

FIG. 1
PRIOR ART

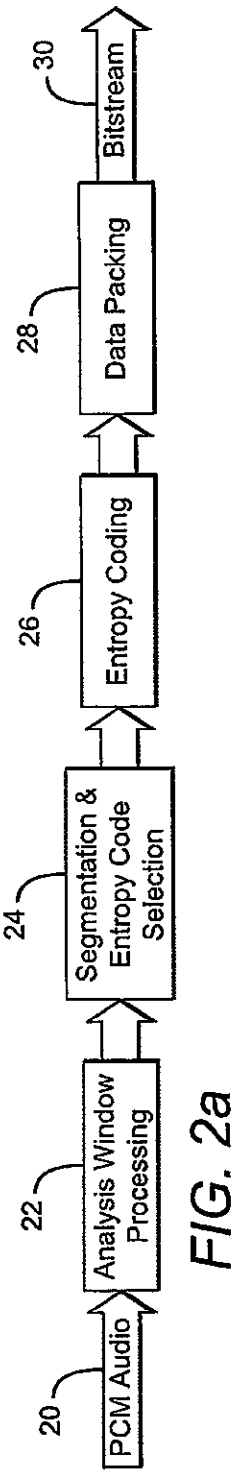


FIG. 2a

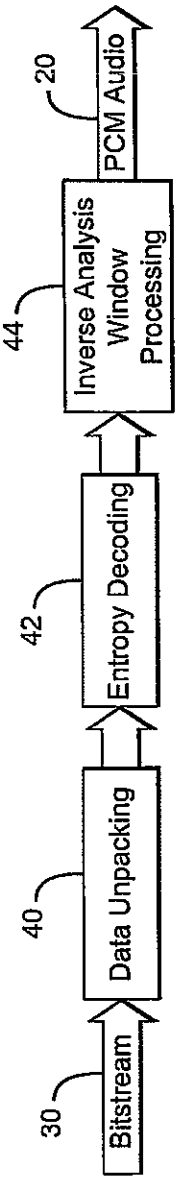


FIG. 2b

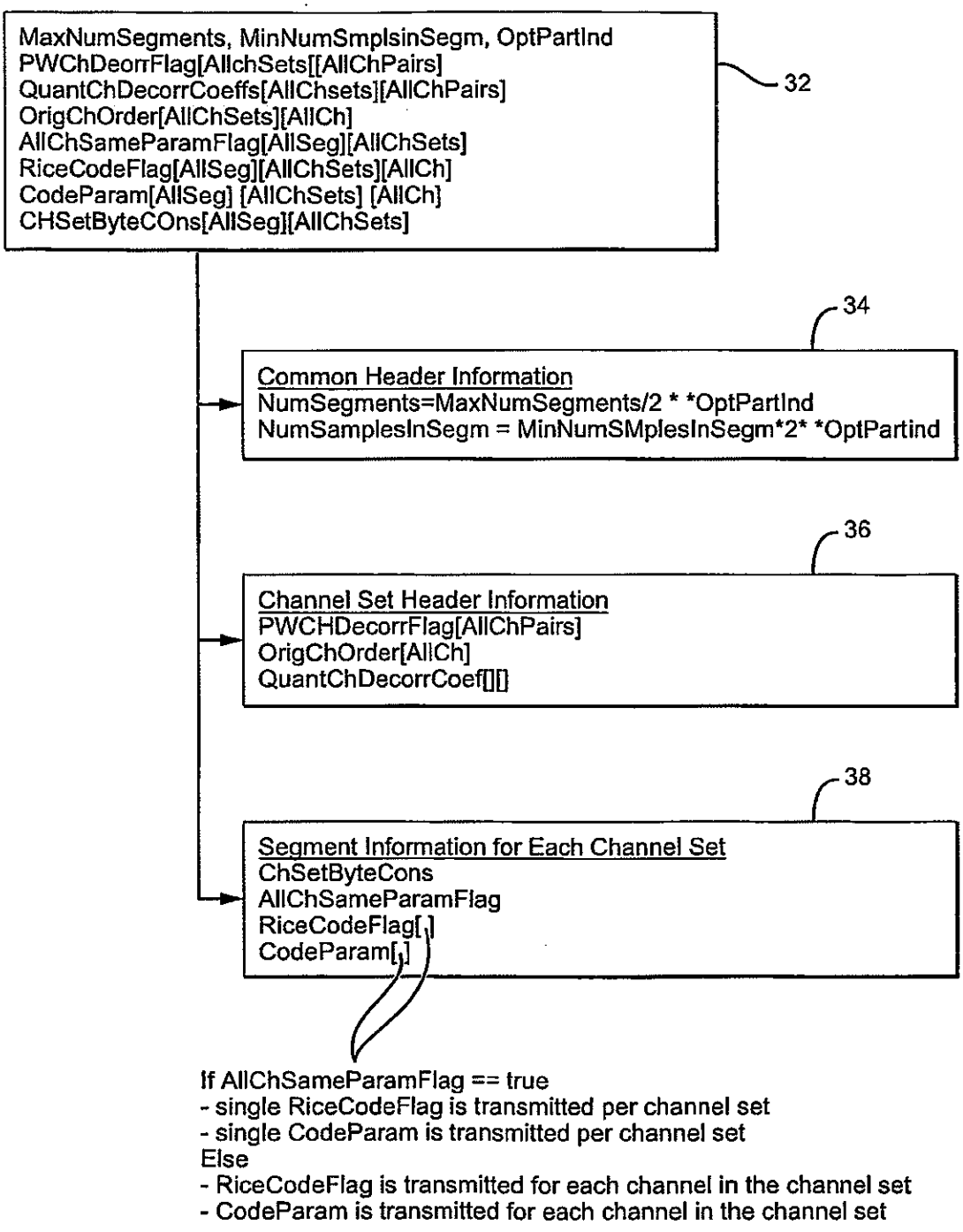

MaxNumSegments, MinNumSmplsinSegm, OptPartInd
PWChDeorrFlag[AllchSets[[AllChPairs]
QuantChDecorrCoeffs[AllChsets][AllChPairs]
OrigChOrder[AllChSets][AllCh]
AllChSameParamFlag[AllSeg][AllChSets]
RiceCodeFlag[AllSeg][AllChSets][AllCh]
CodeParam[AllSeg] [AllChSets] [AllCh]
CHSetByteCOns[AllSeg][AllChSets]
32
34
Common Header Information
NumSegments=MaxNumSegments/2 * *OptPartInd
NumSamplesInSegm = MinNumSMplesInSegm*2* *OptPartind
36
Channel Set Header Information
PWCHDecorrFlag[AllChPairs]
OrigChOrder[AllCh]
QuantChDecorrCoef[][]
38
Segment Information for Each Channel Set
ChSetByteCons
AllChSameParamFlag
RiceCodeFlag[ ]
CodeParam[ ]
If AllChSameParamFlag == true
- single RiceCodeFlag is transmitted per channel set
- single CodeParam is transmitted per channel set
Else
- RiceCodeFlag is transmitted for each channel in the channel set
- CodeParam is transmitted for each channel in the channel set

FIG. 3

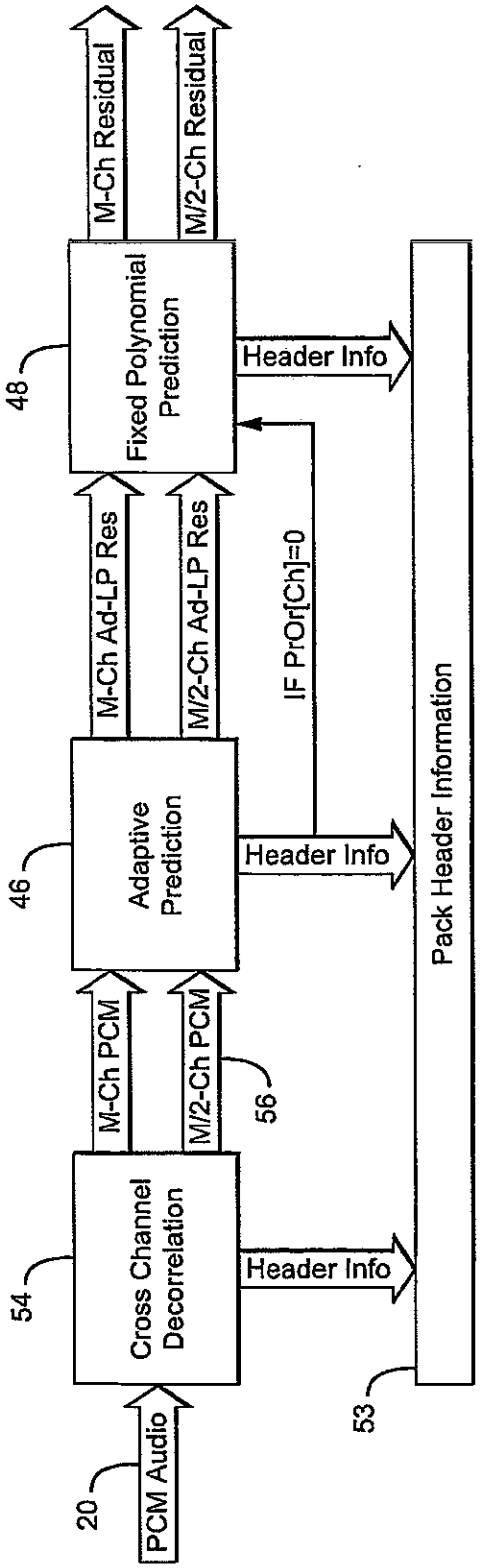

PCM Audio
20
Cross Channel Decorrelation
54
M-Ch PCM
M/2-Ch PCM
56
Adaptive Prediction
46
M-Ch Ad-LP Res
M/2-Ch Ad-LP Res
IF PrOr[Ch]=0
Fixed Polynomial Prediction
48
M-Ch Residual
M/2-Ch Residual
Header Info
Header Info
Header Info
Pack Header Information
53

FIG. 4a

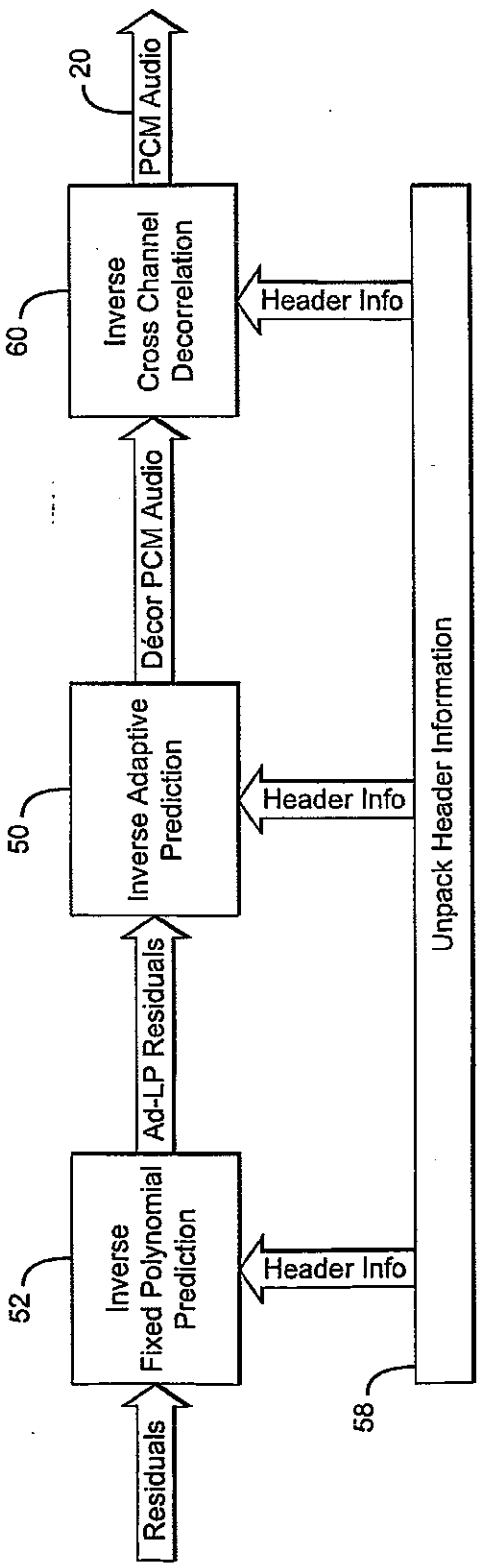

Residuals
Inverse Fixed Polynomial Prediction
52
Ad-LP Residuals
Inverse Adaptive Prediction
50
Décor PCM Audio
Inverse Cross Channel Decorrelation
60
PCM Audio
20
Header Info
Header Info
Header Info
Unpack Header Information
58

FIG. 4b

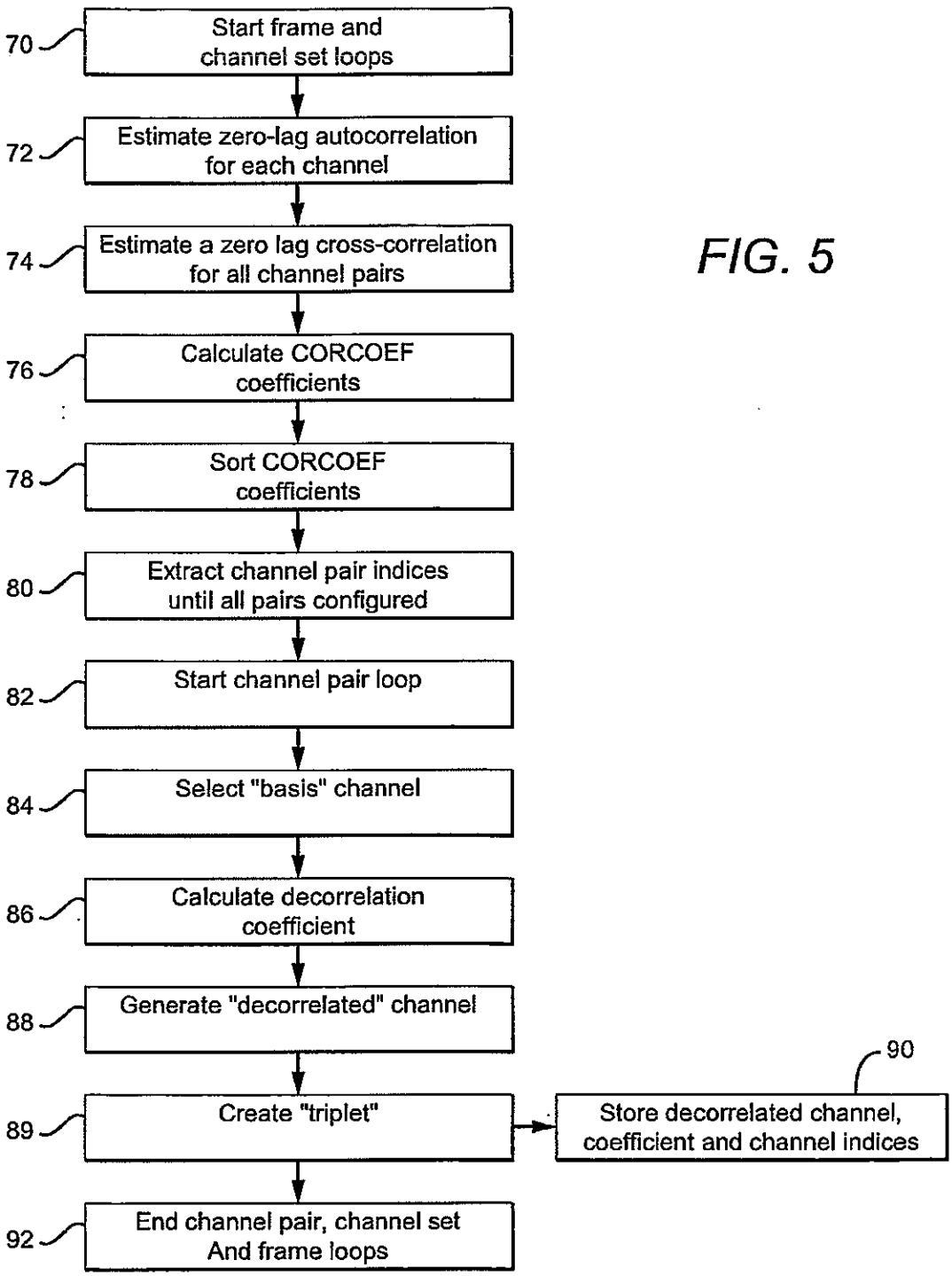

70
Start frame and channel set loops
72
Estimate zero-lag autocorrelation for each channel
74
Estimate a zero lag cross-correlation for all channel pairs
76
Calculate CORCOEF coefficients
78
Sort CORCOEF coefficients
80
Extract channel pair indices until all pairs configured
82
Start channel pair loop
84
Select "basis" channel
86
Calculate decorrelation coefficient
88
Generate "decorrelated" channel
89
Create "triplet"
90
Store decorrelated channel, coefficient and channel indices
92
End channel pair, channel set And frame loops

FIG. 5

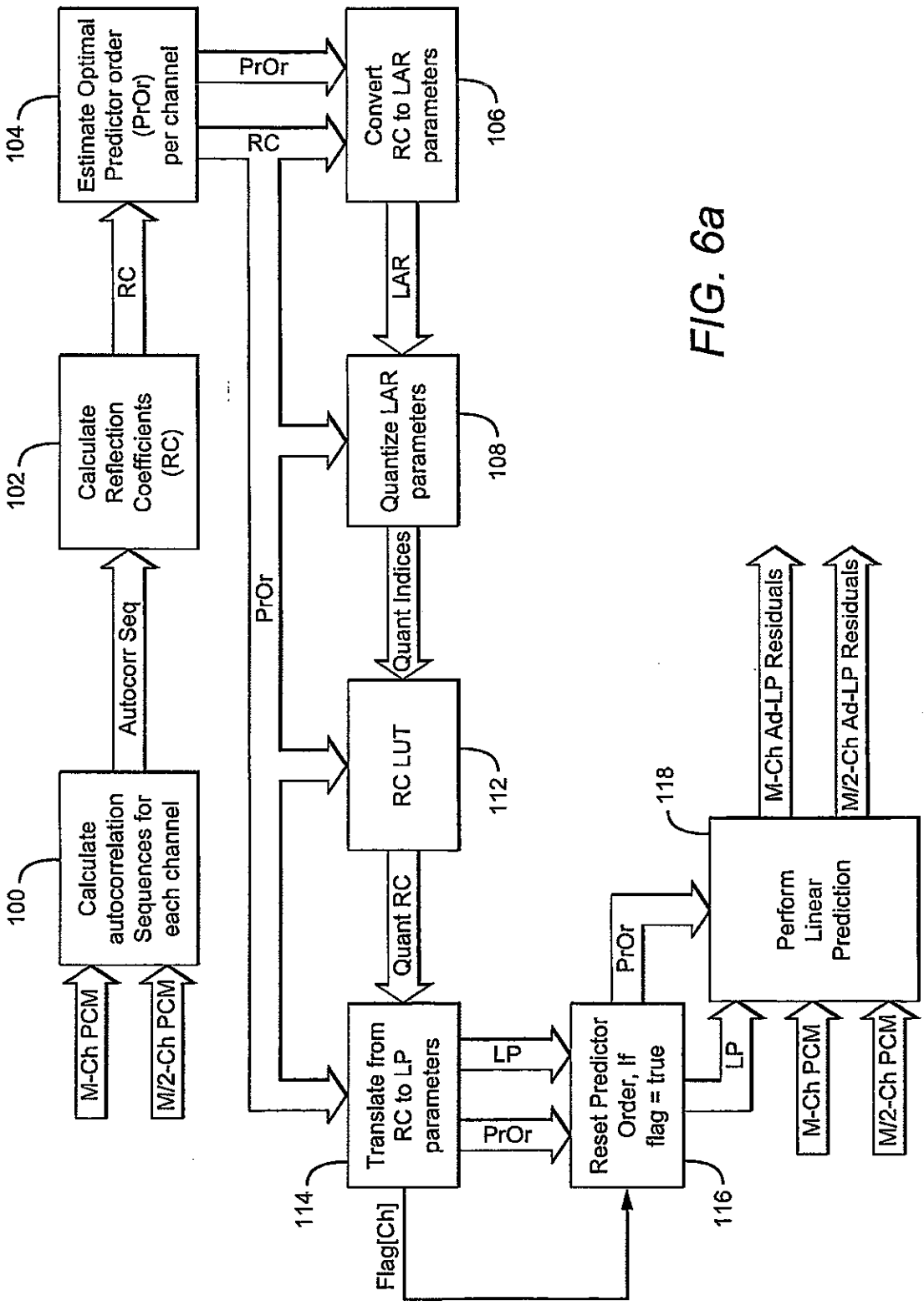

100
Calculate autocorrelation Sequences for each channel
M-Ch PCM
M/2-Ch PCM
Autocorr Seq
102
Calculate Reflection Coefficients (RC)
RC
104
Estimate Optimal Predictor order (PrOr) per channel
PrOr
RC
106
Convert RC to LAR parameters
LAR
108
Quantize LAR parameters
Quant Indices
112
RC LUT
Quant RC
114
Translate from RC to LP parameters
LP
PrOr
116
Reset Predictor Order, If flag = true
Flag[Ch]
PrOr
LP
118
Perform Linear Prediction
M-Ch PCM
M/2-Ch PCM
M-Ch Ad-LP Residuals
M/2-Ch Ad-LP Residuals

FIG. 6a

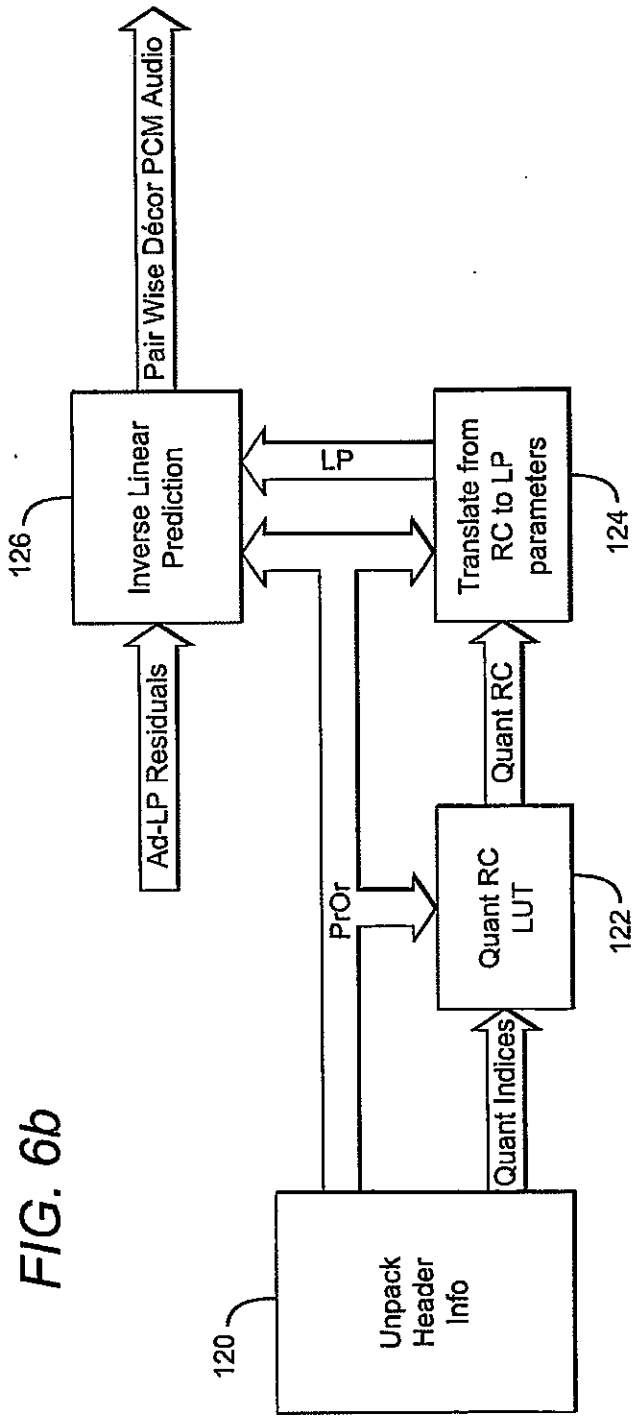

Pair Wise Décor PCM Audio
Inverse Linear Prediction
126
LP
Translate from RC to LP parameters
124
Ad-LP Residuals
Quant RC
PrOr
Quant RC LUT
122
Quant Indices
Unpack Header Info
120

FIG. 6b

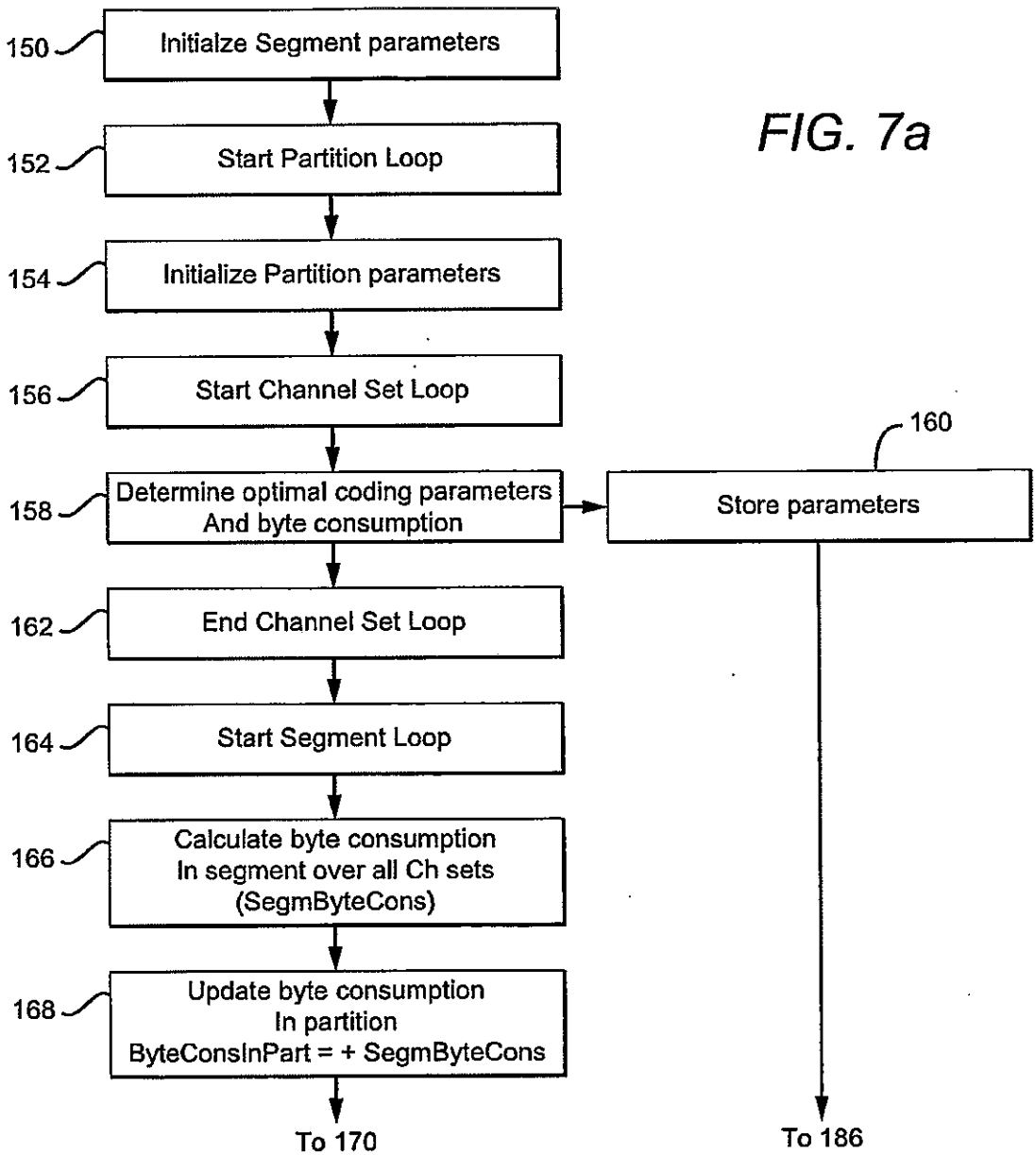

150
Initialze Segment parameters
152
Start Partition Loop
154
Initialize Partition parameters
156
Start Channel Set Loop
158
Determine optimal coding parameters
And byte consumption
160
Store parameters
162
End Channel Set Loop
164
Start Segment Loop
166
Calculate byte consumption
In segment over all Ch sets
(SegmByteCons)
168
Update byte consumption
In partition
ByteConsInPart = + SegmByteCons
To 170
To 186

FIG. 7a

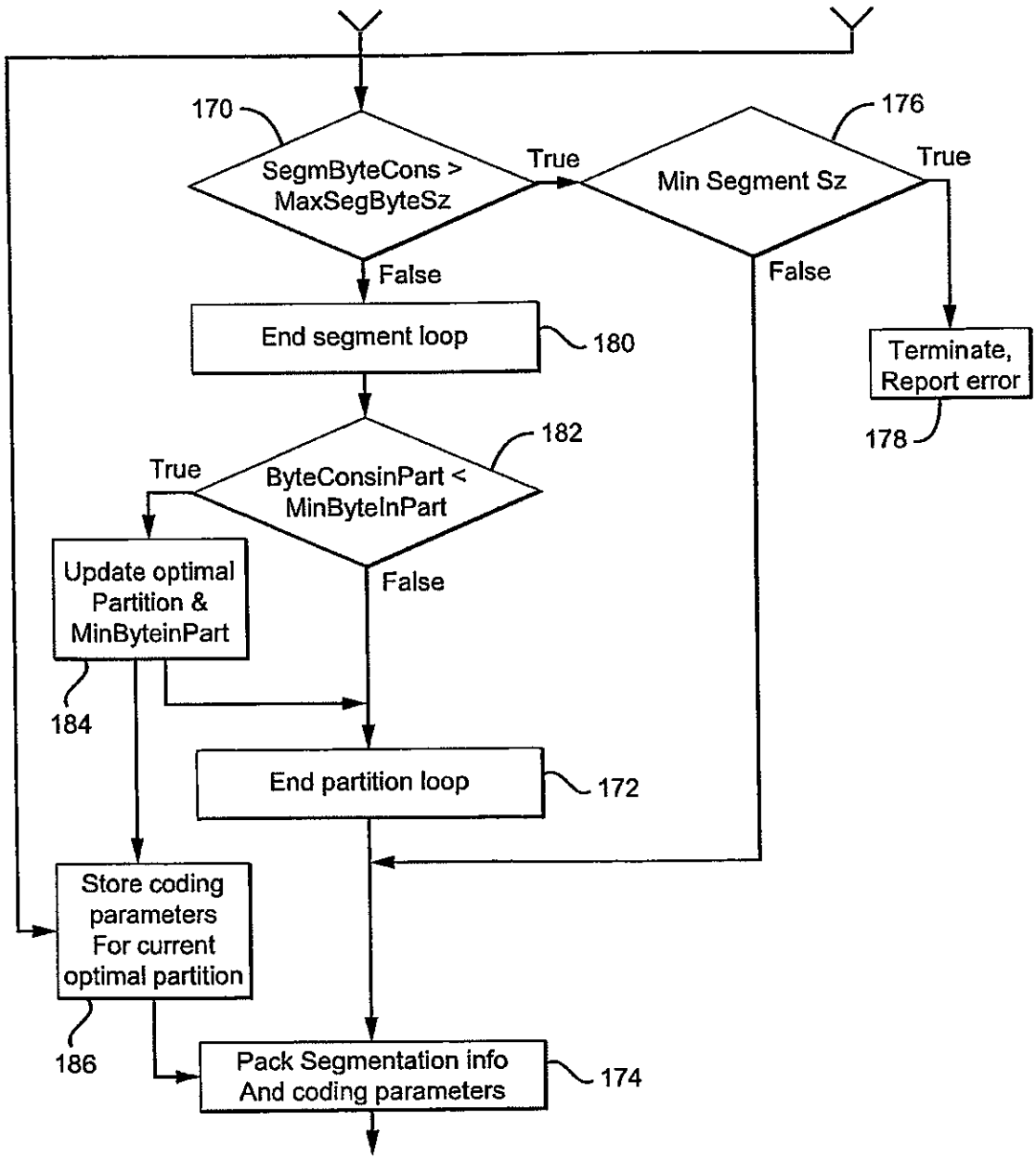
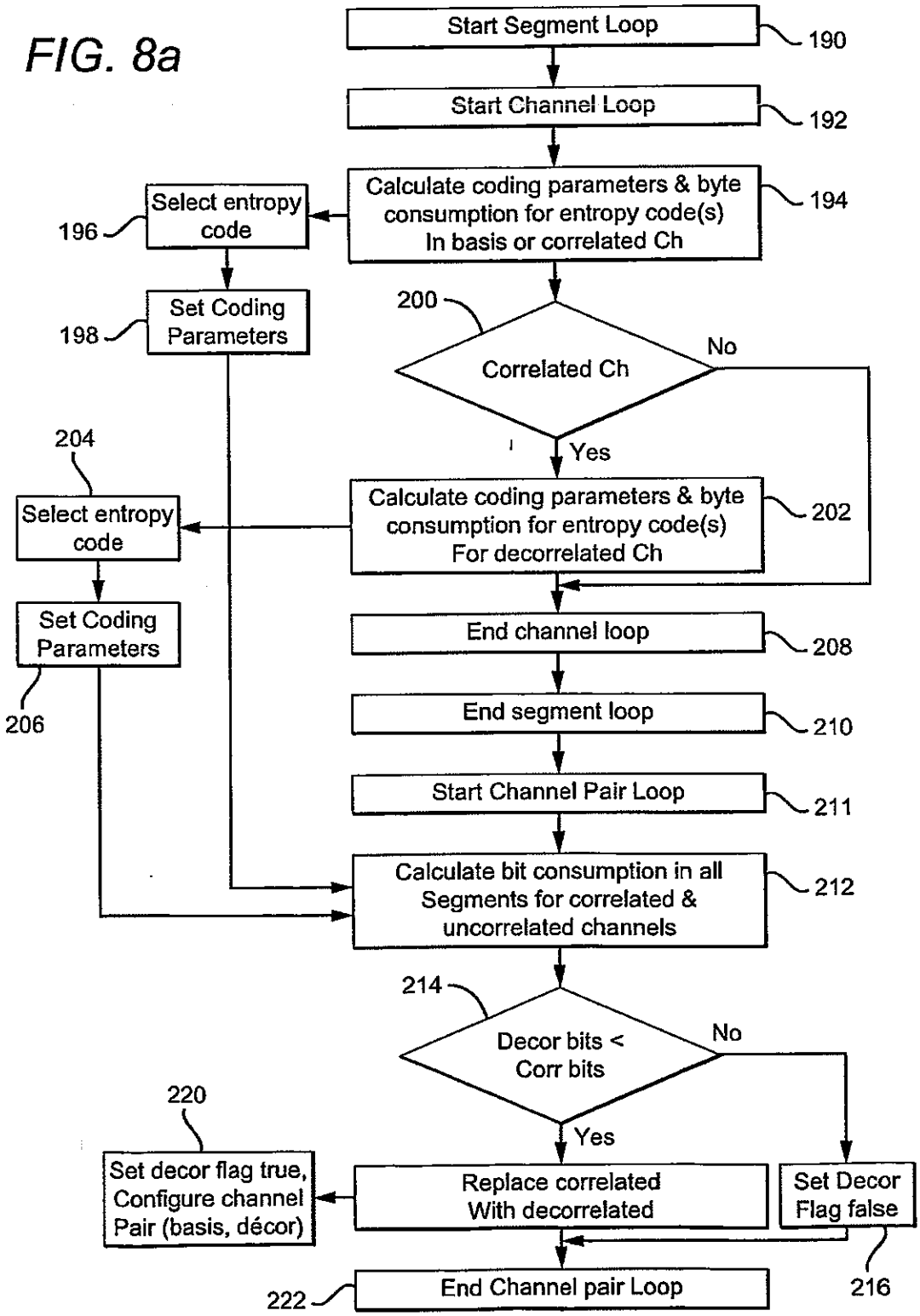

170
SegmByteCons > MaxSegByteSz
True
176
Min Segment Sz
True
False
False
End segment loop
180
Terminate, Report error
178
182
True
ByteConsinPart < MinByteInPart
False
Update optimal Partition & MinByteinPart
184
End partition loop
172
Store coding parameters For current optimal partition
186
Pack Segmentation info And coding parameters
174

FIG. 7b

FIG. 8a


Start Segment Loop
190
Start Channel Loop
192
Calculate coding parameters & byte consumption for entropy code(s) In basis or correlated Ch
194
Select entropy code
196
Set Coding Parameters
198
200
Correlated Ch
No
Yes
Calculate coding parameters & byte consumption for entropy code(s) For decorrelated Ch
202
204
Select entropy code
Set Coding Parameters
206
End channel loop
208
End segment loop
210
Start Channel Pair Loop
211
Calculate bit consumption in all Segments for correlated & uncorrelated channels
212
214
Decor bits < Corr bits
No
Yes
220
Set decor flag true, Configure channel Pair (basis, décor)
Replace correlated With decorrelated
Set Decor Flag false
216
End Channel pair Loop
222

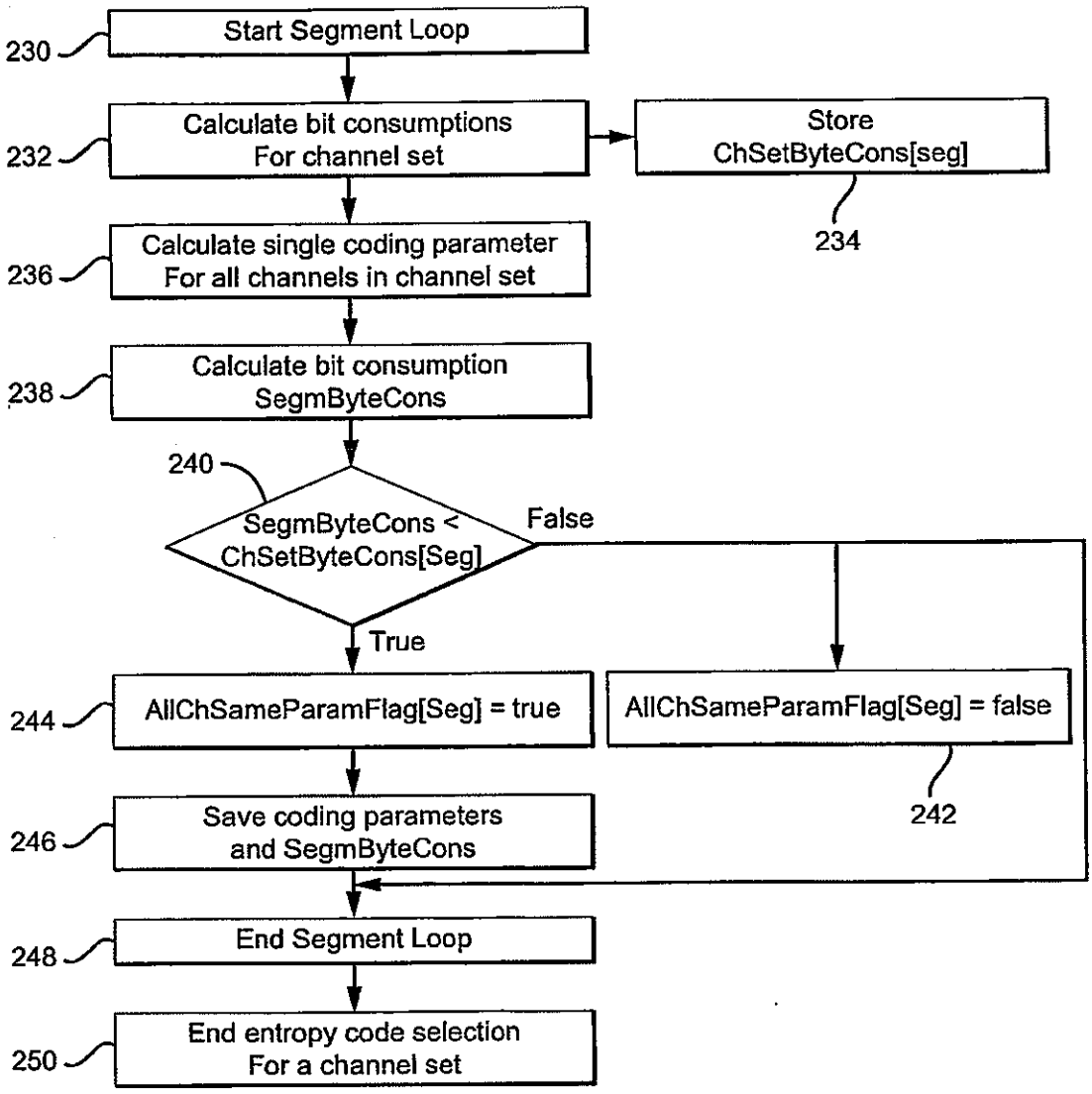
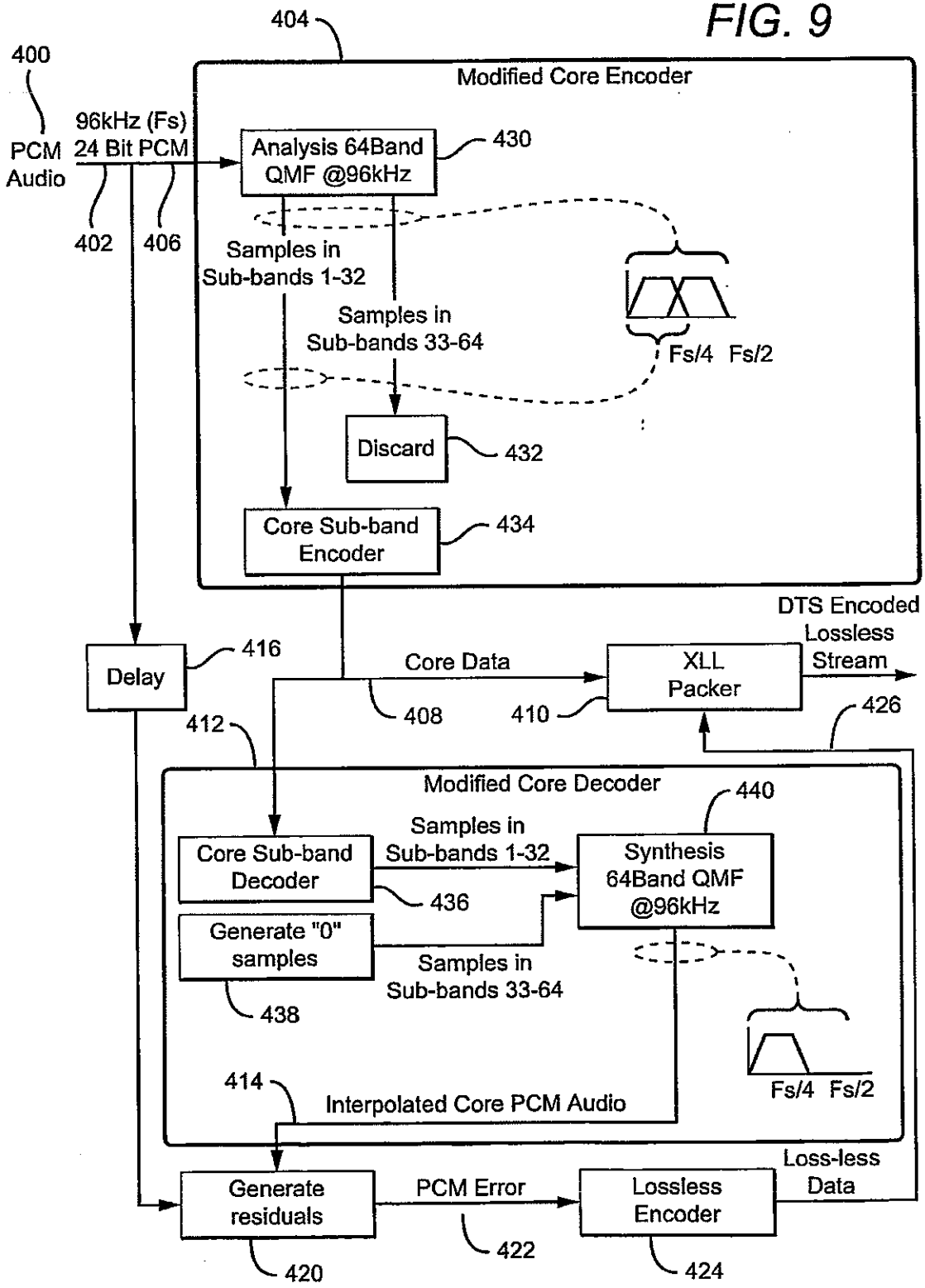

230
Start Segment Loop
232
Calculate bit consumptions
For channel set
Store
ChSetByteCons[seg]
234
236
Calculate single coding parameter
For all channels in channel set
238
Calculate bit consumption
SegmByteCons
240
SegmByteCons <
ChSetByteCons[Seg]
False
True
244
AllChSameParamFlag[Seg] = true
AllChSameParamFlag[Seg] = false
242
246
Save coding parameters
and SegmByteCons
248
End Segment Loop
250
End entropy code selection
For a channel set

FIG. 8b

FIG. 9


404
400
Modified Core Encoder
96kHz (Fs)
24 Bit PCM
PCM
Audio
Analysis 64Band
QMF @96kHz
430
402
406
Samples in
Sub-bands 1-32
Samples in
Sub-bands 33-64
Fs/4 Fs/2
Discard
432
Core Sub-band
Encoder
434
DTS Encoded
Lossless
Stream
Delay
416
Core Data
XLL
Packer
408
410
426
412
Modified Core Decoder
440
Samples in
Sub-bands 1-32
Core Sub-band
Decoder
436
Synthesis
64Band QMF
@96kHz
Generate "0"
samples
Samples in
Sub-bands 33-64
438
Fs/4 Fs/2
414
Interpolated Core PCM Audio
Loss-less
Data
Generate
residuals
PCM Error
Lossless
Encoder
420
422
424

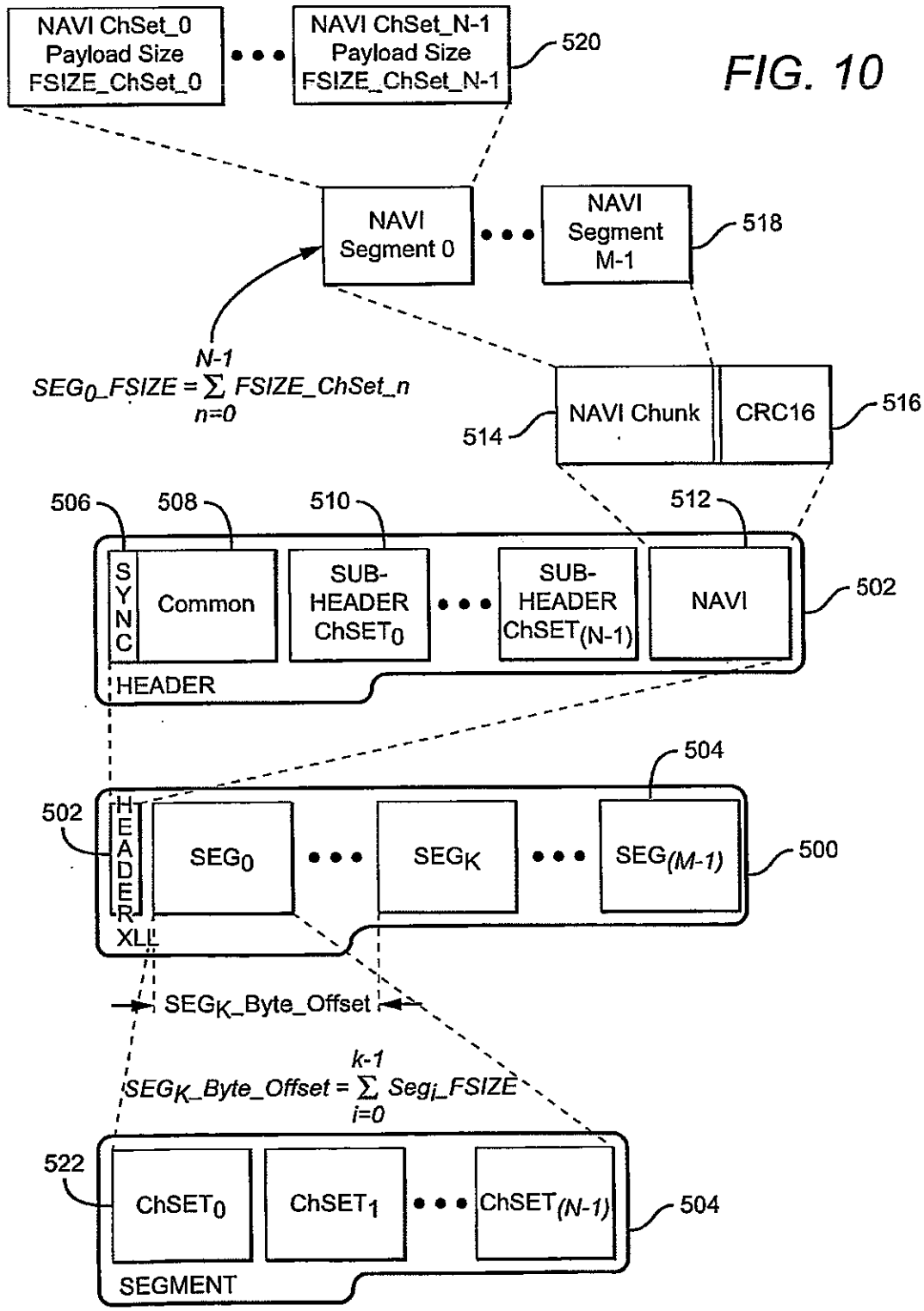
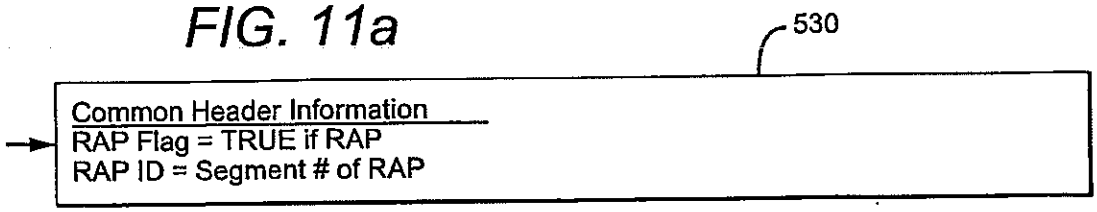

NAVI ChSet_0 Payload Size FSIZE_ChSet_0
NAVI ChSet_N-1 Payload Size FSIZE_ChSet_N-1
520
NAVI Segment 0
NAVI Segment M-1
518
$SEG_0_FSIZE = \sum_{n=0}^{N-1} FSIZE_ChSet_n$
NAVI Chunk
CRC16
514
516
506
508
510
512
SYNC
Common
SUB-HEADER ChSET$_0$
SUB-HEADER ChSET$_{(N-1)}$
NAVI
HEADER
502
504
HEADER XL
SEG$_0$
SEG$_K$
SEG$_{(M-1)}$
500
SEG$_K$_Byte_Offset
$SEG_K_Byte_Offset = \sum_{i=0}^{k-1} Seg_i_FSIZE$
522
ChSET$_0$
ChSET$_1$
ChSET$_{(N-1)}$
SEGMENT

FIG. 10

FIG. 11a



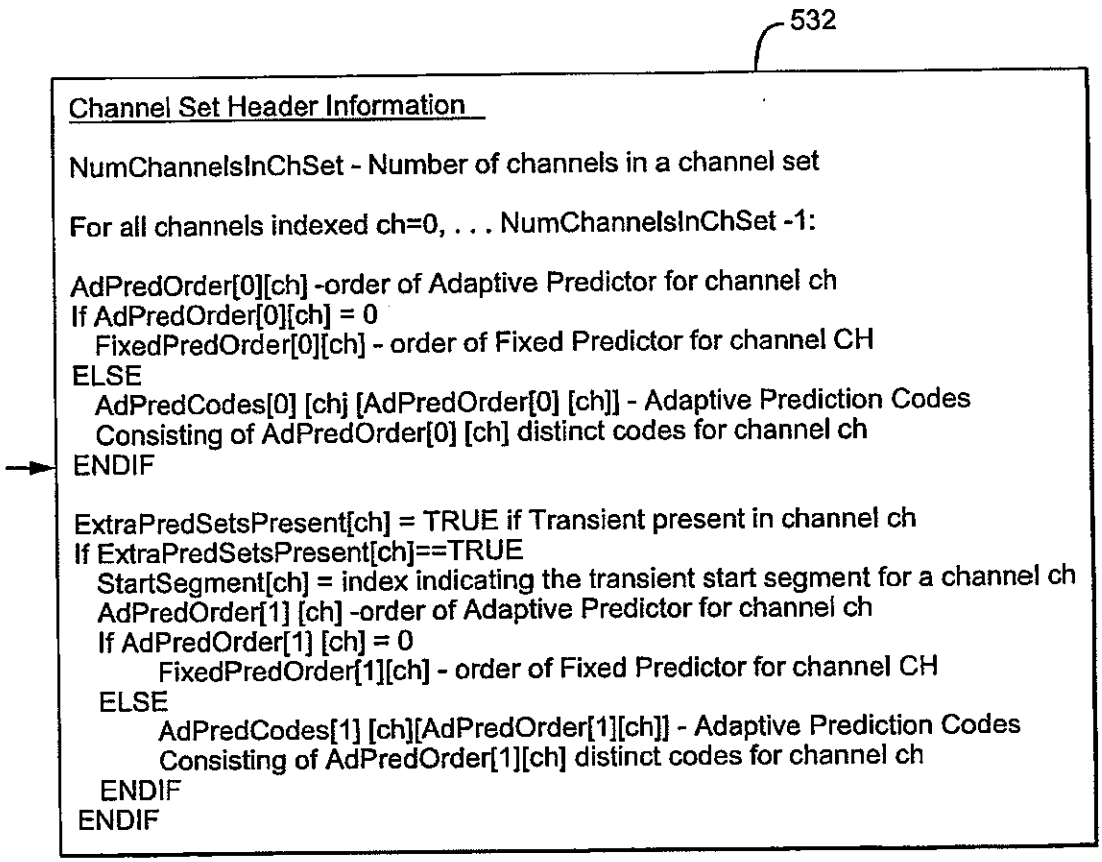


FIG. 11b

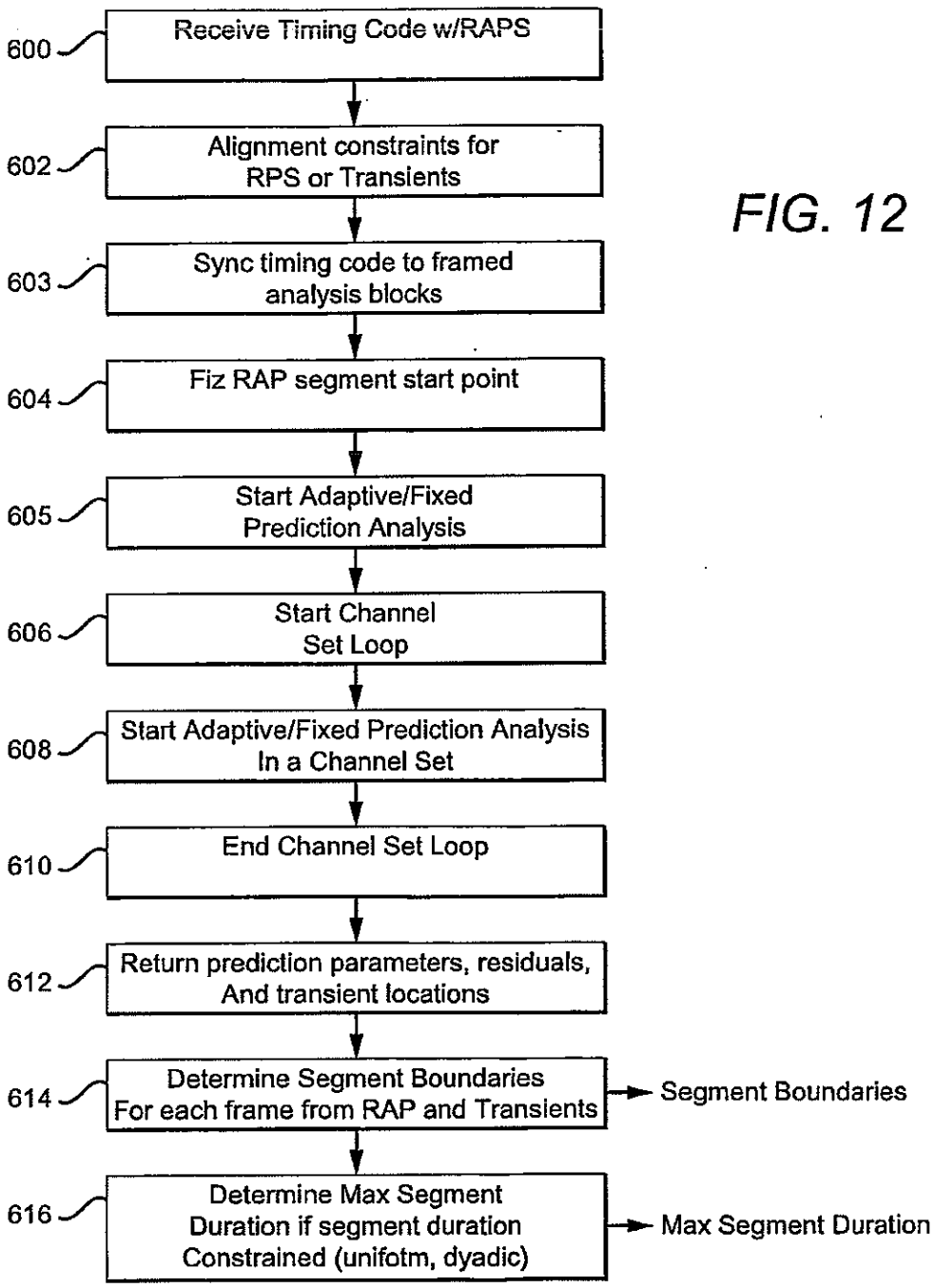

600
Receive Timing Code w/RAPS
602
Alignment constraints for RPS or Transients
603
Sync timing code to framed analysis blocks
604
Fiz RAP segment start point
605
Start Adaptive/Fixed Prediction Analysis
606
Start Channel Set Loop
608
Start Adaptive/Fixed Prediction Analysis In a Channel Set
610
End Channel Set Loop
612
Return prediction parameters, residuals, And transient locations
614
Determine Segment Boundaries For each frame from RAP and Transients
Segment Boundaries
616
Determine Max Segment Duration if segment duration Constrained (unifotm, dyadic)
Max Segment Duration

FIG. 12

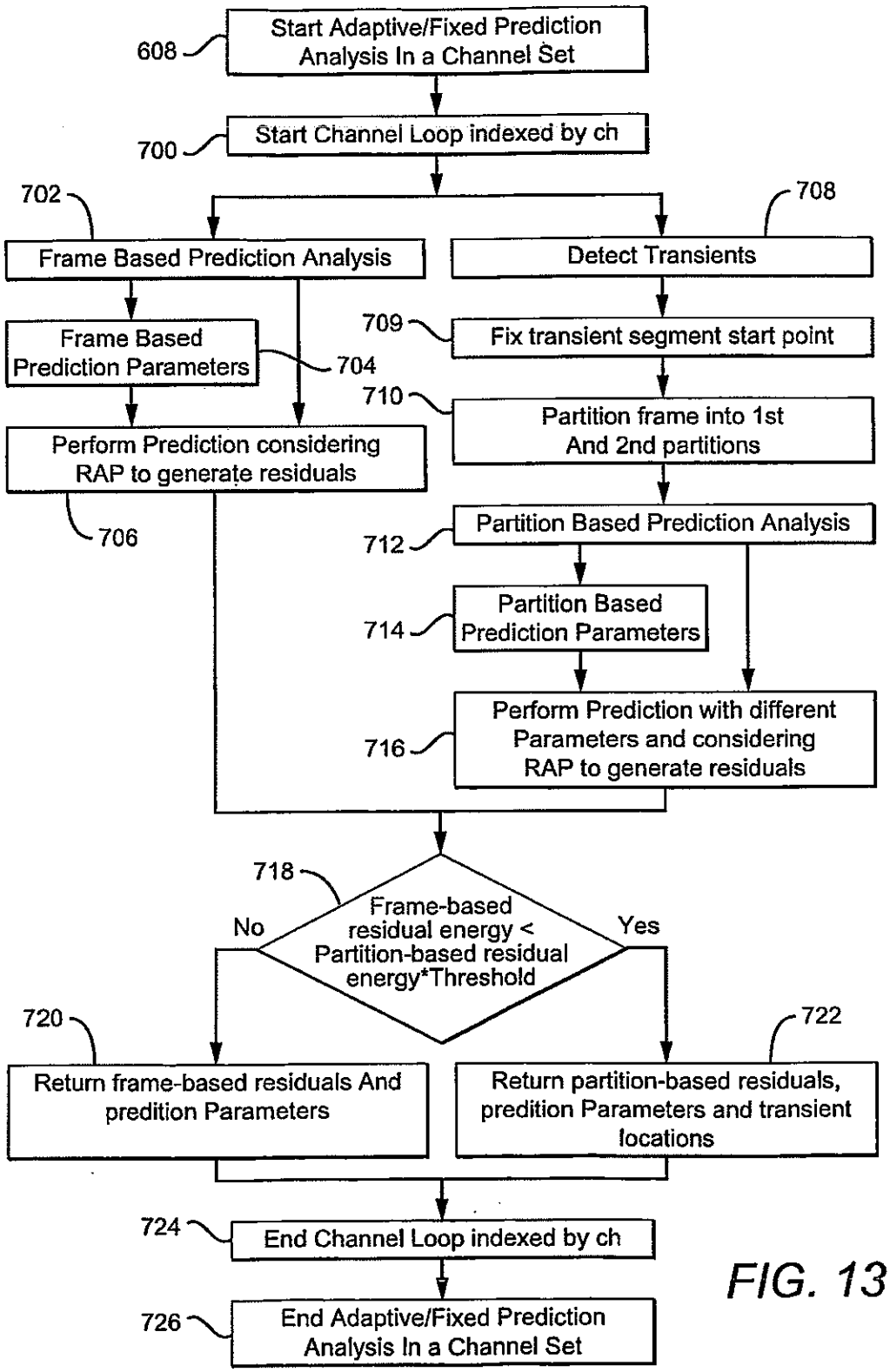
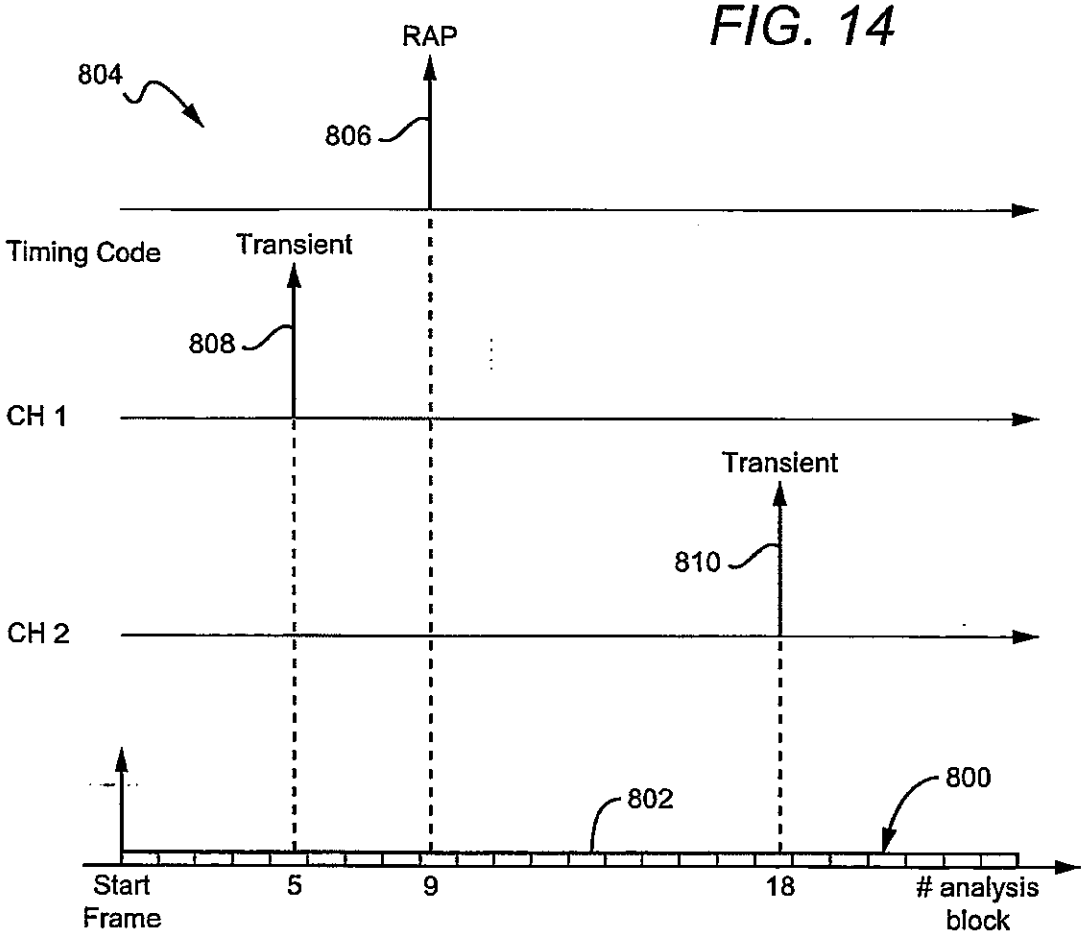

608
Start Adaptive/Fixed Prediction Analysis In a Channel Set
700
Start Channel Loop indexed by ch
702
Frame Based Prediction Analysis
708
Detect Transients
Frame Based Prediction Parameters
704
709
Fix transient segment start point
710
Partition frame into 1st And 2nd partitions
Perform Prediction considering RAP to generate residuals
706
712
Partition Based Prediction Analysis
714
Partition Based Prediction Parameters
716
Perform Prediction with different Parameters and considering RAP to generate residuals
718
Frame-based residual energy < Partition-based residual energy*Threshold
No
Yes
720
Return frame-based residuals And predition Parameters
722
Return partition-based residuals, predition Parameters and transient locations
724
End Channel Loop indexed by ch
726
End Adaptive/Fixed Prediction Analysis In a Channel Set

FIG. 13

FIG. 14

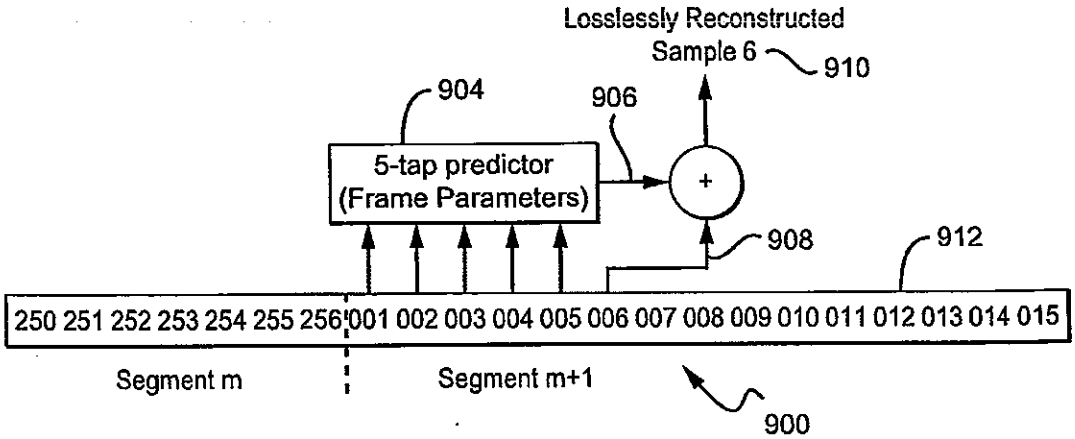


Constrained Segment Duration
RAP Max duration = 8 ABs
CH 1 max = 4 ABs
CH 2 max = 1 AB, if 2nd AB OK than 16

Pick Max Frame Duration = 4 x AB_dur.

Unconstrained Segment Duration
Segment Start 1: 1st segment
Segment Start 2: 5th segment
Segment Start 3: 9th segment
Segment Start 4: 18th segment

FIG. 15a



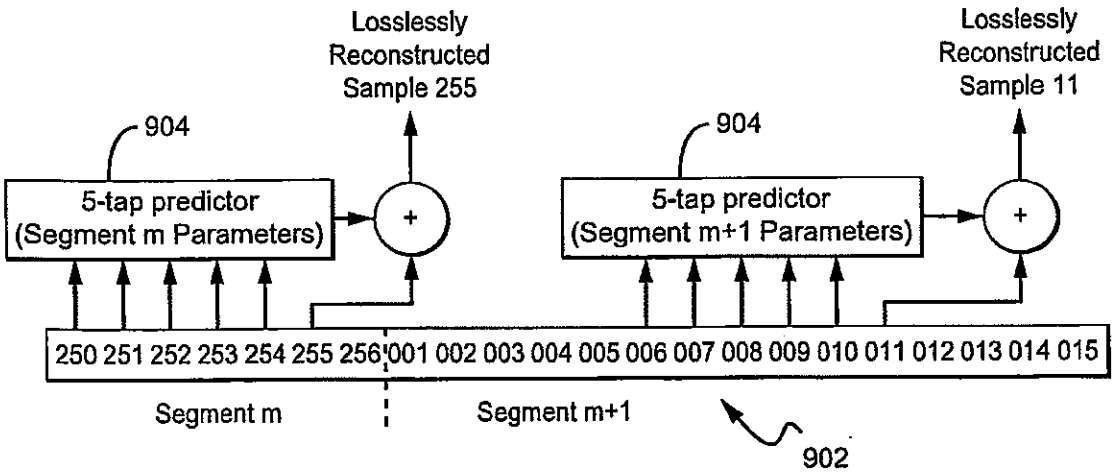


FIG. 15b

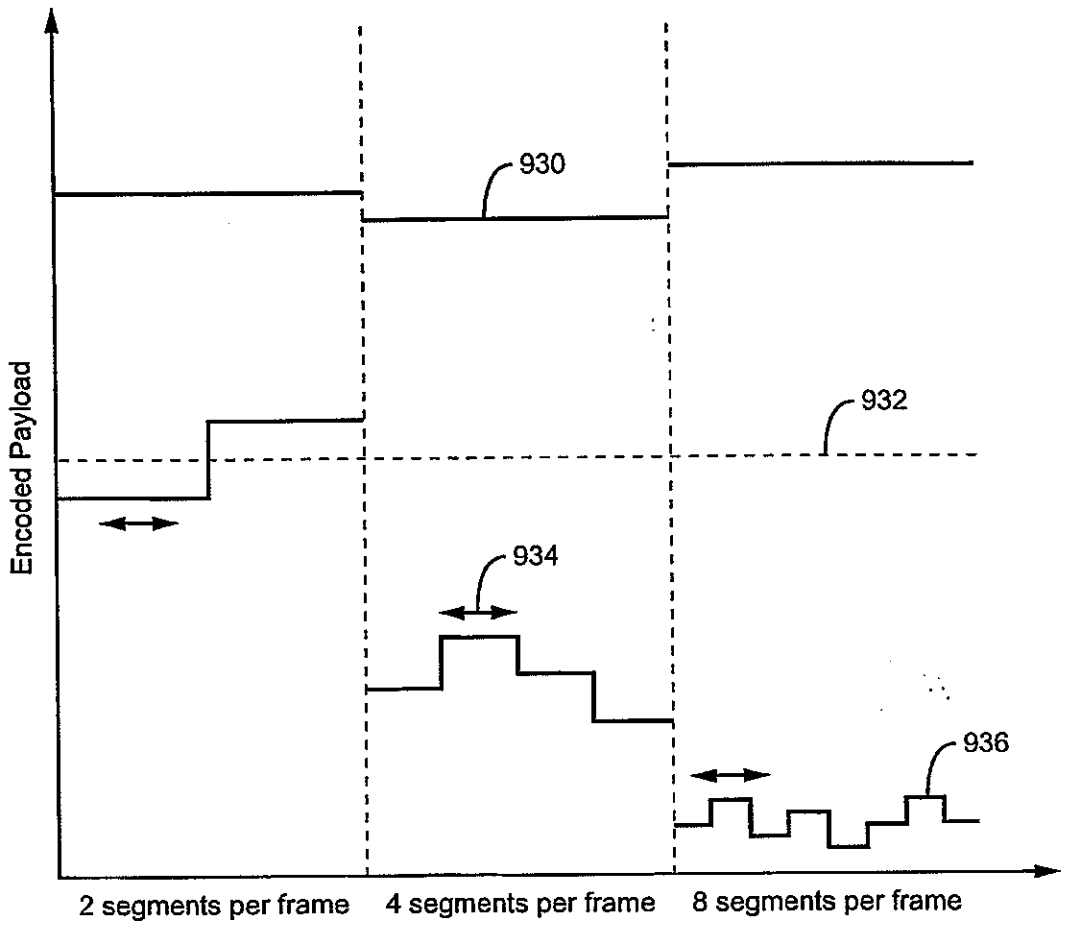

Encoded Payload
930
932
934
936
2 segments per frame
4 segments per frame
8 segments per frame

FIG. 16