FIG. 1

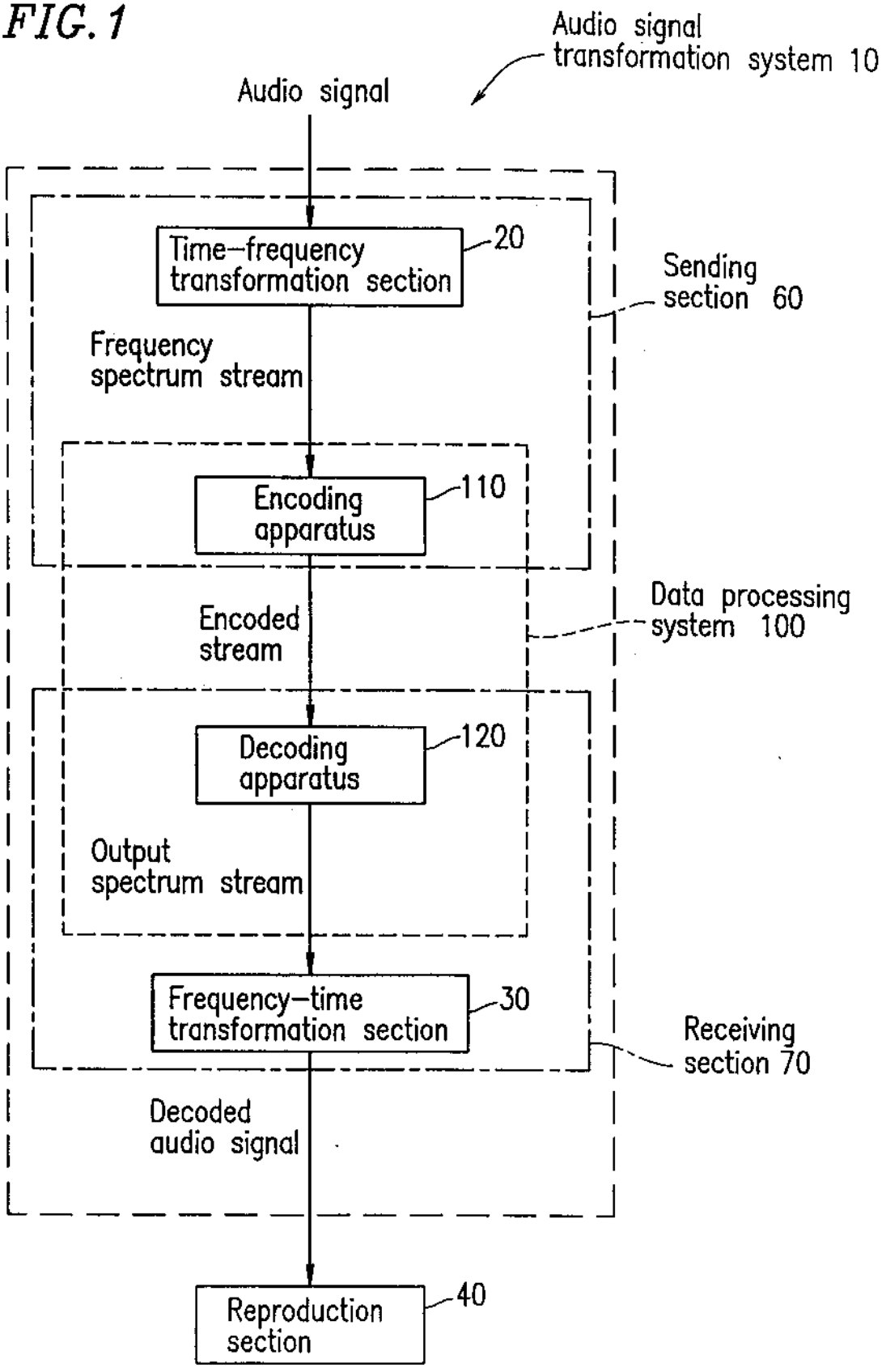

Audio signal transformation system 10
Audio signal
Time–frequency transformation section
20
Sending section 60
Frequency spectrum stream
Encoding apparatus
110
Data processing system 100
Encoded stream
Decoding apparatus
120
Output spectrum stream
Frequency–time transformation section
30
Receiving section 70
Decoded audio signal
Reproduction section
40

FIG. 2A

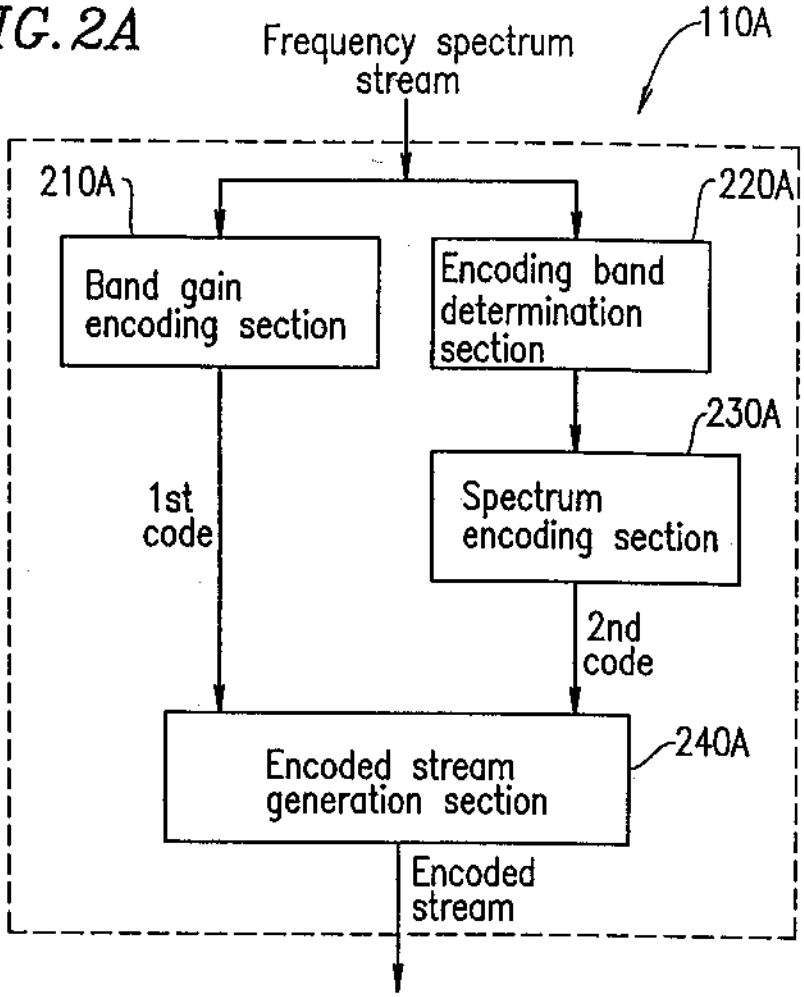

Frequency spectrum stream
110A
210A
220A
Band gain encoding section
Encoding band determination section
230A
Spectrum encoding section
1st code
2nd code
240A
Encoded stream generation section
Encoded stream

FIG. 2B

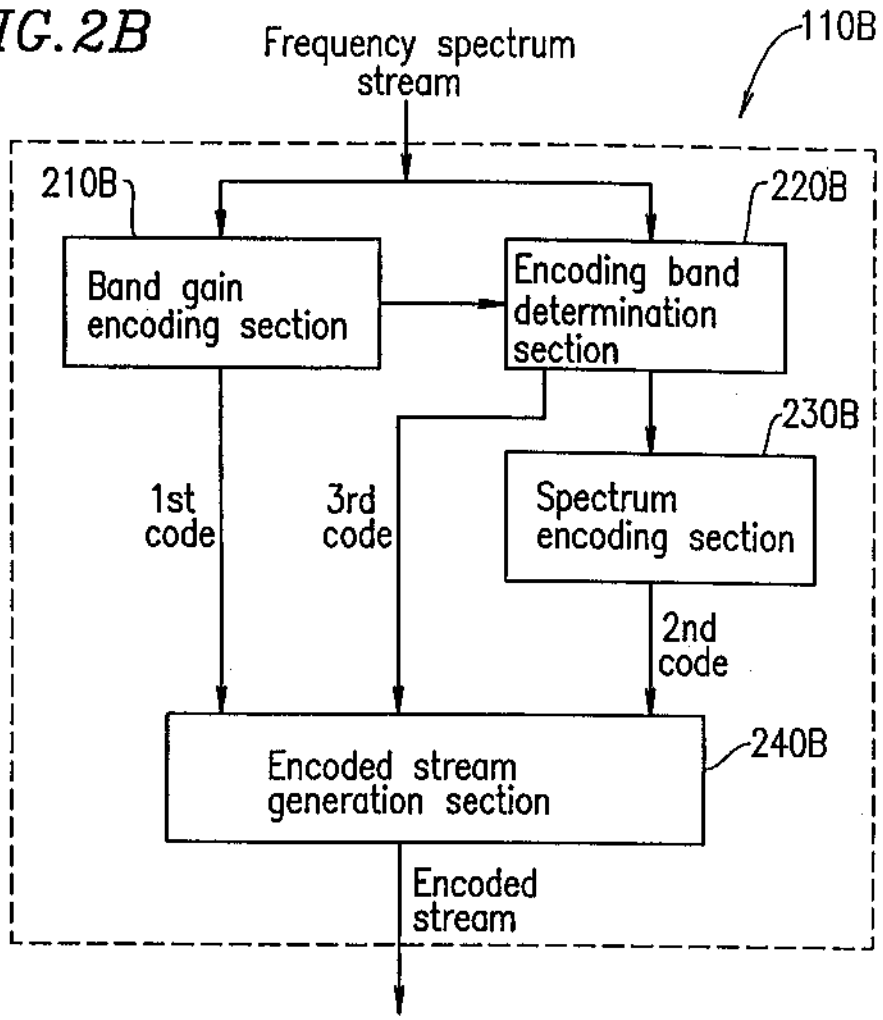

Frequency spectrum stream
110B
210B
220B
Band gain encoding section
Encoding band determination section
230B
1st code
3rd code
Spectrum encoding section
2nd code
Encoded stream generation section
240B
Encoded stream

FIG. 2C

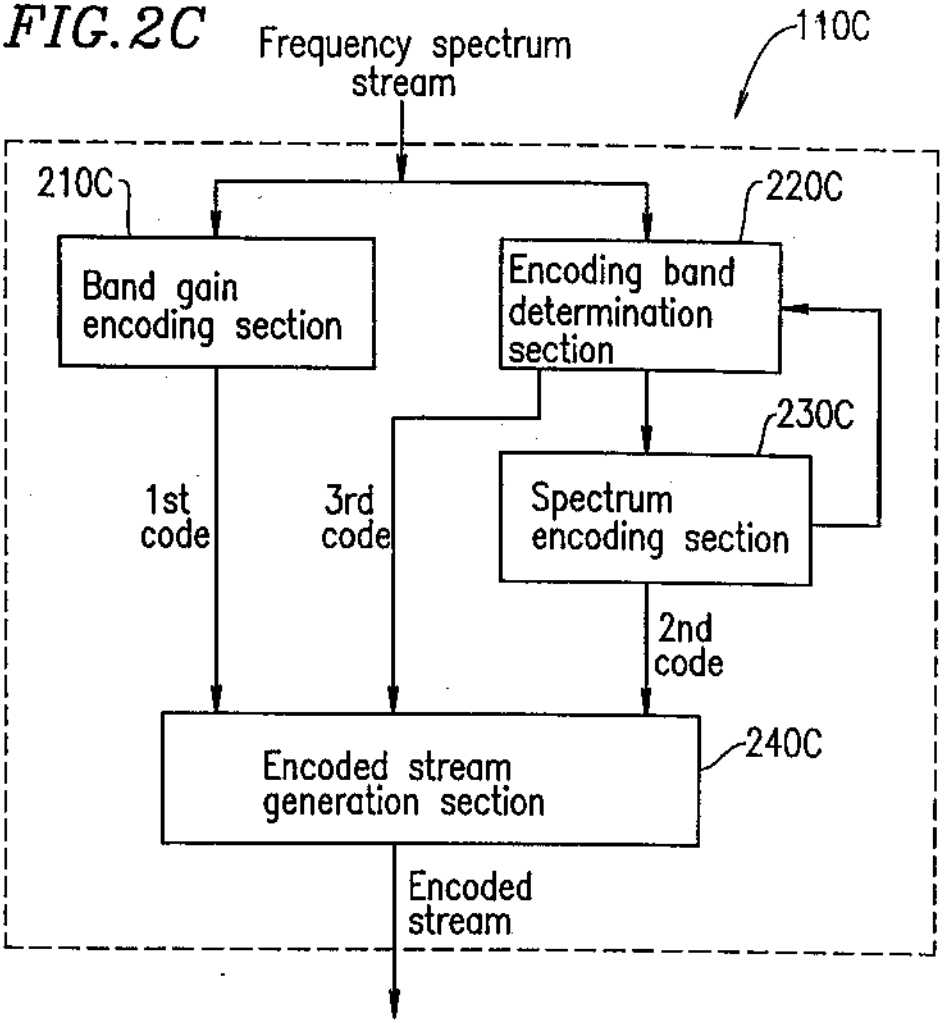

Frequency spectrum stream
110C
210C
220C
Band gain encoding section
Encoding band determination section
230C
Spectrum encoding section
1st code
3rd code
2nd code
Encoded stream generation section
240C
Encoded stream

FIG. 3

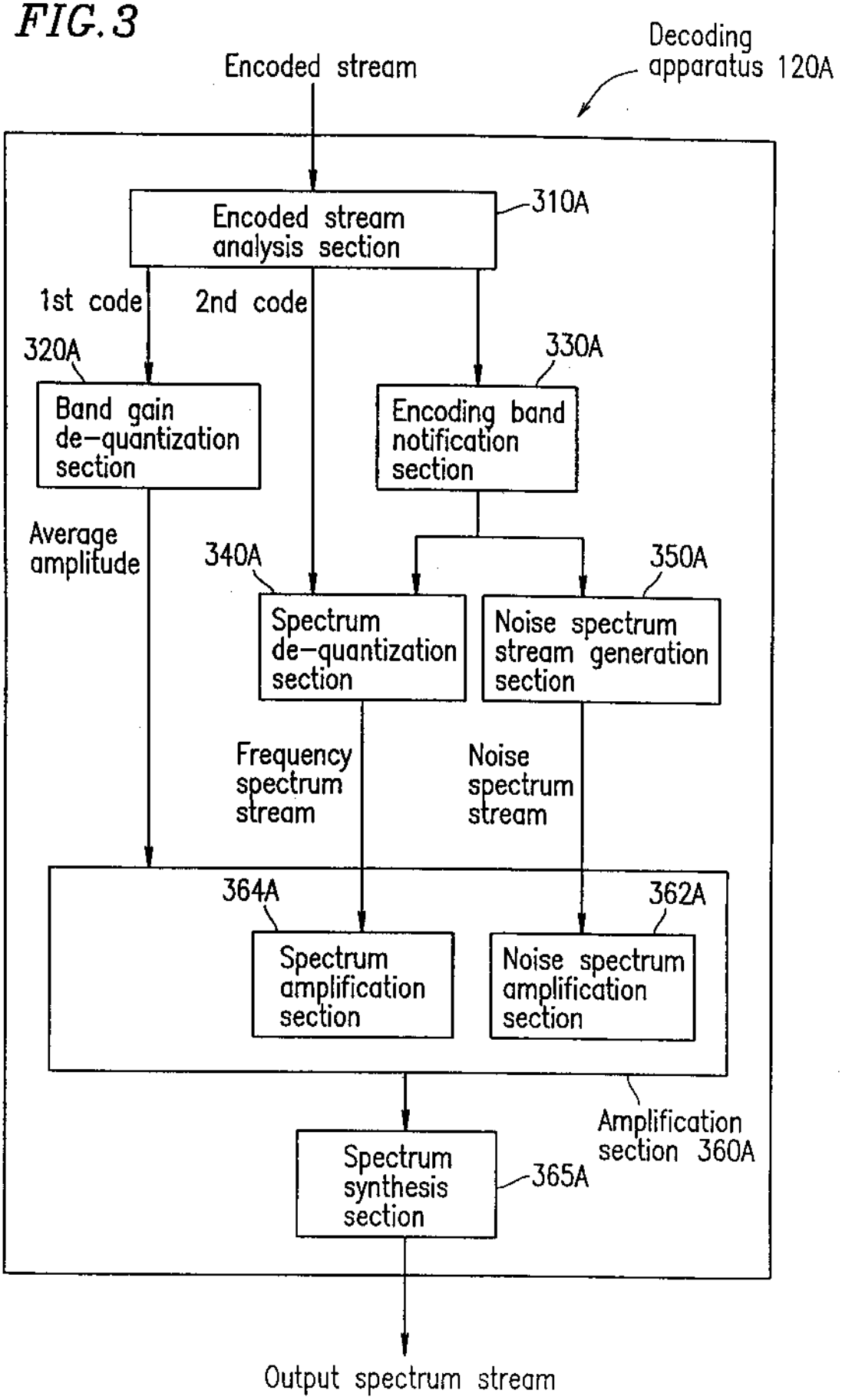

Encoded stream
Decoding apparatus 120A
Encoded stream analysis section
310A
1st code
2nd code
320A
330A
Band gain de-quantization section
Encoding band notification section
Average amplitude
340A
350A
Spectrum de-quantization section
Noise spectrum stream generation section
Frequency spectrum stream
Noise spectrum stream
364A
362A
Spectrum amplification section
Noise spectrum amplification section
Amplification section 360A
Spectrum synthesis section
365A
Output spectrum stream

FIG. 4

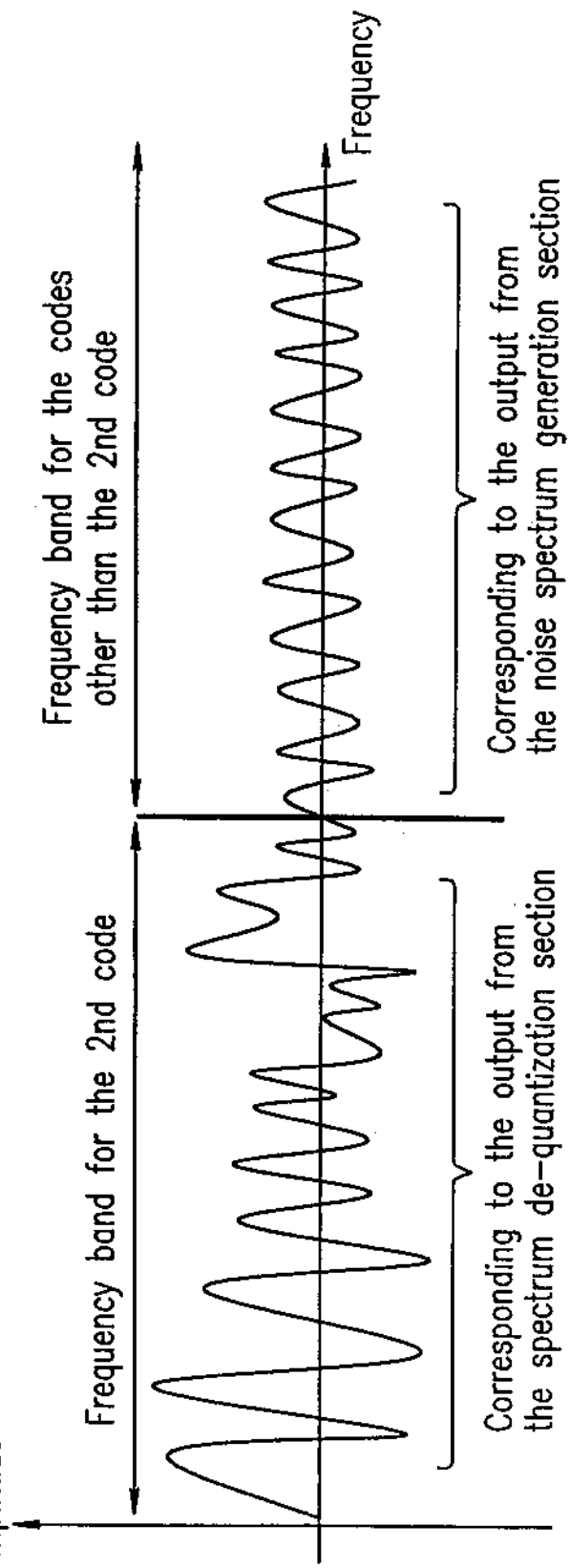

Amplitude
Frequency band for the 2nd code
Frequency band for the codes other than the 2nd code
Frequency
Corresponding to the output from the spectrum de-quantization section
Corresponding to the output from the noise spectrum generation section

FIG. 5

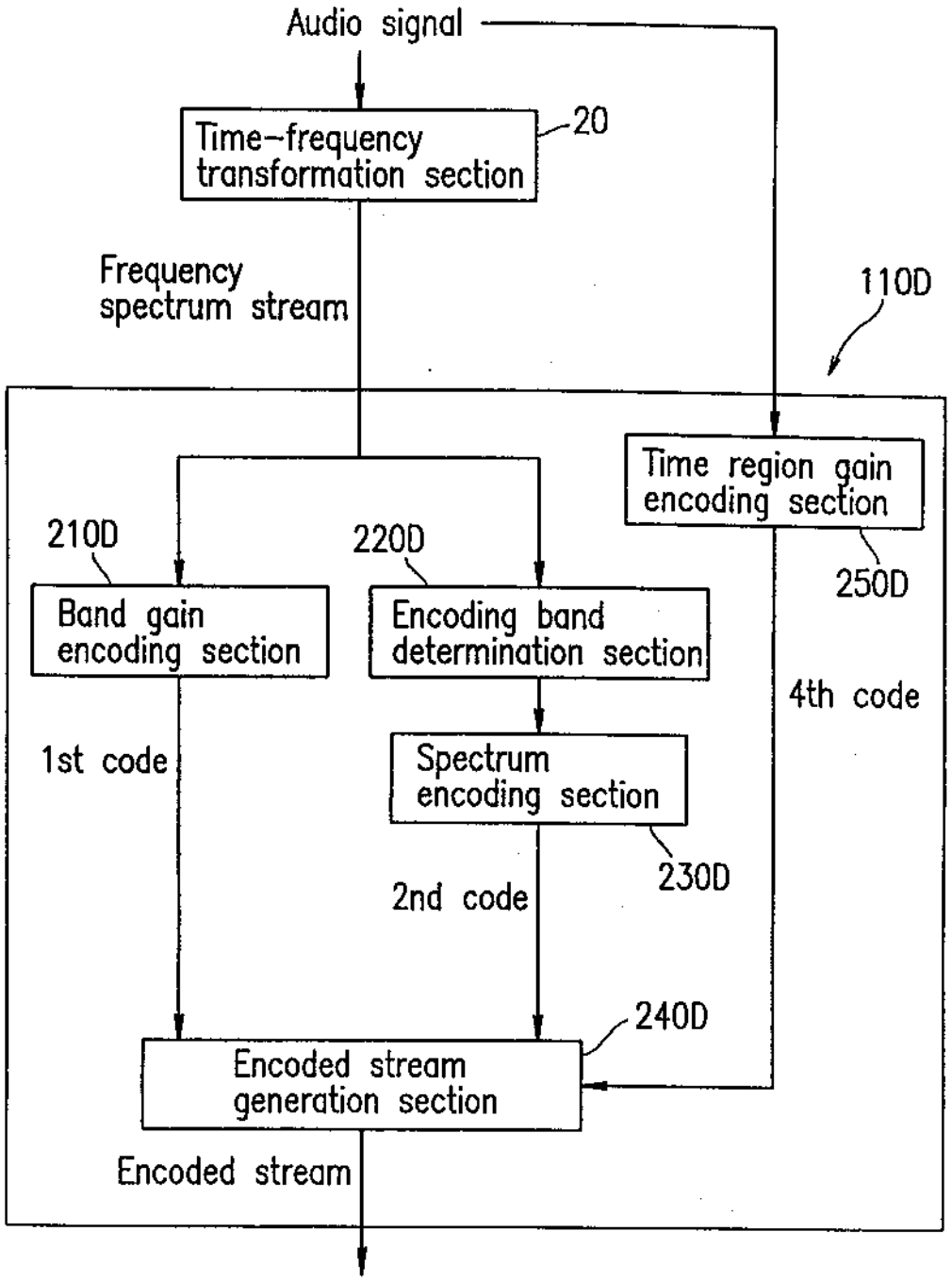

Audio signal
Time-frequency transformation section
20
Frequency spectrum stream
110D
Time region gain encoding section
250D
210D
220D
Band gain encoding section
Encoding band determination section
4th code
1st code
Spectrum encoding section
230D
2nd code
240D
Encoded stream generation section
Encoded stream

FIG. 6

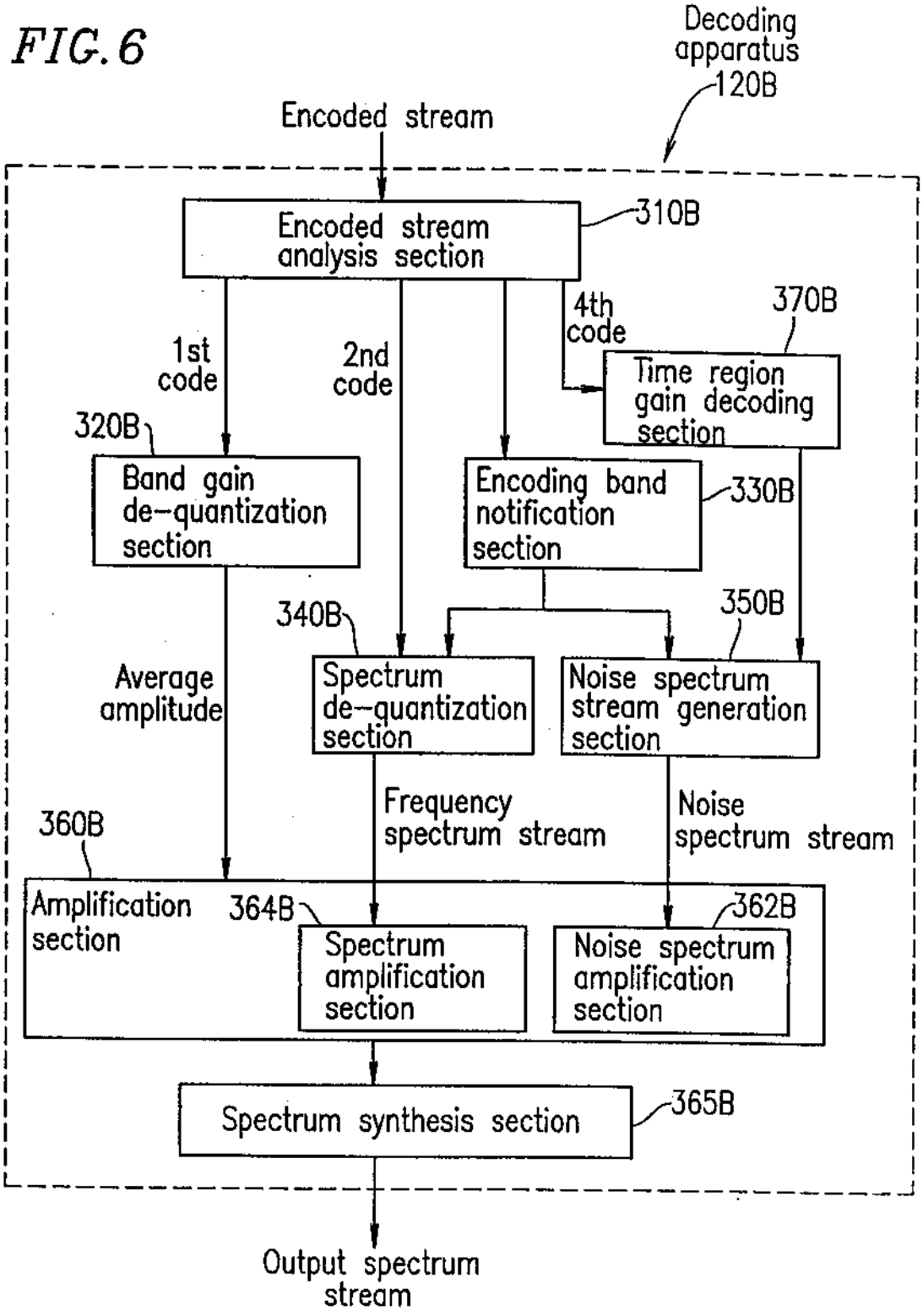

Decoding apparatus
120B
Encoded stream
Encoded stream analysis section
310B
1st code
2nd code
4th code
370B
Time region gain decoding section
320B
Band gain de-quantization section
Encoding band notification section
330B
340B
350B
Average amplitude
Spectrum de-quantization section
Noise spectrum stream generation section
Frequency spectrum stream
Noise spectrum stream
360B
Amplification section
364B
362B
Spectrum amplification section
Noise spectrum amplification section
Spectrum synthesis section
365B
Output spectrum stream

FIG. 7

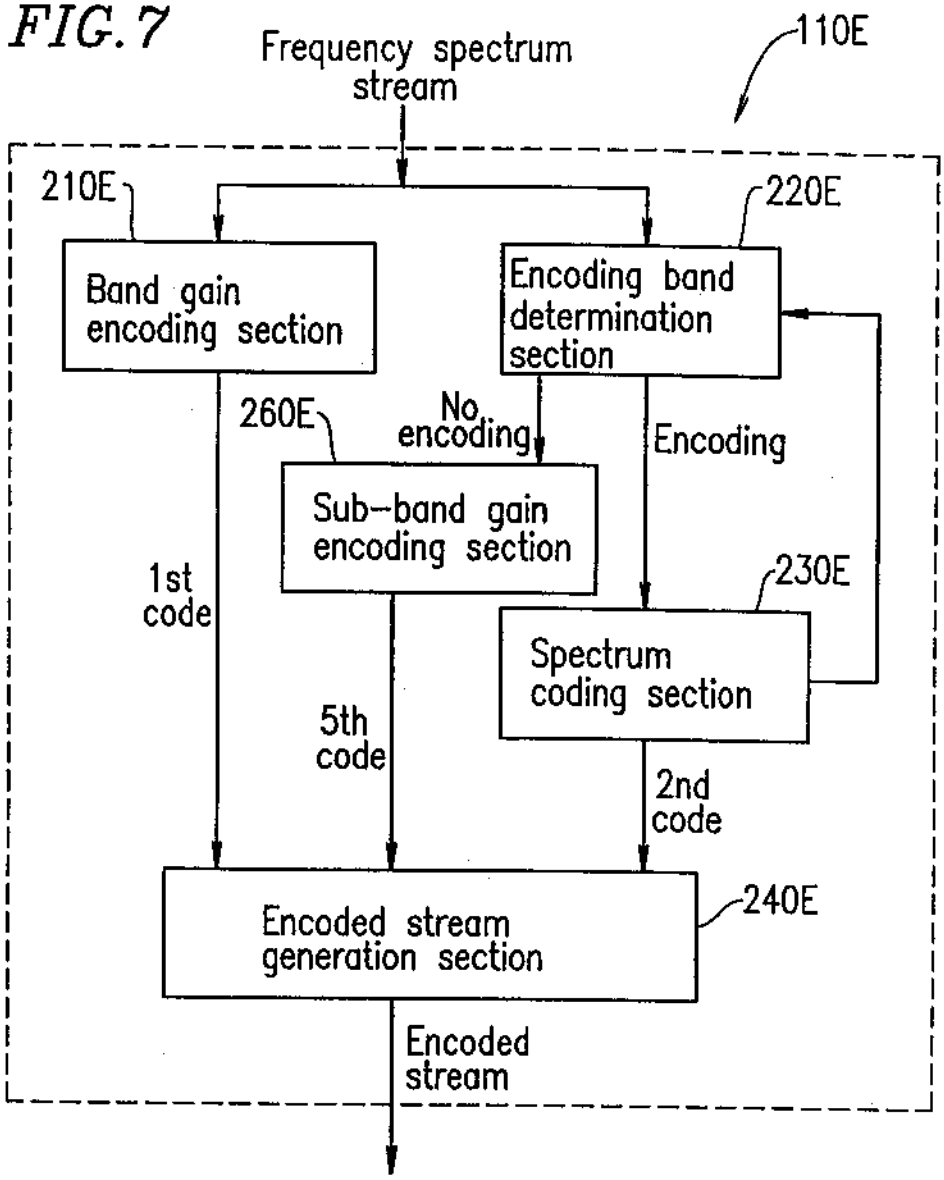

Frequency spectrum stream
110E
210E
220E
Band gain encoding section
Encoding band determination section
260E
No encoding
Encoding
Sub-band gain encoding section
1st code
230E
Spectrum coding section
5th code
2nd code
Encoded stream generation section
240E
Encoded stream

FIG.8

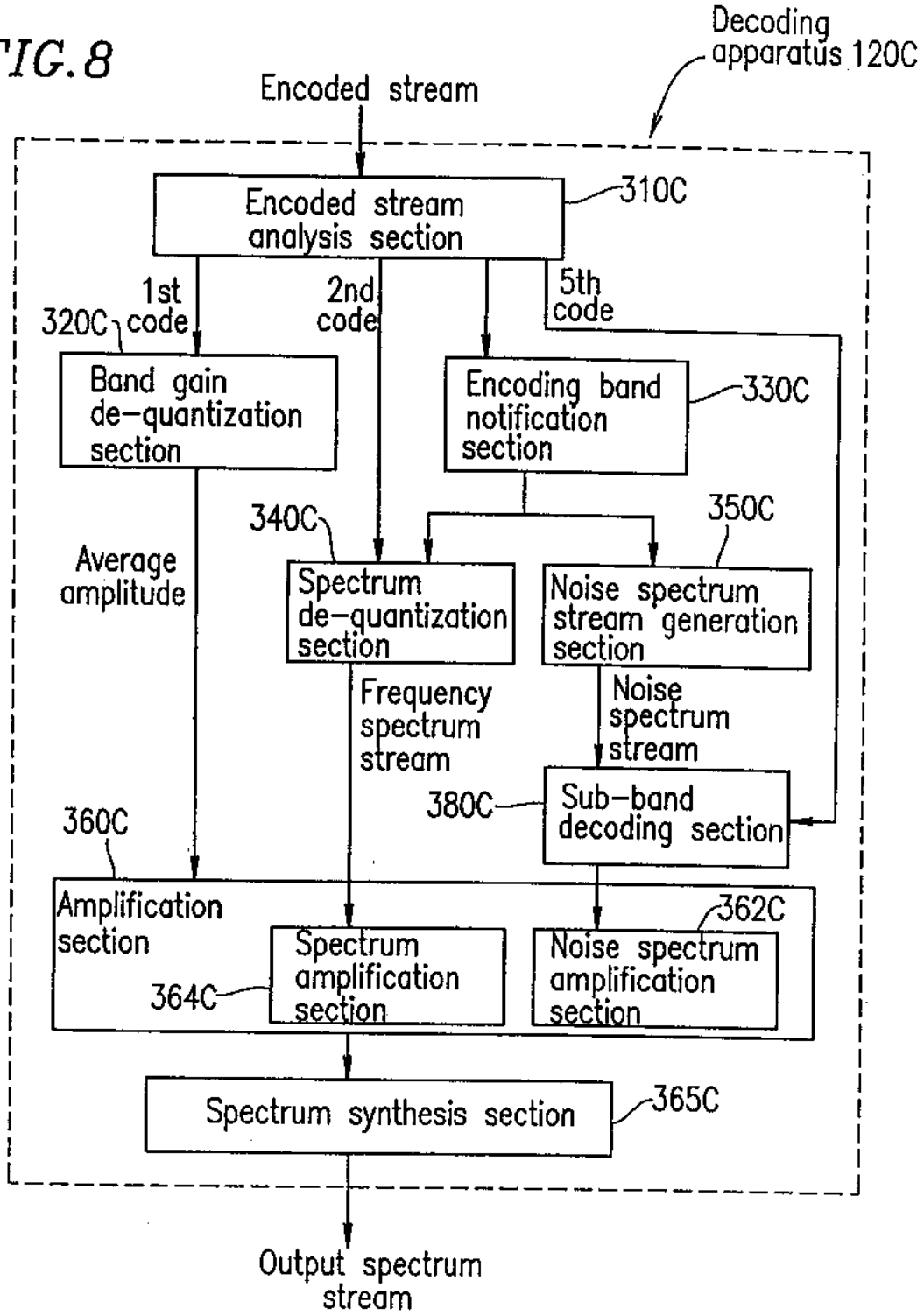

Decoding apparatus 120C
Encoded stream
Encoded stream analysis section
310C
1st code
320C
2nd code
5th code
Band gain de-quantization section
Encoding band notification section
330C
340C
350C
Average amplitude
Spectrum de-quantization section
Noise spectrum stream generation section
Frequency spectrum stream
Noise spectrum stream
380C
Sub-band decoding section
360C
Amplification section
362C
Spectrum amplification section
364C
Noise spectrum amplification section
Spectrum synthesis section
365C
Output spectrum stream

FIG. 9

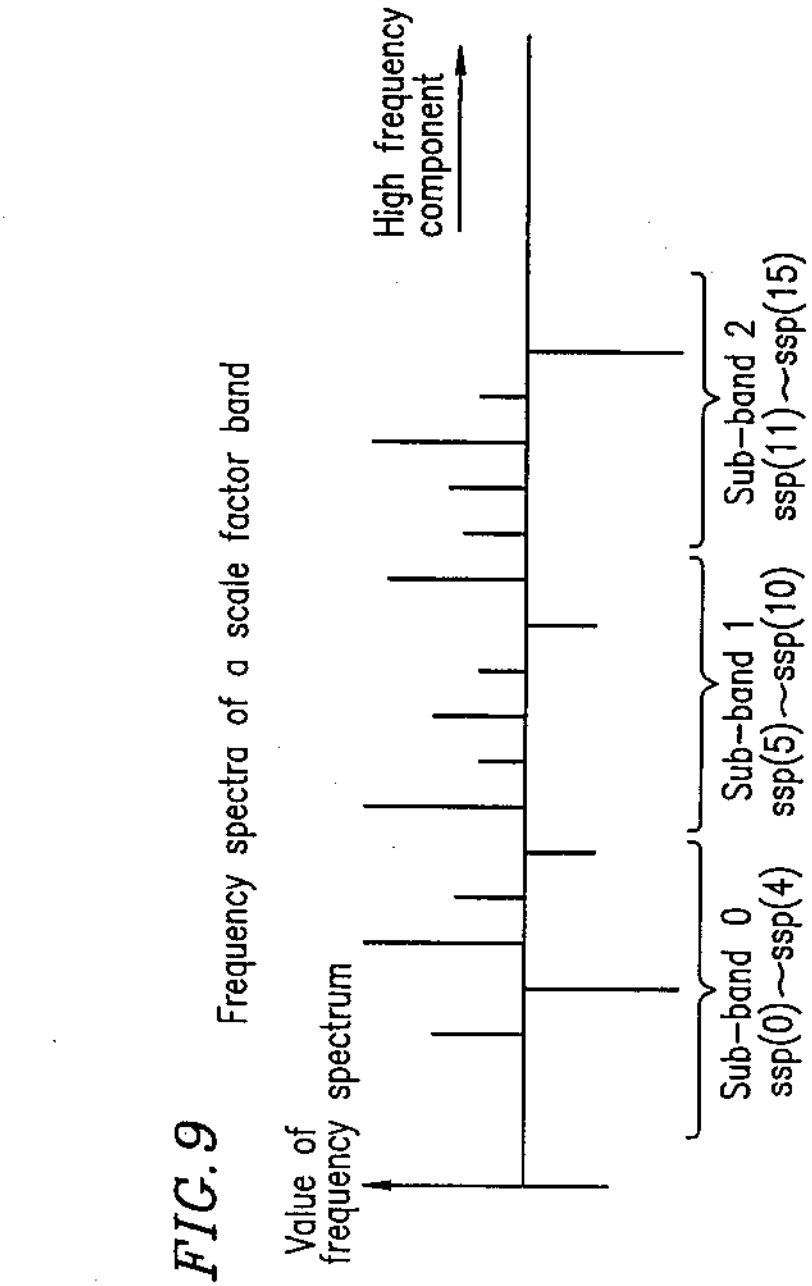
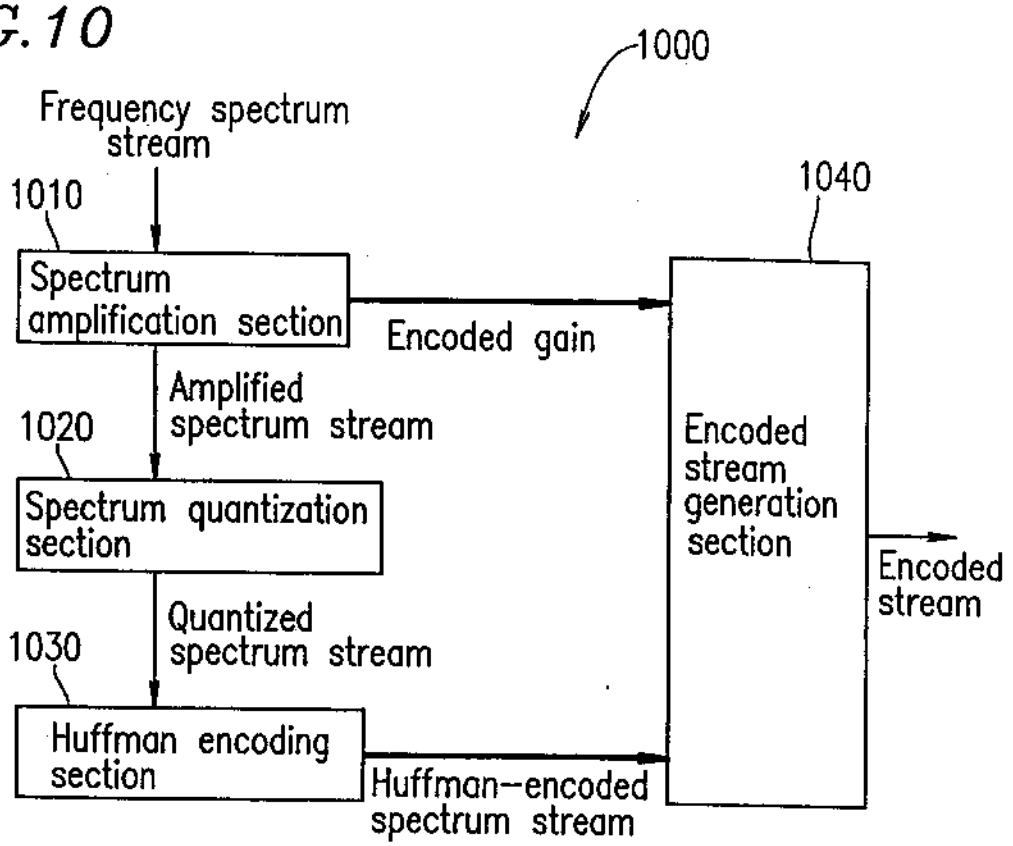

Frequency spectra of a scale factor band
Value of frequency spectrum
High frequency component
Sub-band 0
ssp(0)~ssp(4)
Sub-band 1
ssp(5)~ssp(10)
Sub-band 2
ssp(11)~ssp(15)

FIG. 10


1000
Frequency spectrum stream
1010
Spectrum amplification section
Encoded gain
1040
Amplified spectrum stream
1020
Spectrum quantization section
Encoded stream generation section
Encoded stream
Quantized spectrum stream
1030
Huffman encoding section
Huffman-encoded spectrum stream