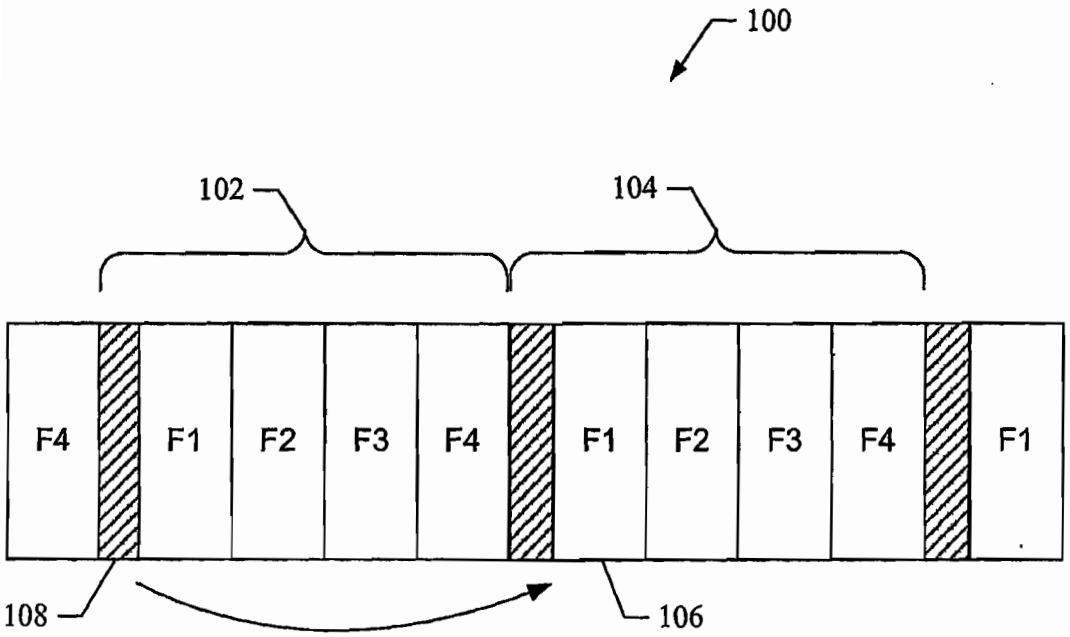


FIG. 1

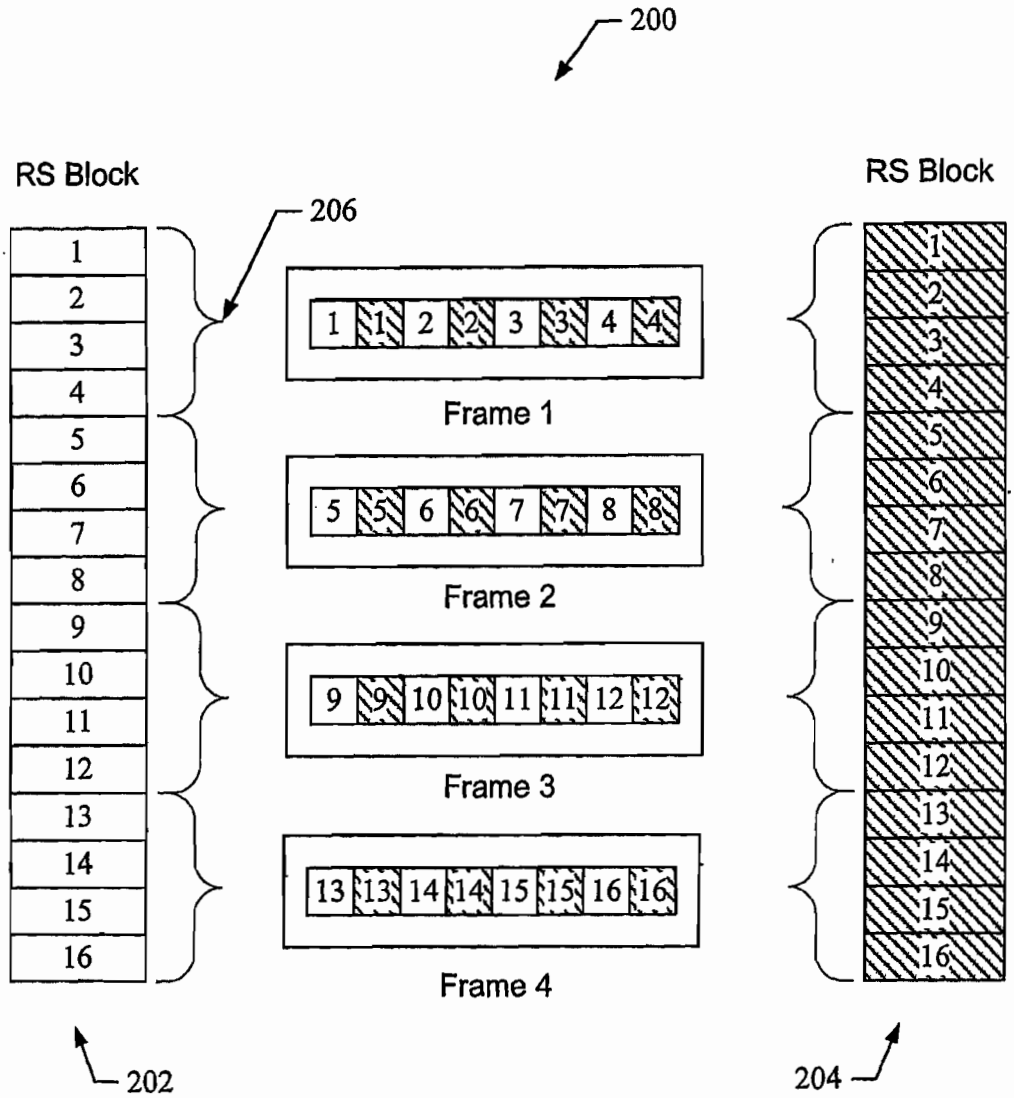

200
RS Block
206
RS Block
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
1 1 2 2 3 3 4 4
Frame 1
5 5 6 6 7 7 8 8
Frame 2
9 9 10 10 11 11 12 12
Frame 3
13 13 14 14 15 15 16 16
Frame 4
202
204

FIG. 2

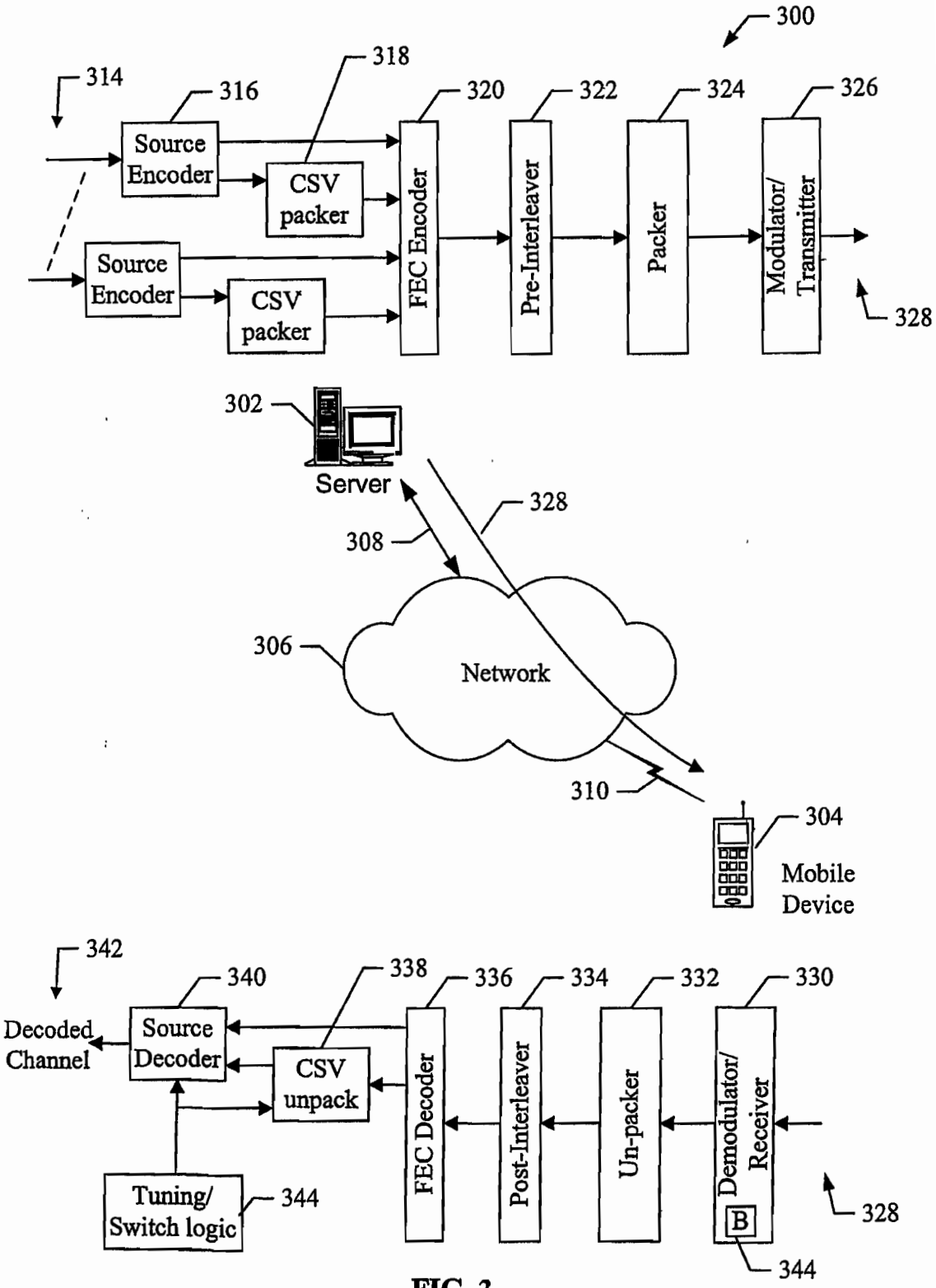

300
314
316
318
320
322
324
326
Source Encoder
Source Encoder
CSV packer
CSV packer
FEC Encoder
Pre-Interleaver
Packer
Modulator/ Transmitter
328
302
Server
328
308
306
Network
310
304
Mobile Device
342
340
338
336
334
332
330
Decoded Channel
Source Decoder
CSV unpack
FEC Decoder
Post-Interleaver
Un-packer
Demodulator/ Receiver
328
Tuning/ Switch logic
344
B
344

FIG. 3

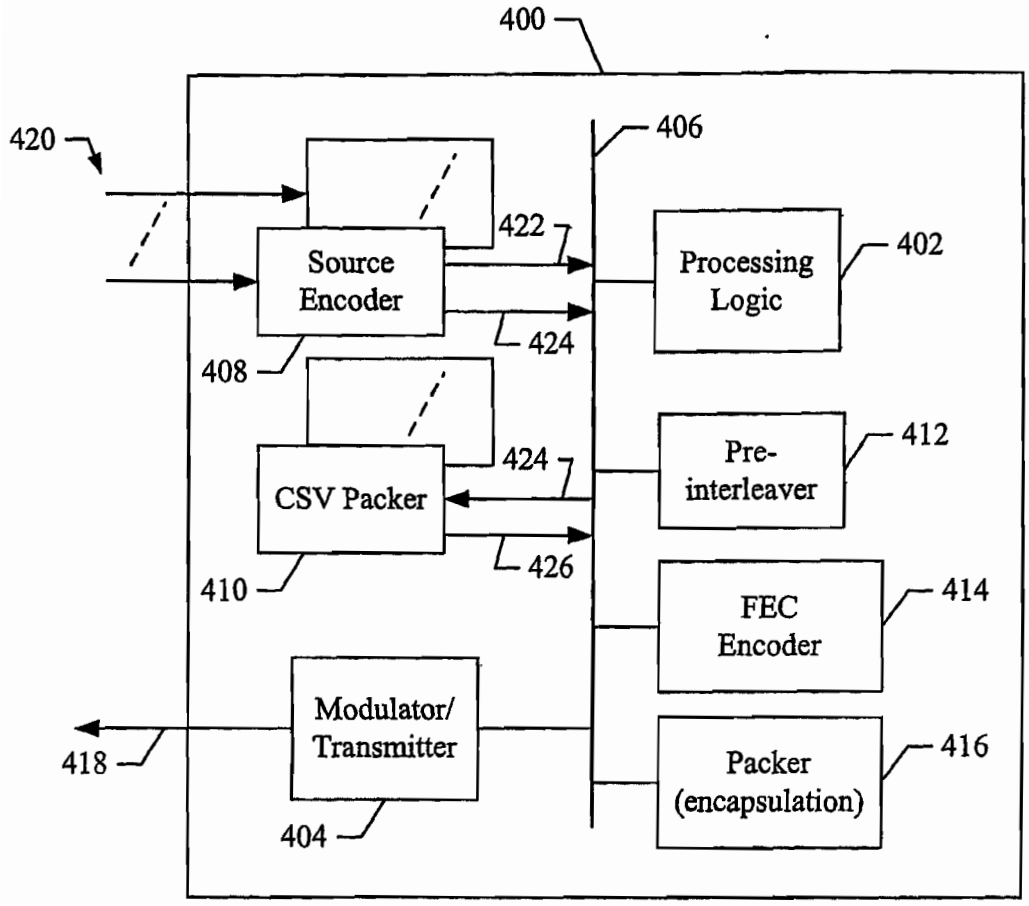

400
420
406
422
Source Encoder
Processing Logic
402
424
408
424
CSV Packer
Pre-interleaver
412
426
410
FEC Encoder
414
Modulator/ Transmitter
418
Packer (encapsulation)
416
404

FIG. 4

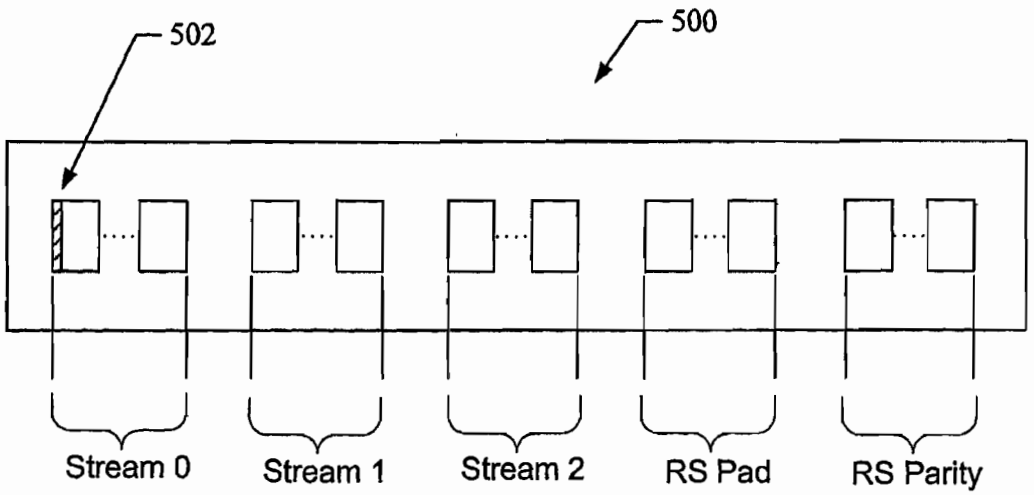

502
500
Stream 0
Stream 1
Stream 2
RS Pad
RS Parity

FIG. 5

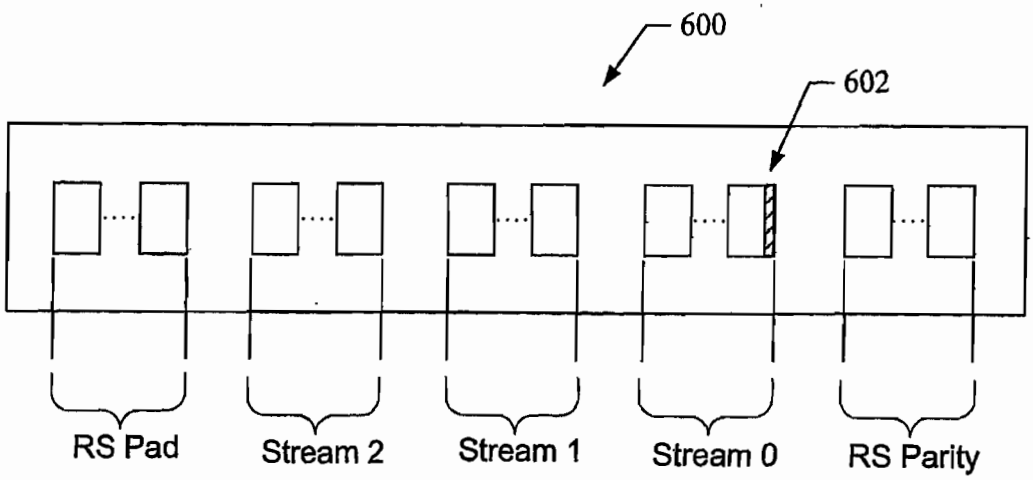

600
602
RS Pad
Stream 2
Stream 1
Stream 0
RS Parity

FIG. 6

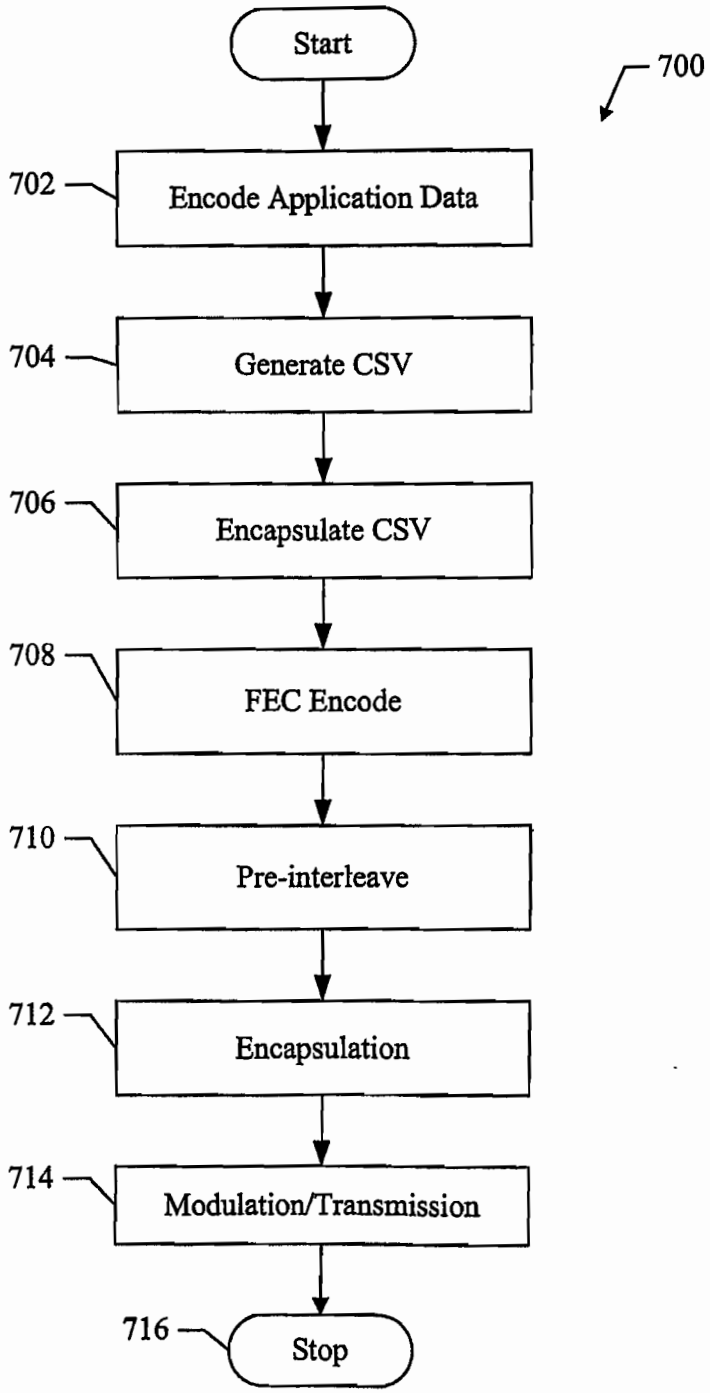

Start
700
702
Encode Application Data
704
Generate CSV
706
Encapsulate CSV
708
FEC Encode
710
Pre-interleave
712
Encapsulation
714
Modulation/Transmission
716
Stop

FIG. 7

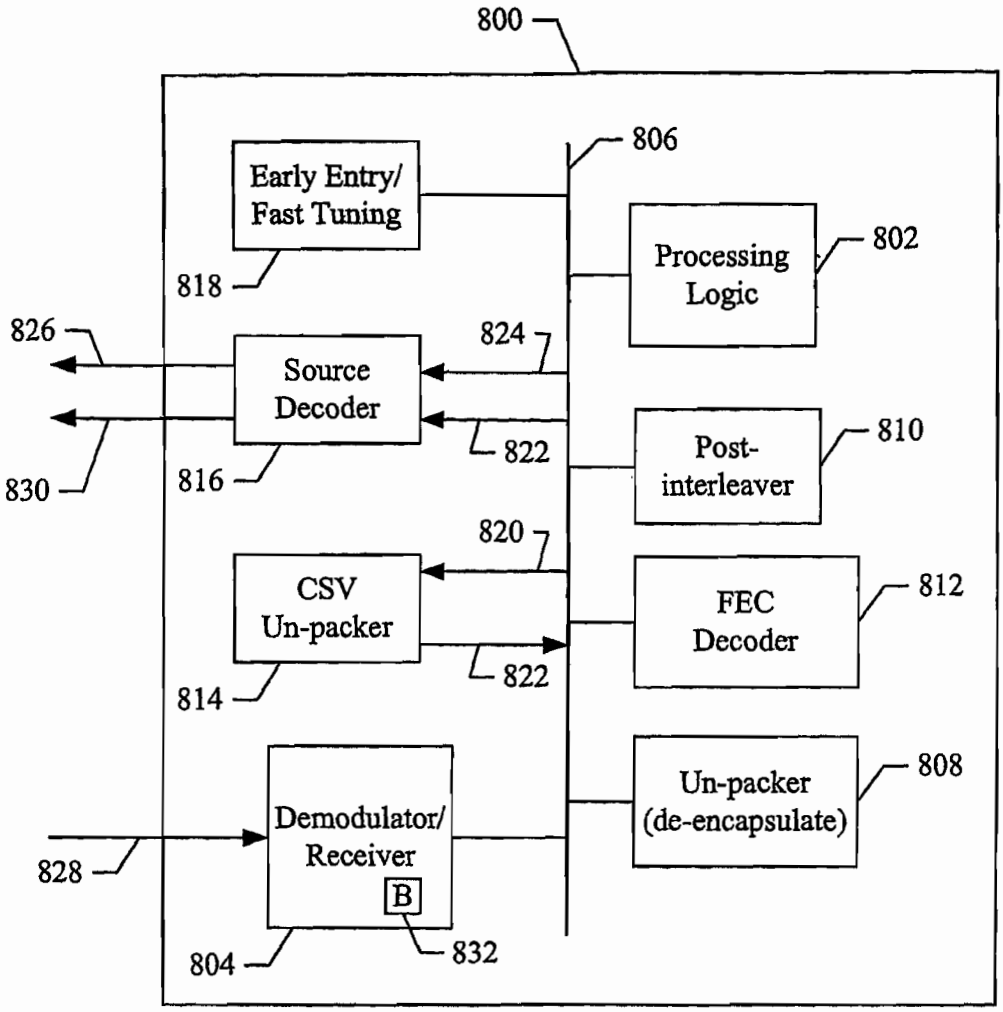

800
806
Early Entry/
Fast Tuning
818
Processing
Logic
802
826
824
Source
Decoder
822
830
816
Post-
interleaver
810
820
CSV
Un-packer
FEC
Decoder
812
822
814
Demodulator/
Receiver
B
Un-packer
(de-encapsulate)
808
828
804
832

FIG. 8

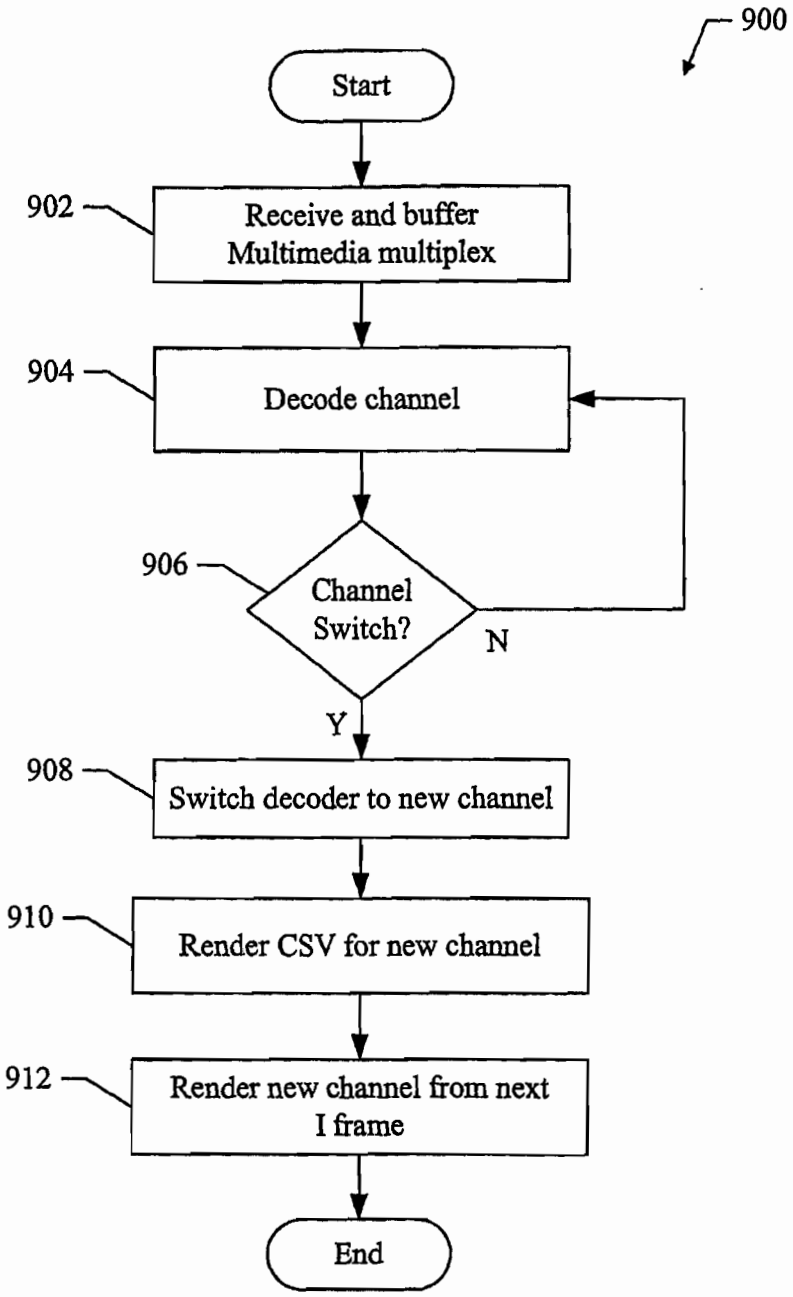

900
Start
902
Receive and buffer Multimedia multiplex
904
Decode channel
906
Channel Switch?
N
Y
908
Switch decoder to new channel
910
Render CSV for new channel
912
Render new channel from next I frame
End

FIG. 9

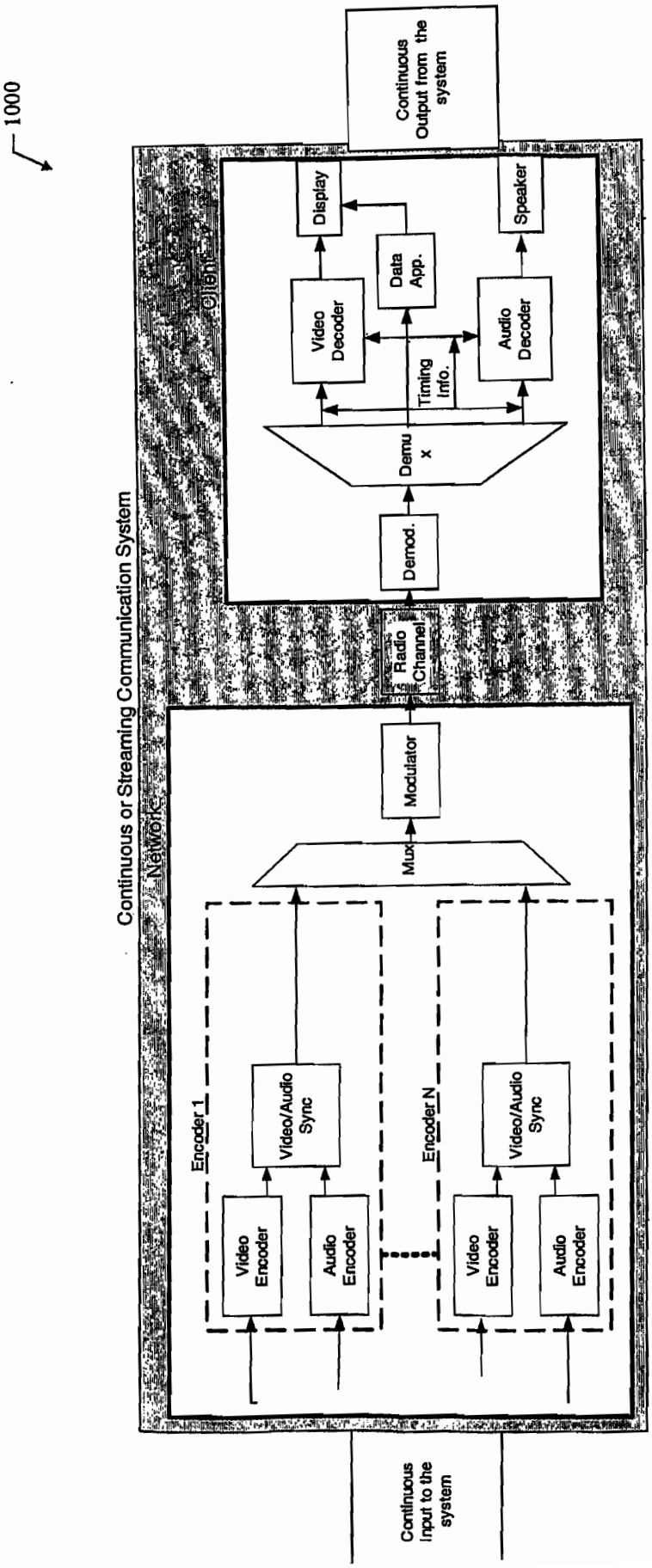

1000
Continuous or Streaming Communication System
Network
Client
Continuous Output from the system
Display
Speaker
Data App.
Video Decoder
Audio Decoder
Timing Info.
Demu x
Demod.
Radio Channel
Modulator
Mux
Encoder 1
Encoder N
Video/Audio Sync
Video/Audio Sync
Video Encoder
Audio Encoder
Video Encoder
Audio Encoder
Continuous Input to the system

FIG. 10

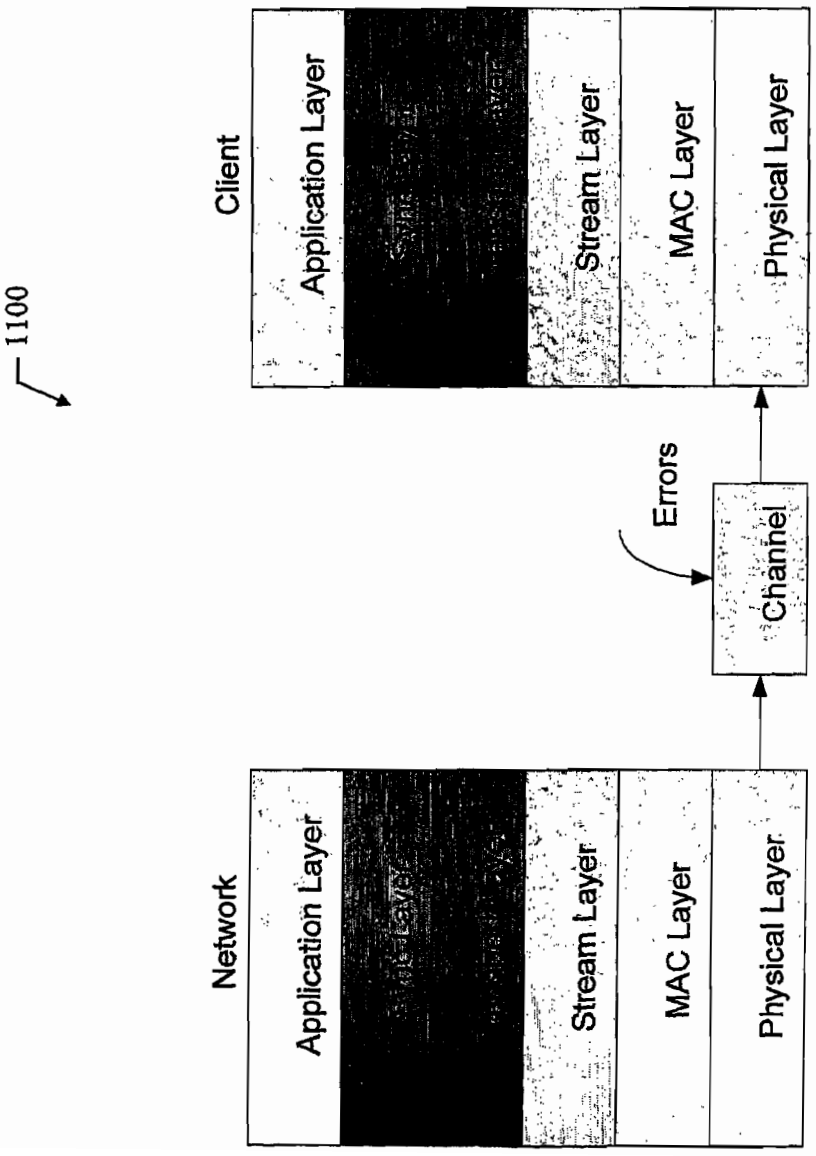

1100
Client
Application Layer
Stream Layer
MAC Layer
Physical Layer
Errors
Channel
Network
Application Layer
Stream Layer
MAC Layer
Physical Layer

FIG. 11

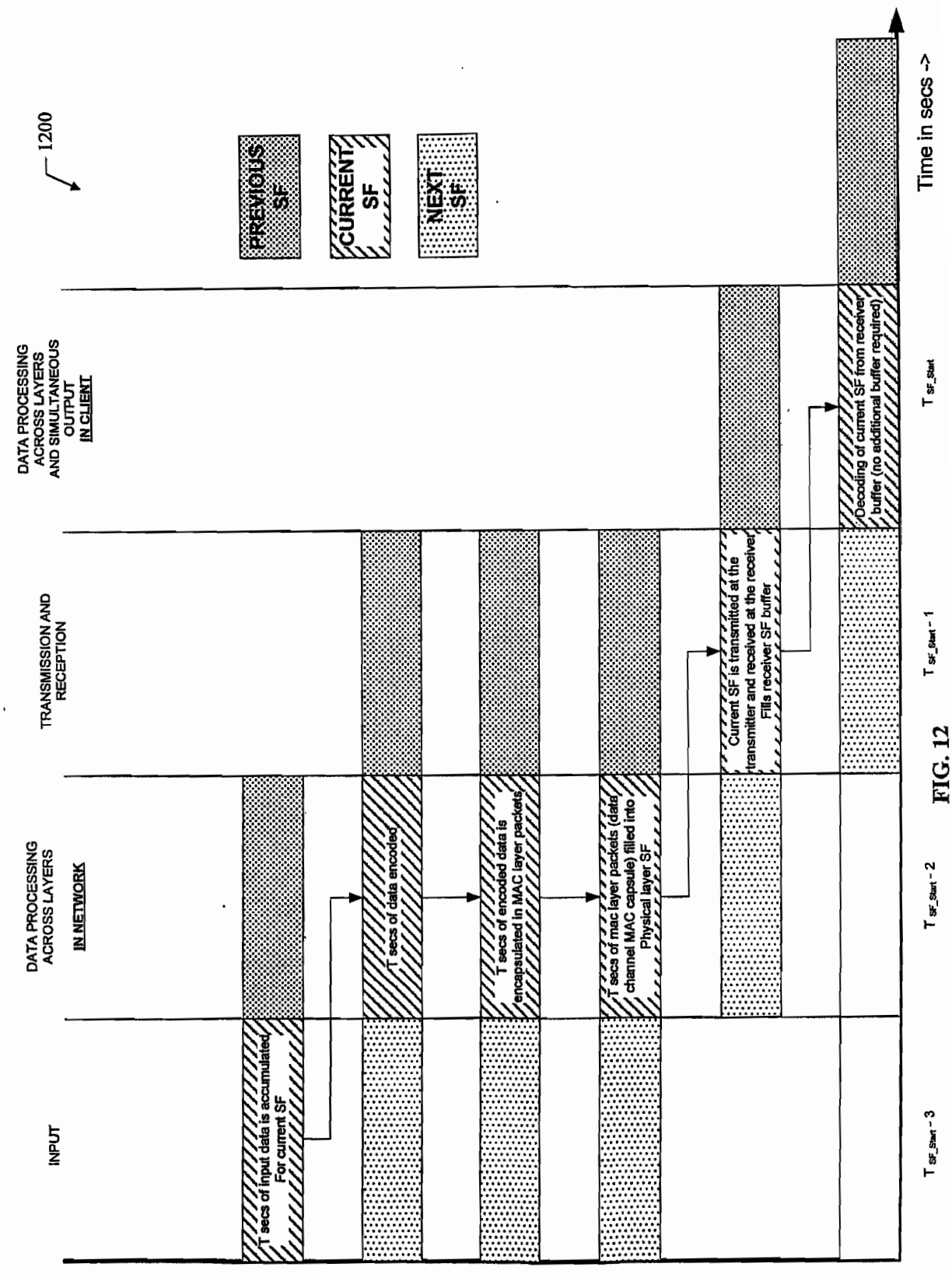

SF Processing
APPLICATION LAYER -> STREAM/MAC LAYER -> PHYSICAL LAYER
1200
PREVIOUS SF
CURRENT SF
NEXT SF
DATA PROCESSING ACROSS LAYERS AND SIMULTANEOUS OUTPUT IN CLIENT
TRANSMISSION AND RECEPTION
DATA PROCESSING ACROSS LAYERS IN NETWORK
INPUT
T secs of input data is accumulated For current SF
T secs of data encoded
T secs of encoded data is encapsulated in MAC layer packets
T secs of mac layer packets (data/ channel MAC capsule) filled into Physical layer SF
Current SF is transmitted at the transmitter and received at the receiver Fills receiver SF buffer
Decoding of current SF from receiver buffer (no additional buffer required)
T SF_Start - 3
T SF_Start - 2
T SF_Start - 1
T SF_Start
Time in secs ->

FIG. 12

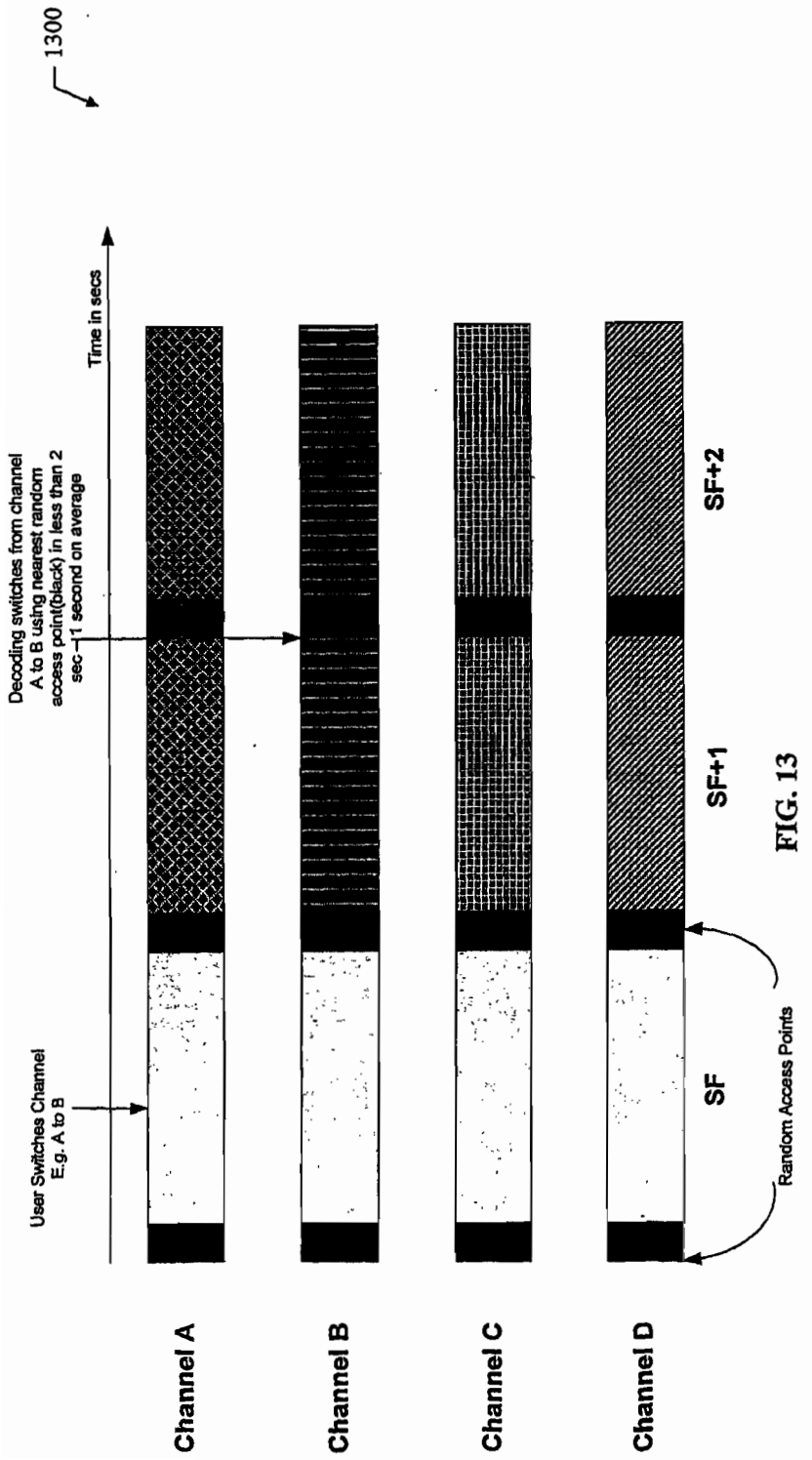

1300
Time in secs
Decoding switches from channel A to B using nearest random access point(black) in less than 2 sec –1 second on average
User Switches Channel E.g. A to B
Channel A
Channel B
Channel C
Channel D
SF
SF+1
SF+2
Random Access Points

FIG. 13

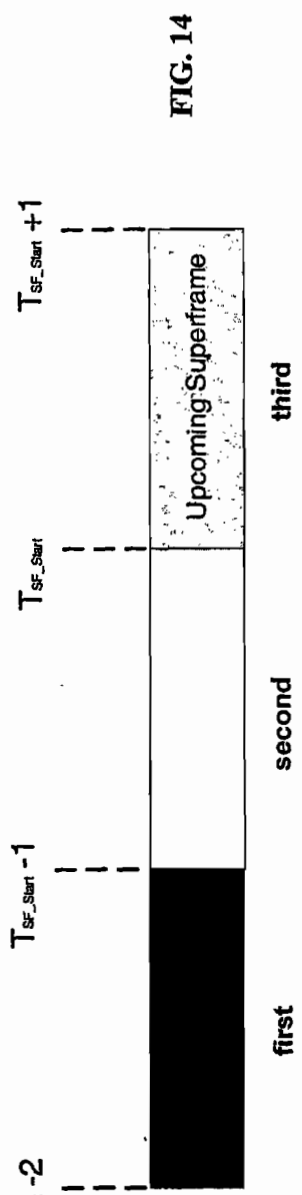

1400
T_{SF_Start} -2
T_{SF_Start} -1
T_{SF_Start}
T_{SF_Start} +1
Upcoming Superframe
first
second
third

FIG. 14

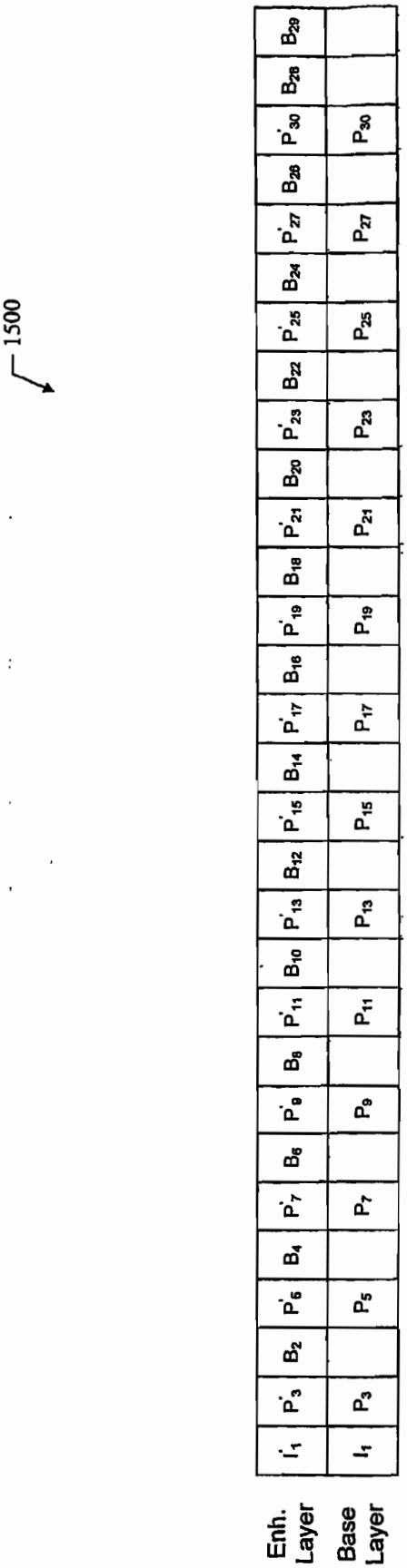

1500
Enh. Layer
Base Layer
I'1 P'3 B2 P'5 B4 P'7 B6 P'9 B8 P'11 B10 P'13 B12 P'15 B14 P'17 B16 P'19 B18 P'21 B20 P'23 B22 P'25 B24 P'27 B26 P'30 B28 B29
I1 P3 P5 P7 P9 P11 P13 P15 P17 P19 P21 P23 P25 P27 P30

FIG. 15

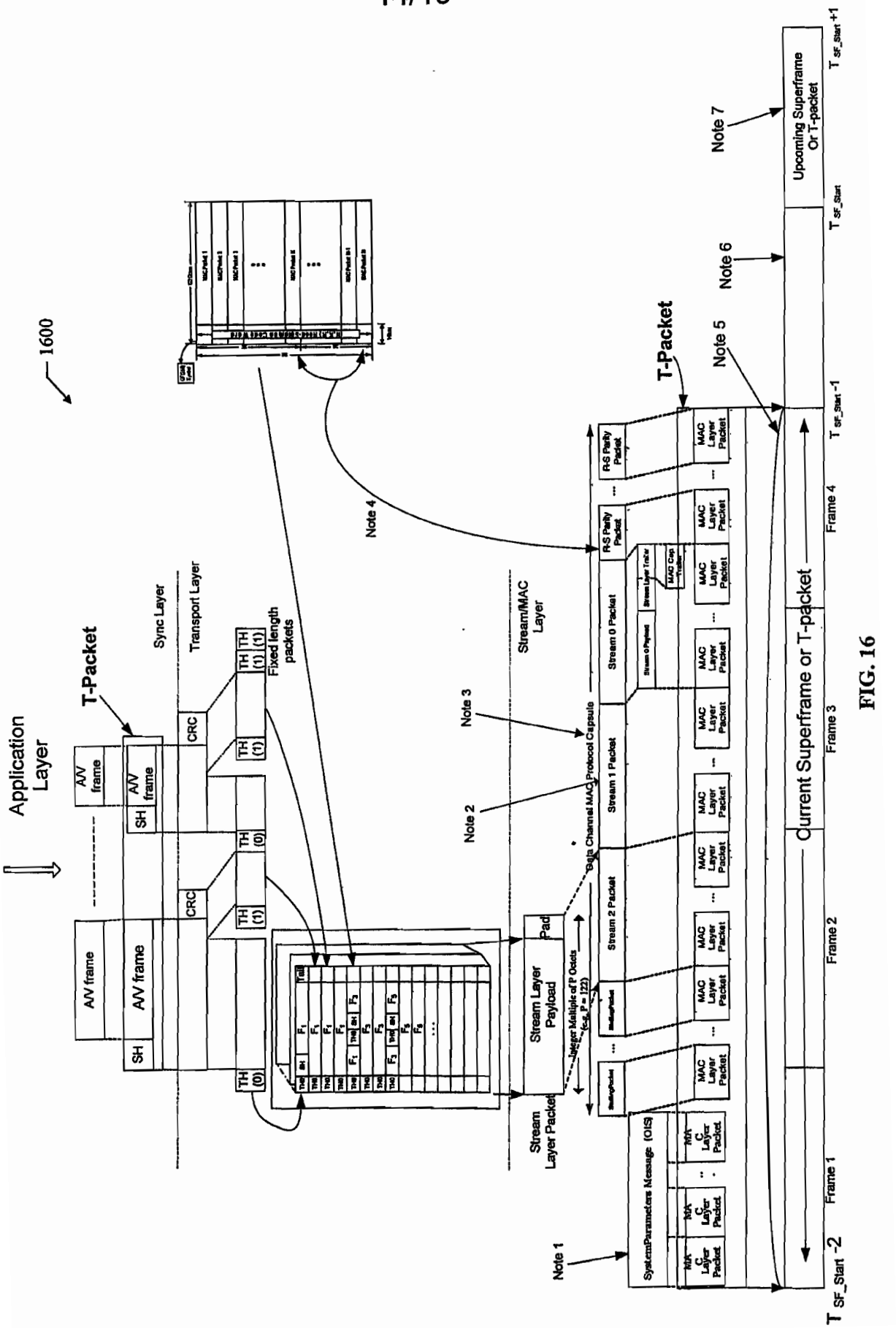

1600
Application Layer
T-Packet
A/V frame
SH
CRC
Sync Layer
Transport Layer
TH (0)
TH (1)
TH (1) (1)
Fixed length packets
Stream/MAC Layer
Note 1
Note 2
Note 3
Note 4
Note 5
Note 6
Note 7
Pad
Stream Layer Payload
Stream Layer Packet
Data Channel MAC Protocol Capsule
Stream 0 Packet
Stream 1 Packet
Stream 2 Packet
MAC Layer Packet
R-S Parity Packet
System Parameters Message (OIS)
Current Superframe or T-packet
Upcoming Superframe Or T-packet
Frame 1
Frame 2
Frame 3
Frame 4
T SF_Start -2
T SF_Start -1
T SF_Start
T SF_Start +1

FIG. 16

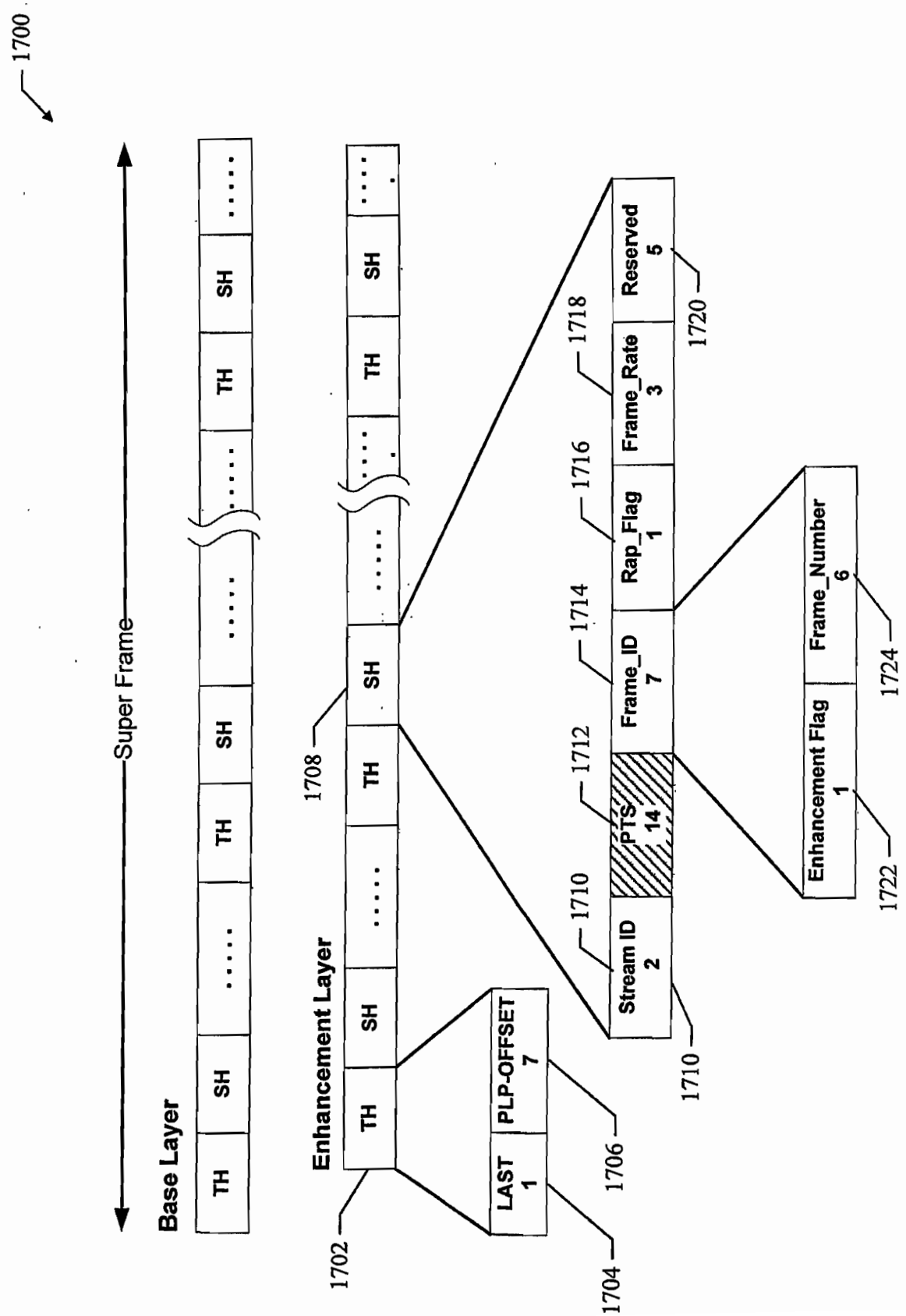
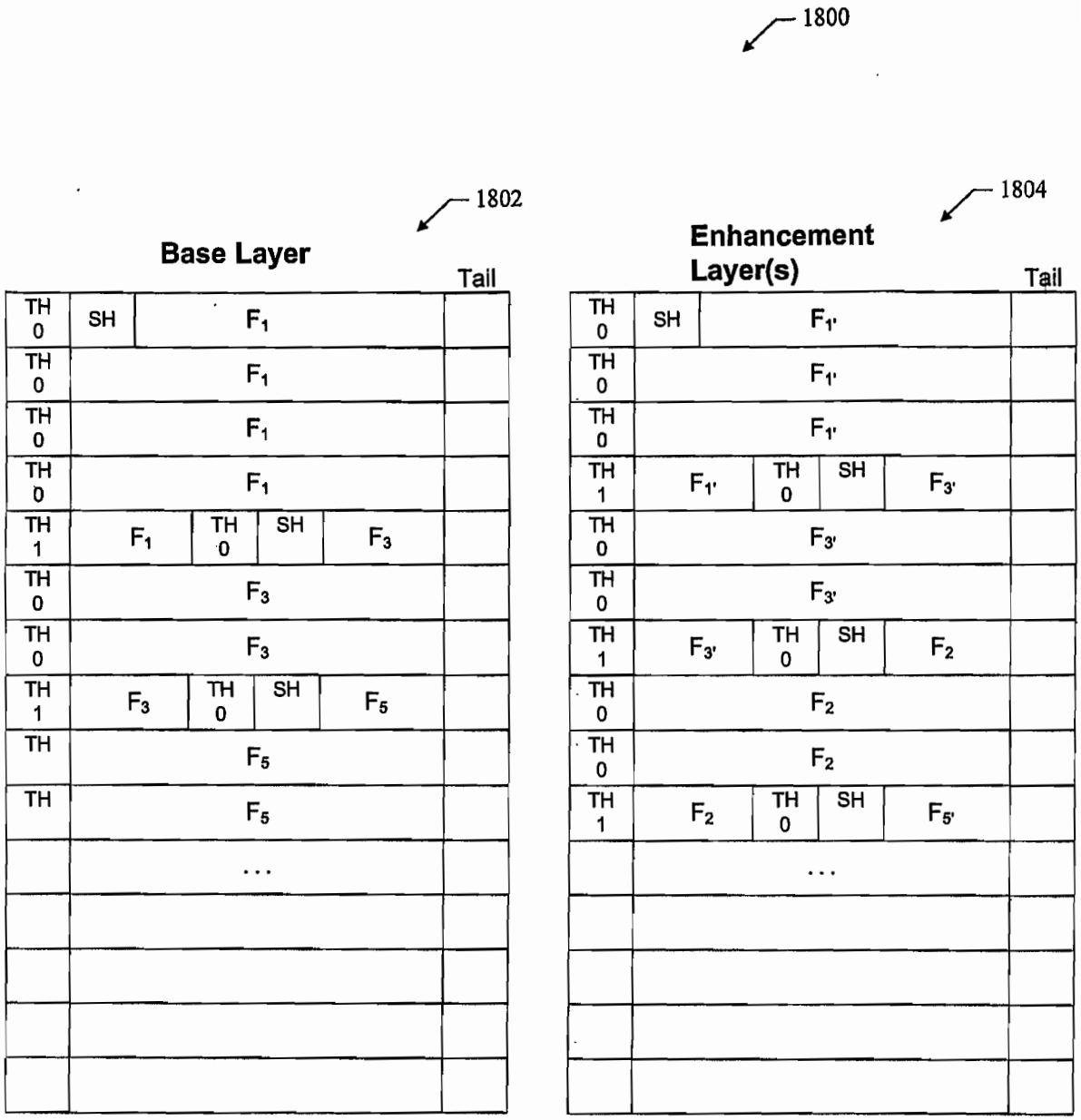

1700
Super Frame
Base Layer
TH
SH
TH
SH
SH
TH
SH
Enhancement Layer
TH
SH
TH
SH
TH
SH
1702
1704
LAST 1
PLP-OFFSET 7
1706
1708
1710
Stream ID 2
1712
PTS 14
1714
Frame_ID 7
1716
Rap_Flag 1
1718
Frame_Rate 3
1720
Reserved 5
1722
Enhancement Flag 1
1724
Frame_Number 6

FIG. 17



TH = Transport Header
SH = Sync Header
Tail = Tail with CRC

FIG. 18

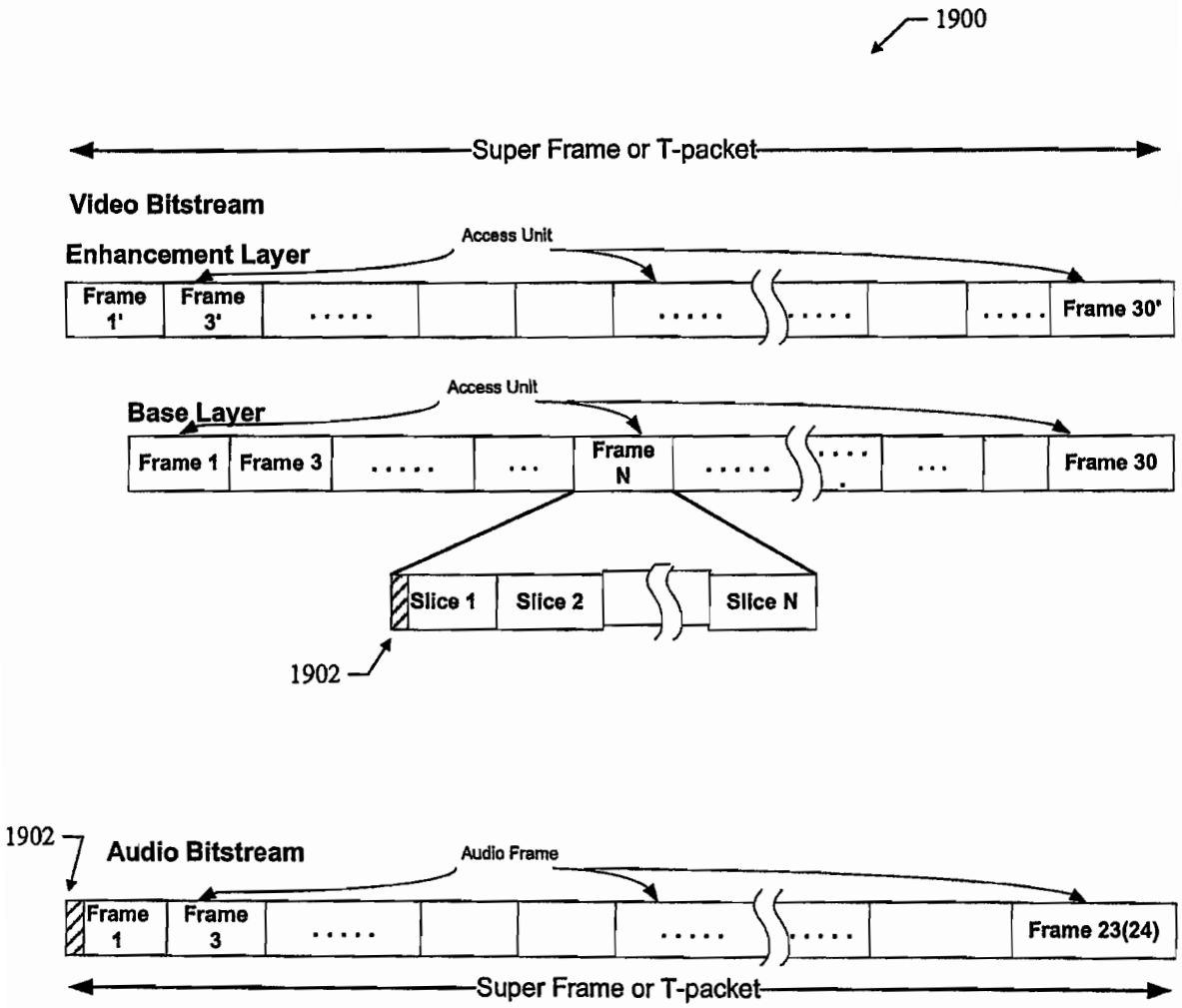

1900
Super Frame or T-packet
Video Bitstream
Enhancement Layer
Access Unit
Frame 1'
Frame 3'
Frame 30'
Base Layer
Access Unit
Frame 1
Frame 3
Frame N
Frame 30
Slice 1
Slice 2
Slice N
1902
1902
Audio Bitstream
Audio Frame
Frame 1
Frame 3
Frame 23(24)
Super Frame or T-packet

FIG. 19

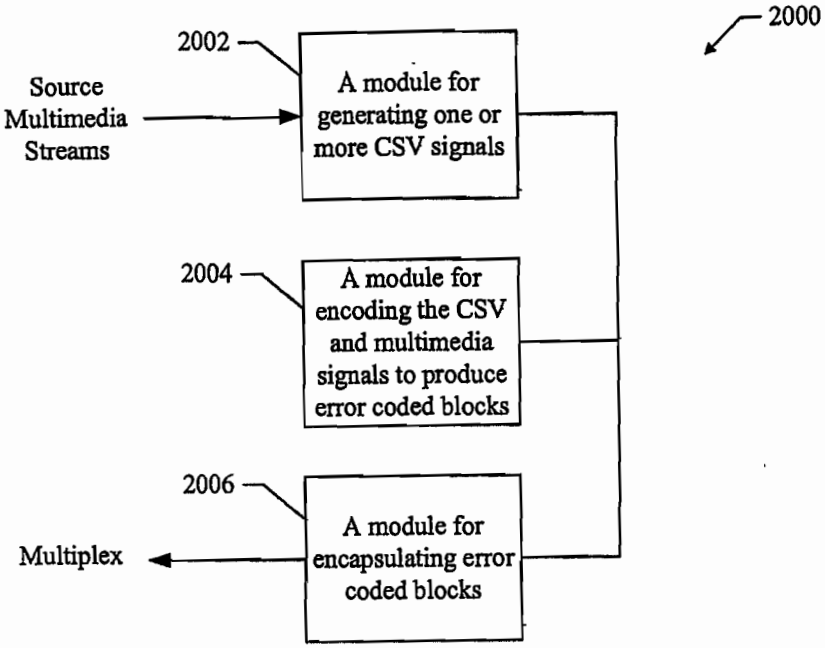

2000
2002
Source Multimedia Streams
A module for generating one or more CSV signals
2004
A module for encoding the CSV and multimedia signals to produce error coded blocks
2006
Multiplex
A module for encapsulating error coded blocks

FIG. 20

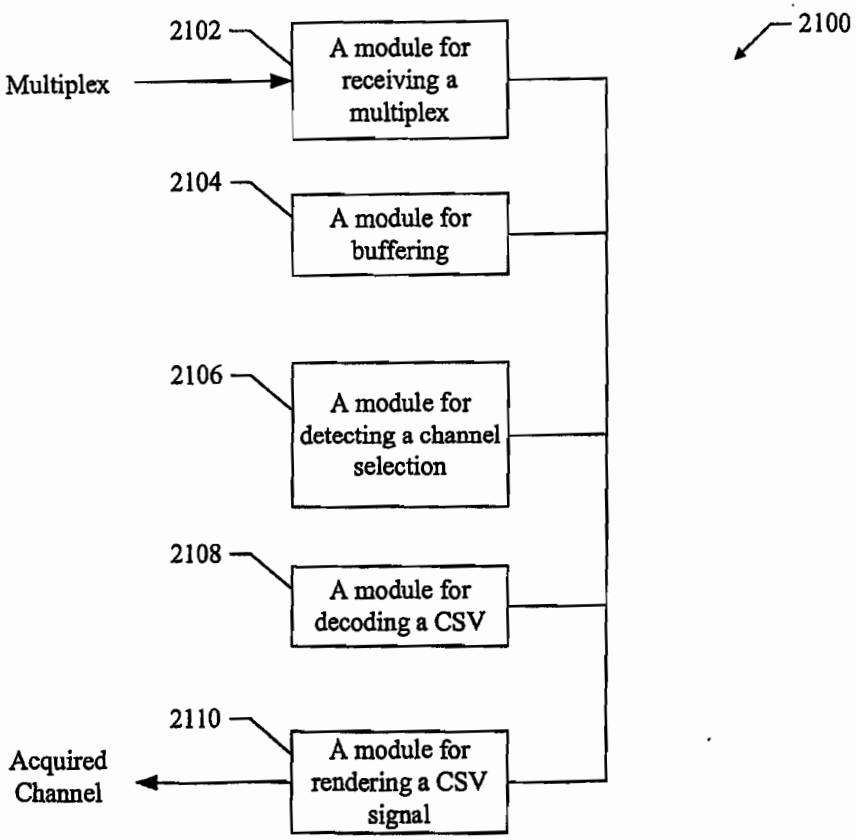

2100
2102
Multiplex
A module for receiving a multiplex
2104
A module for buffering
2106
A module for detecting a channel selection
2108
A module for decoding a CSV
2110
Acquired Channel
A module for rendering a CSV signal

FIG. 21

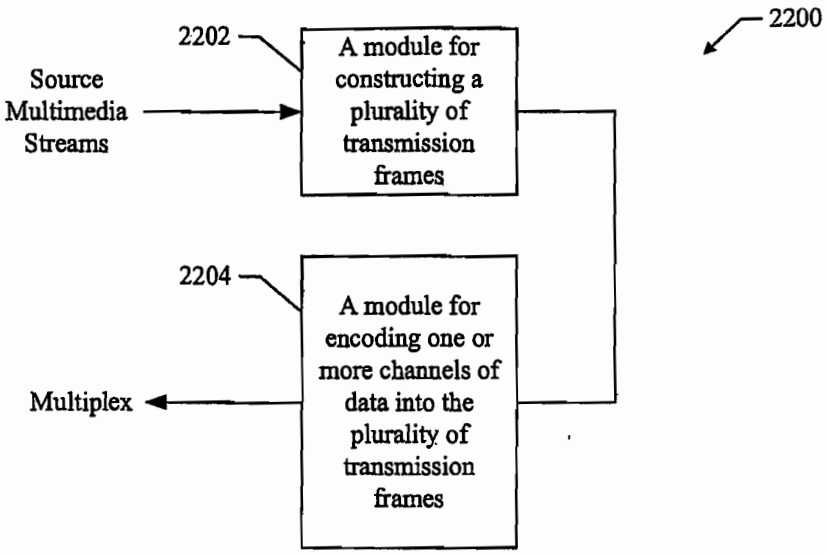

2200
2202
A module for constructing a plurality of transmission frames
Source Multimedia Streams
2204
A module for encoding one or more channels of data into the plurality of transmission frames
Multiplex

FIG. 22

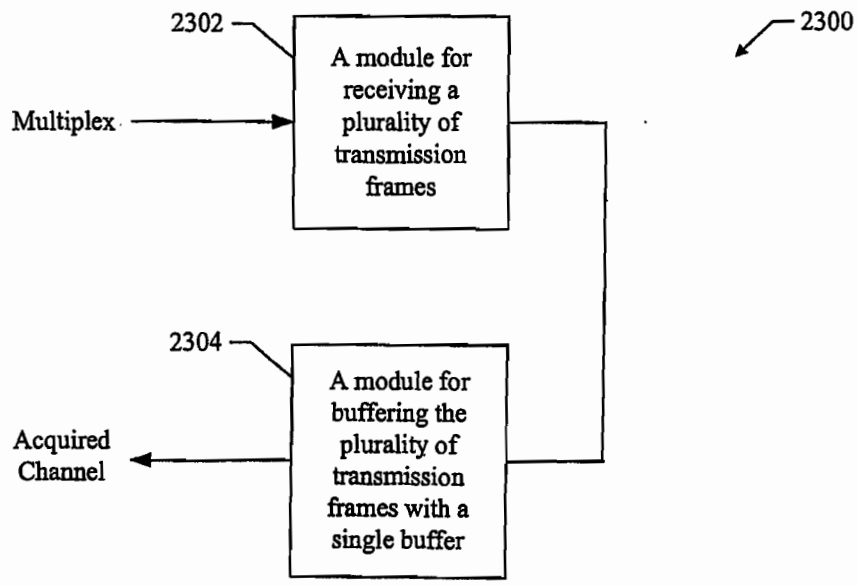

2300
2302
A module for receiving a plurality of transmission frames
Multiplex
2304
A module for buffering the plurality of transmission frames with a single buffer
Acquired Channel

FIG. 23