idx_l1	Variable length	0, 1, 2, or 3 (condL && availableL) + (condA && availableA) << 1	ref_idx_lc[xL][yL] > 0 ref_idx_l0[xL][yL] > 0 ref_idx_l1[xL][yL] > 0	ref_idx_lc[xA][yA] > 0 ref_idx_l0[xA][yA] > 0 ref_idx_l1[xA][yA] > 0
s8	Cbf_cb(MODE_INTRA)	Fixed length	0, 1, 2, 3	cbf_cb[xL][yL]	cbf_cb[xA][yA]
	Cbf_cr(MODE_INTRA)			cbf_cr[xL][yL]	cbf_cr[xA][yA]
s9	Cbf_luma	Fixed length	0, 1, 2, 3	cbf_luma[xL][yL]	cbf_luma[xA][yA]
s10	no_residual_data_flag	Fixed length	0, 1, 2, 3	no_residual_data_flag[xL][yL]	no_residual_data_flag[xA][yA]
NA	alf_cu_flag	1bin	0, 1, 2	alf_cu_flag[xL][yL]	alf_cu_flag[xA][yA]

FIG. 4

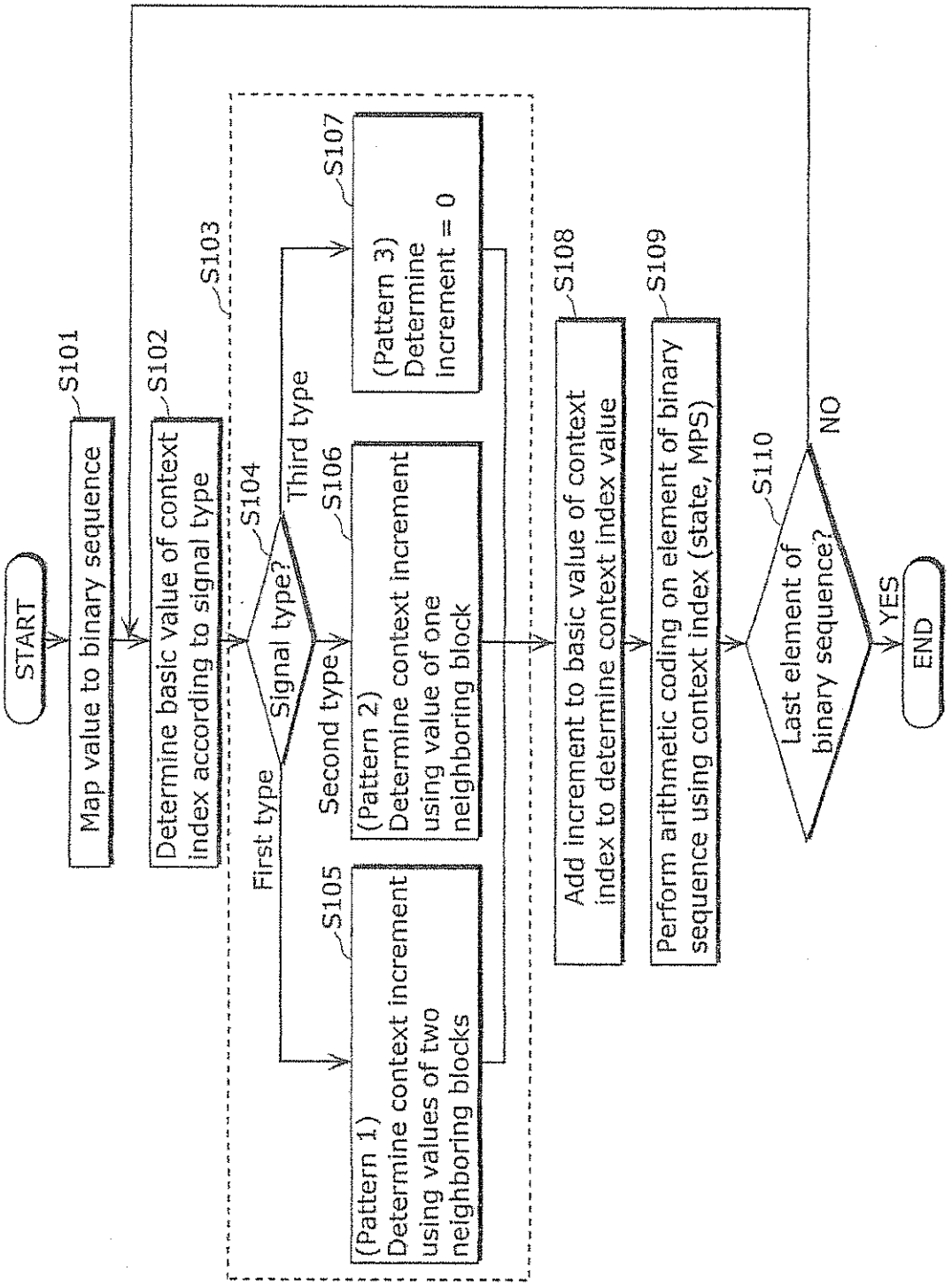
START
S101
Map value to binary sequence
S102
Determine basic value of context index according to signal type
S103
S104
Signal type?
First type
Second type
Third type
S105
(Pattern 1)
Determine context increment using values of two neighboring blocks
S106
(Pattern 2)
Determine context increment using value of one neighboring block
S107
(Pattern 3)
Determine increment = 0
S108
Add increment to basic value of context index to determine context index value
S109
Perform arithmetic coding on element of binary sequence using context index (state, MPS)
S110
Last element of binary sequence?
NO
YES
END

FIG. 5

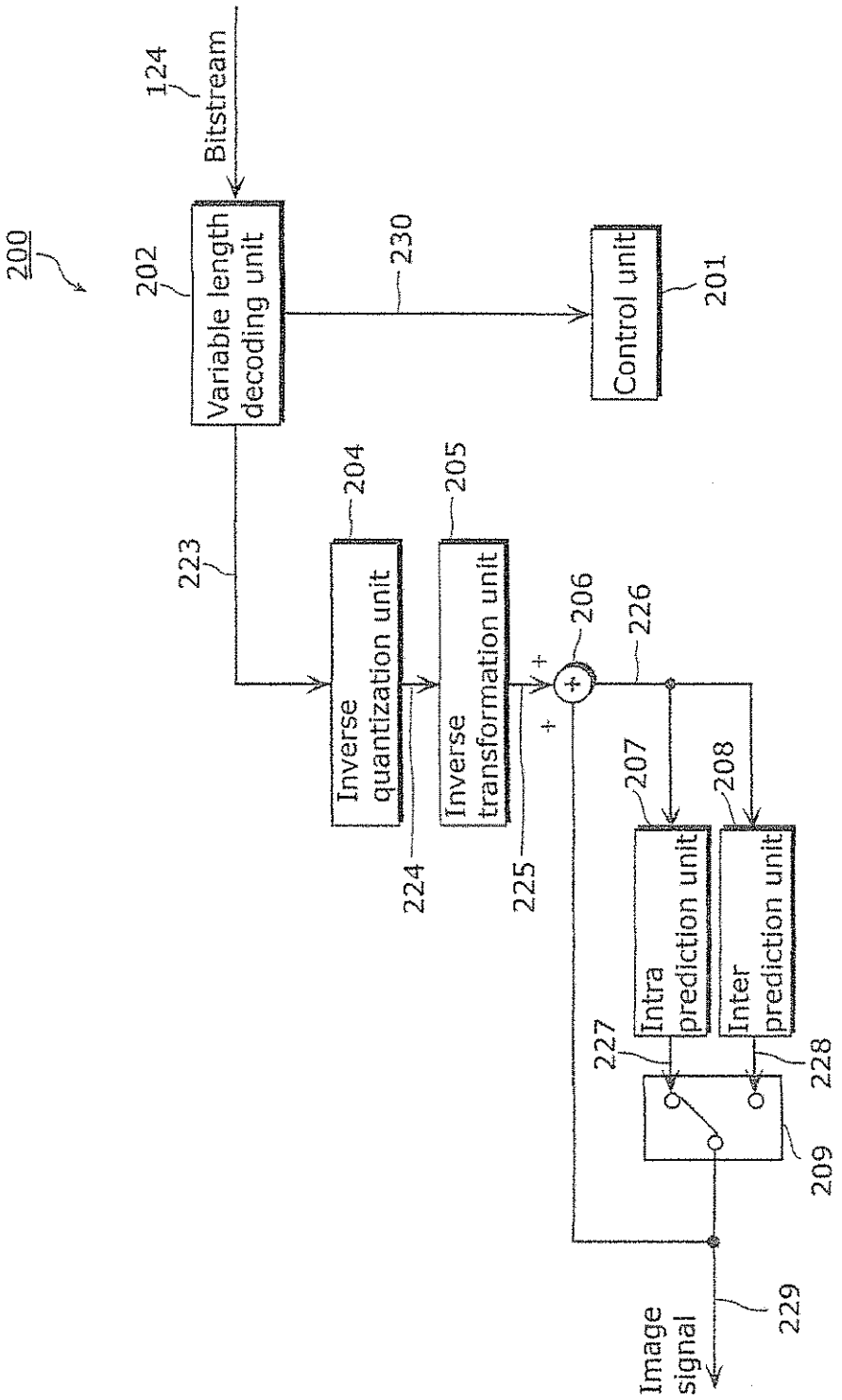
200
124
Bitstream
202
Variable length decoding unit
230
Control unit
201
223
204
Inverse quantization unit
205
Inverse transformation unit
206
226
224
225
207
Intra prediction unit
208
Inter prediction unit
227
228
209
229
Image signal

FIG. 6

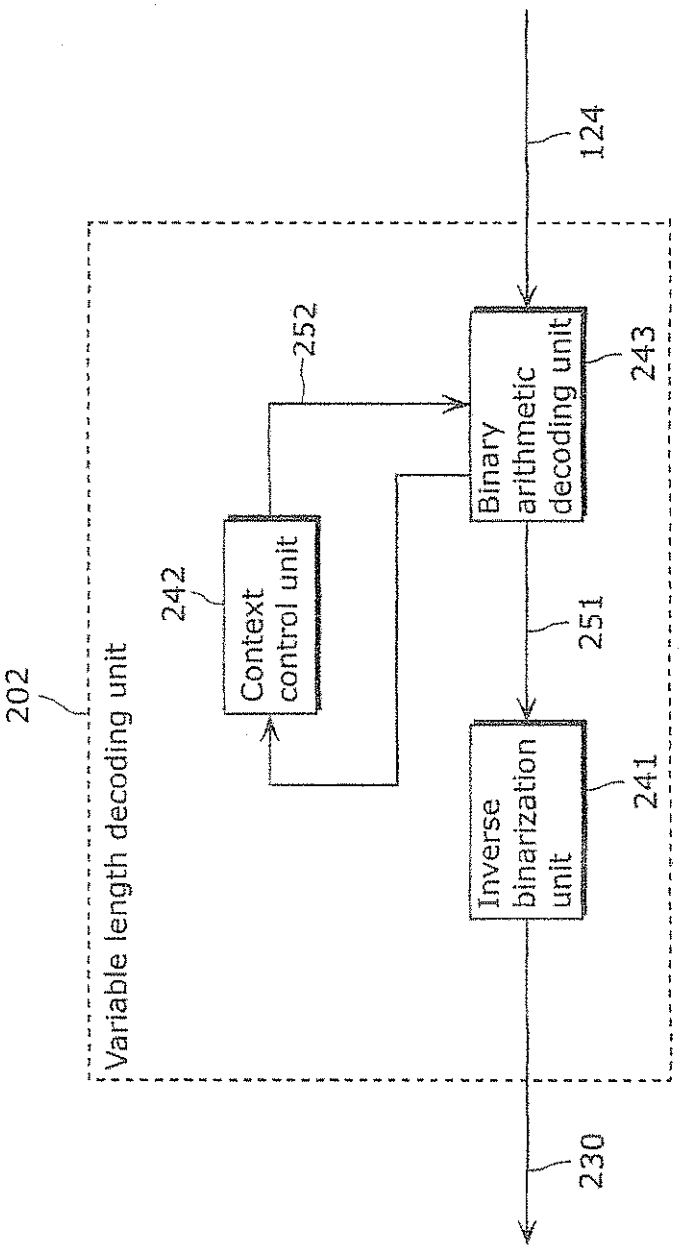
202
Variable length decoding unit
242
Context control unit
252
Binary arithmetic decoding unit
243
124
251
Inverse binarization unit
241
230

FIG. 7

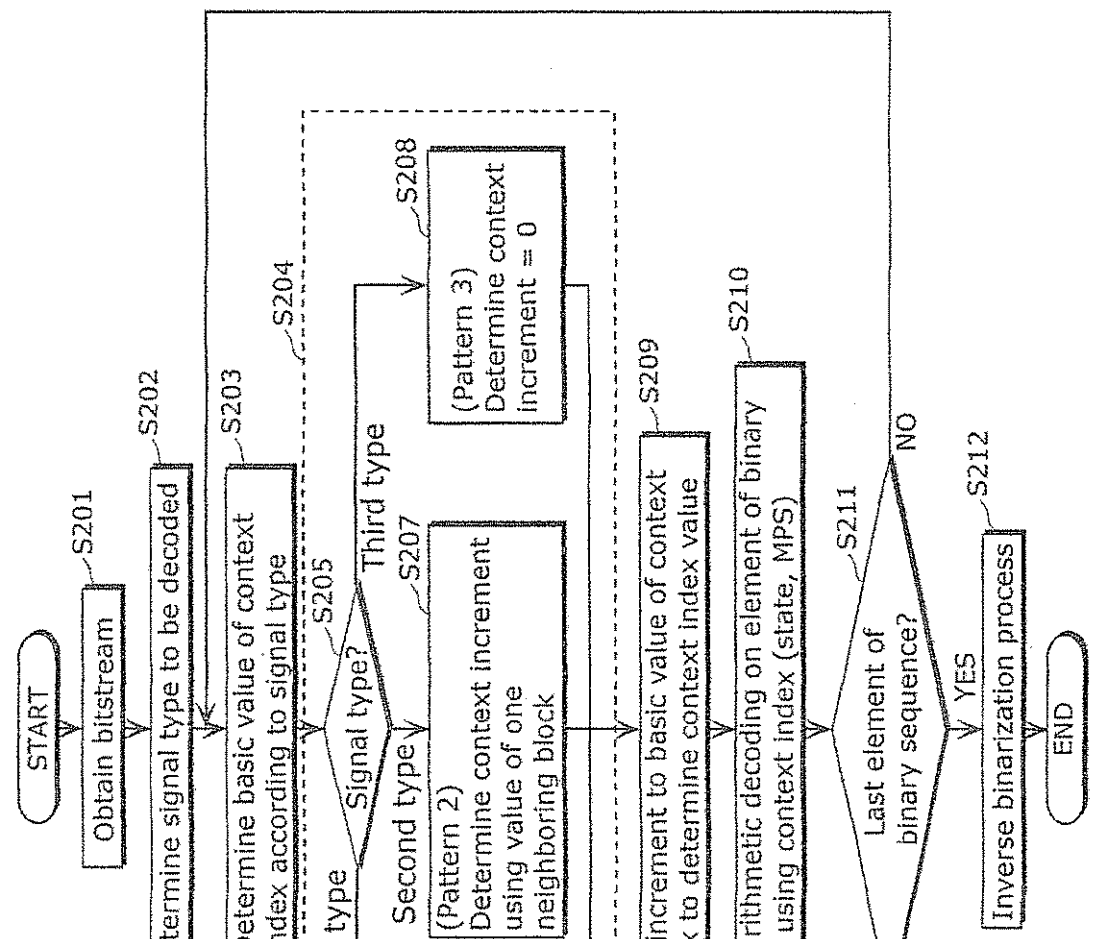
START
Obtain bitstream
S201
Determine signal type to be decoded
S202
Determine basic value of context index according to signal type
S203
S204
S205
Signal type?
First type
Second type
Third type
S206
(Pattern 1)
Determine context increment using values of two neighboring blocks
S207
(Pattern 2)
Determine context increment using value of one neighboring block
S208
(Pattern 3)
Determine context increment = 0
S209
Add increment to basic value of context index to determine context index value
S210
Perform arithmetic decoding on element of binary sequence using context index (state, MPS)
S211
Last element of binary sequence?
NO
YES
S212
Inverse binarization process
END

FIG. 8

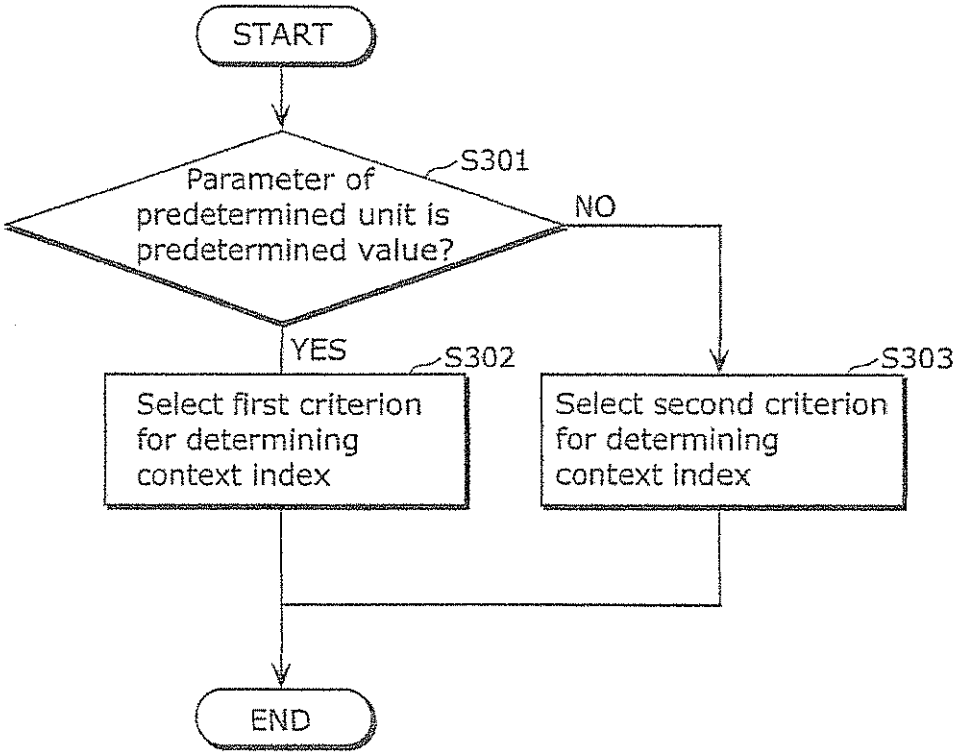
START
S301
Parameter of predetermined unit is predetermined value?
NO
YES
S302
Select first criterion for determining context index
S303
Select second criterion for determining context index
END

FIG. 9

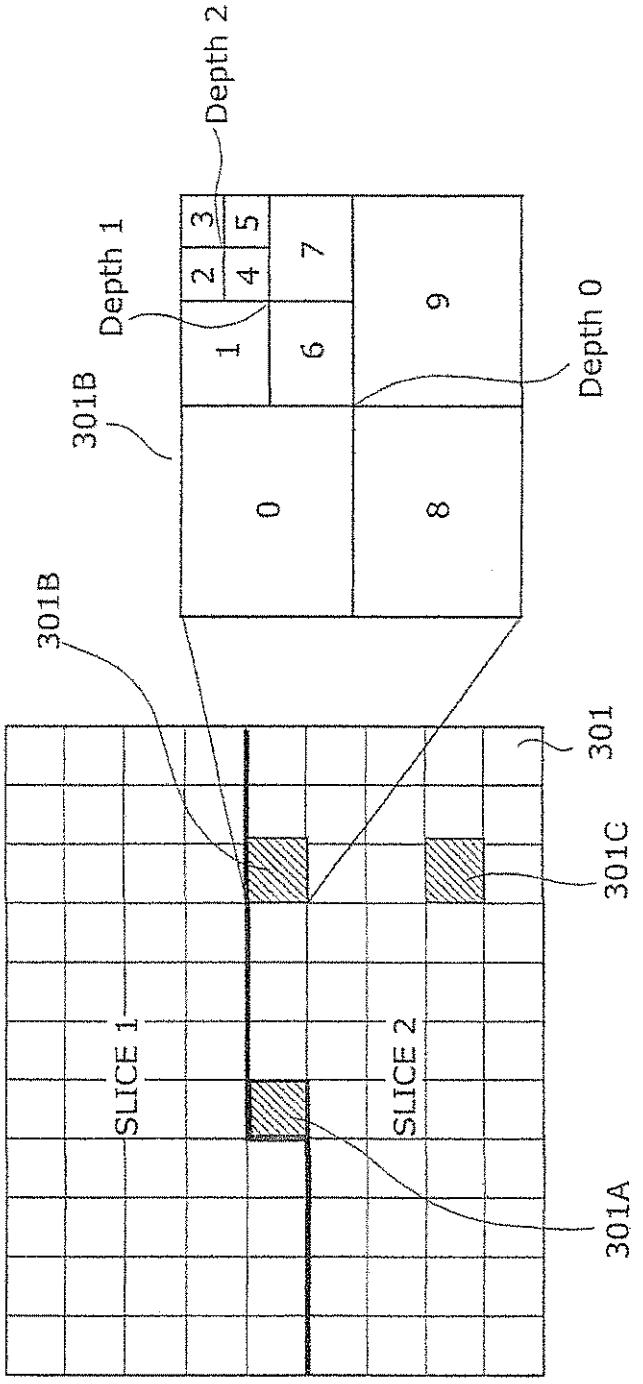
Depth 2
Depth 1
Depth 0
301B
301B
0
1
2
3
4
5
6
7
8
9
301
301C
301A
SLICE 1
SLICE 2

FIG. 10

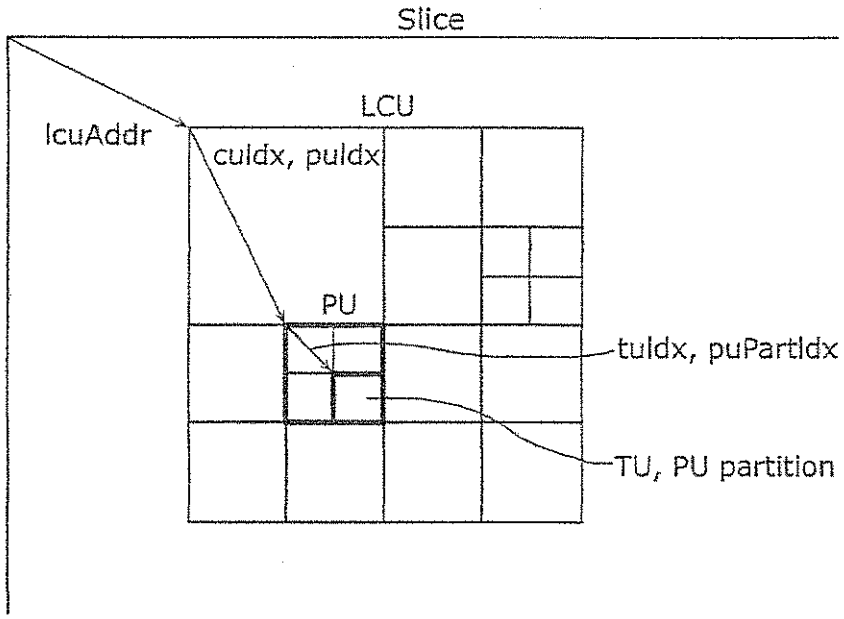
Slice
LCU
lcuAddr
cuIdx, puIdx
PU
tuIdx, puPartIdx
TU, PU partition

FIG. 11

Verification pattern	Signal type (syntax element)	Binarization scheme	Context index increment of binary sequence element (binIdx = 0)	c5 Left block condition L condL	c6 Upper block condition A condA
Pattern 1	split_coding_unit_flag	Fixed length	0, 1, or 2 (condL && availableL) + (condA && availableA)	cuDepth[xL][yL] > cuDepth[xP][yP]	cuDepth[xA][yA] > cuDepth[xP][yP]
Pattern 2			0 or 1 (condL && availableL)	cuDepth[xL][yL] > cuDepth[xP][yP]	Fixed (not held in memory)
Pattern 3			Fixed to 0	Fixed	Fixed (not held in memory)

FIG. 12A

Pattern 2: using only left block (split_coding_unit_flag)

	Intra			Random access			Low delay			Low delay (P)		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.02	-0.07	0.04	0.09	0.56	-0.12						
Class B	0.02	0.04	0.03	0.06	0.08	0.18	0.15	0.33	0.28	0.16	0.17	-0.13
Class C	0.03	0.09	0.06	0.18	0.16	0.20	0.16	0.22	0.08	0.25	0.23	0.69
Class D	0.05	-0.05	0.06	0.32	0.39	0.18	0.06	0.35	0.87	0.12	-0.21	0.85
Class E	0.13	-0.02	0.01				0.36	0.79	-0.89	0.38	0.90	-0.72
All	0.05	0.01	0.03	0.17	0.18	0.18	0.17	0.40	0.16	0.21	0.22	0.21
Enc Time [%]	100 %			99 %			99 %			99 %		
Dec Time [%]	101 %			103 %			102 %			103 %		

FIG. 12B

Pattern 3: using neither left block nor upper block (split_coding_unit_flag)

	Intra			Random access			Low delay			Low delay (P)		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.05	-0.05	0.01	0.15	0.56	-0.27						
Class B	0.11	-0.01	0.04	0.23	0.16	0.49	0.32	0.20	0.53	0.36	0.27	0.54
Class C	0.04	0.09	0.13	0.18	0.46	0.23	0.32	0.20	0.35	0.22	0.05	0.52
Class D	0.07	-0.05	0.02	0.29	-0.13	-0.05	0.25	0.57	0.65	0.26	0.41	0.46
Class E	0.20	-0.13	-0.33				0.65	0.44	-0.65	0.61	1.03	-0.06
All	0.10	-0.01	-0.01	0.24	0.17	0.22	0.36	0.34	0.29	0.35	0.39	0.41
Enc Time [%]	100 %			99 %			99 %			99 %		
Dec Time [%]	101 %			103 %			103 %			103 %		

FIG. 13

Verification number	Signal type (syntax element)	Binarization scheme	Context index increment of binary sequence element (binIdx = 0)	c5 Left block condition L condL	c6 Upper block condition A condA
Pattern 1	skip_flag	Fixed length	0, 1, 2	skip_flag[xL][yL]	skip_flag[xA][yA]
Pattern 2			0 or 1	skip_flag[xL][yL]	Fixed
Pattern 3			Fixed to 0	Fixed	Fixed

FIG. 14A

Pattern 2: using only left block (skip_flag)

	Intra			Random access			Low delay			Low delay (P)		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.00	0.00	0.00	0.05	-0.23	-0.01						
Class B	0.00	0.00	0.00	0.11	0.03	0.02	0.12	0.21	0.23	0.07	-0.03	-0.04
Class C	0.00	0.00	0.00	0.06	0.16	0.10	0.08	0.24	0.11	0.11	0.19	0.44
Class D	0.00	0.00	0.00	0.11	-0.11	-0.10	0.09	0.39	0.07	0.26	-0.09	0.37
Class E	0.00	0.00	0.00				0.03	0.13	-0.33	0.28	0.32	0.16
All	0.00	0.00	0.00	0.09	-0.02	-0.02	0.08	0.25	0.05	0.17	0.07	0.22
Enc Time [%]	1.00			0.99			0.99			0.99		
Dec Time [%]	101 %			103 %			102 %			103 %		

FIG. 14B

Pattern 3: using neither left block nor upper block (skip_flag)

	Intra			Random access			Low delay			Low delay (P)		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.00	0.00	0.00	0.11	0.11	-0.04						
Class B	0.00	0.00	0.00	0.21	0.06	0.14	0.20	0.45	0.15	0.17	0.32	0.36
Class C	0.00	0.00	0.00	0.04	0.20	-0.17	-0.01	0.06	0.12	0.15	0.03	0.18
Class D	0.00	0.00	0.00	0.15	-0.31	-0.08	0.26	0.20	0.26	0.16	-0.32	-0.18
Class E	0.00	0.00	0.00				0.22	-0.05	-0.20	0.31	0.31	-0.07
All	0.00	0.00	0.00	0.14	-0.00	-0.02	0.17	0.20	0.11	0.19	0.09	0.10
Enc Time [%]	1.00			0.99			0.99			0.99		
Dec Time [%]	101 %			103 %			102 %			103 %		

FIG. 15

Verification number	Signal type (syntax element)	Binarization scheme	Context index increment of binary sequence element (binIdx = 0)	c5 Left block condition L condL	c6 Upper block condition A condA
Pattern 1	merge_flag	Fixed length	0, 1, 2	merge_flag[xL][yL]	merge_flag[xA][yA]
Pattern 2			0 or 1	merge_flag[xL][yL]	Fixed
Pattern 3			Fixed to 0	Fixed	Fixed

FIG. 16A

Pattern 2: using only left block (merge_flag)

	Intra			Random access			Low delay			Low delay (P)		
merge_flag	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.00	0.00	0.00	0.00	-0.00	0.09						
Class B	0.00	0.00	0.00	-0.03	-0.08	0.11	-0.06	0.22	0.16	-0.03	0.07	0.12
Class C	0.00	0.00	0.00	-0.04	0.19	0.06	-0.09	0.06	0.15	0.05	0.09	0.23
Class D	0.00	0.00	0.00	-0.01	-0.47	-0.26	-0.01	-0.02	0.04	-0.00	-0.20	0.33
Class E	0.00	0.00	0.00				0.07	0.04	-0.40	0.06	0.05	-0.51
All	0.00	0.00	0.00	-0.02	-0.11	-0.03	-0.03	0.09	0.02	0.01	0.00	0.08
Enc Time [%]		100 %			99 %			99 %			99 %	
Dec Time [%]		101 %			103 %			102 %			103 %	

FIG. 16B

Pattern 3: using neither left block nor upper block (merge_flag)

	Intra			Random access			Low delay			Low delay (P)		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.00	0.00	0.00	0.03	0.16	0.06						
Class B	0.00	0.00	0.00	0.02	0.06	0.27	-0.03	0.19	0.05	-0.04	0.37	0.34
Class C	0.00	0.00	0.00	-0.01	0.19	0.11	-0.03	0.21	0.10	0.06	-0.03	0.36
Class D	0.00	0.00	0.00	0.02	-0.04	-0.33	0.02	-0.09	0.01	-0.02	-0.57	-0.09
Class E	0.00	0.00	0.00				-0.02	0.18	-0.41	0.05	0.29	-0.34
All	0.00	0.00	0.00	0.01	0.05	0.04	-0.02	0.12	-0.03	0.01	0.02	0.11
Enc Time [%]		100 %			99 %			99 %			99 %	
Dec Time [%]		101 %			103 %			103 %			103 %	

FIG. 17

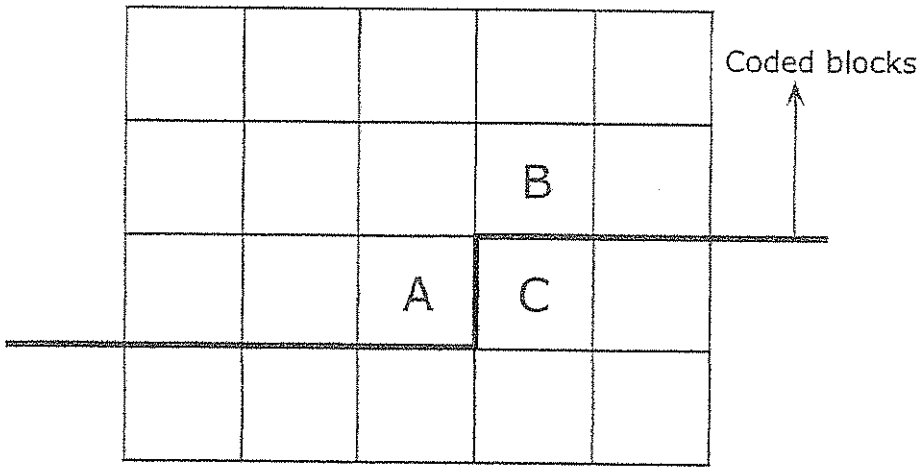

FIG. 18

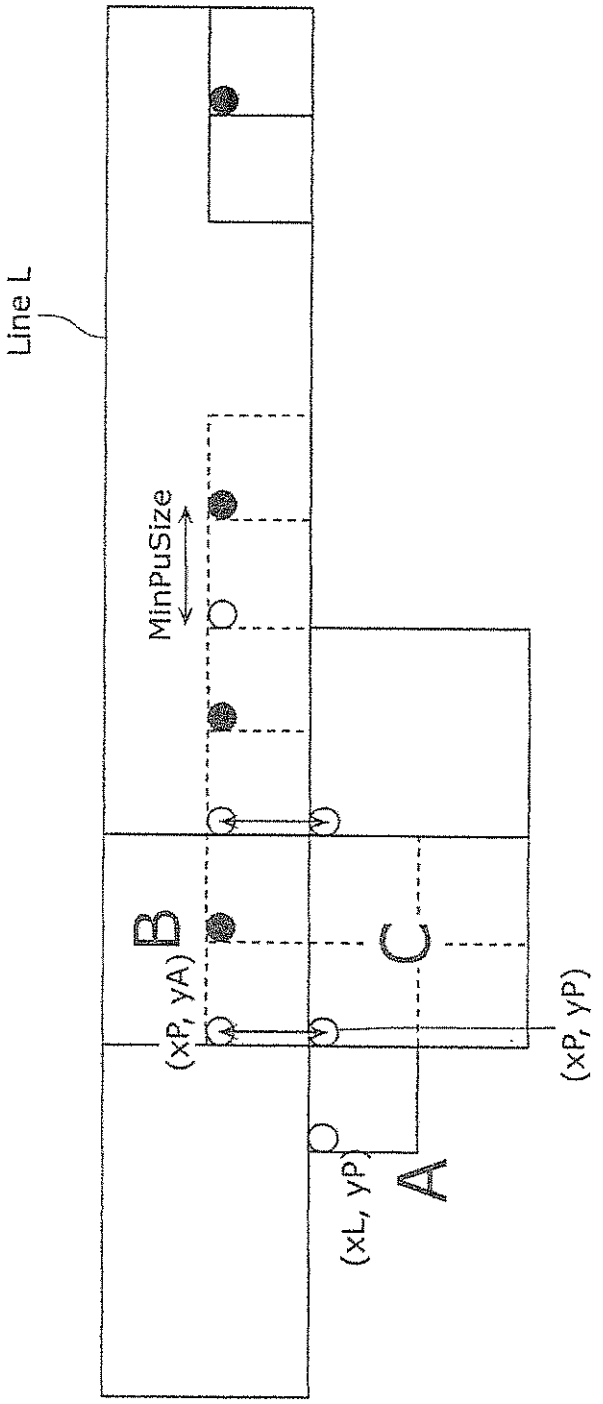

FIG. 19

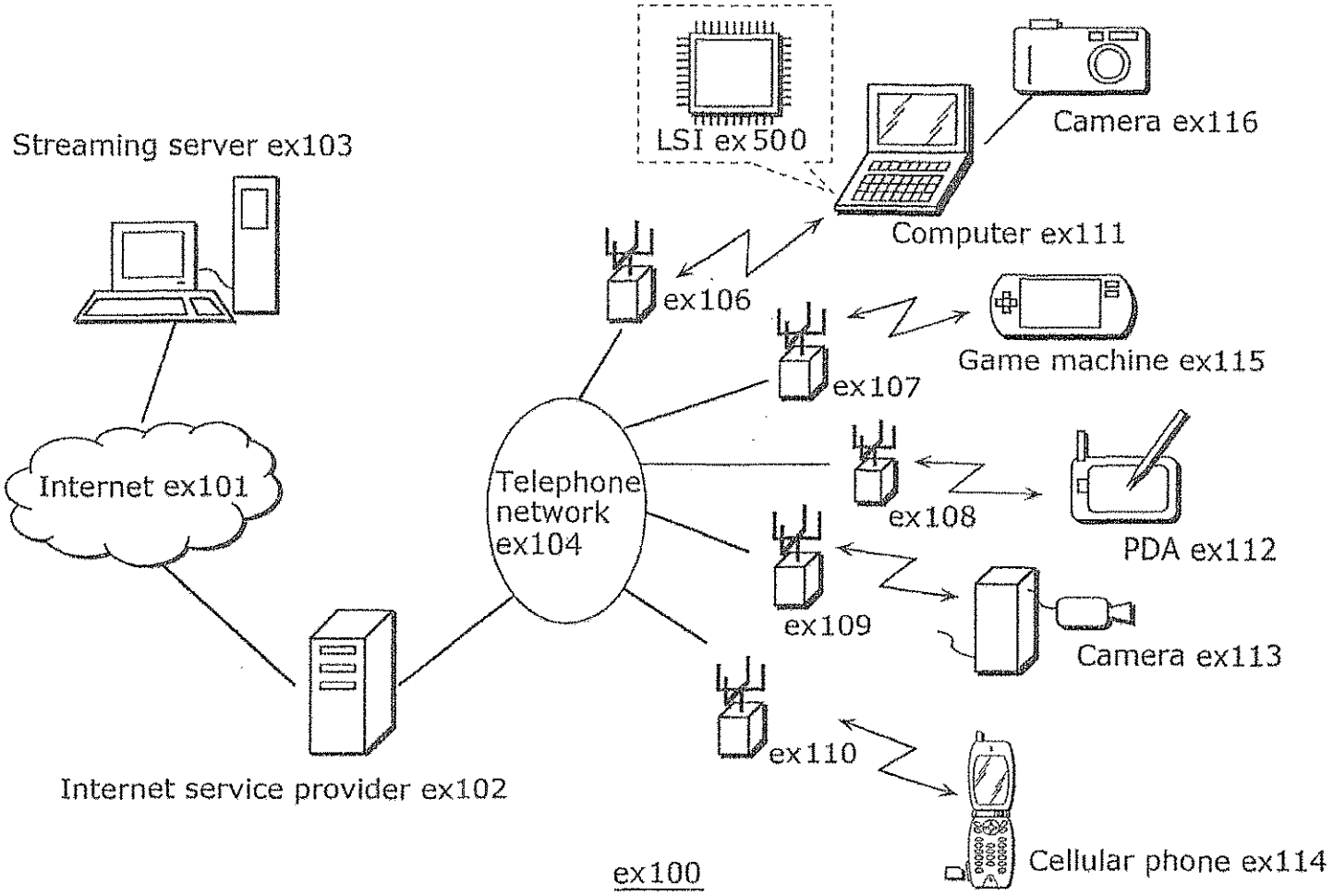
LSI ex500
Camera ex116
Streaming server ex103
Computer ex111
ex106
ex107
Game machine ex115
Internet ex101
Telephone network ex104
ex108
PDA ex112
ex109
Camera ex113
ex110
Internet service provider ex102
Cellular phone ex114
ex100

FIG. 20

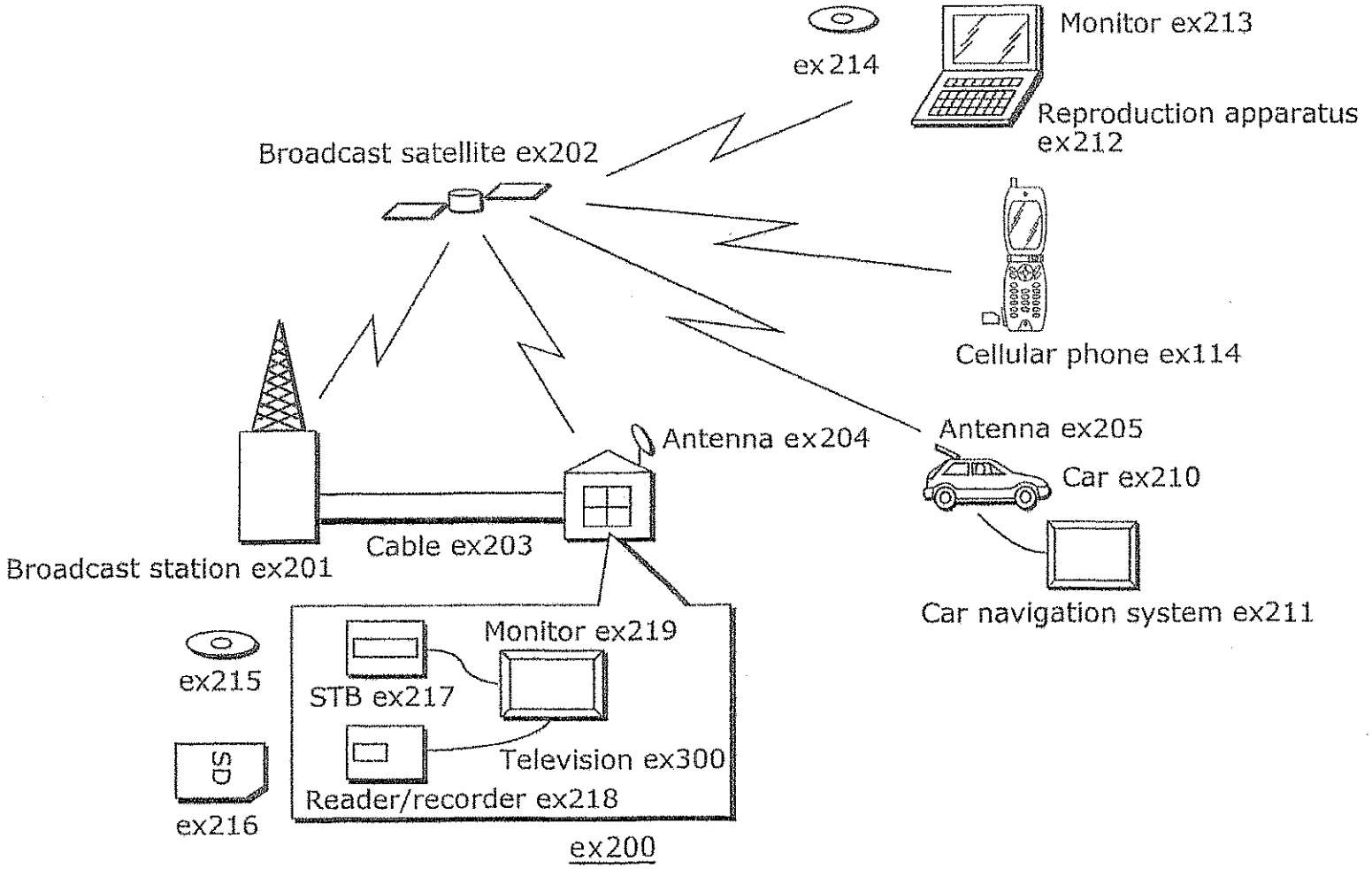
ex214
Monitor ex213
Reproduction apparatus ex212
Broadcast satellite ex202
Cellular phone ex114
Antenna ex204
Antenna ex205
Car ex210
Broadcast station ex201
Cable ex203
Car navigation system ex211
Monitor ex219
ex215
STB ex217
Television ex300
SD
Reader/recorder ex218
ex216
ex200

FIG. 21

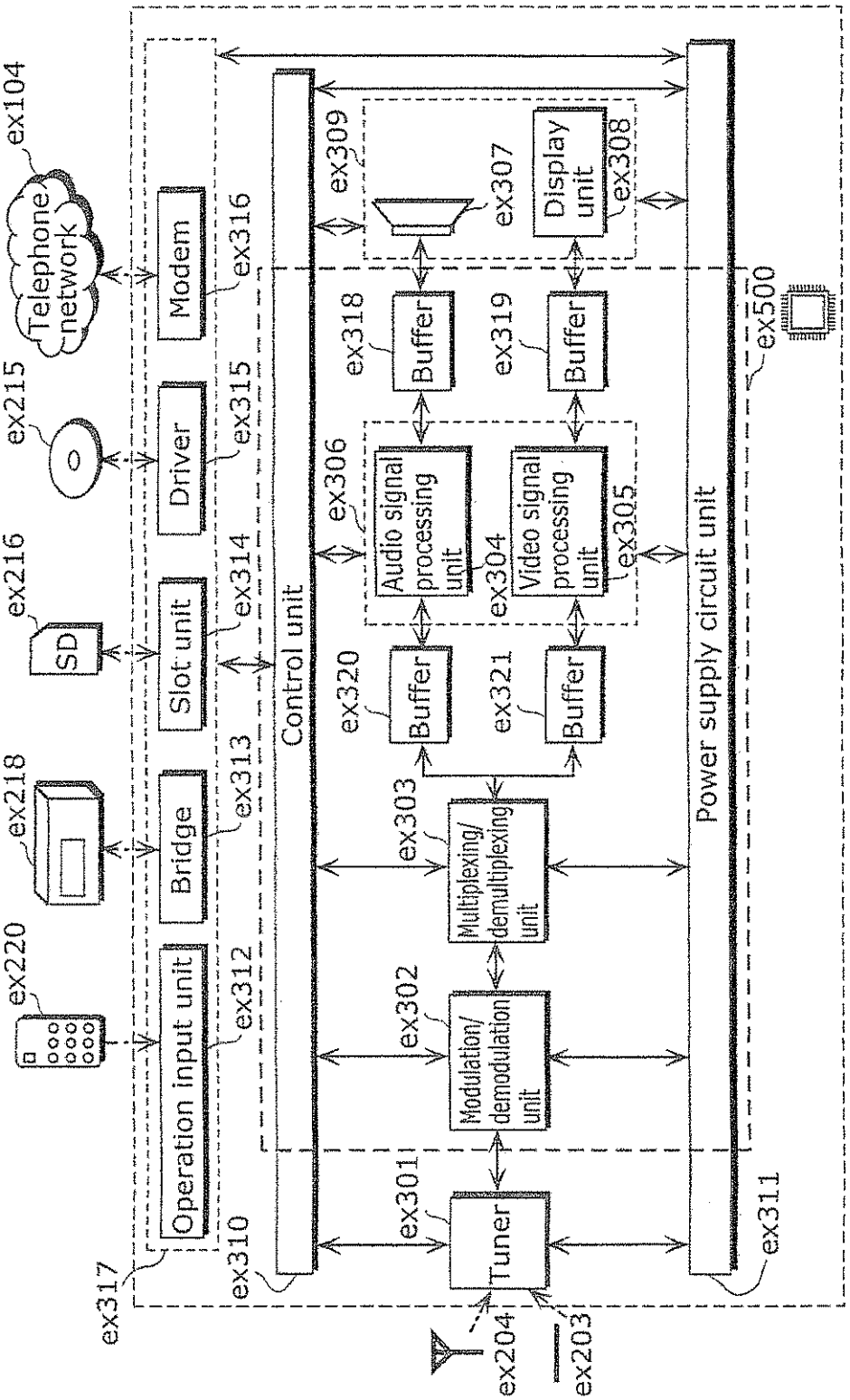
ex104
Telephone network
ex215
ex216
SD
ex218
ex220
ex317
ex310
Operation input unit
ex312
Bridge
ex313
Slot unit
ex314
Driver
ex315
Modem
ex316
Control unit
ex306
Audio signal processing unit
ex304
Video signal processing unit
ex305
ex318
Buffer
ex319
Buffer
ex320
Buffer
ex321
Buffer
ex307
ex309
Display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

FIG. 22

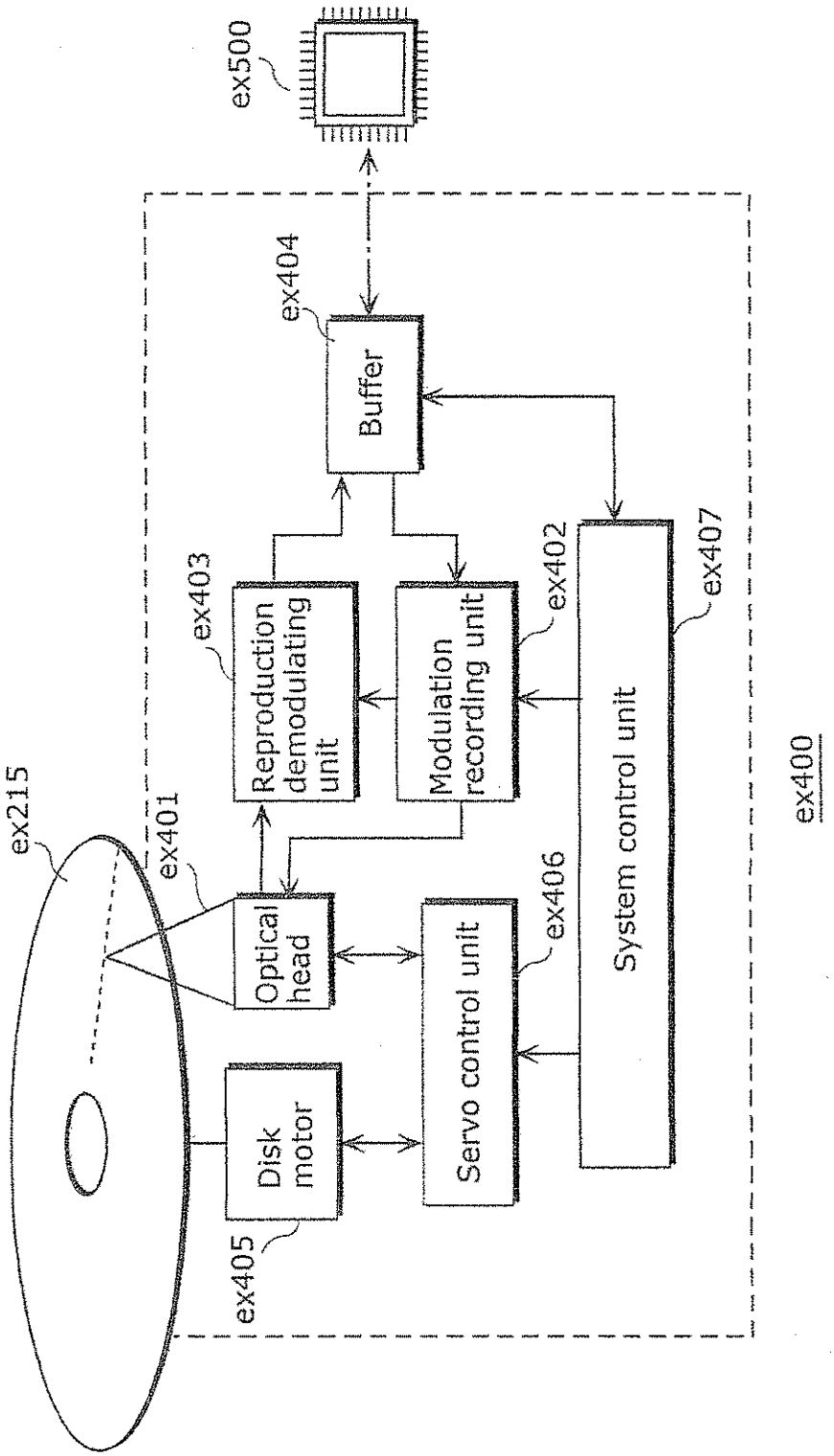
ex500
ex404
Buffer
ex403
Reproduction demodulating unit
Modulation recording unit
ex402
ex407
System control unit
ex215
ex401
Optical head
ex406
Servo control unit
Disk motor
ex405
ex400

FIG. 23

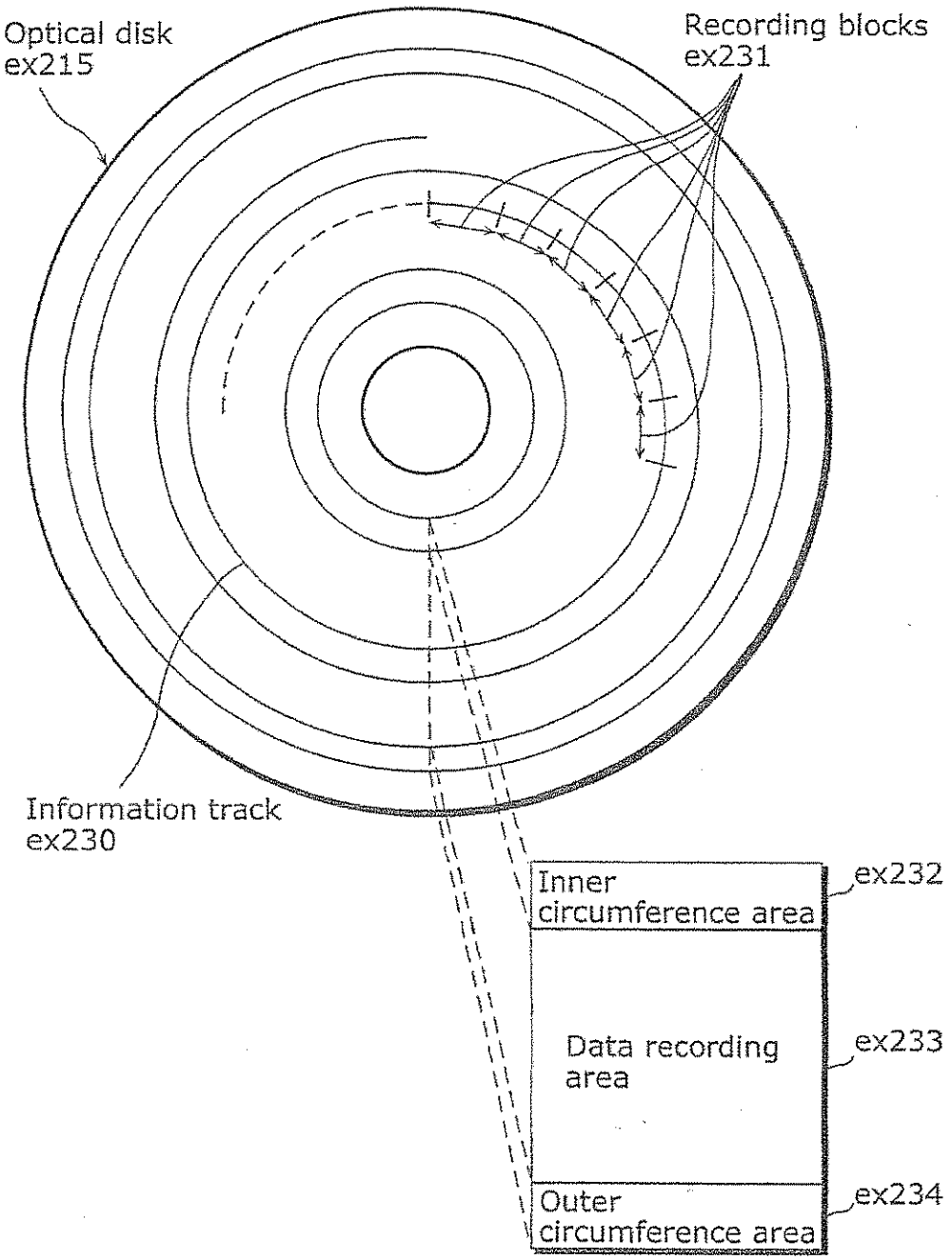
Optical disk
ex215
Recording blocks
ex231
Information track
ex230
Inner
circumference area
ex232
Data recording
area
ex233
Outer
circumference area
ex234

FIG. 24A

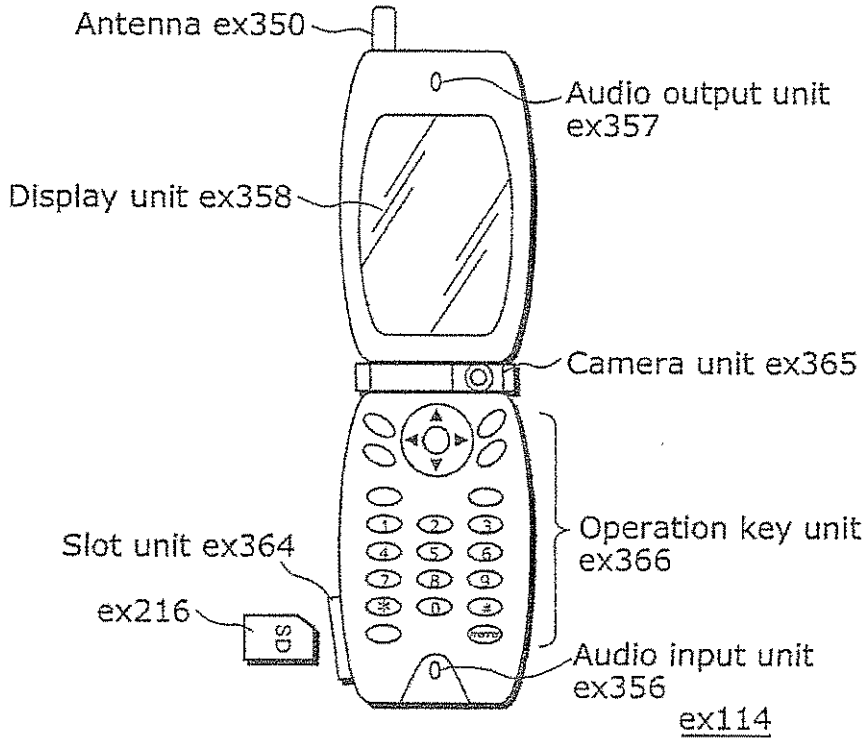

FIG. 24B

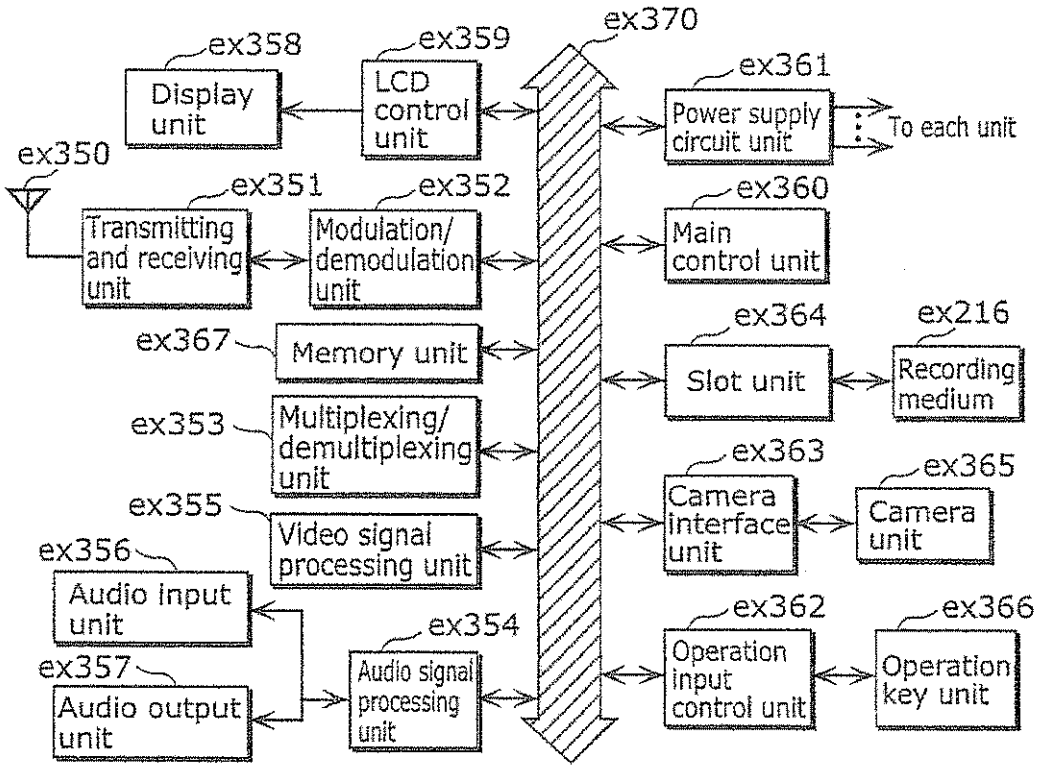

FIG. 25

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. 26

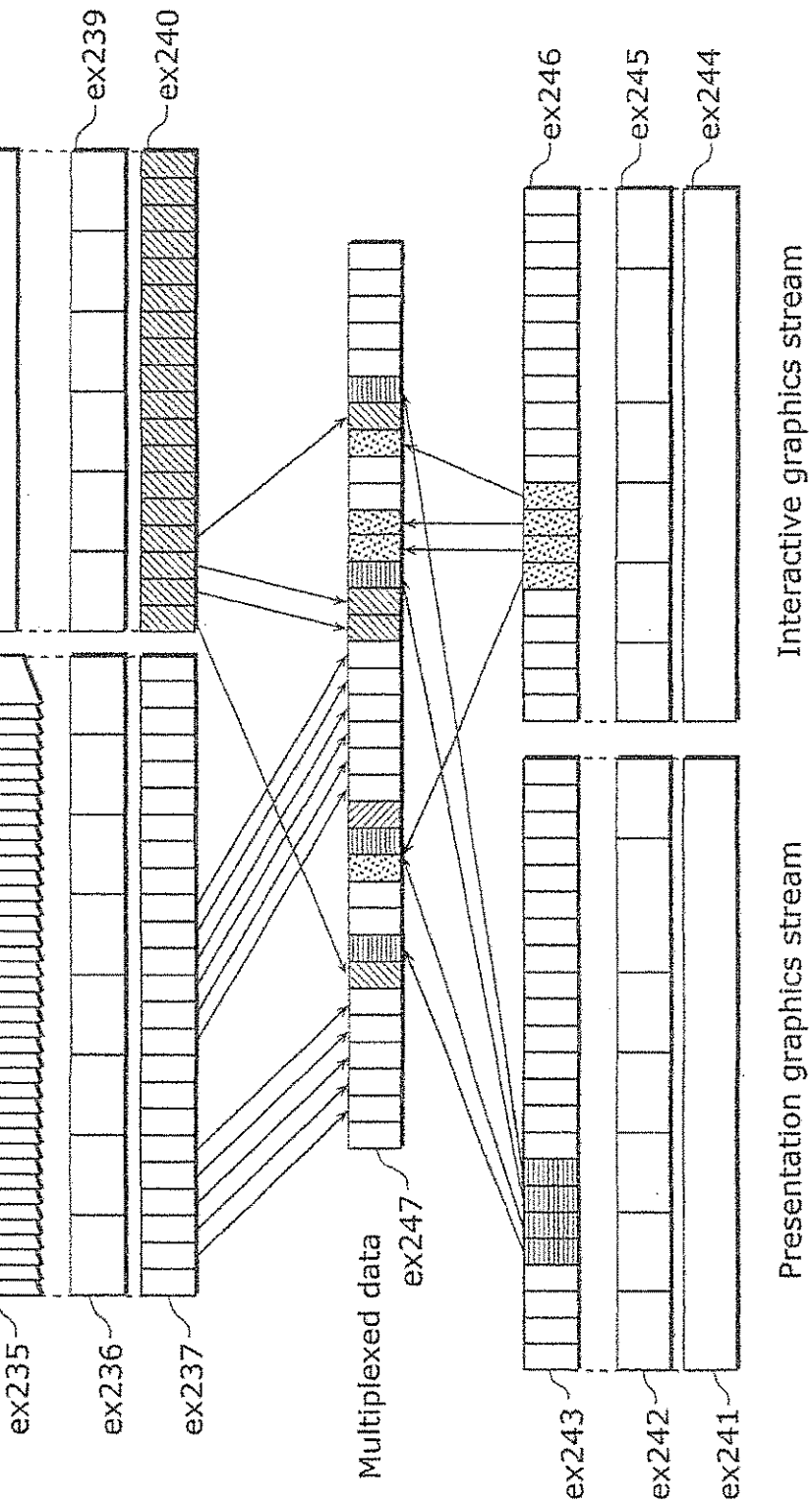
Video frame stream
Audio frame stream
ex238
ex239
ex240
ex235
ex236
ex237
Multiplexed data
ex247
ex246
ex245
ex244
ex243
ex242
ex241
Interactive graphics stream
Presentation graphics stream

FIG. 27

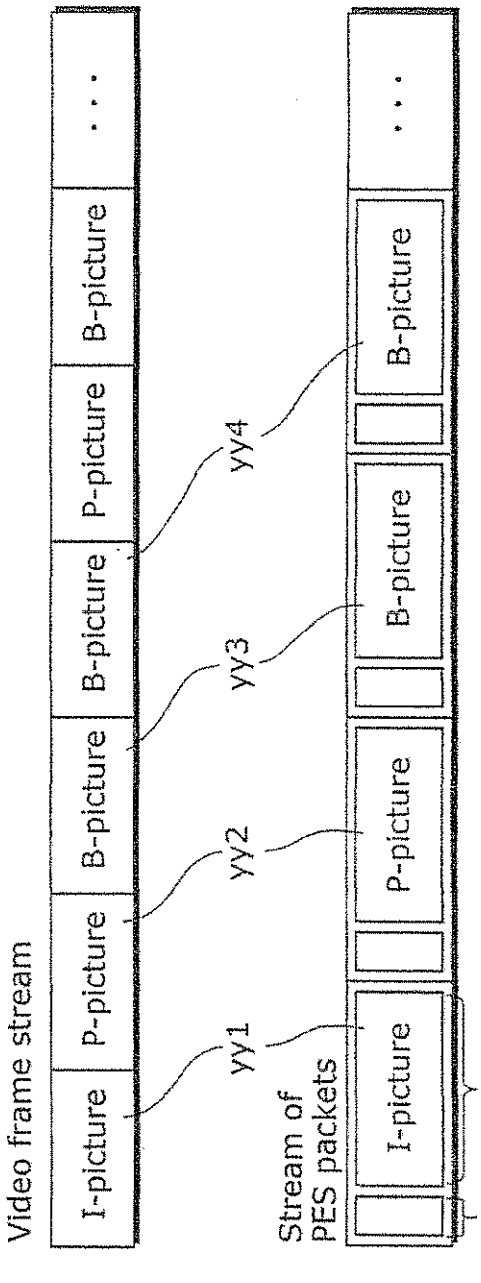
Video frame stream
I-picture
P-picture
B-picture
B-picture
P-picture
B-picture
. . .
yy1
yy2
yy3
yy4
Stream of PES packets
I-picture
P-picture
B-picture
B-picture
. . .
PES header
PES payload

FIG. 28

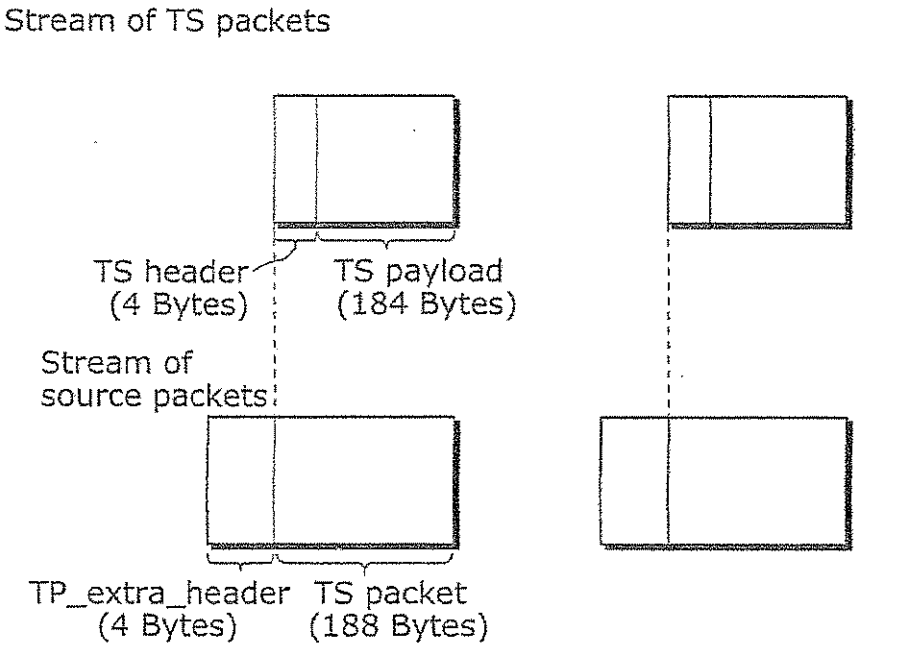
Stream of TS packets
TS header
(4 Bytes)
TS payload
(184 Bytes)
Stream of
source packets
TP_extra_header
(4 Bytes)
TS packet
(188 Bytes)
Multiplexed data
SPN 0 1 2 3 4 5 6 7 ...
Source packet

FIG. 29

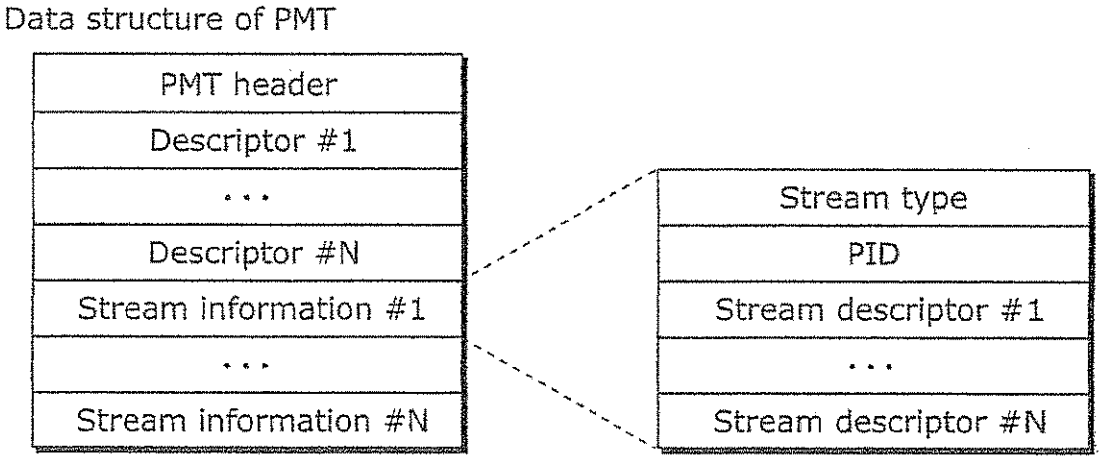
Data structure of PMT
PMT header
Descriptor #1
• • •
Descriptor #N
Stream information #1
• • •
Stream information #N
Stream type
PID
Stream descriptor #1
• • •
Stream descriptor #N

FIG. 30

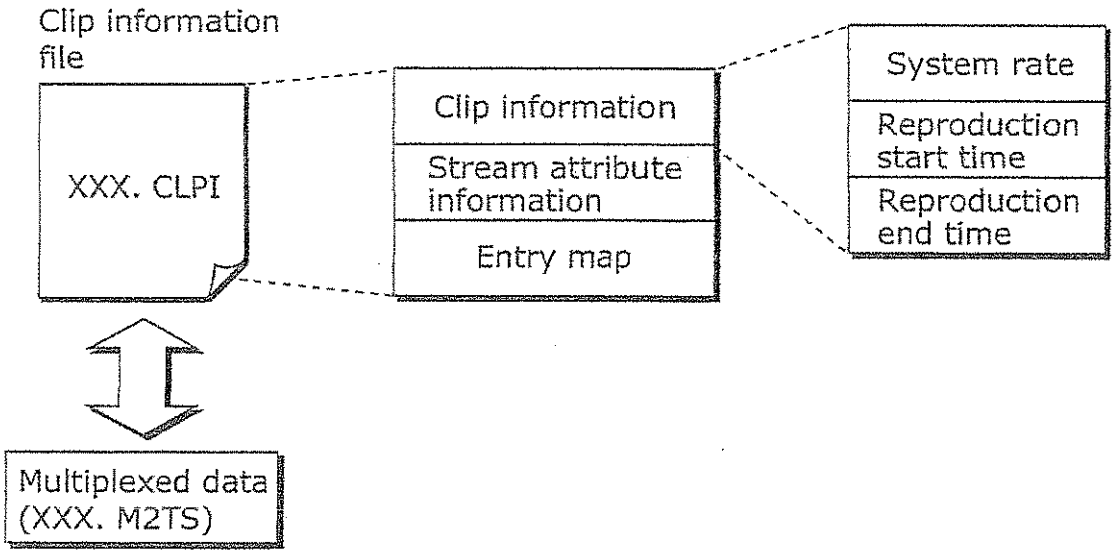
Clip information file
XXX. CLPI
Clip information
Stream attribute information
Entry map
System rate
Reproduction start time
Reproduction end time
Multiplexed data (XXX. M2TS)

FIG. 31

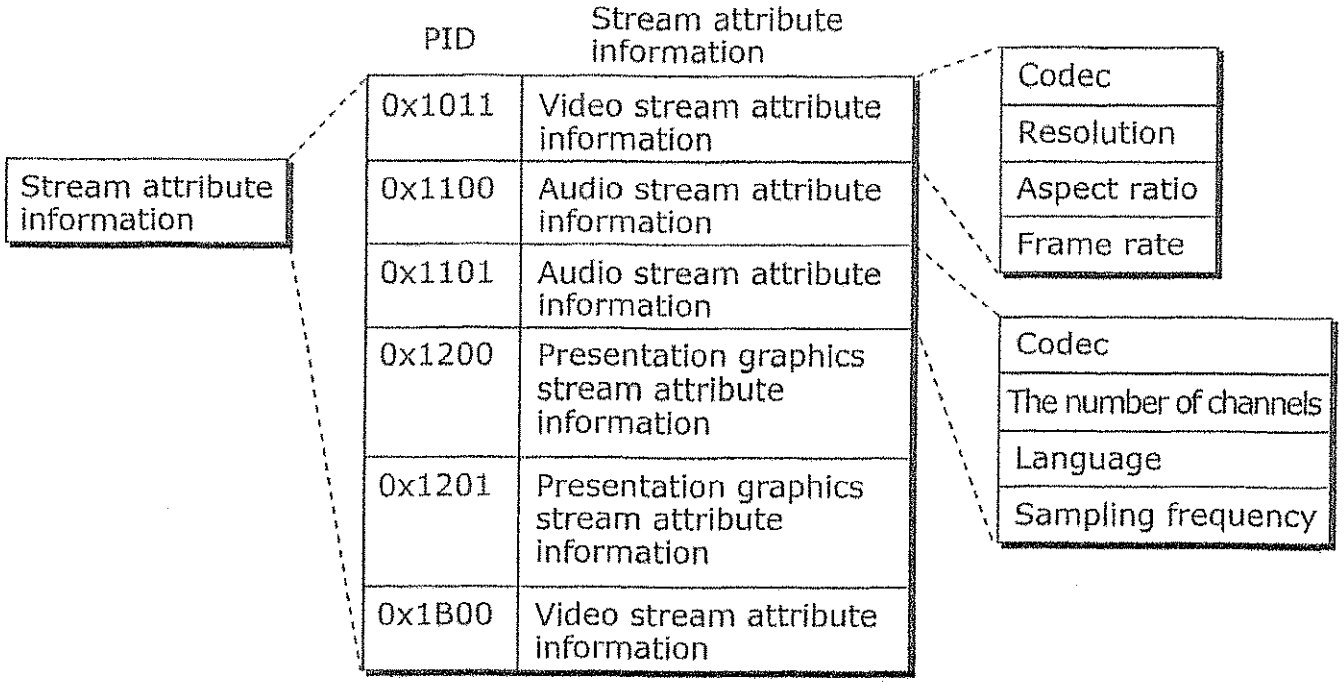
Stream attribute information
PID
Stream attribute information
0x1011
Video stream attribute information
0x1100
Audio stream attribute information
0x1101
Audio stream attribute information
0x1200
Presentation graphics stream attribute information
0x1201
Presentation graphics stream attribute information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

FIG. 32

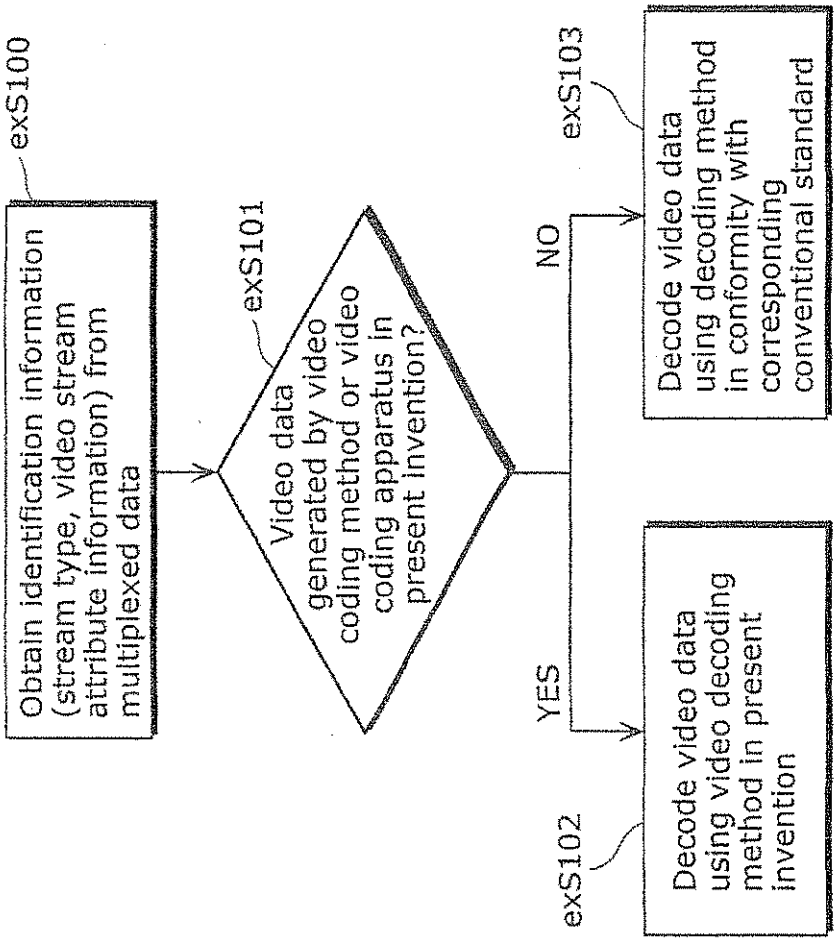
exS100
Obtain identification information (stream type, video stream attribute information) from multiplexed data
exS101
Video data generated by video coding method or video coding apparatus in present invention?
YES
NO
exS102
Decode video data using video decoding method in present invention
exS103
Decode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

FIG. 33

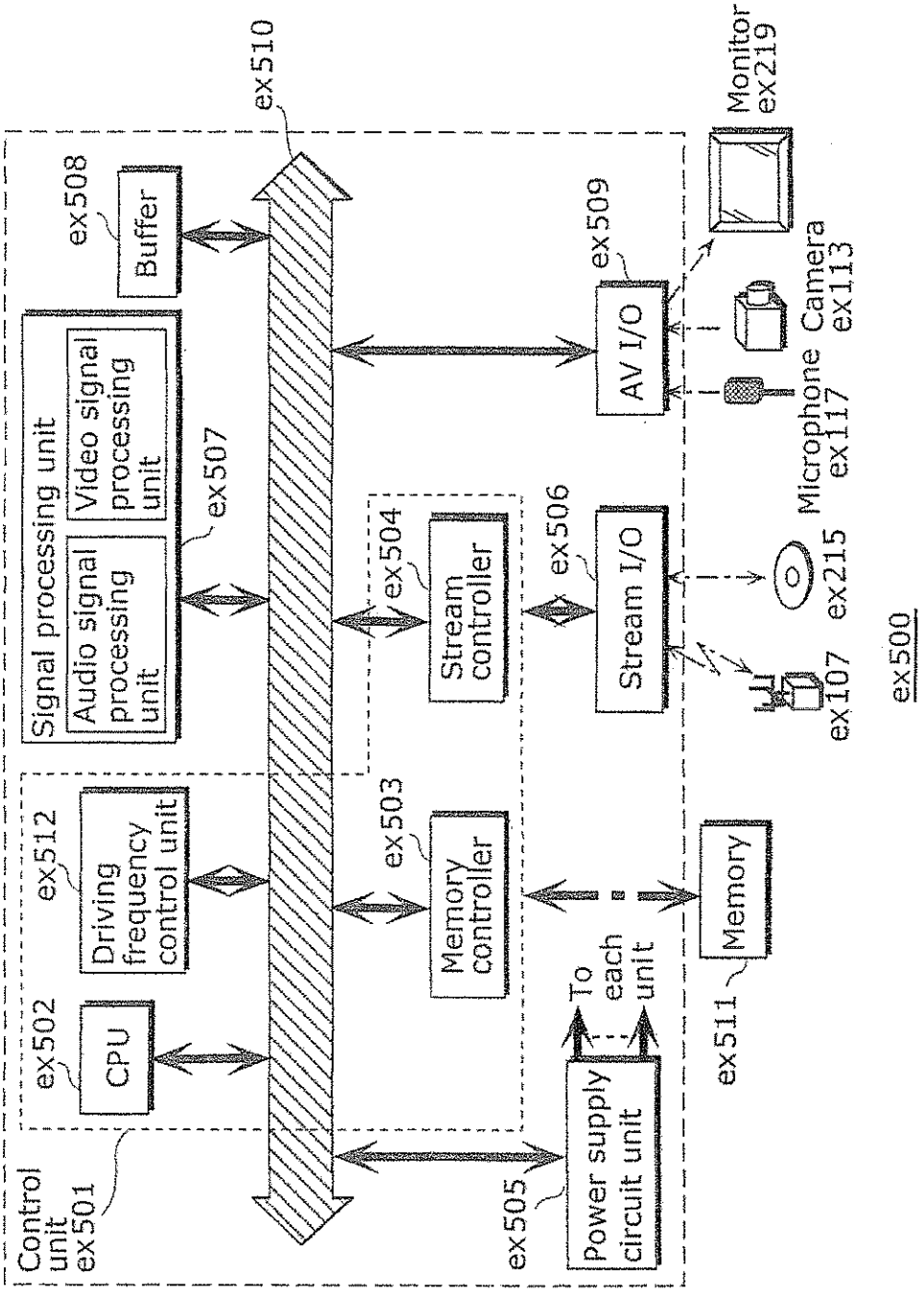
Control unit ex501
CPU ex502
Driving frequency control unit ex512
Signal processing unit
Audio signal processing unit
Video signal processing unit ex507
Buffer ex508
ex510
Memory controller ex503
Stream controller ex504
Power supply circuit unit ex505
To each unit
Stream I/O ex506
AV I/O ex509
Memory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

FIG. 34

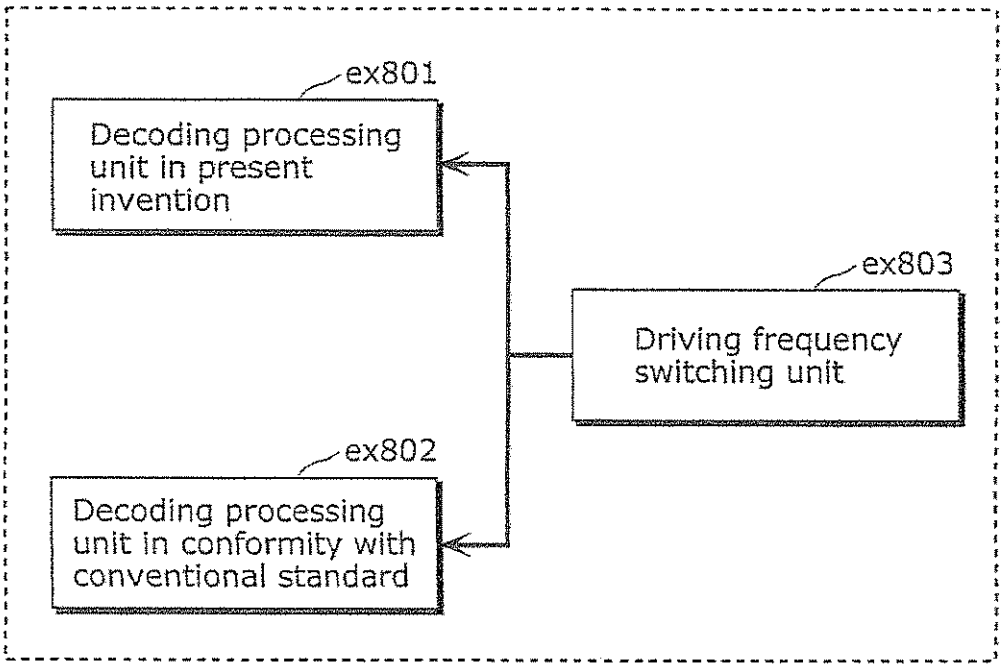
ex801
Decoding processing unit in present invention
ex803
Driving frequency switching unit
ex802
Decoding processing unit in conformity with conventional standard

FIG. 35

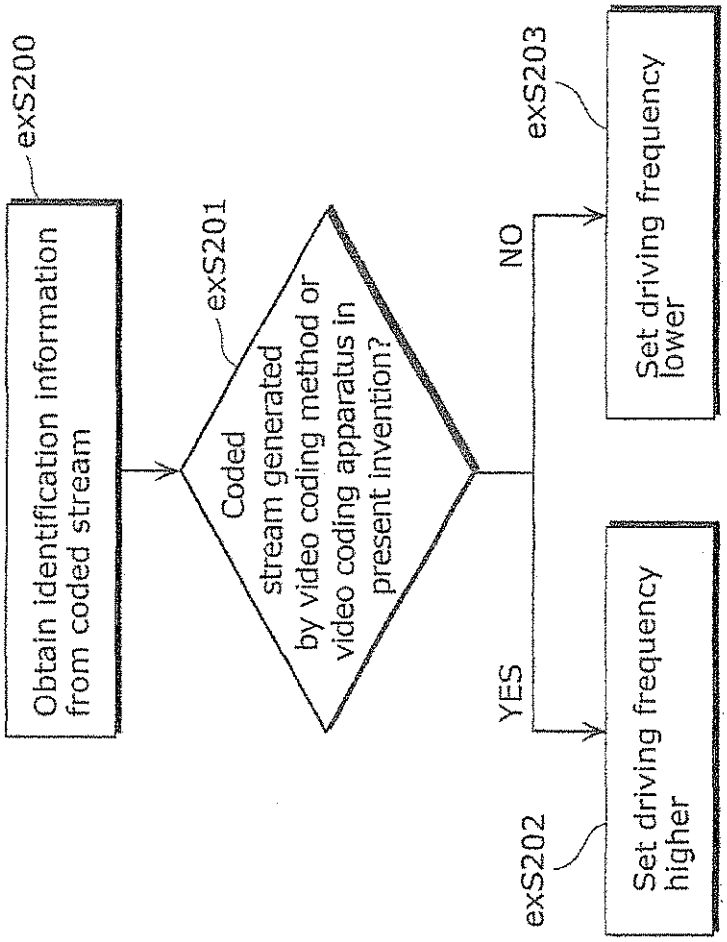
exS200
Obtain identification information from coded stream
exS201
Coded stream generated by video coding method or video coding apparatus in present invention?
YES
NO
exS202
Set driving frequency higher
exS203
Set driving frequency lower

FIG. 36

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

FIG. 37A

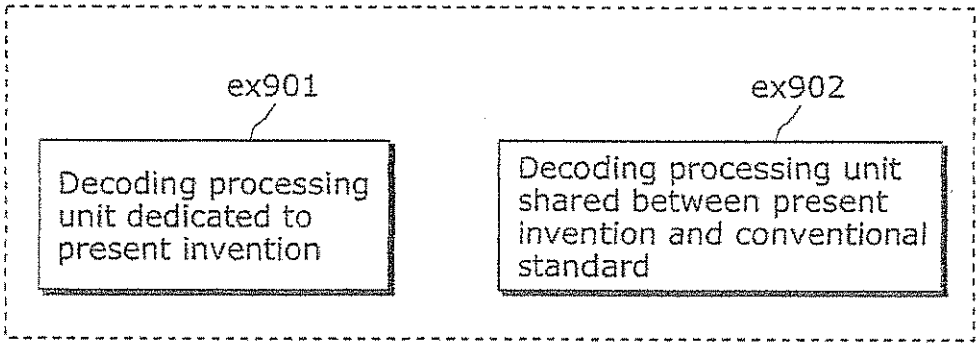
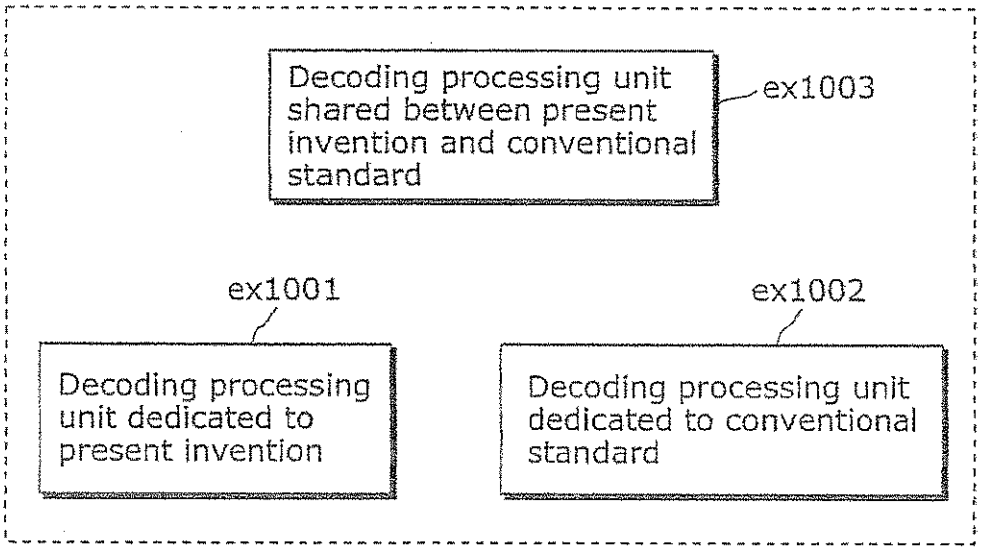
FIG. 37B