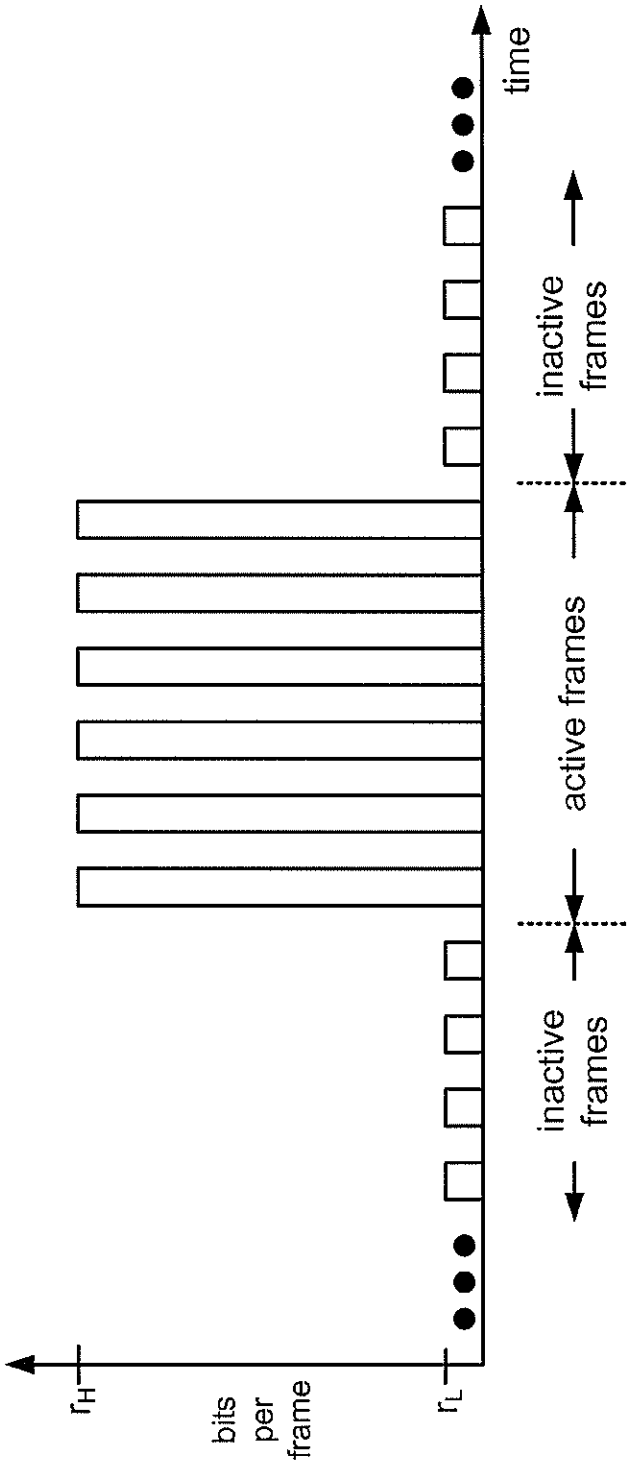
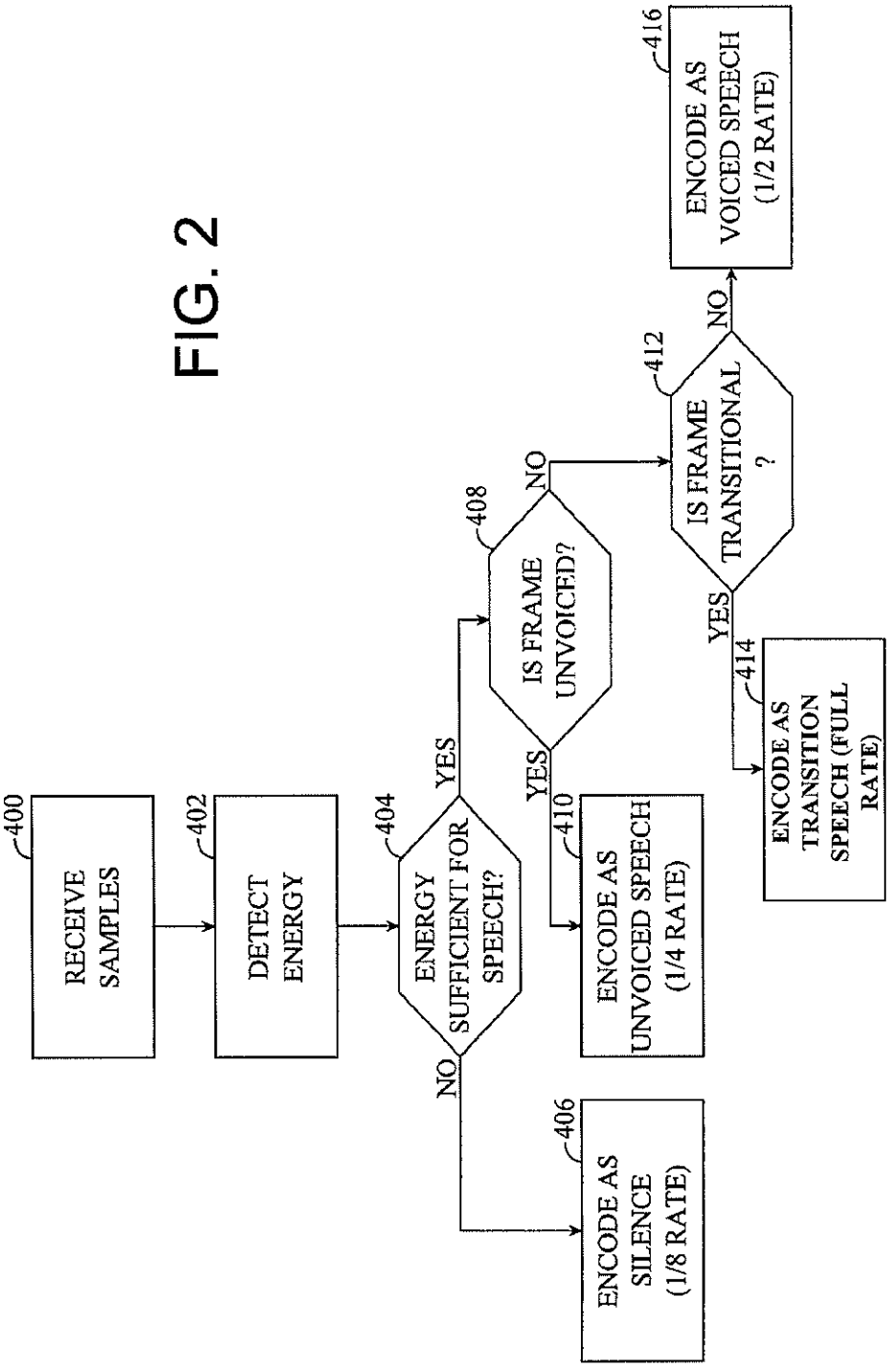

time
inactive frames
active frames
inactive frames
r_H
bits per frame
r_L

FIG. 1

FIG. 2


400
RECEIVE SAMPLES
402
DETECT ENERGY
404
ENERGY SUFFICIENT FOR SPEECH?
NO
406
ENCODE AS SILENCE (1/8 RATE)
YES
408
IS FRAME UNVOICED?
YES
410
ENCODE AS UNVOICED SPEECH (1/4 RATE)
NO
412
IS FRAME TRANSITIONAL ?
YES
414
ENCODE AS TRANSITION SPEECH (FULL RATE)
NO
416
ENCODE AS VOICED SPEECH (1/2 RATE)

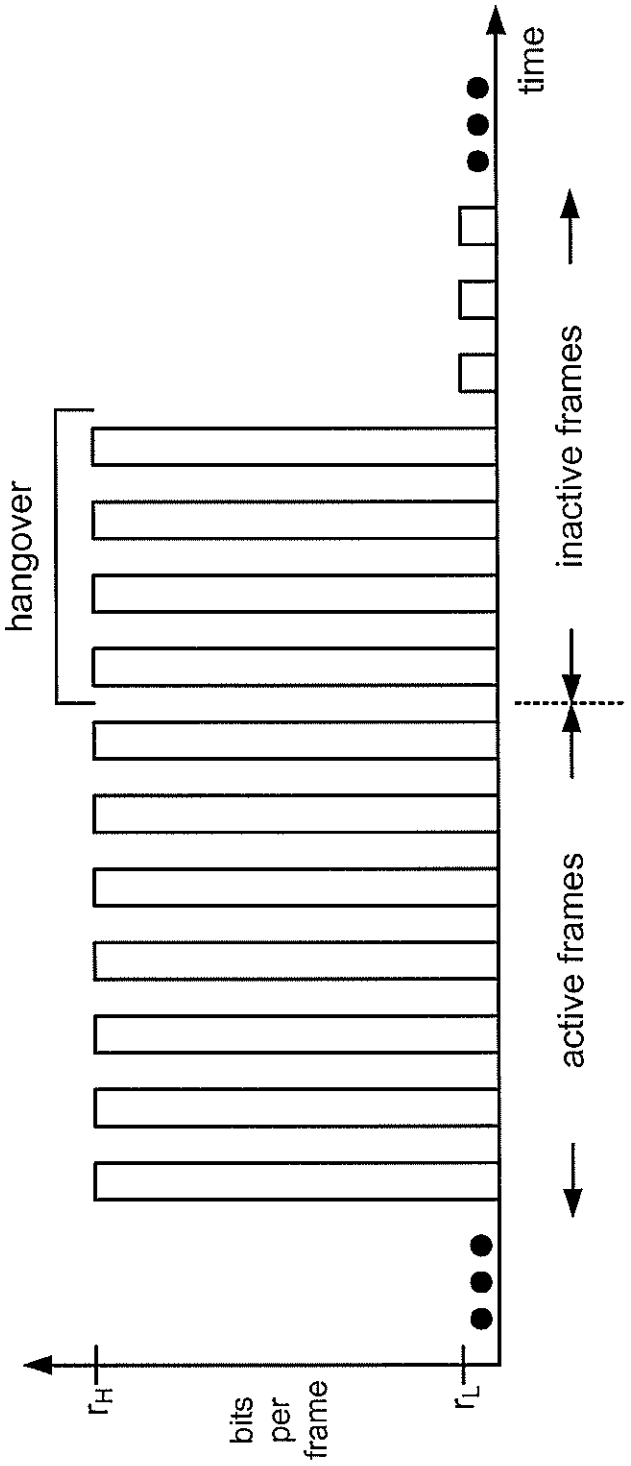

time
hangover
inactive frames
active frames
r_H
r_L
bits per frame

FIG. 3

FIG. 4A

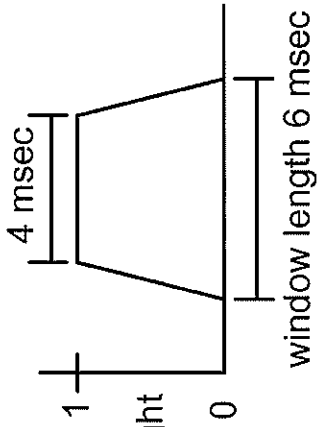
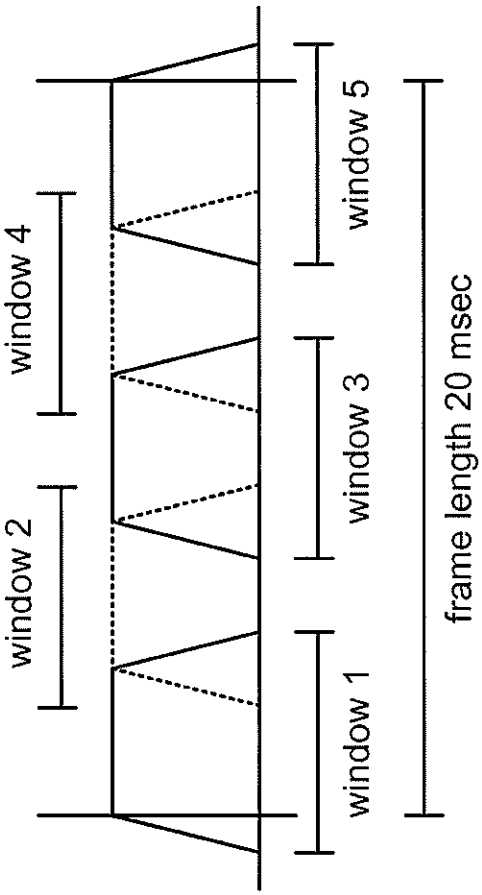

4 msec
1
weight
0
window length 6 msec

FIG. 4B


window 2
window 4
window 1
window 3
window 5
frame length 20 msec

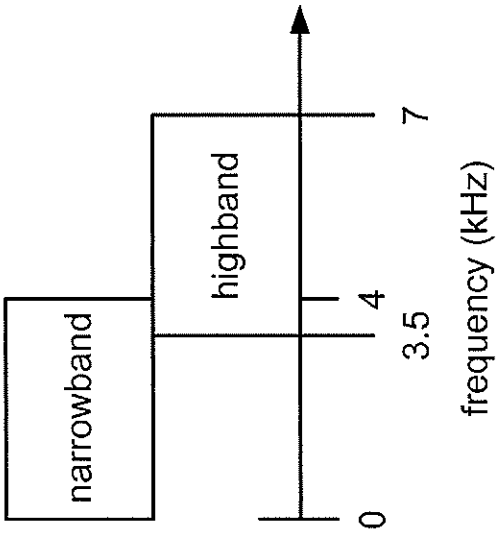

narrowband
highband
0
4
3.5
7
frequency (kHz)

FIG. 5B

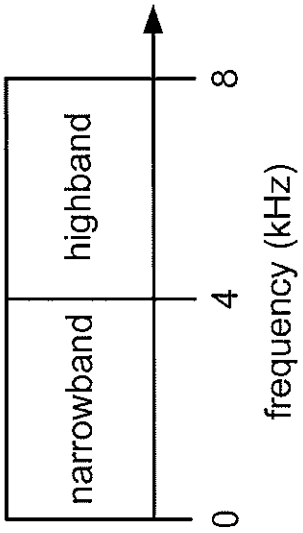

narrowband
highband
0
4
8
frequency (kHz)

FIG. 5A

FIG. 6A

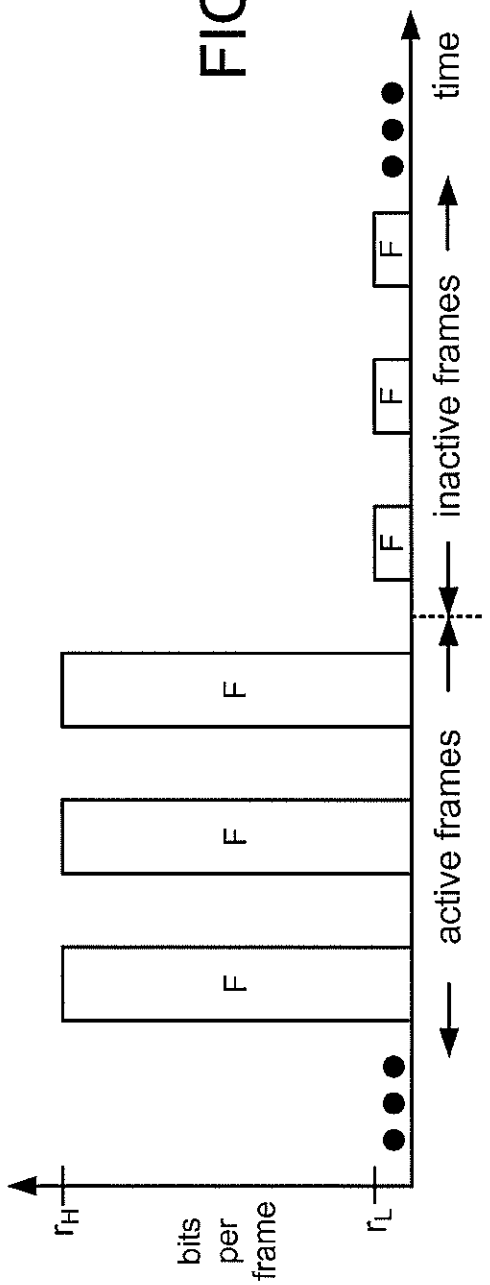

r_H
bits per frame
r_L
F
F
F
F
F
F
active frames
inactive frames
time

FIG. 6B

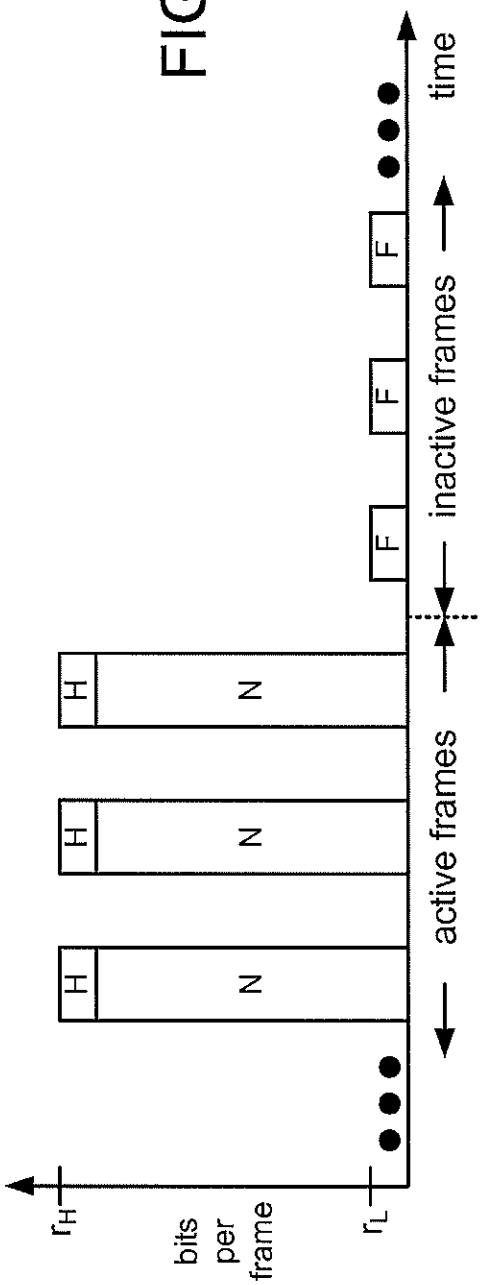

r_H
bits per frame
r_L
H
N
H
N
H
N
F
F
F
active frames
inactive frames
time

FIG. 7A

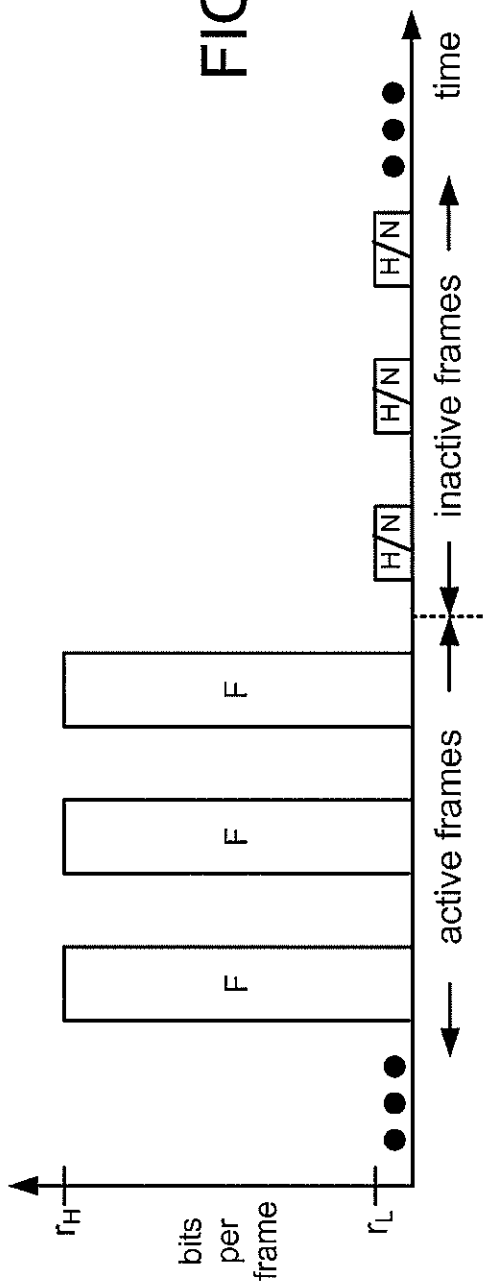

bits per frame
r_H
r_L
F
F
F
H/N
H/N
H/N
active frames
inactive frames
time

FIG. 7B

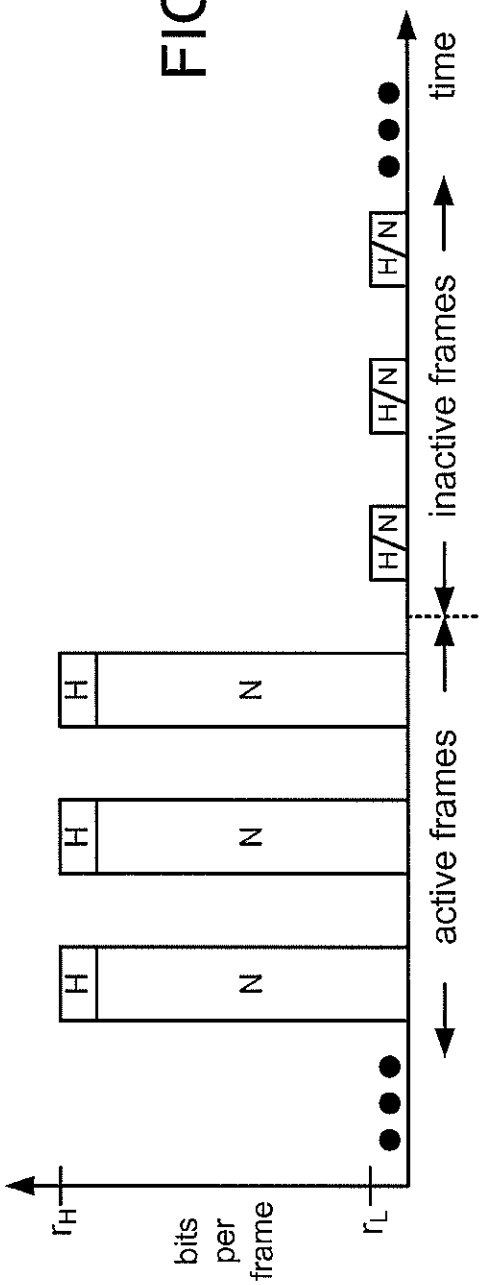

bits per frame
r_H
r_L
H
N
H
N
H
N
H/N
H/N
H/N
active frames
inactive frames
time

FIG. 8A

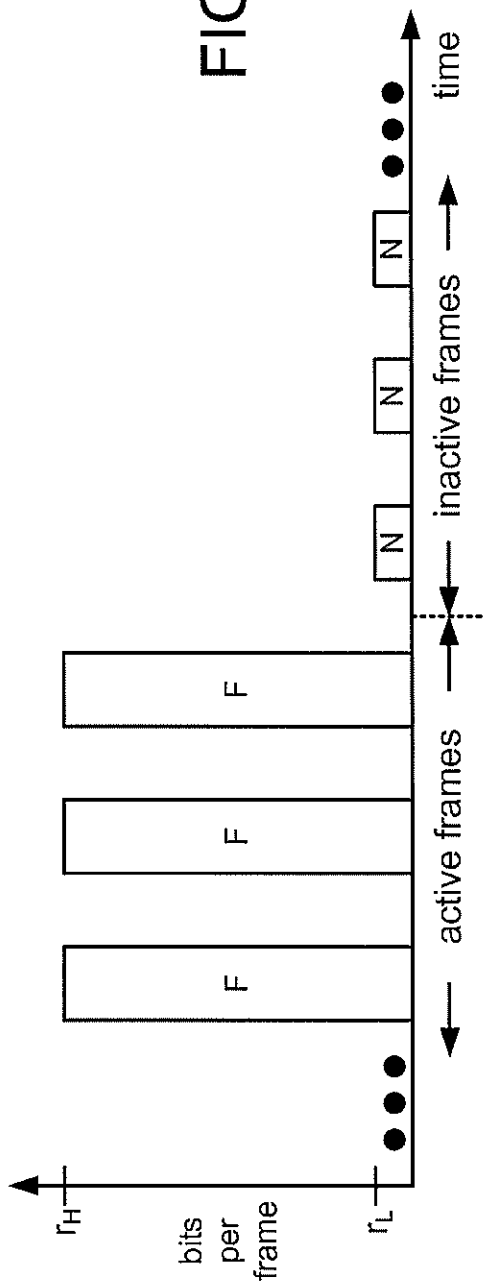
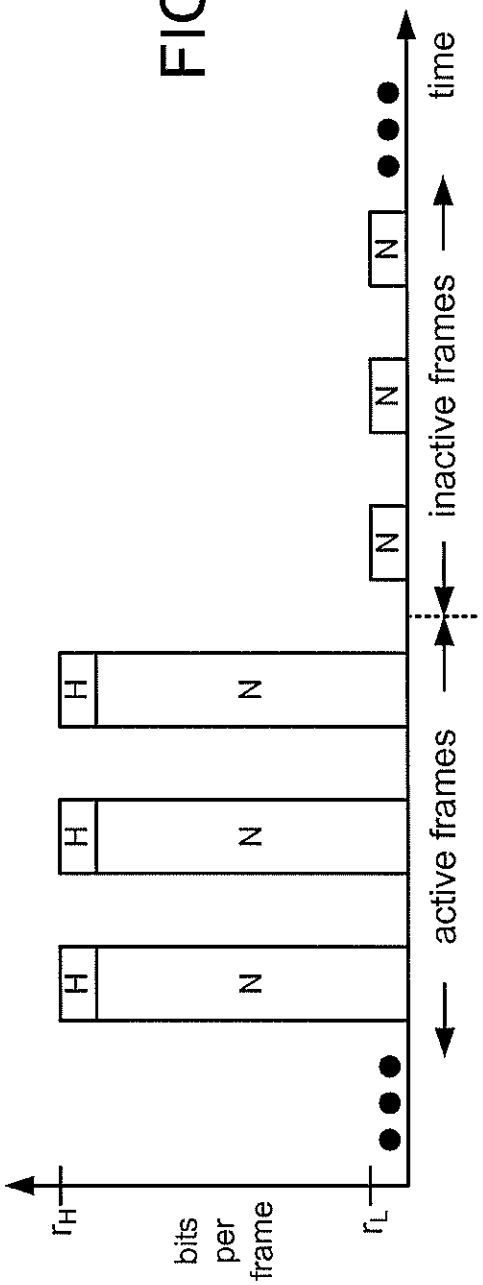

r_H
bits per frame
r_L
F
F
F
N
N
N
active frames
inactive frames
time

FIG. 8B


r_H
bits per frame
r_L
H
N
H
N
H
N
N
N
N
active frames
inactive frames
time

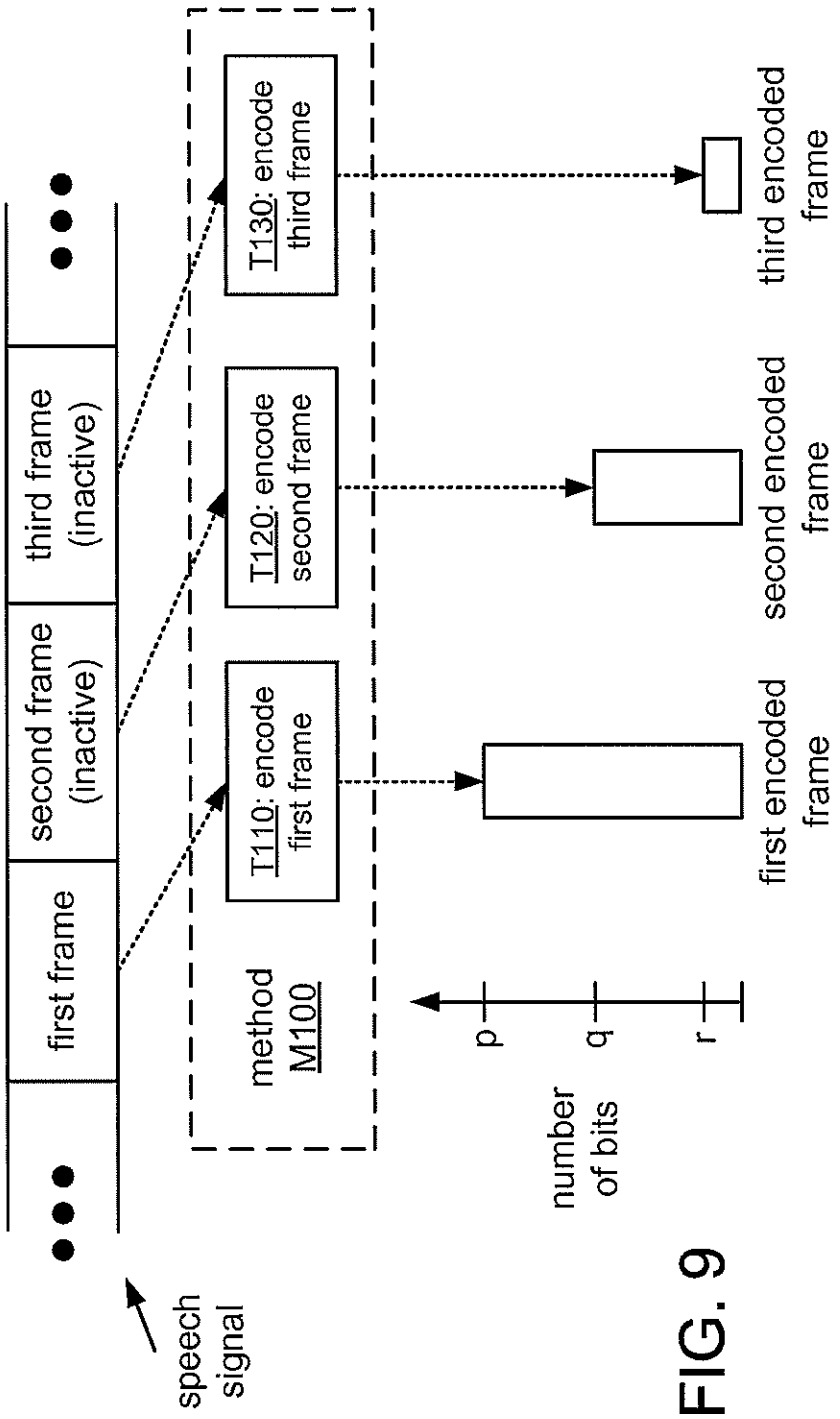

speech signal
first frame
second frame (inactive)
third frame (inactive)
method M100
T110: encode first frame
T120: encode second frame
T130: encode third frame
number of bits
p
q
r
first encoded frame
second encoded frame
third encoded frame

FIG. 9

FIG. 10A

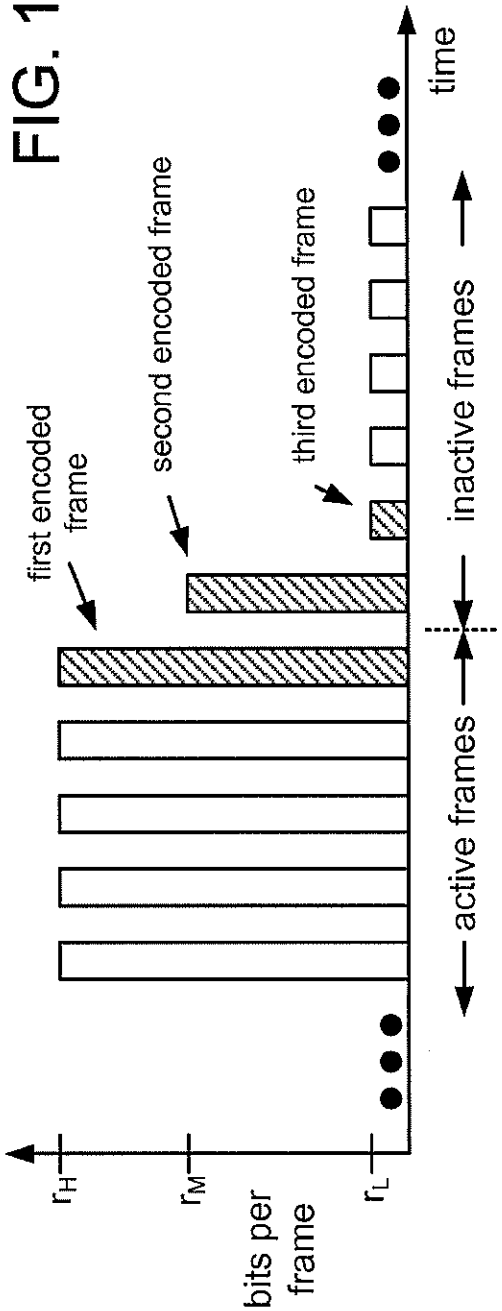


FIG. 10B

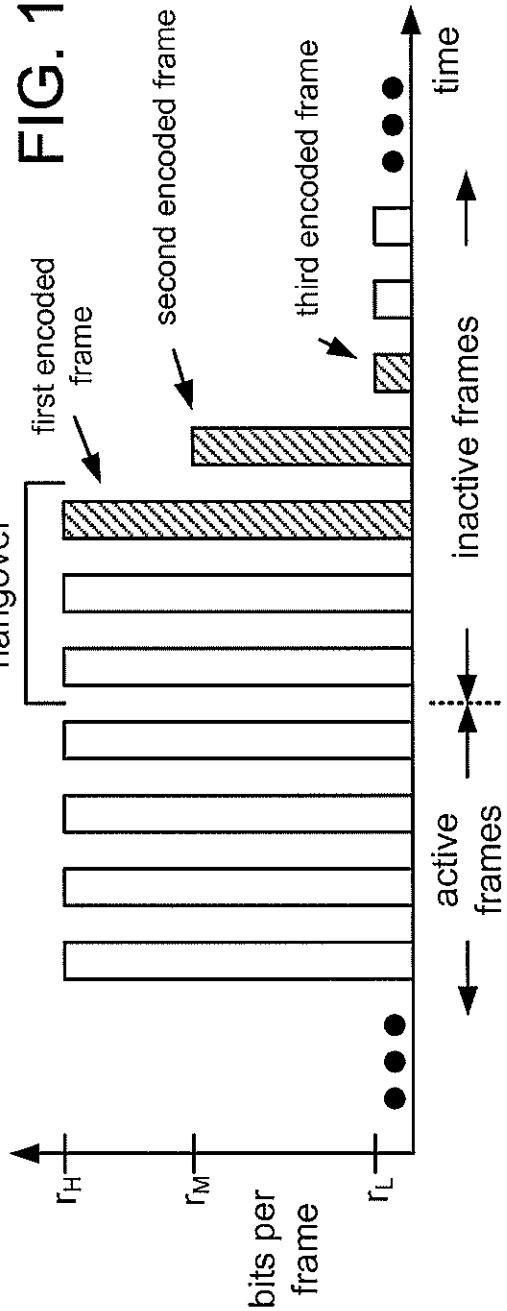


FIG. 11A

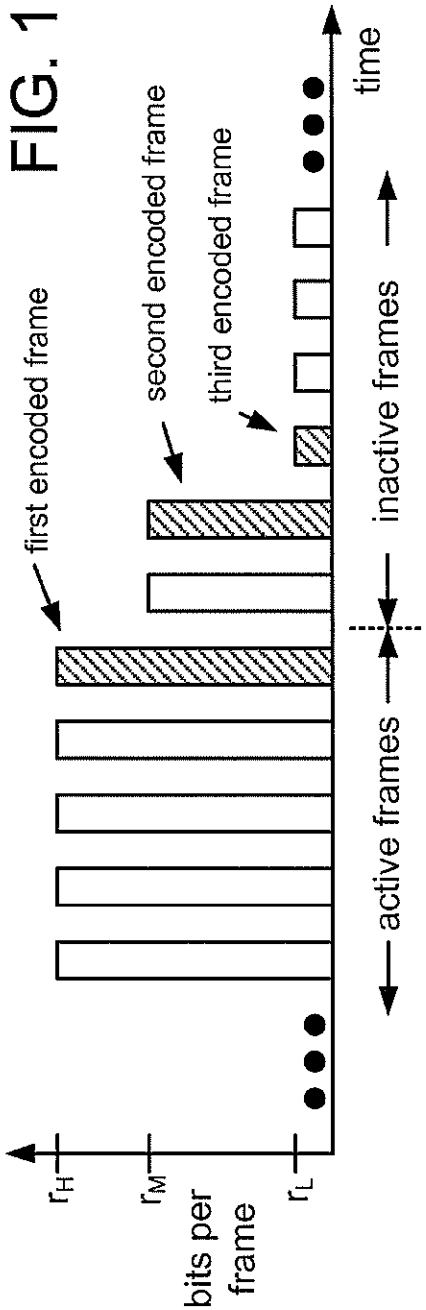


FIG. 11B

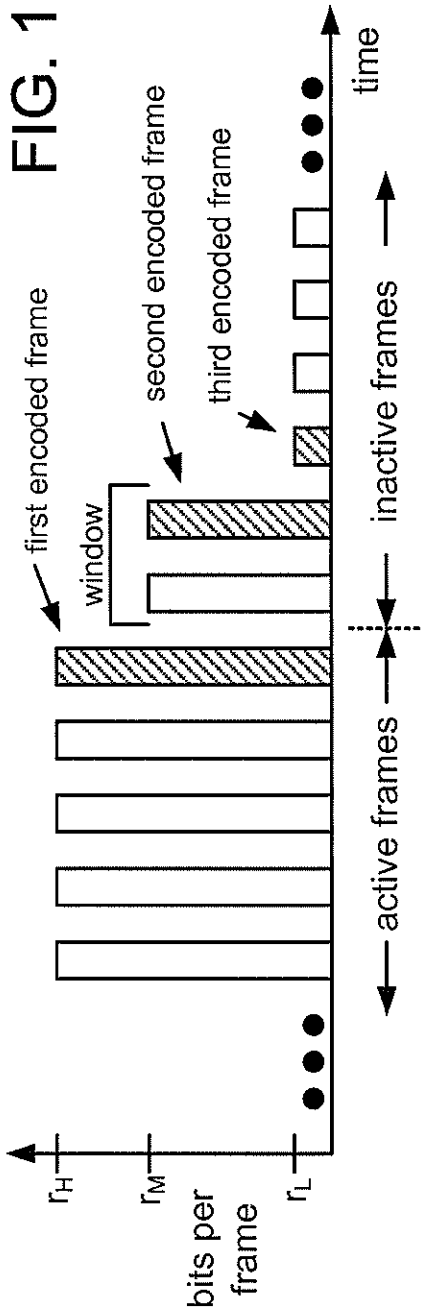


FIG. 12A

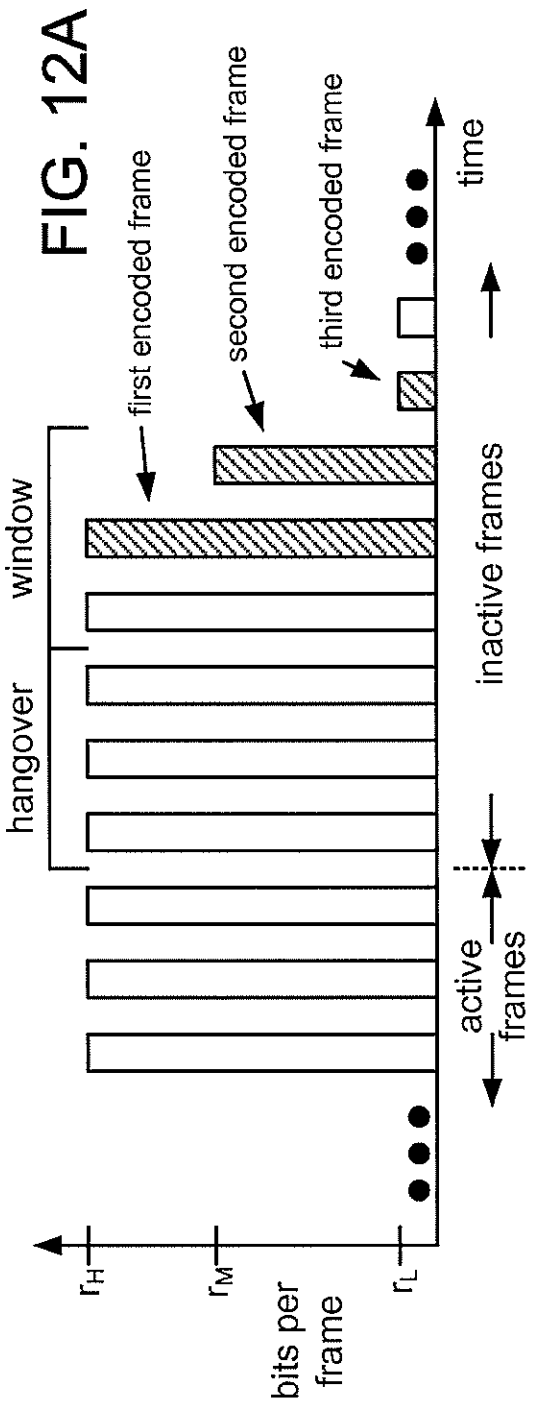


FIG. 12B

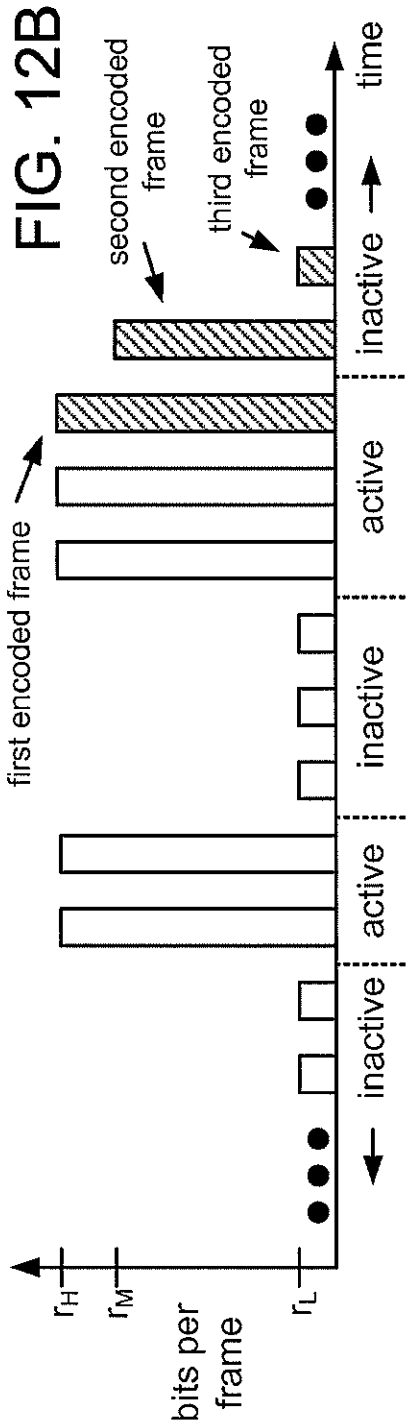


FIG. 13A

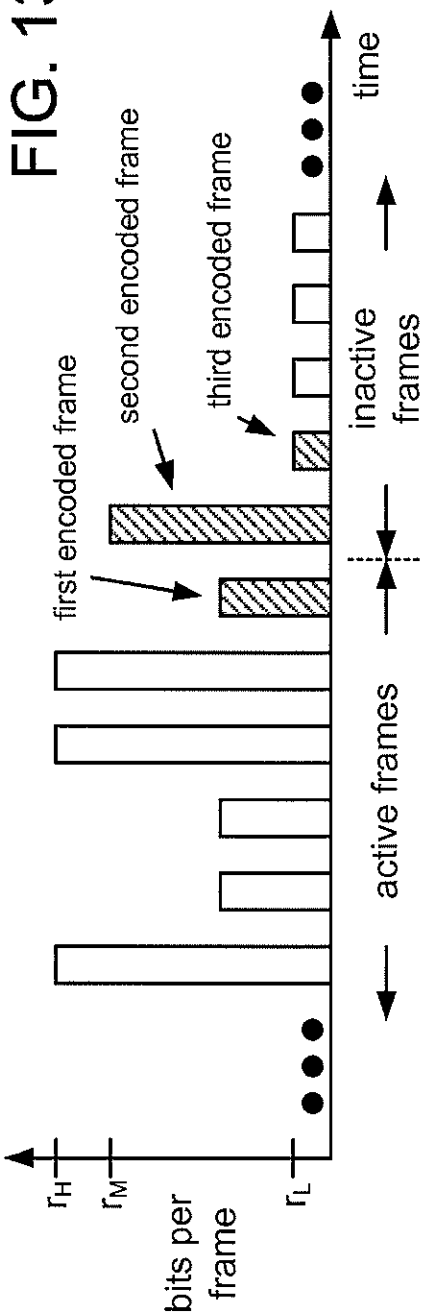
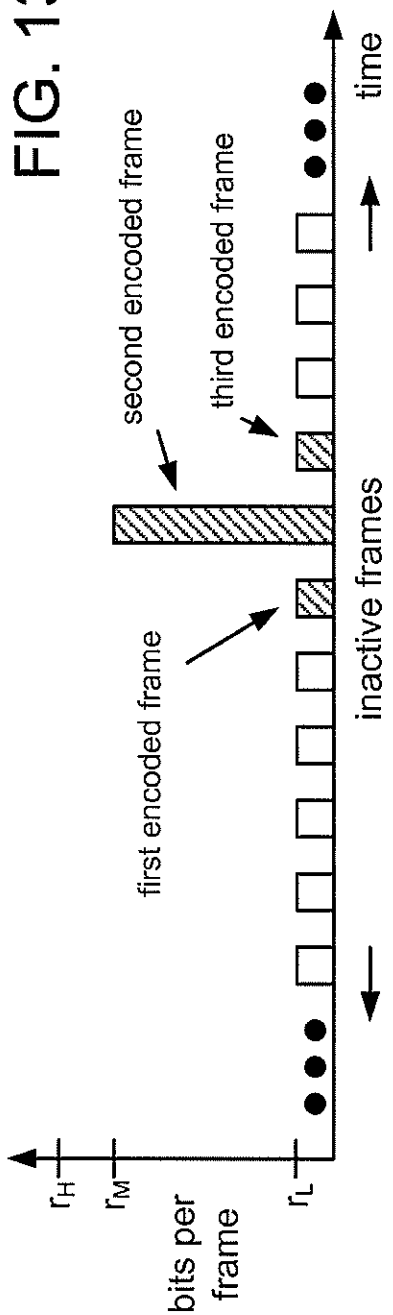


FIG. 13B



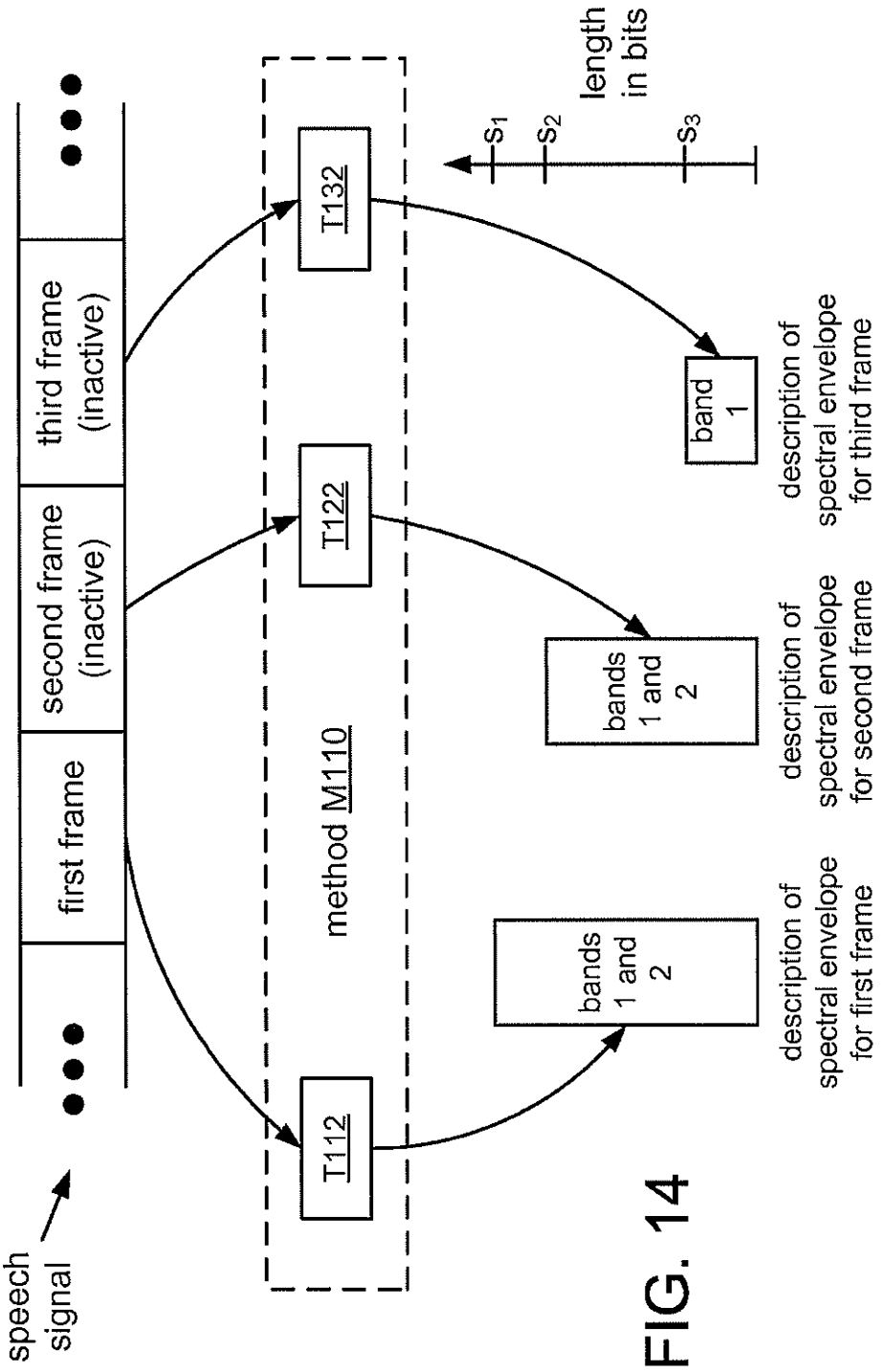

speech signal
first frame
second frame (inactive)
third frame (inactive)
method M110
T112
T122
T132
bands 1 and 2
bands 1 and 2
band 1
length in bits
s_1
s_2
s_3
description of spectral envelope for first frame
description of spectral envelope for second frame
description of spectral envelope for third frame

FIG. 14

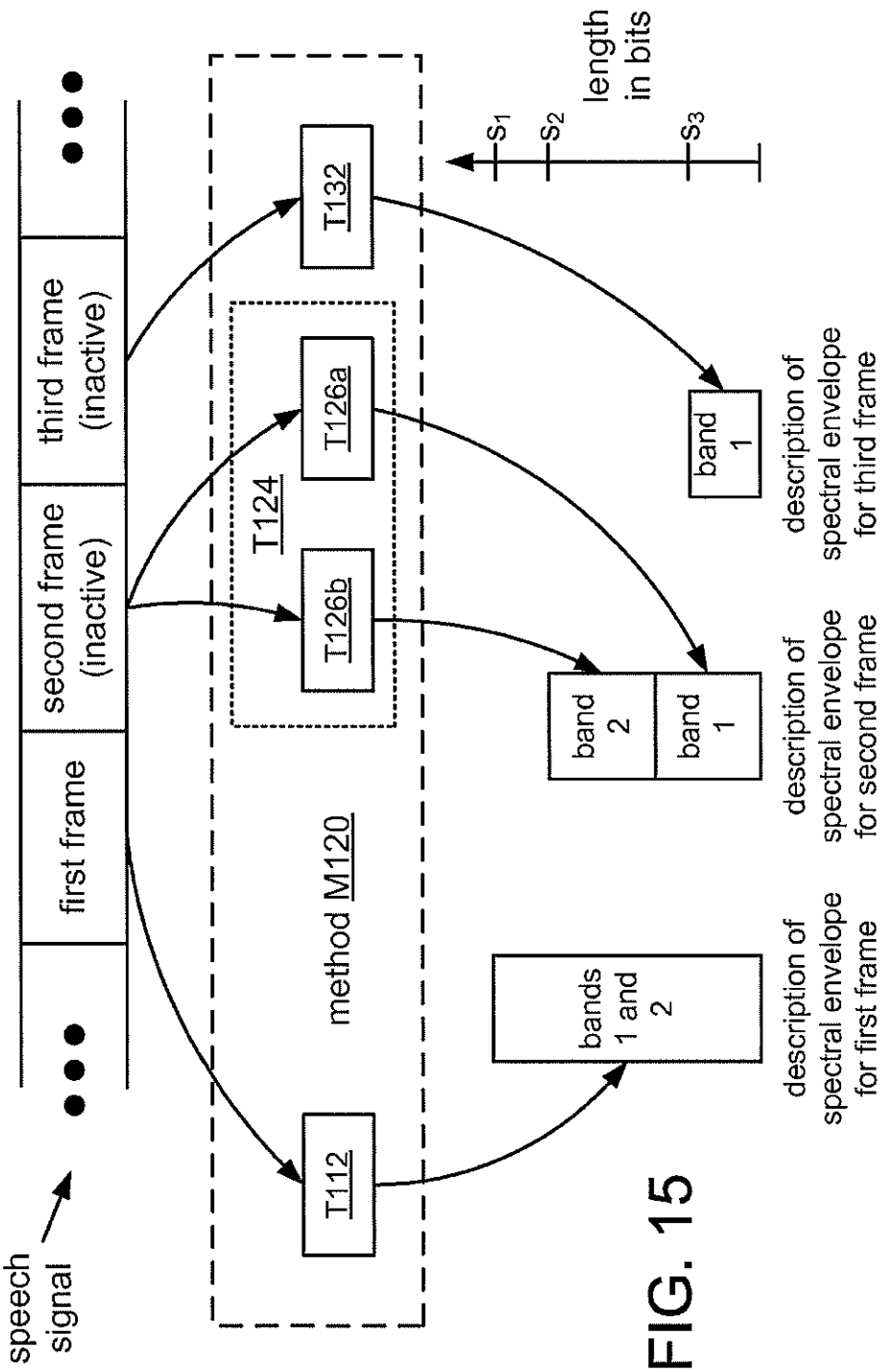

speech signal
first frame
second frame (inactive)
third frame (inactive)
method M120
T112
T124
T126a
T126b
T132
bands 1 and 2
band 2
band 1
band 1
description of spectral envelope for first frame
description of spectral envelope for second frame
description of spectral envelope for third frame
length in bits
s1
s2
s3

FIG. 15

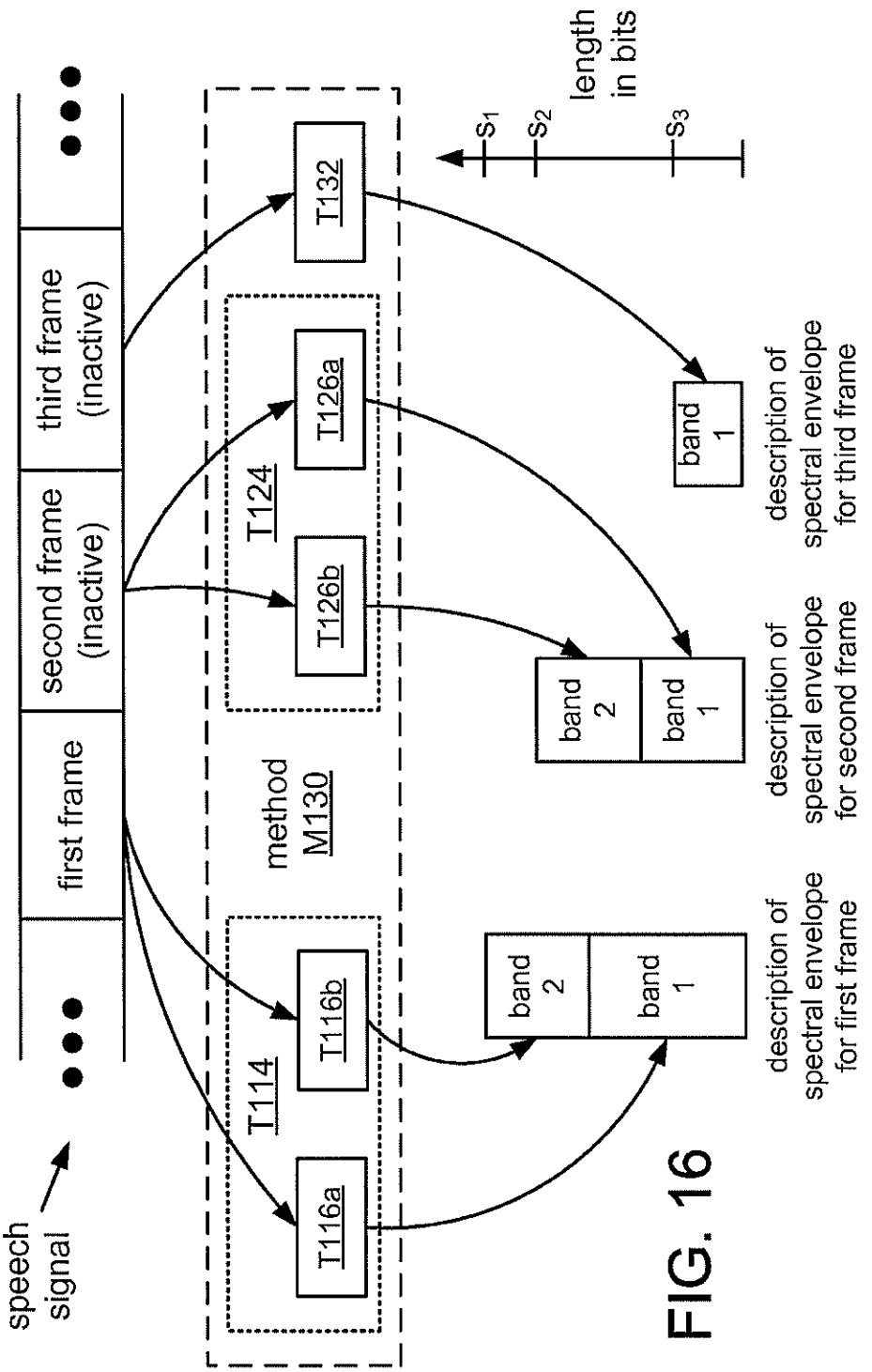

speech signal
first frame
second frame (inactive)
third frame (inactive)
method M130
T114
T116a
T116b
T124
T126a
T126b
T132
band 1
band 2
band 1
band 2
band 1
description of spectral envelope for first frame
description of spectral envelope for second frame
description of spectral envelope for third frame
length in bits
s1
s2
s3

FIG. 16

FIG. 17A

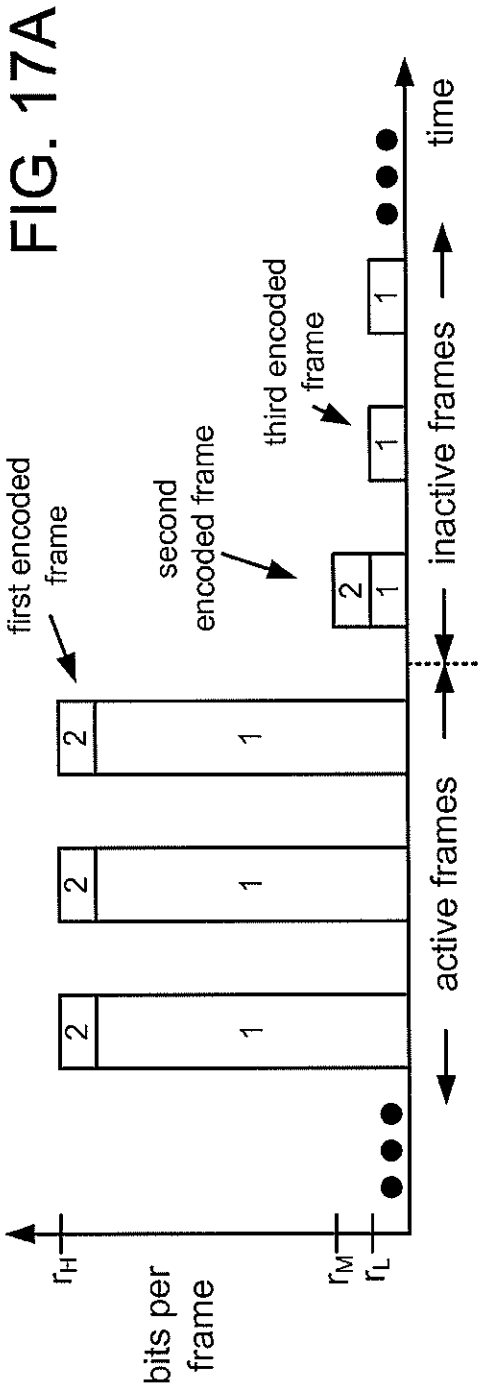
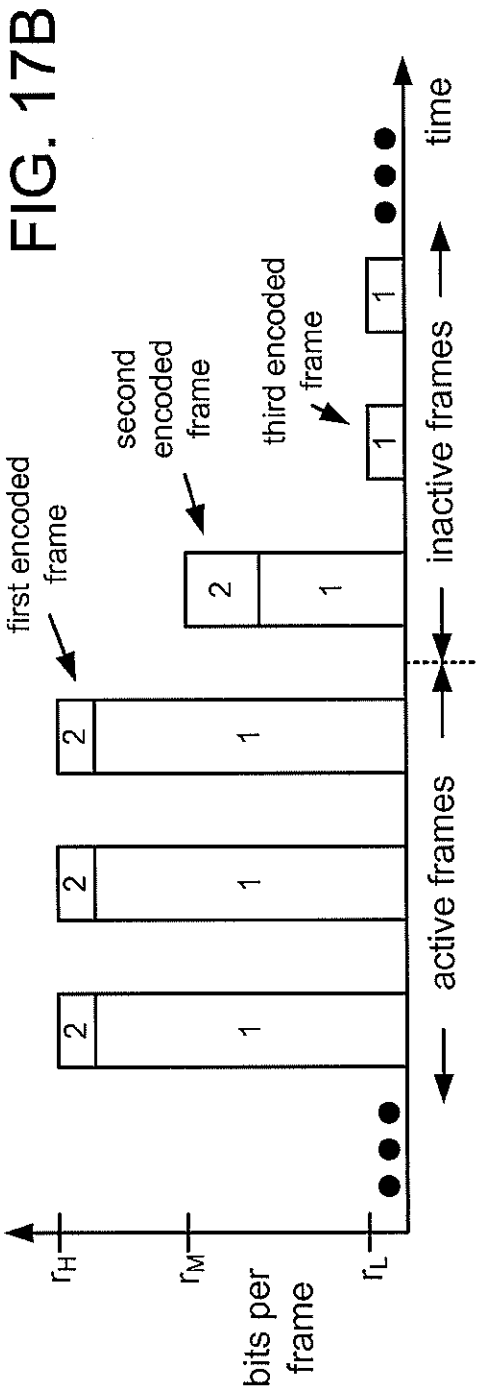


FIG. 17B



	narrowband	high band	available for other use	speech type
coding scheme 1: full-rate CELP (171 bits)	153 bits (28 for spectral, 125 for excitation)	16 bits (8 for spectral, 8 for temporal)	2 bits	voiced
coding scheme 2: half-rate NELP (80 bits)	47 bits (28 for spectral, 19 for temporal)	27 bits (12 for spectral, 15 for temporal)	6 bits	unvoiced
coding scheme 3: eighth-rate NELP (16 bits)	15 bits (10 for spectral, 5 for temporal)	(no bits)	1 bit	inactive

FIG. 18A

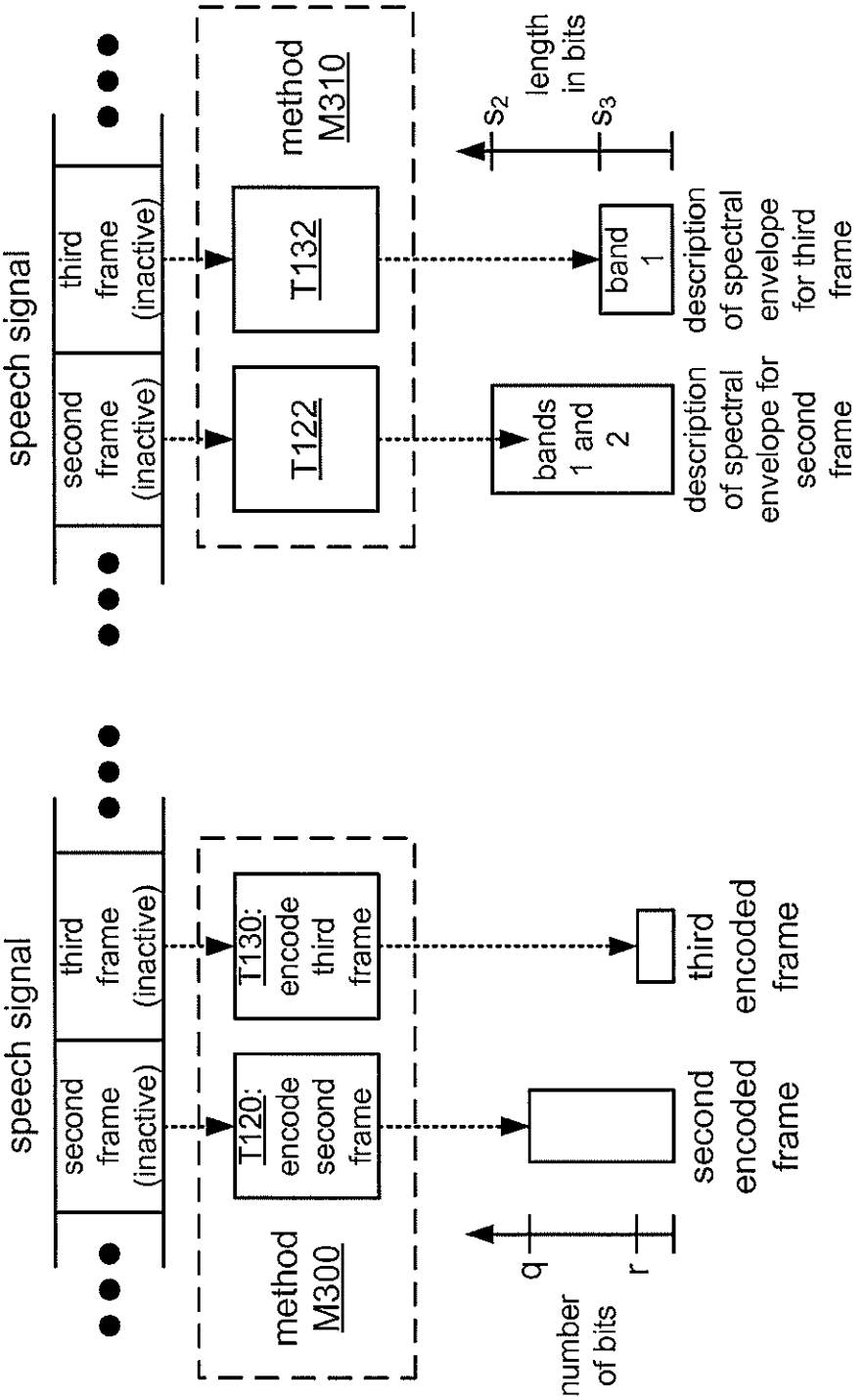


FIG. 18B

FIG. 18C

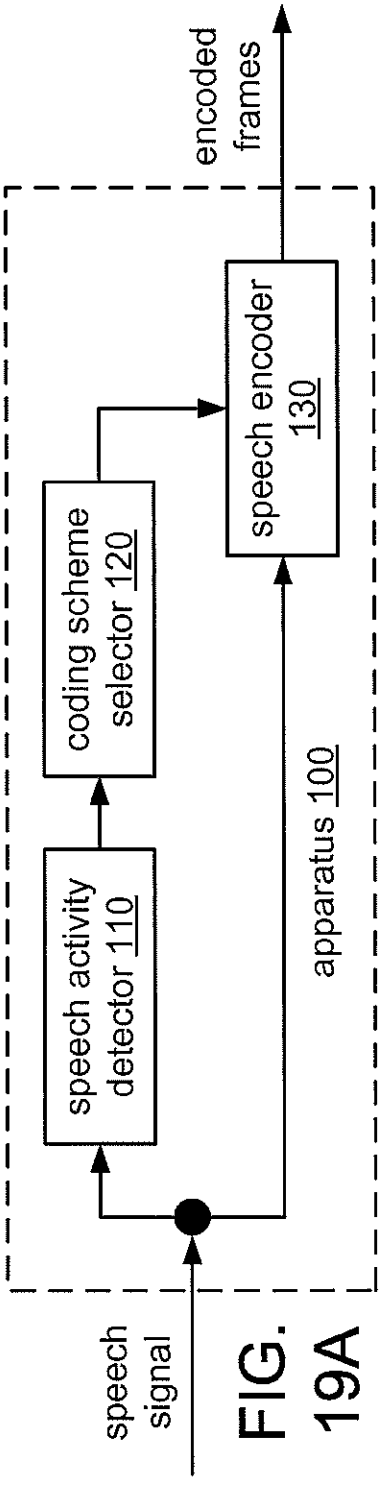


FIG. 19A

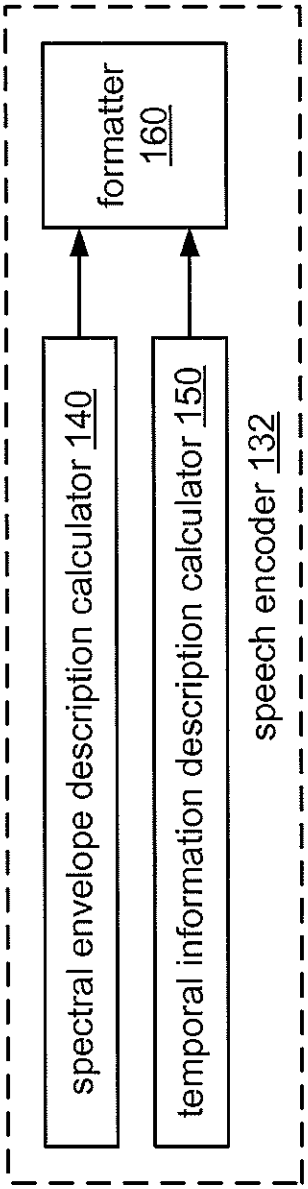


FIG. 19B

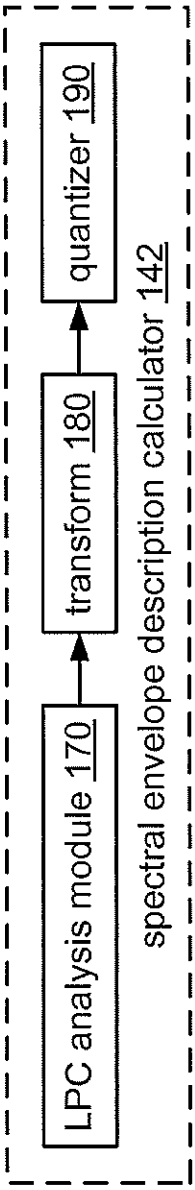


FIG. 19C

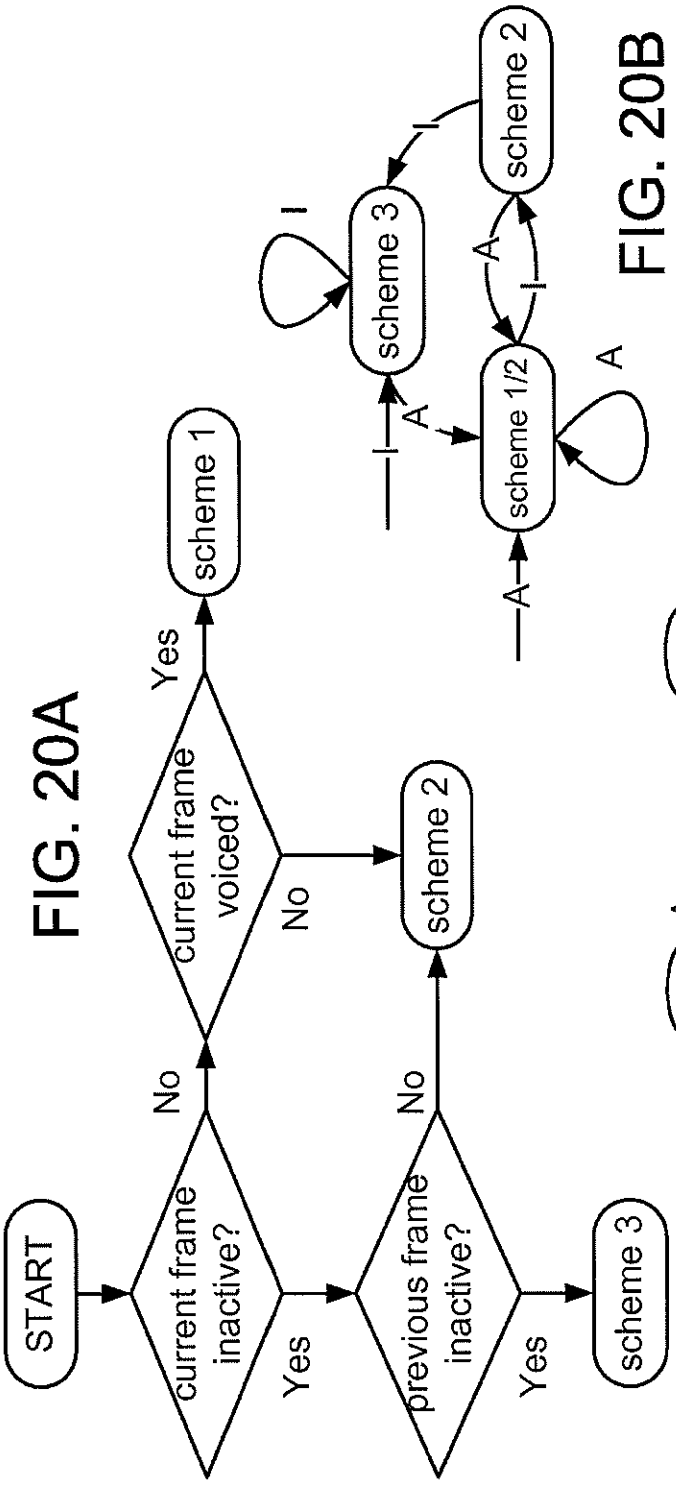


FIG. 20A

FIG. 20B

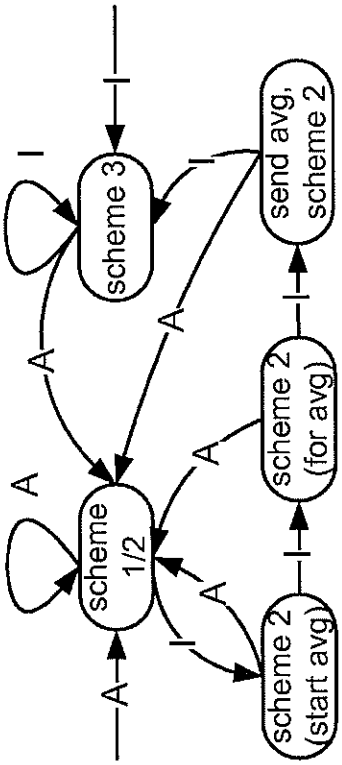


FIG. 21C

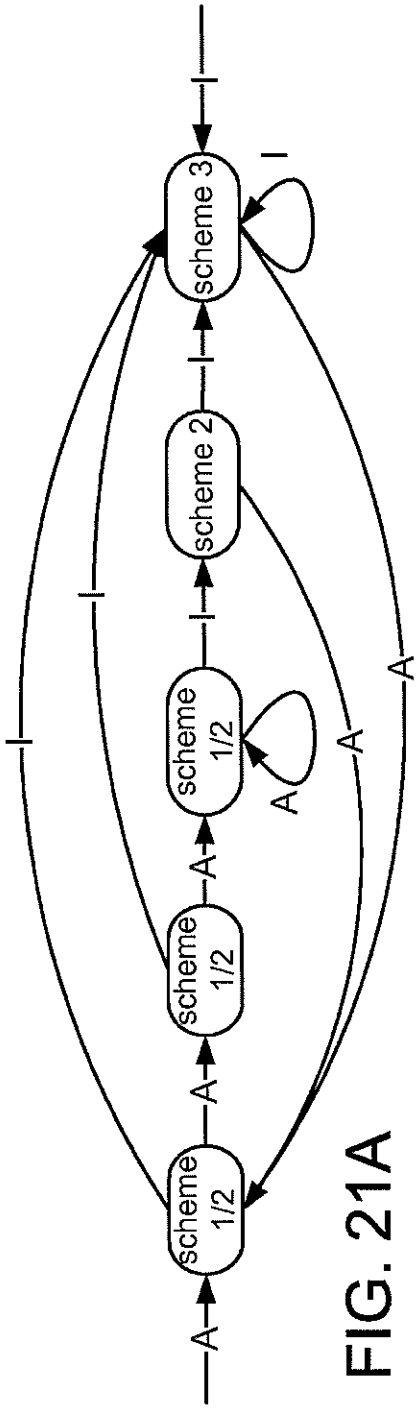


FIG. 21A

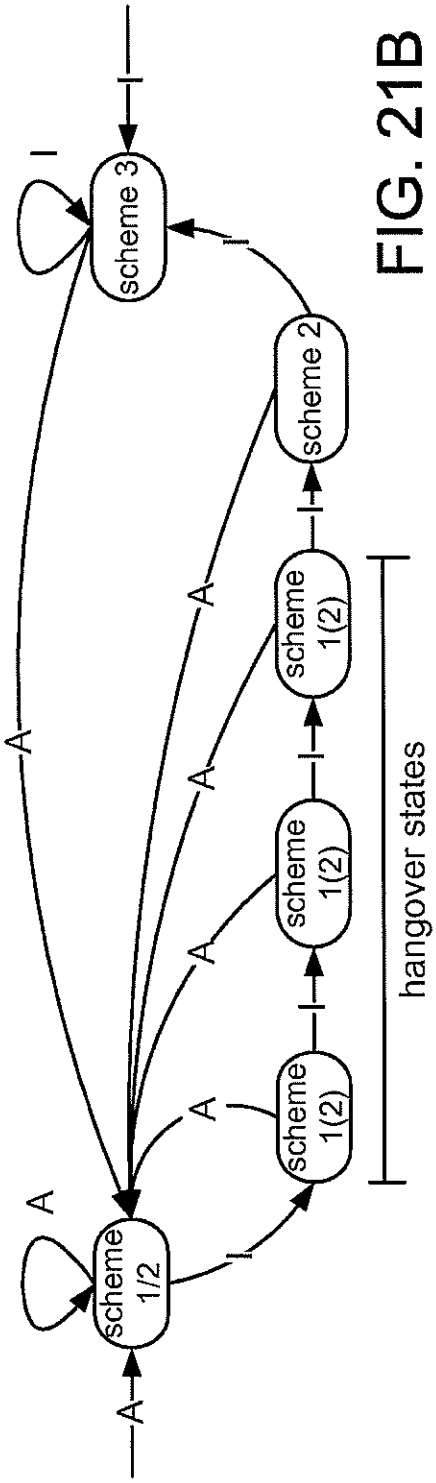


FIG. 21B

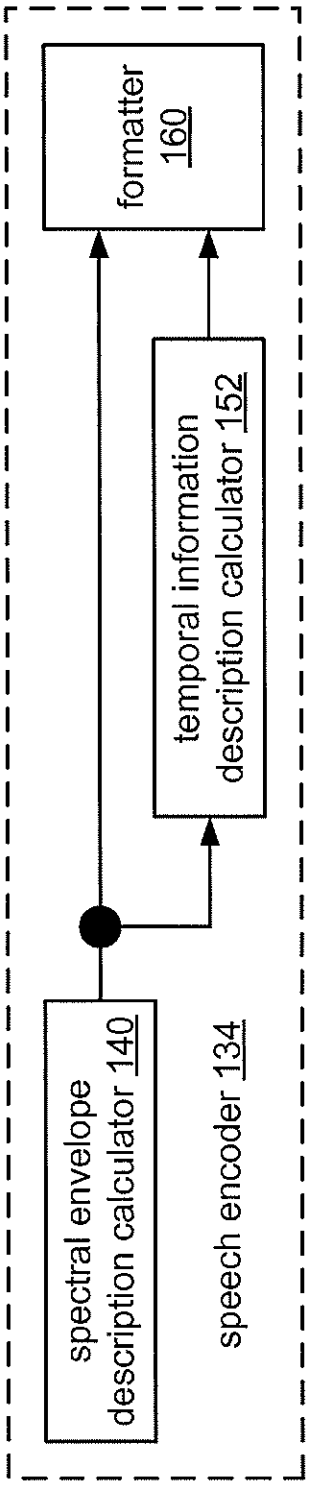


FIG. 22A

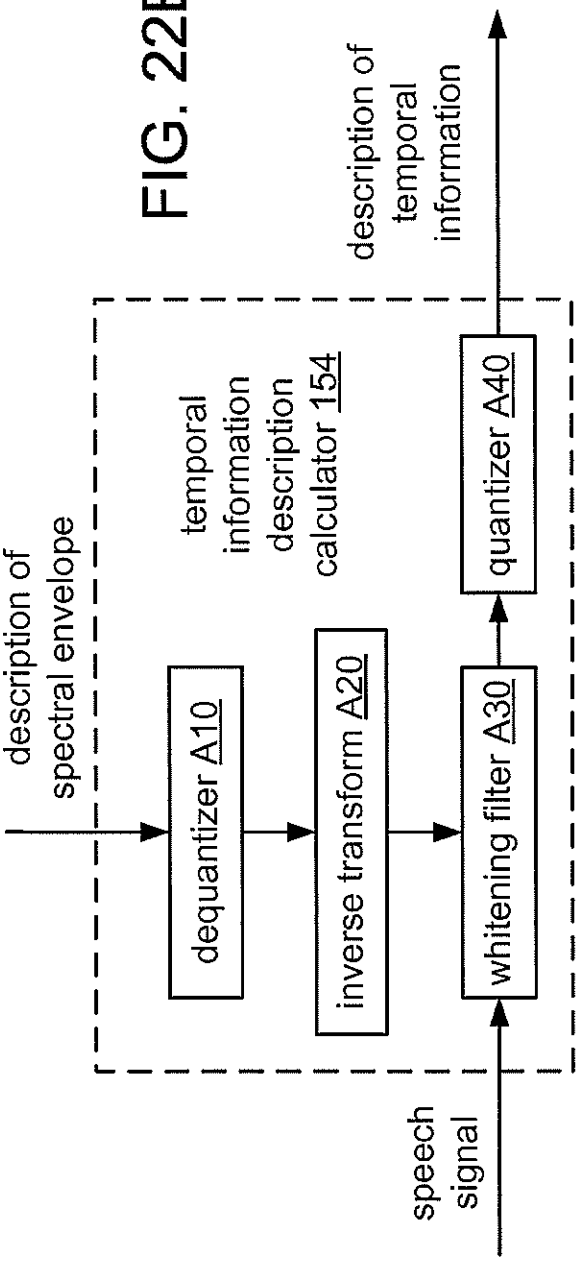


FIG. 22B

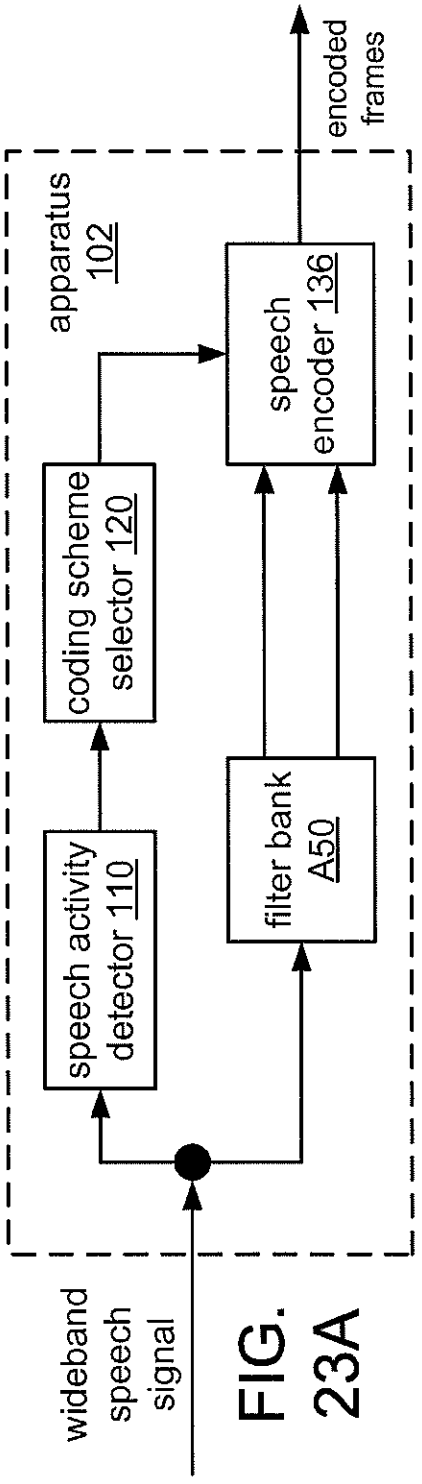


FIG. 23A



FIG. 23B

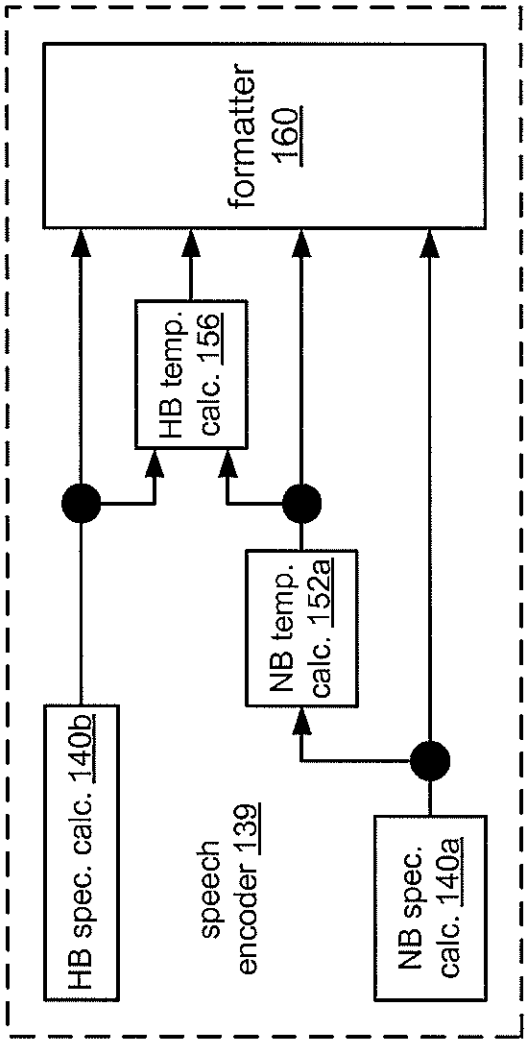


FIG. 24A

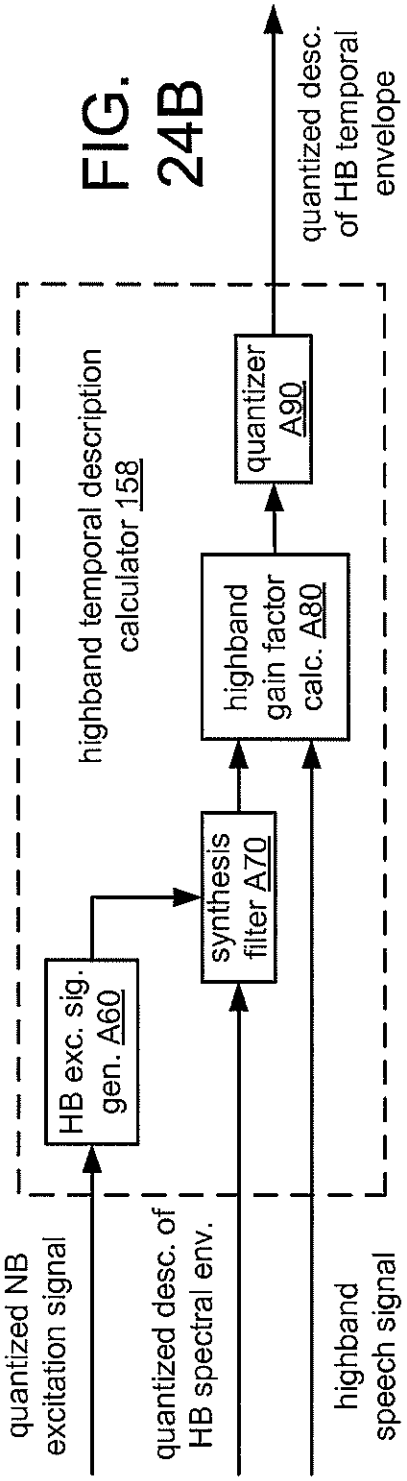


FIG. 24B

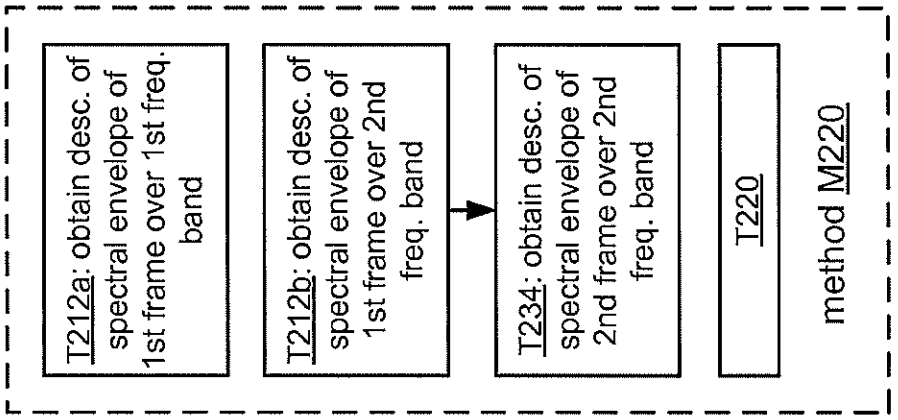


FIG. 25C

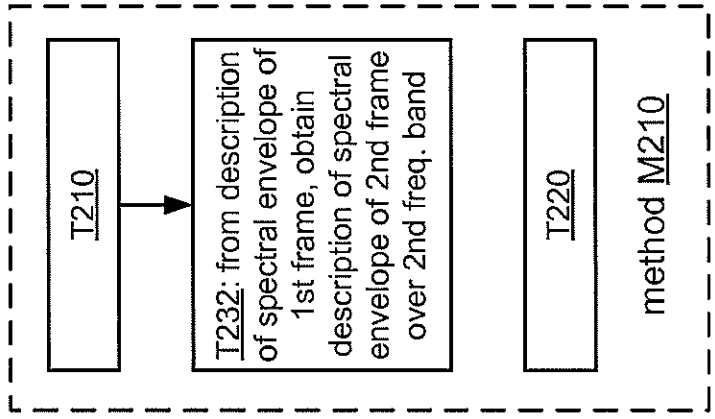


FIG. 25B

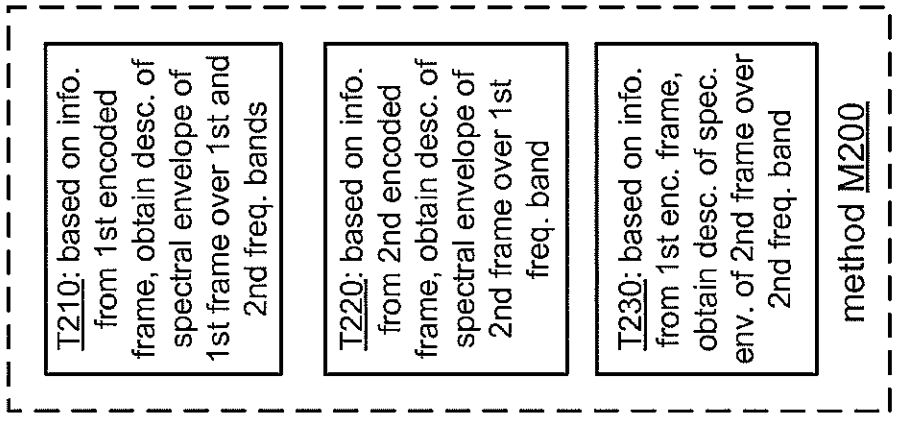


FIG. 25A

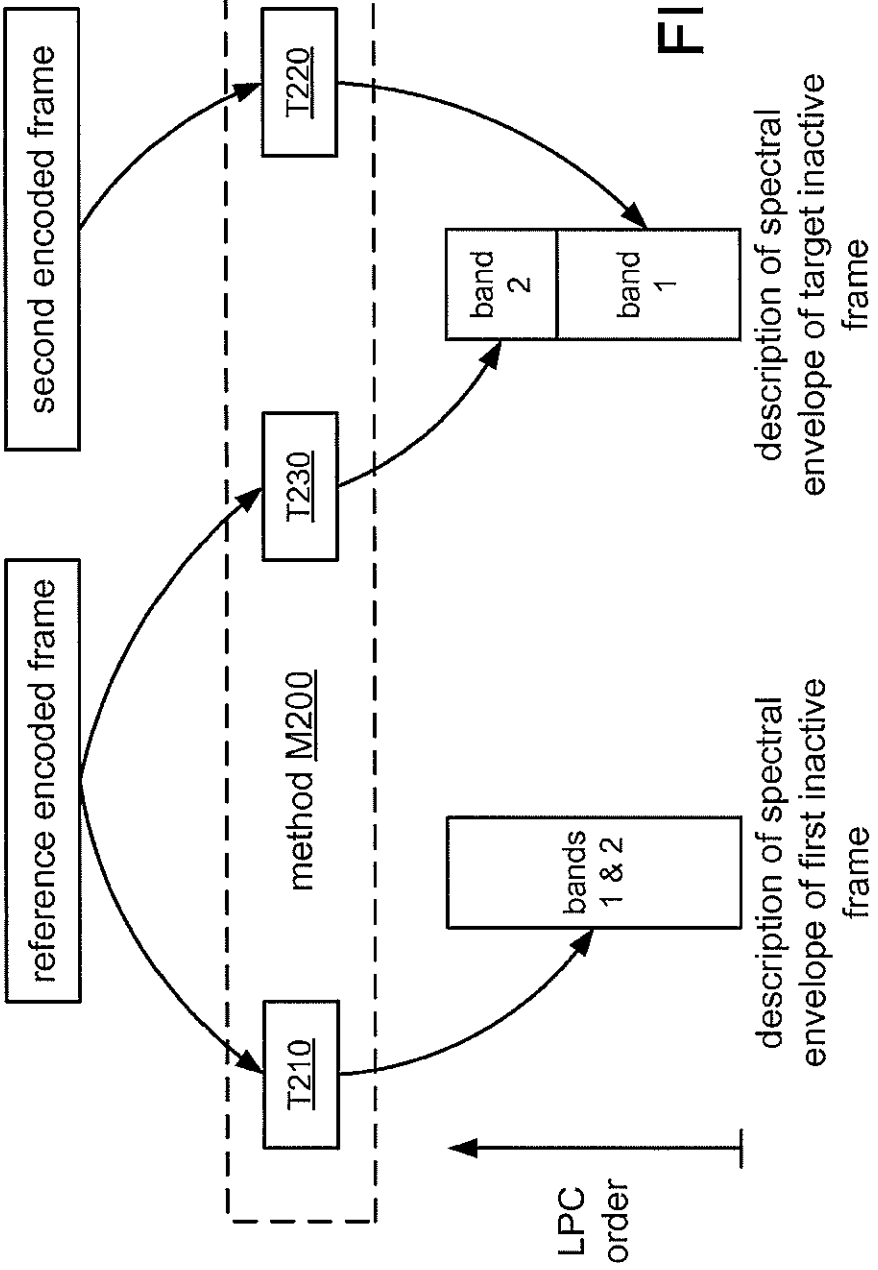

second encoded frame
reference encoded frame
T220
T230
T210
method M200
band 2
band 1
bands 1 & 2
description of spectral envelope of target inactive frame
description of spectral envelope of first inactive frame
LPC order

FIG. 26

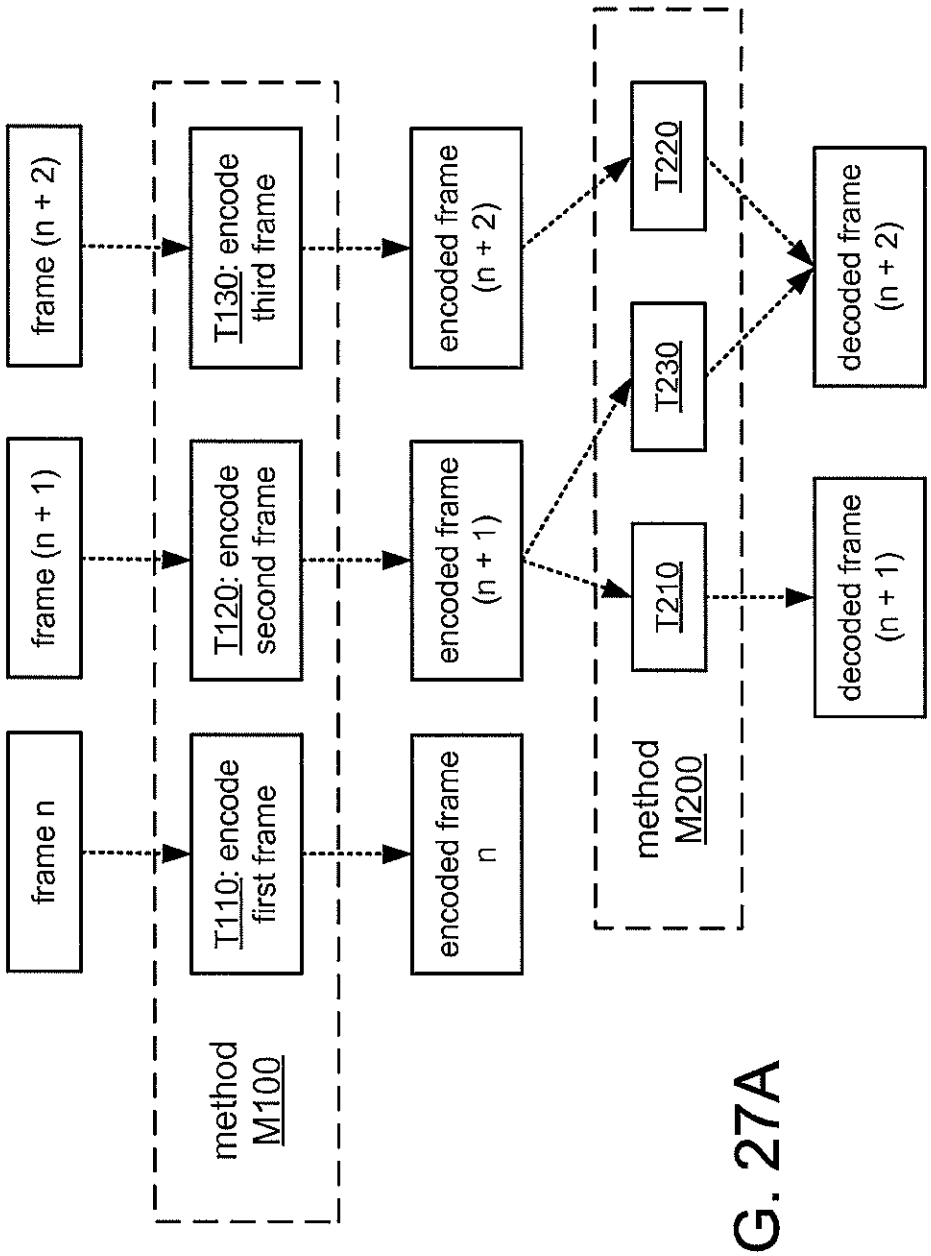

frame n
frame (n + 1)
frame (n + 2)
T110: encode first frame
T120: encode second frame
T130: encode third frame
encoded frame n
encoded frame (n + 1)
encoded frame (n + 2)
method M100
T210
T230
T220
decoded frame (n + 1)
decoded frame (n + 2)
method M200

FIG. 27A

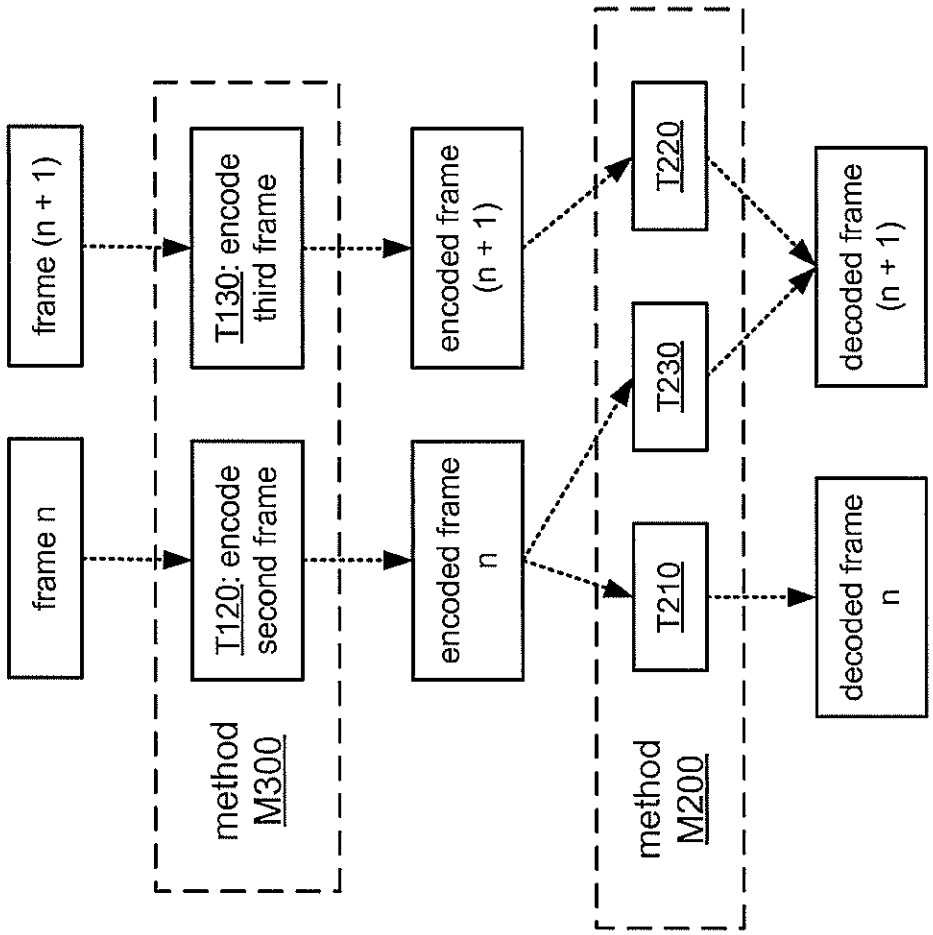

frame (n + 1)
frame n
T130: encode third frame
T120: encode second frame
method M300
encoded frame (n + 1)
encoded frame n
T220
T230
T210
method M200
decoded frame (n + 1)
decoded frame n

FIG. 27B

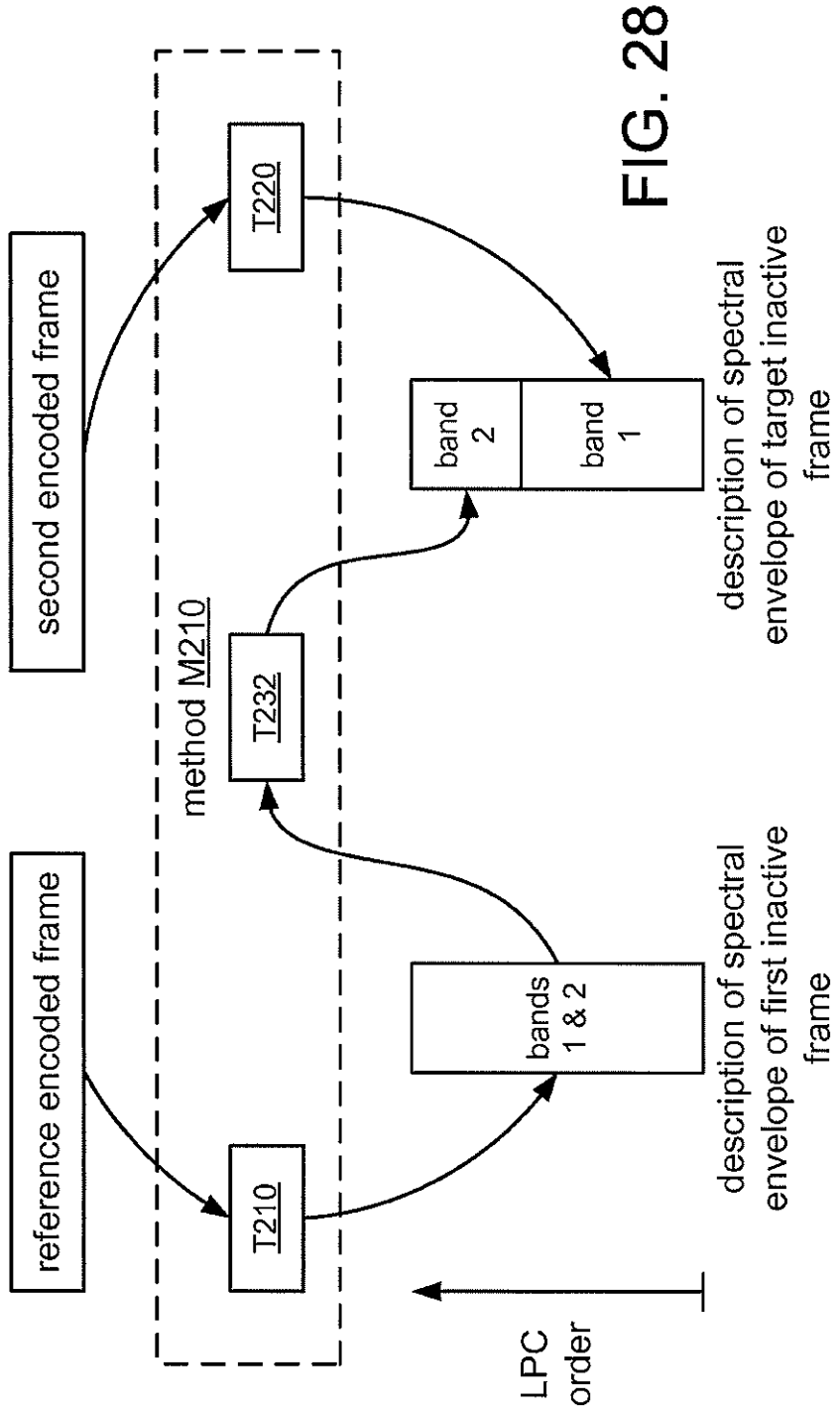

reference encoded frame
second encoded frame
method M210
T210
T220
T232
bands 1 & 2
band 2
band 1
description of first inactive envelope of frame
description of spectral envelope of target inactive frame
LPC order

FIG. 28

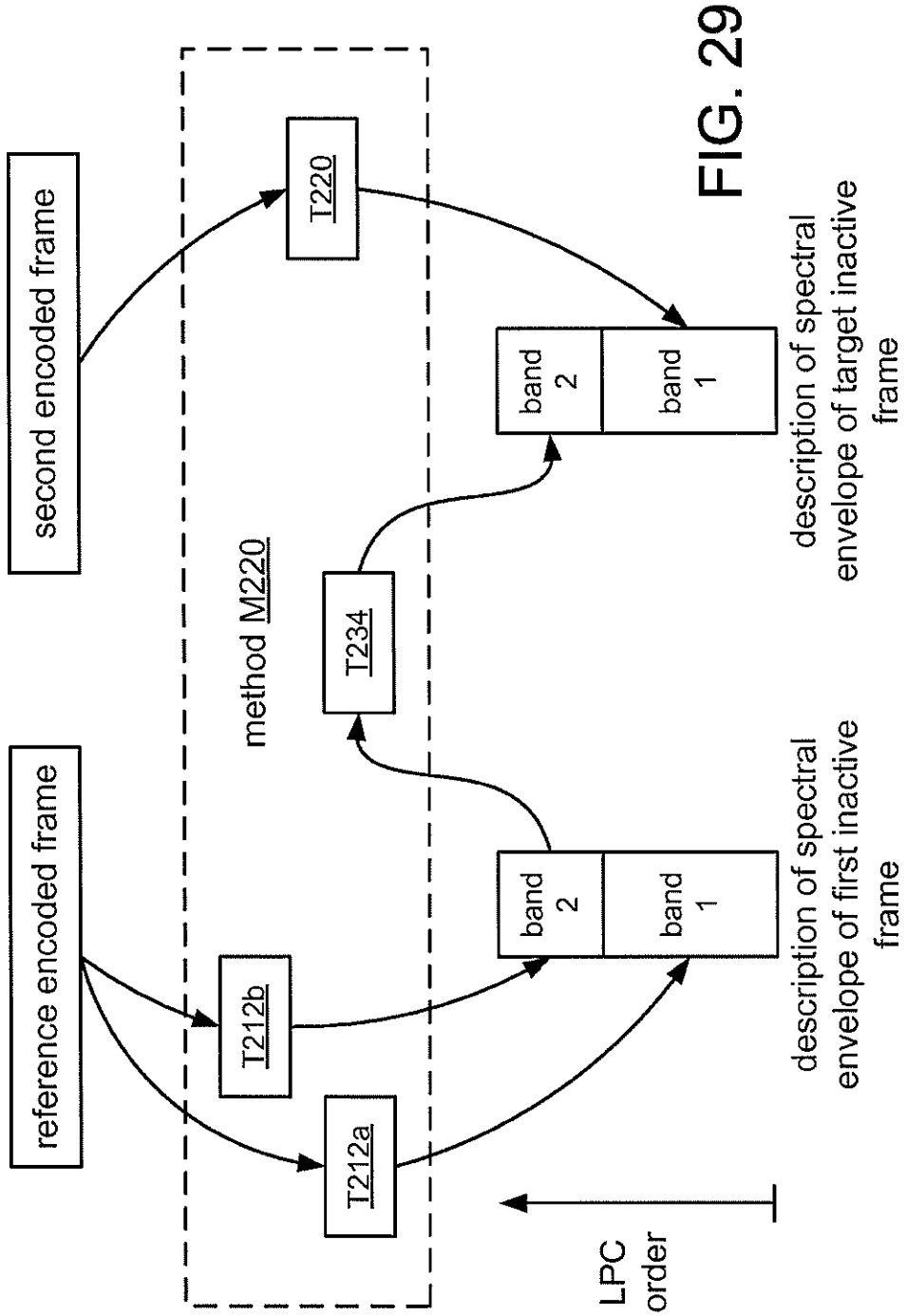

second encoded frame
reference encoded frame
method M220
T220
T234
T212b
T212a
band 2
band 1
band 2
band 1
description of spectral envelope of target inactive frame
description of spectral envelope of first inactive frame
LPC order

FIG. 29

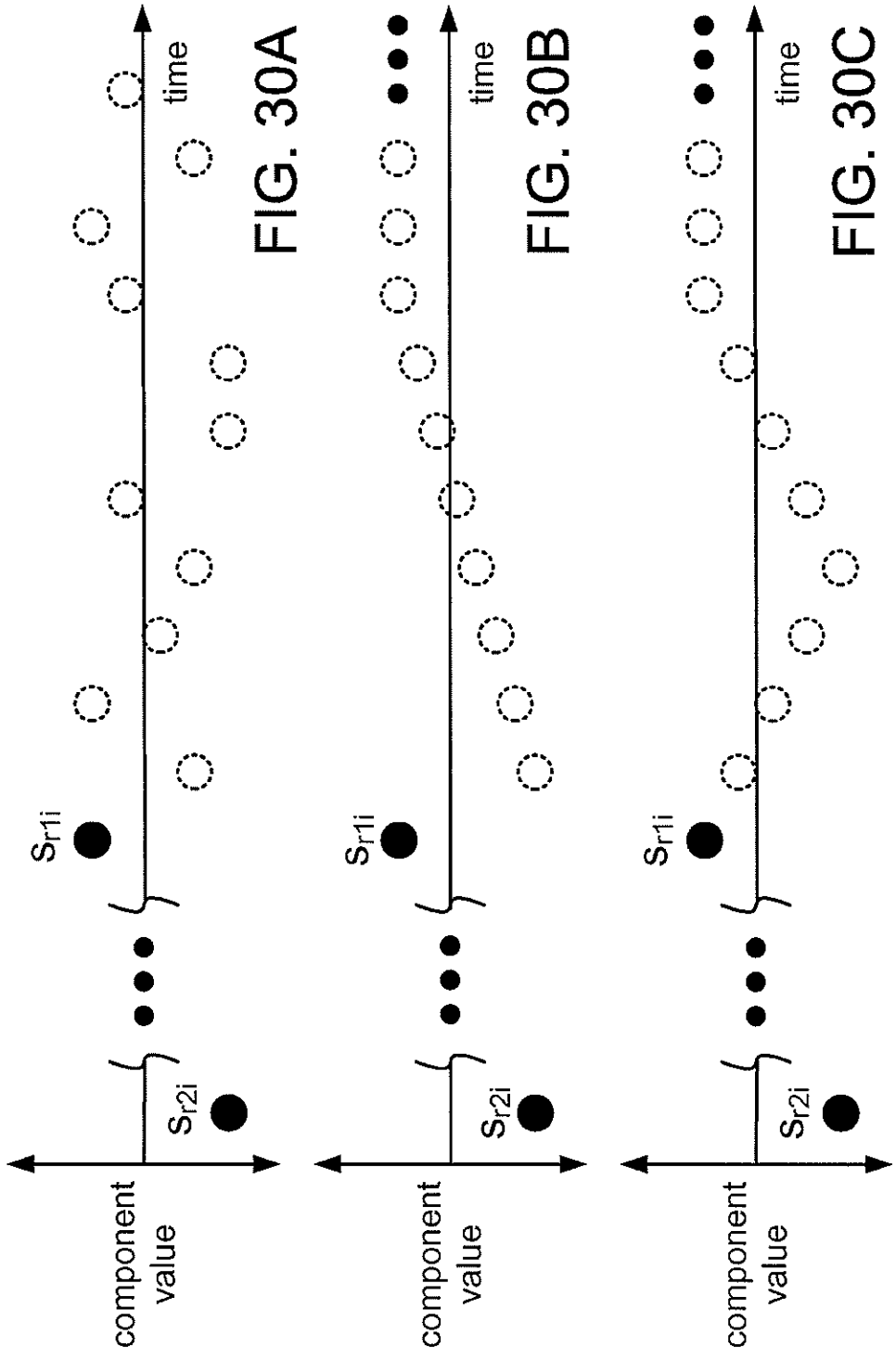


FIG. 30A

FIG. 30B

FIG. 30C

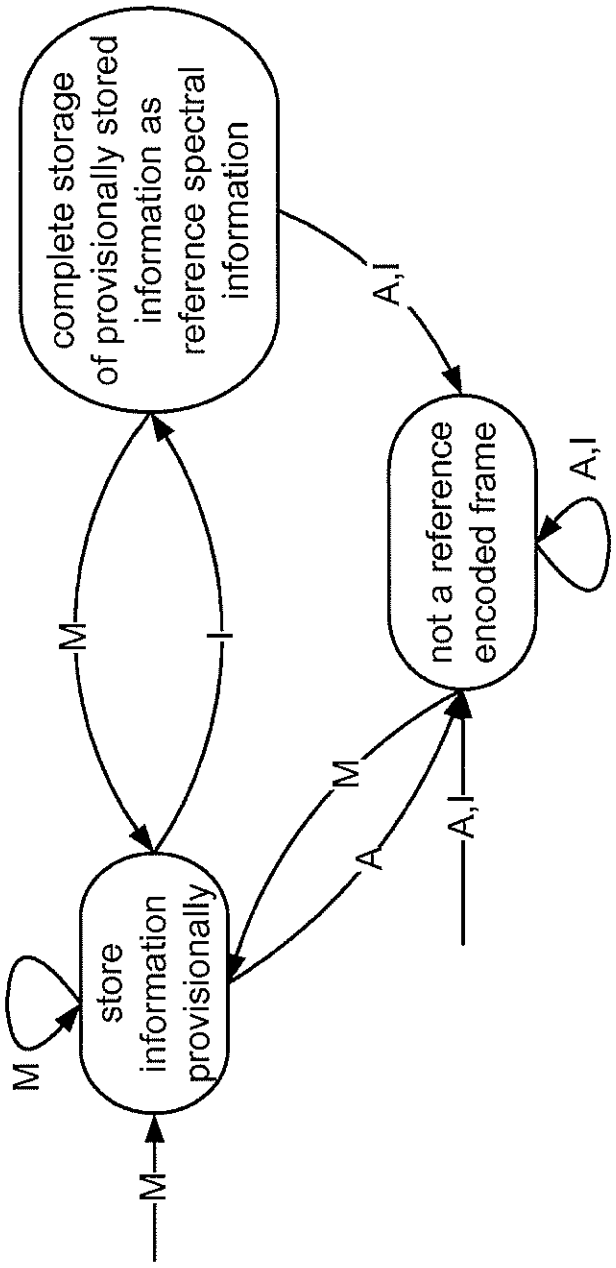

complete storage of provisionally stored information as reference spectral information
not a reference encoded frame
store information provisionally
A,I
A,I
M
I
M
M
A
A,I
M

FIG. 31

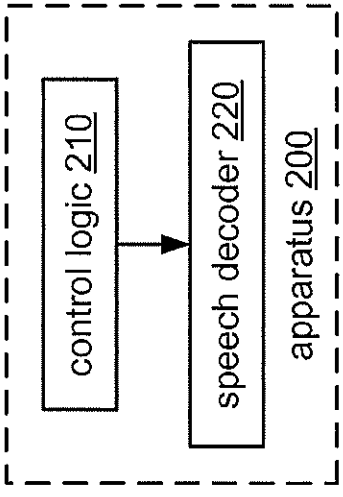


FIG. 32A

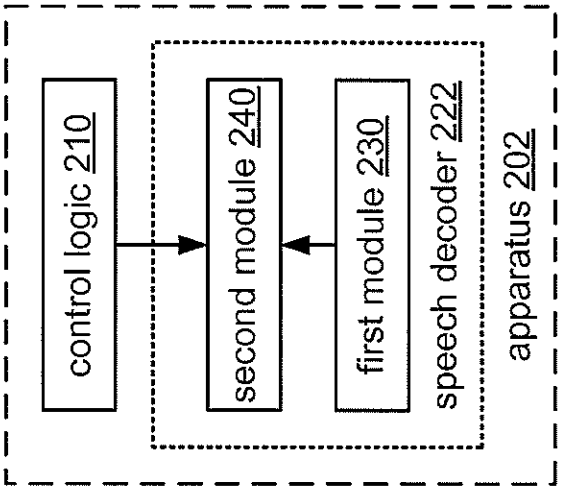


FIG. 32B

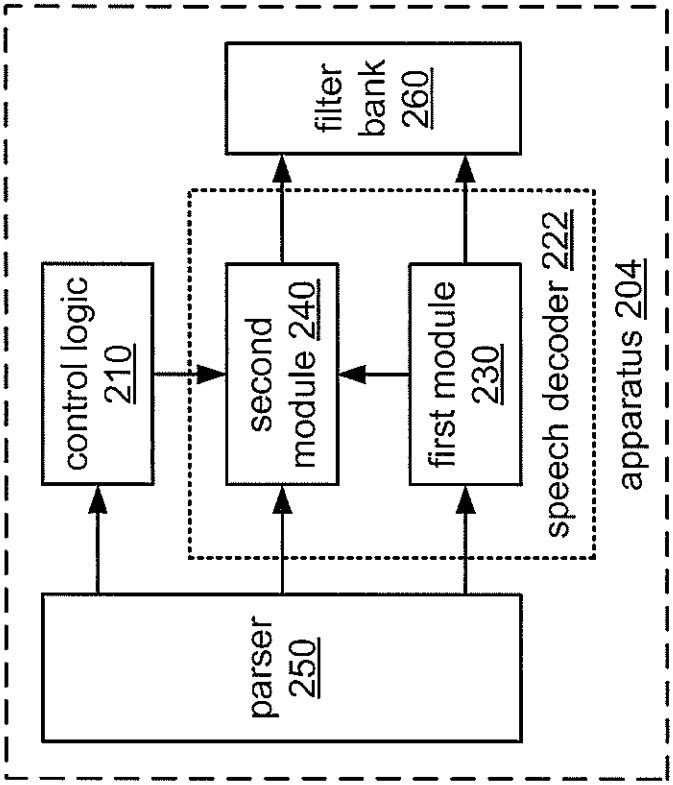


FIG. 32C

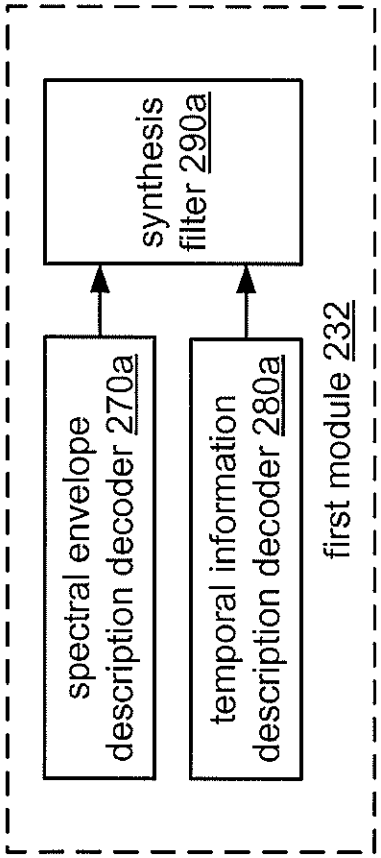


FIG. 33A

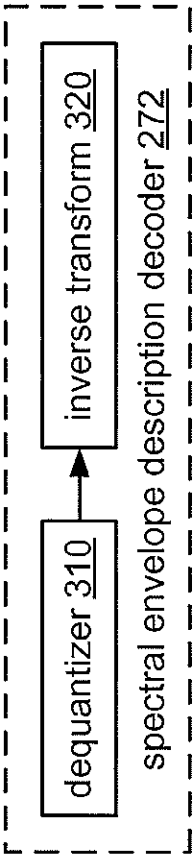


FIG. 33B

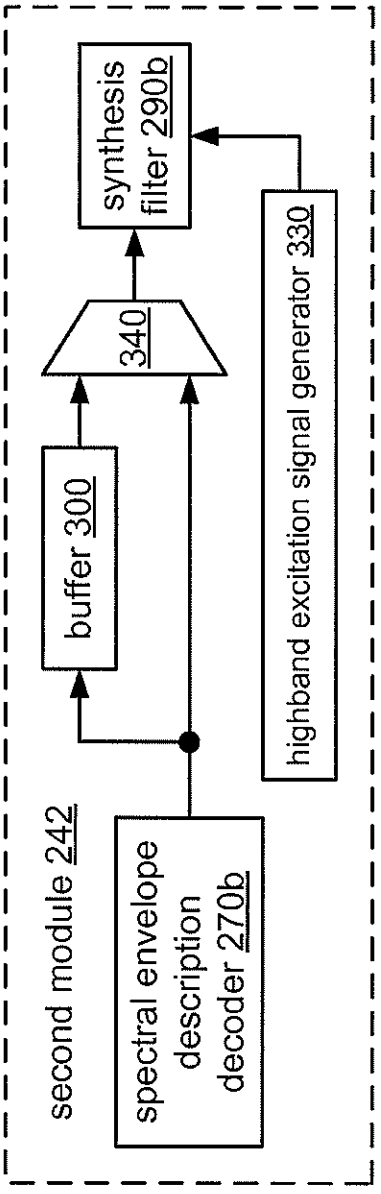


FIG. 34A

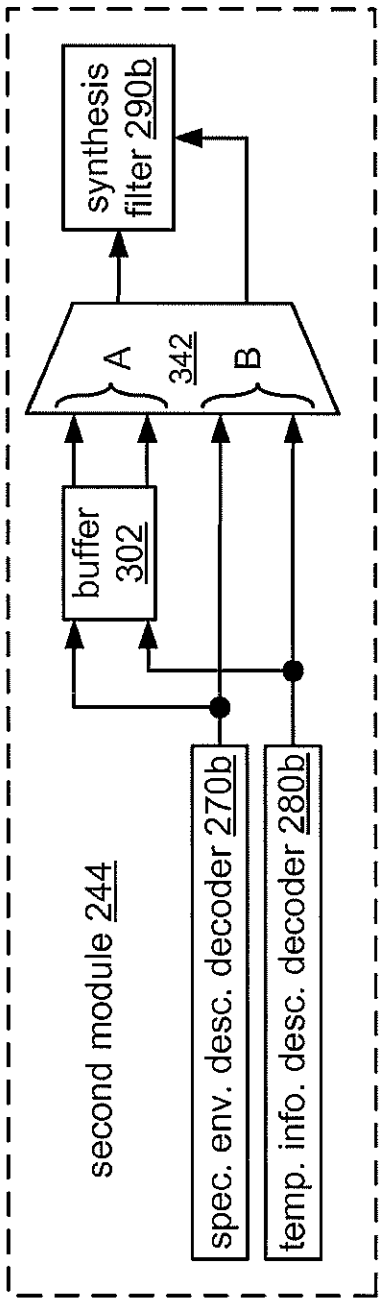


FIG. 34B

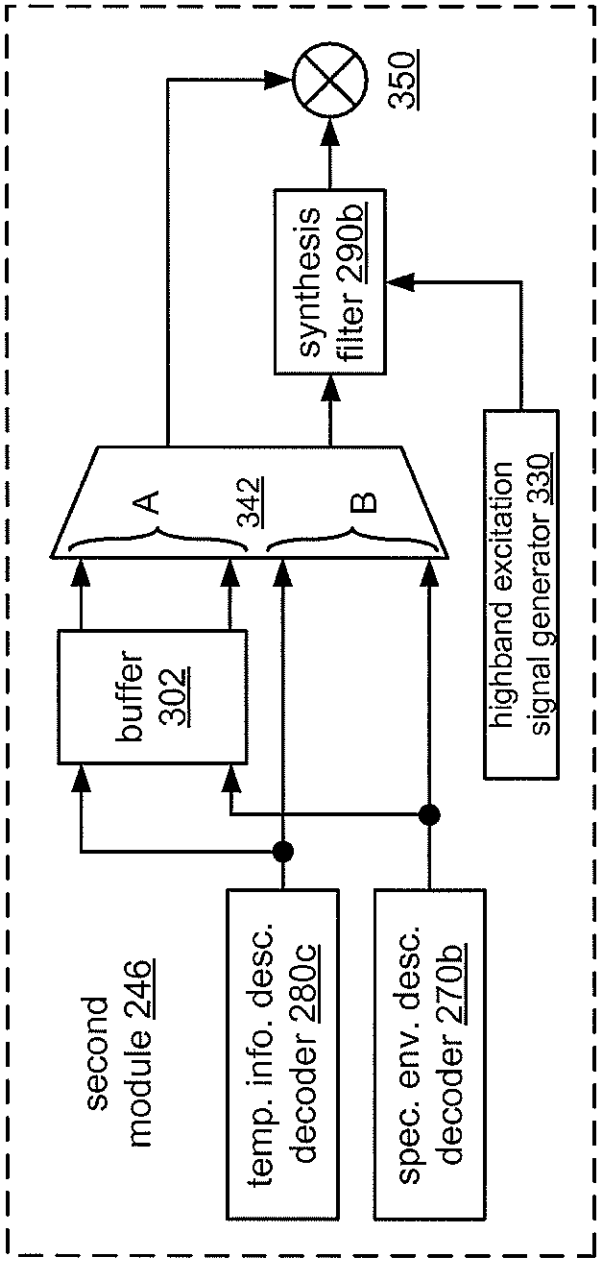


FIG. 34C

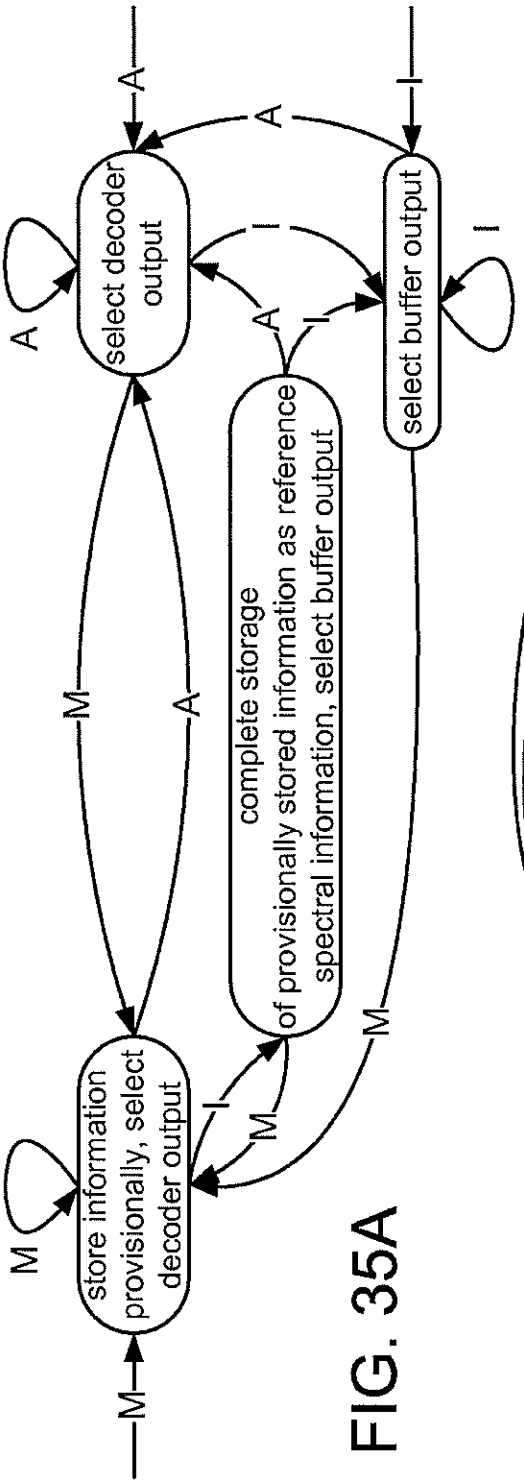


FIG. 35A

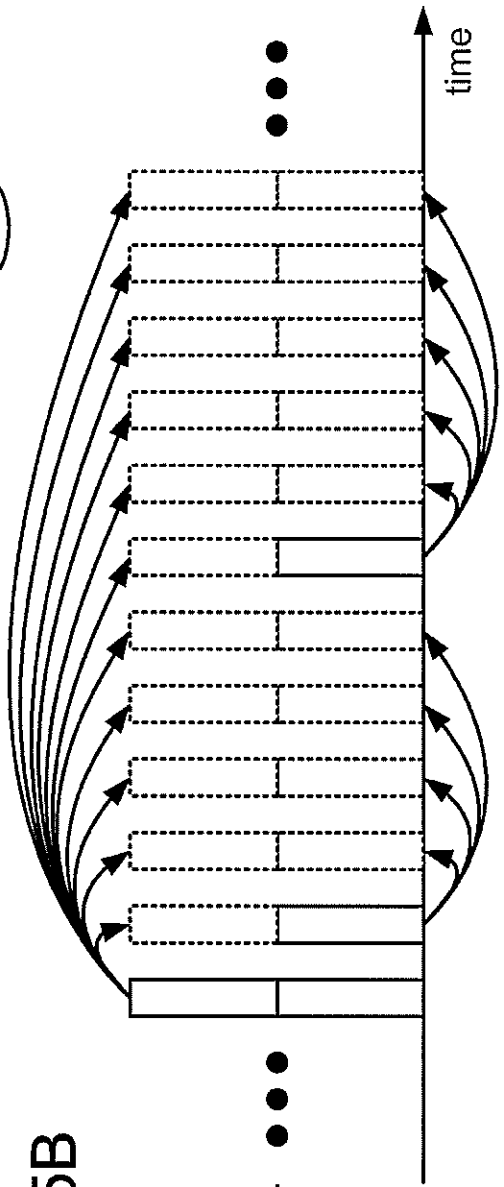


FIG. 35B