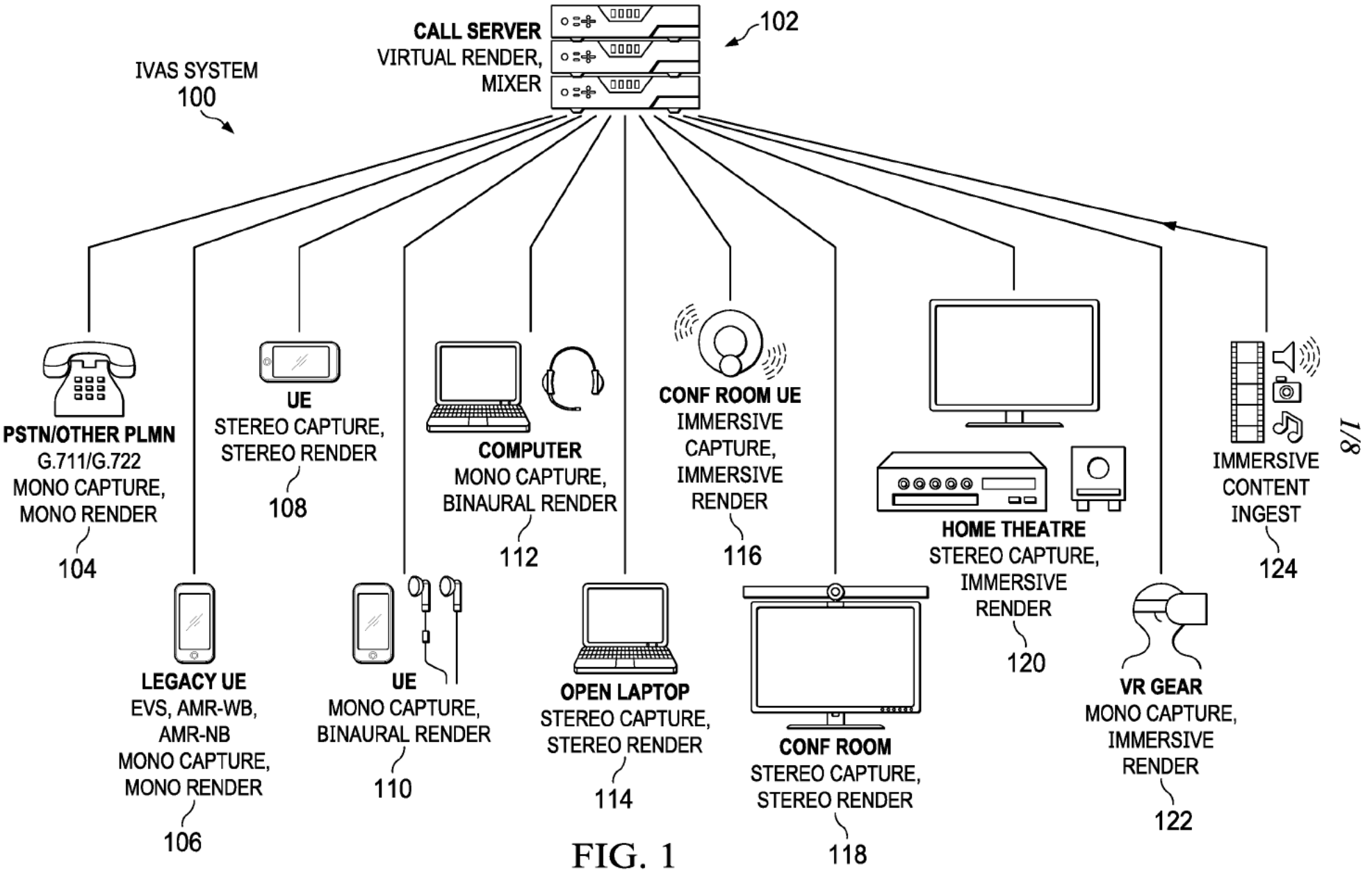

IVAS SYSTEM
100
CALL SERVER
VIRTUAL RENDER,
MIXER
102
PSTN/OTHER PLMN
G.711/G.722
MONO CAPTURE,
MONO RENDER
104
LEGACY UE
EVS, AMR-WB,
AMR-NB
MONO CAPTURE,
MONO RENDER
106
UE
STEREO CAPTURE,
STEREO RENDER
108
UE
MONO CAPTURE,
BINAURAL RENDER
110
COMPUTER
MONO CAPTURE,
BINAURAL RENDER
112
OPEN LAPTOP
STEREO CAPTURE,
STEREO RENDER
114
CONF ROOM UE
IMMERSIVE
CAPTURE,
IMMERSIVE
RENDER
116
CONF ROOM
STEREO CAPTURE,
STEREO RENDER
118
HOME THEATRE
STEREO CAPTURE,
IMMERSIVE
RENDER
120
VR GEAR
MONO CAPTURE,
IMMERSIVE
RENDER
122
IMMERSIVE
CONTENT
INGEST
124

FIG. 1

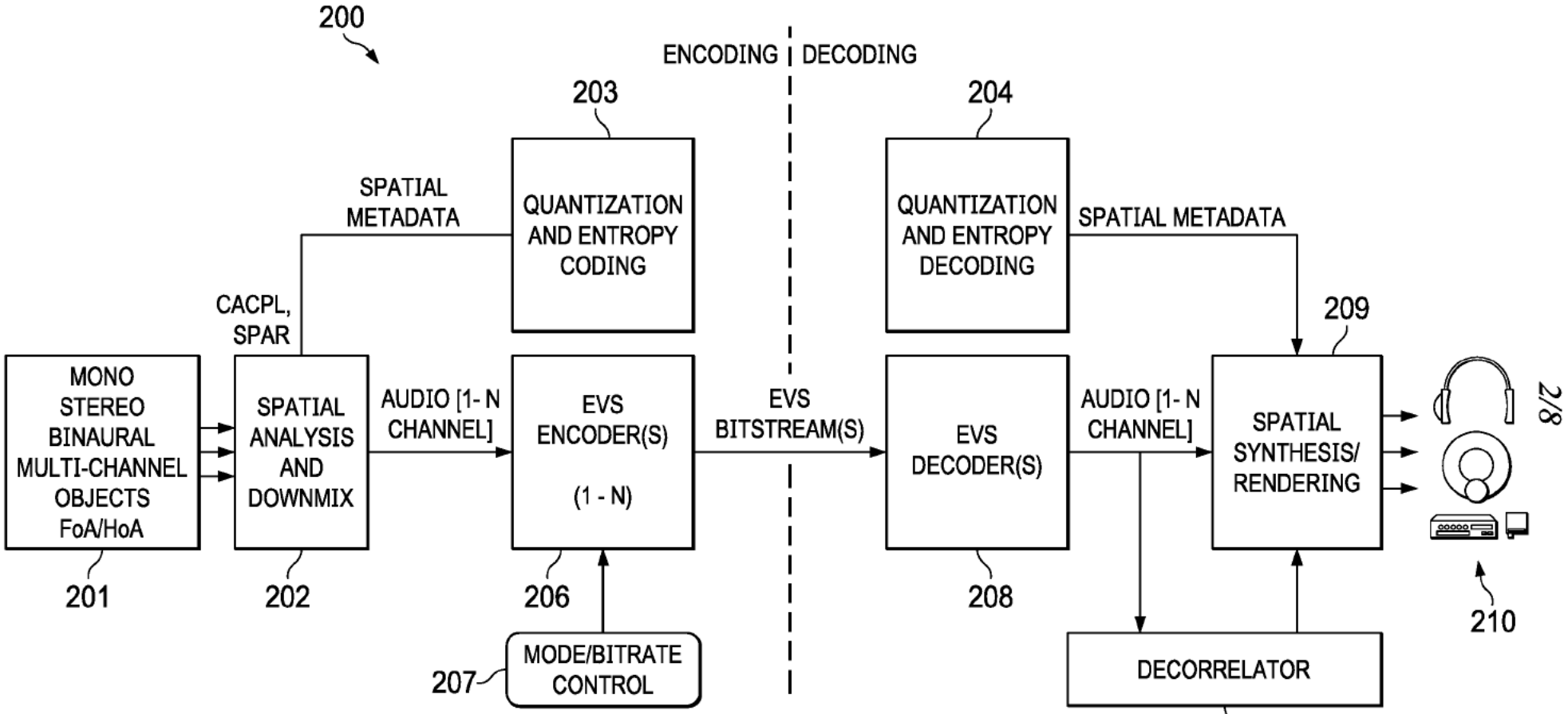

200
ENCODING
DECODING
203
204
SPATIAL METADATA
QUANTIZATION AND ENTROPY CODING
QUANTIZATION AND ENTROPY DECODING
SPATIAL METADATA
CACPL, SPAR
209
MONO
STEREO
BINAURAL
MULTI-CHANNEL
OBJECTS
FoA/HoA
SPATIAL ANALYSIS AND DOWNMIX
AUDIO [1- N CHANNEL]
EVS ENCODER(S)
(1 - N)
EVS BITSTREAM(S)
EVS DECODER(S)
AUDIO [1- N CHANNEL]
SPATIAL SYNTHESIS/ RENDERING
201
202
206
208
210
MODE/BITRATE CONTROL
207
DECORRELATOR
211

FIG. 2

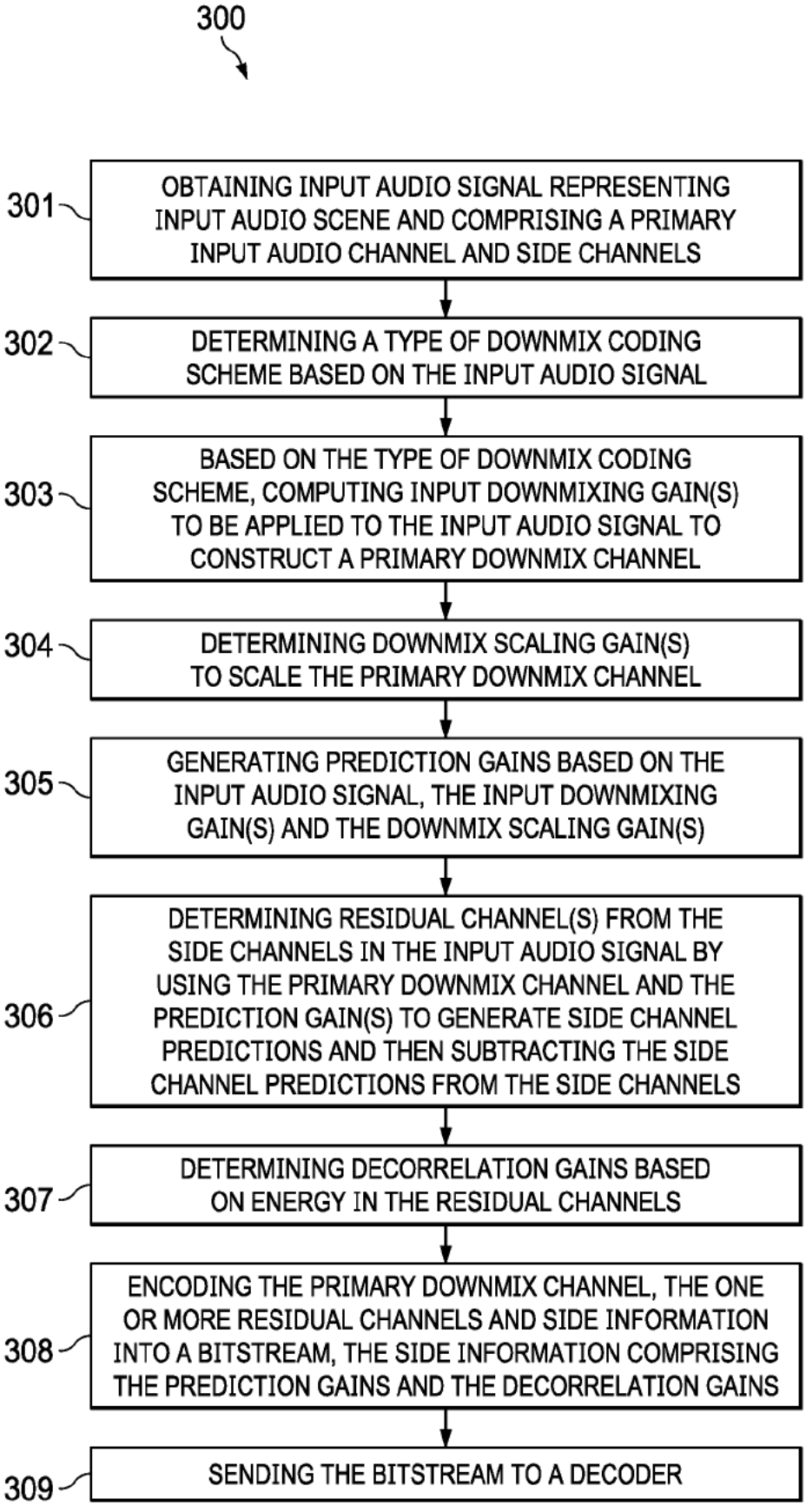

300
301
OBTAINING INPUT AUDIO SIGNAL REPRESENTING INPUT AUDIO SCENE AND COMPRISING A PRIMARY INPUT AUDIO CHANNEL AND SIDE CHANNELS
302
DETERMINING A TYPE OF DOWNMIX CODING SCHEME BASED ON THE INPUT AUDIO SIGNAL
303
BASED ON THE TYPE OF DOWNMIX CODING SCHEME, COMPUTING INPUT DOWNMIXING GAIN(S) TO BE APPLIED TO THE INPUT AUDIO SIGNAL TO CONSTRUCT A PRIMARY DOWNMIX CHANNEL
304
DETERMINING DOWNMIX SCALING GAIN(S) TO SCALE THE PRIMARY DOWNMIX CHANNEL
305
GENERATING PREDICTION GAINS BASED ON THE INPUT AUDIO SIGNAL, THE INPUT DOWNMIXING GAIN(S) AND THE DOWNMIX SCALING GAIN(S)
306
DETERMINING RESIDUAL CHANNEL(S) FROM THE SIDE CHANNELS IN THE INPUT AUDIO SIGNAL BY USING THE PRIMARY DOWNMIX CHANNEL AND THE PREDICTION GAIN(S) TO GENERATE SIDE CHANNEL PREDICTIONS AND THEN SUBTRACTING THE SIDE CHANNEL PREDICTIONS FROM THE SIDE CHANNELS
307
DETERMINING DECORRELATION GAINS BASED ON ENERGY IN THE RESIDUAL CHANNELS
308
ENCODING THE PRIMARY DOWNMIX CHANNEL, THE ONE OR MORE RESIDUAL CHANNELS AND SIDE INFORMATION INTO A BITSTREAM, THE SIDE INFORMATION COMPRISING THE PREDICTION GAINS AND THE DECORRELATION GAINS
309
SENDING THE BITSTREAM TO A DECODER

FIG. 3

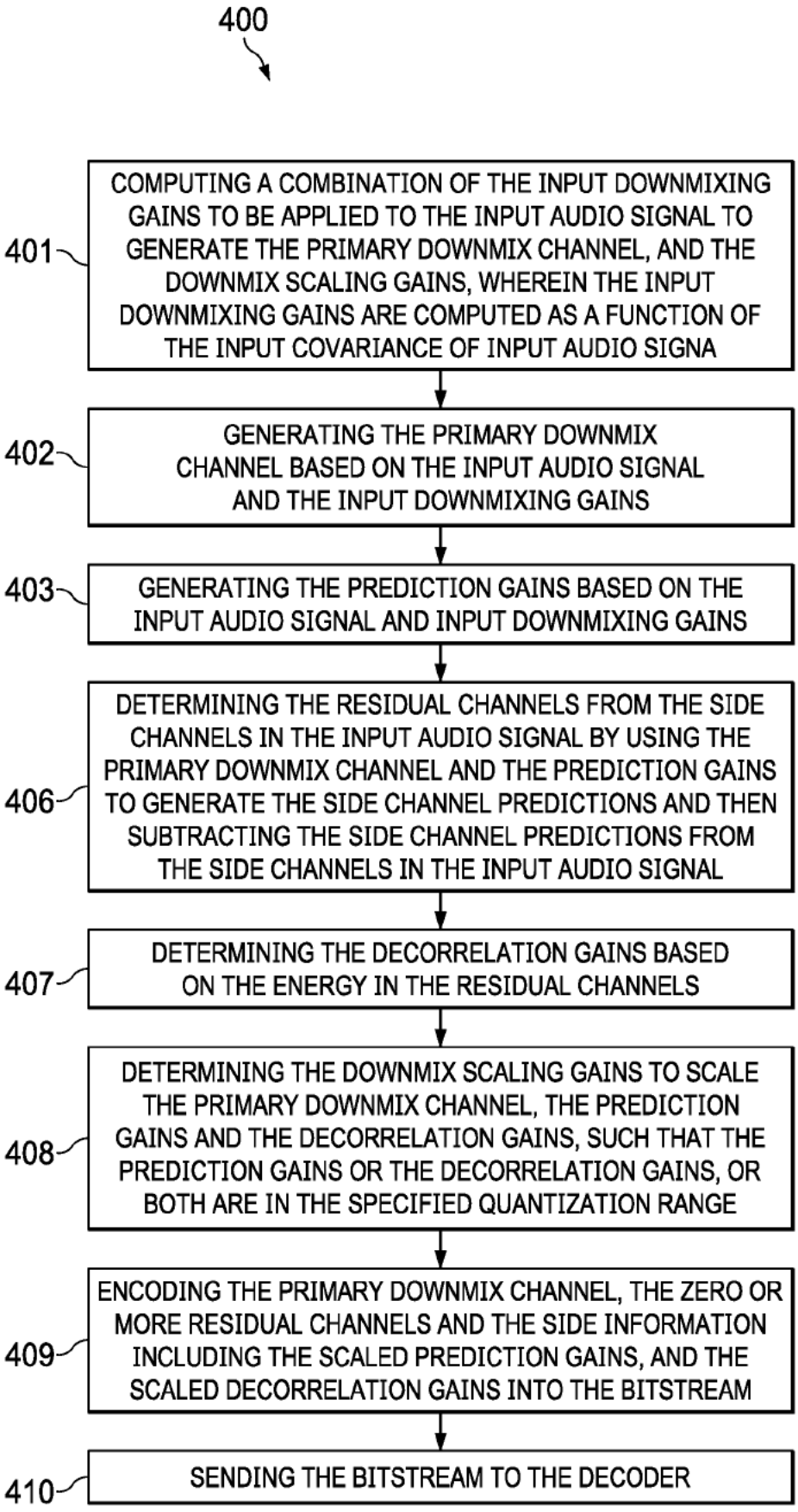

400
401
COMPUTING A COMBINATION OF THE INPUT DOWNMIXING GAINS TO BE APPLIED TO THE INPUT AUDIO SIGNAL TO GENERATE THE PRIMARY DOWNMIX CHANNEL, AND THE DOWNMIX SCALING GAINS, WHEREIN THE INPUT DOWNMIXING GAINS ARE COMPUTED AS A FUNCTION OF THE INPUT COVARIANCE OF INPUT AUDIO SIGNA
402
GENERATING THE PRIMARY DOWNMIX CHANNEL BASED ON THE INPUT AUDIO SIGNAL AND THE INPUT DOWNMIXING GAINS
403
GENERATING THE PREDICTION GAINS BASED ON THE INPUT AUDIO SIGNAL AND INPUT DOWNMIXING GAINS
406
DETERMINING THE RESIDUAL CHANNELS FROM THE SIDE CHANNELS IN THE INPUT AUDIO SIGNAL BY USING THE PRIMARY DOWNMIX CHANNEL AND THE PREDICTION GAINS TO GENERATE THE SIDE CHANNEL PREDICTIONS AND THEN SUBTRACTING THE SIDE CHANNEL PREDICTIONS FROM THE SIDE CHANNELS IN THE INPUT AUDIO SIGNAL
407
DETERMINING THE DECORRELATION GAINS BASED ON THE ENERGY IN THE RESIDUAL CHANNELS
408
DETERMINING THE DOWNMIX SCALING GAINS TO SCALE THE PRIMARY DOWNMIX CHANNEL, THE PREDICTION GAINS AND THE DECORRELATION GAINS, SUCH THAT THE PREDICTION GAINS OR THE DECORRELATION GAINS, OR BOTH ARE IN THE SPECIFIED QUANTIZATION RANGE
409
ENCODING THE PRIMARY DOWNMIX CHANNEL, THE ZERO OR MORE RESIDUAL CHANNELS AND THE SIDE INFORMATION INCLUDING THE SCALED PREDICTION GAINS, AND THE SCALED DECORRELATION GAINS INTO THE BITSTREAM
410
SENDING THE BITSTREAM TO THE DECODER

FIG. 4A

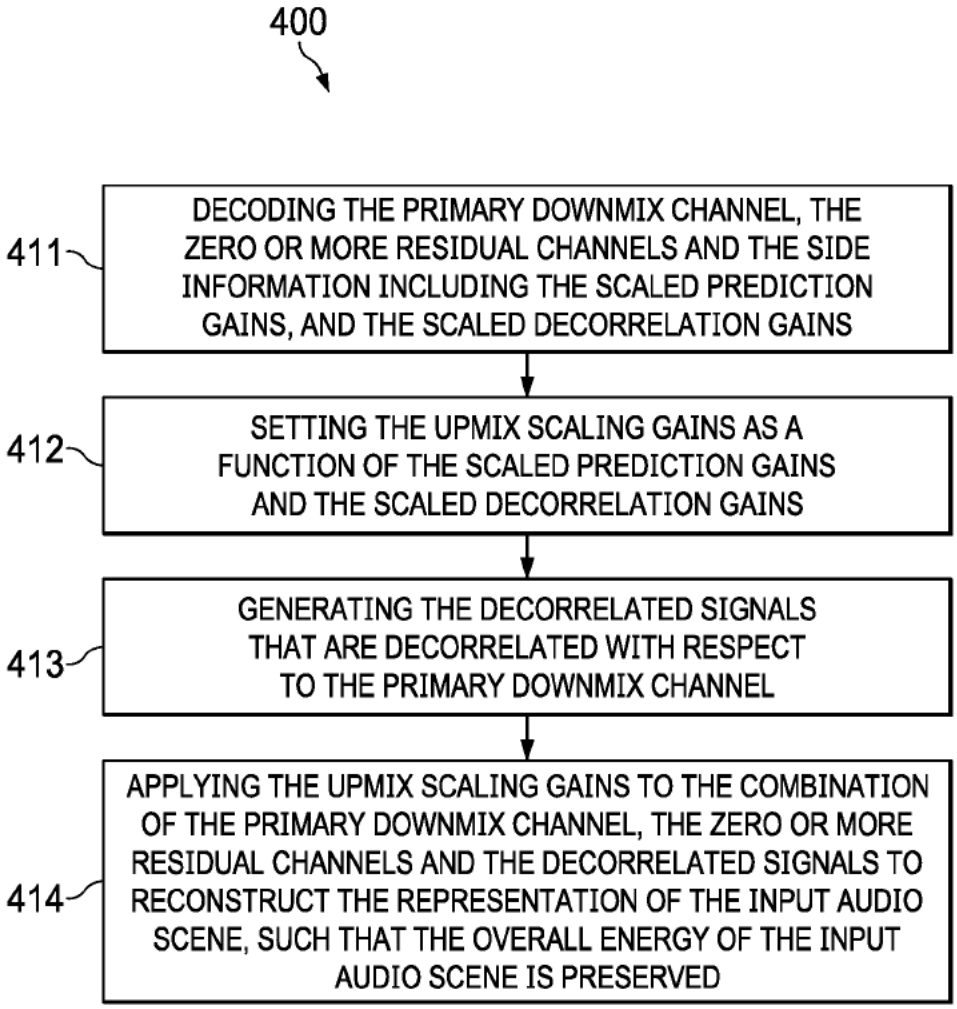

400
411
DECODING THE PRIMARY DOWNMIX CHANNEL, THE ZERO OR MORE RESIDUAL CHANNELS AND THE SIDE INFORMATION INCLUDING THE SCALED PREDICTION GAINS, AND THE SCALED DECORRELATION GAINS
412
SETTING THE UPMIX SCALING GAINS AS A FUNCTION OF THE SCALED PREDICTION GAINS AND THE SCALED DECORRELATION GAINS
413
GENERATING THE DECORRELATED SIGNALS THAT ARE DECORRELATED WITH RESPECT TO THE PRIMARY DOWNMIX CHANNEL
414
APPLYING THE UPMIX SCALING GAINS TO THE COMBINATION OF THE PRIMARY DOWNMIX CHANNEL, THE ZERO OR MORE RESIDUAL CHANNELS AND THE DECORRELATED SIGNALS TO RECONSTRUCT THE REPRESENTATION OF THE INPUT AUDIO SCENE, SUCH THAT THE OVERALL ENERGY OF THE INPUT AUDIO SCENE IS PRESERVED

FIG. 4B

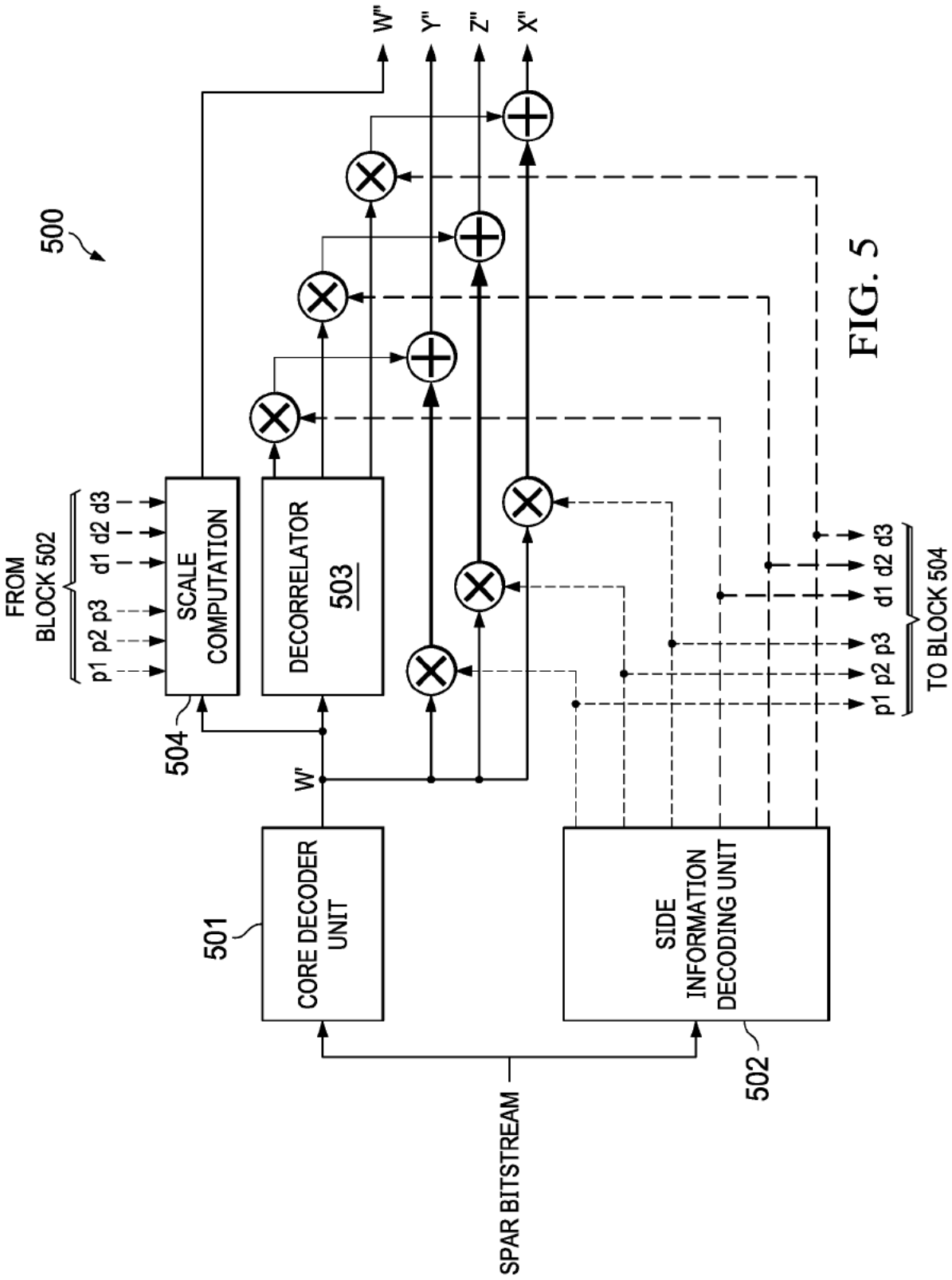

500
W"
Y"
Z"
X"
FROM
BLOCK 502
p1 p2 p3 d1 d2 d3
SCALE
COMPUTATION
DECORRELATOR
503
504
W'
501
CORE DECODER
UNIT
SIDE
INFORMATION
DECODING UNIT
502
SPAR BITSTREAM
p1 p2 p3 d1 d2 d3
TO BLOCK 504

FIG. 5

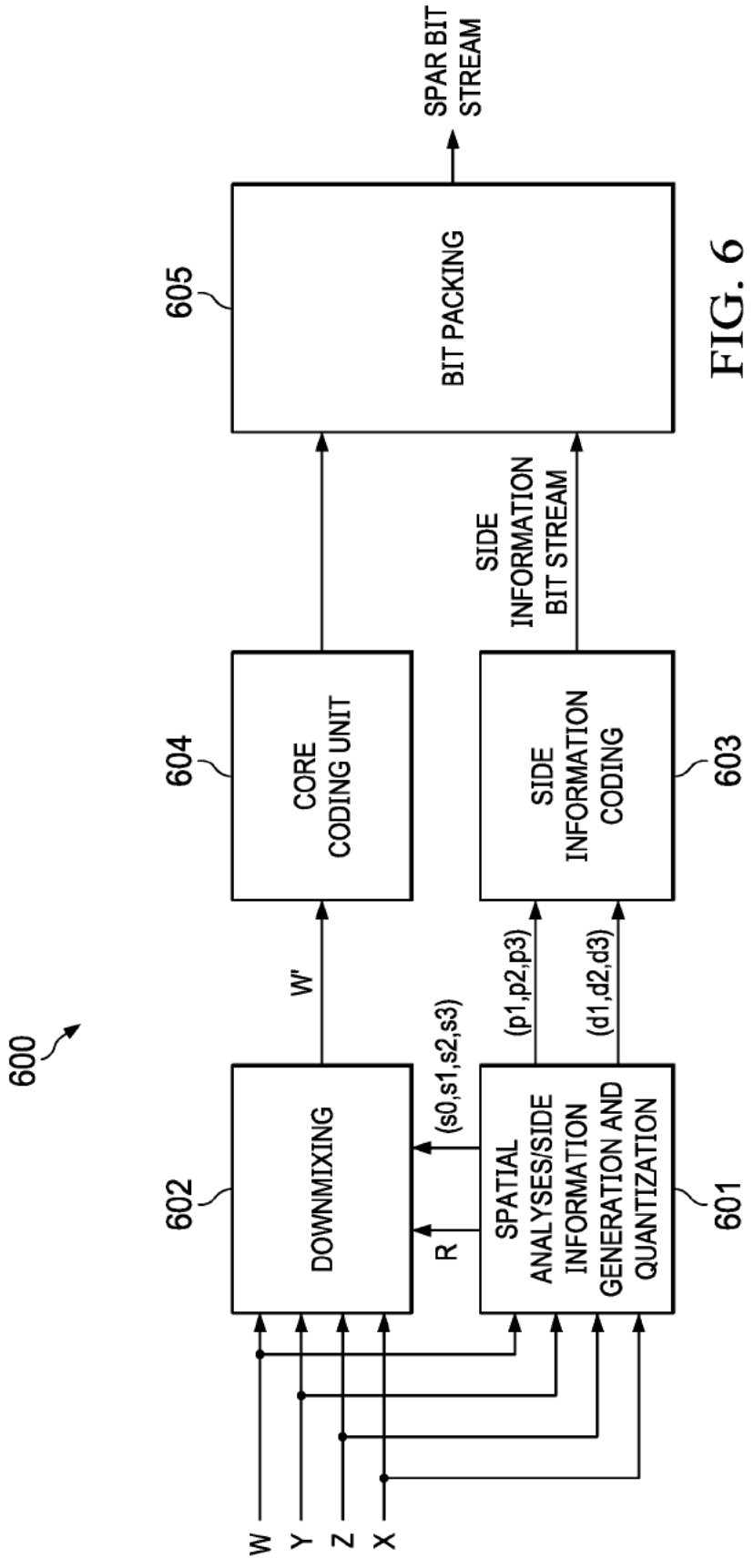

600
W
Y
Z
X
602
DOWNMIXING
601
SPATIAL ANALYSES/SIDE INFORMATION GENERATION AND QUANTIZATION
R
(s0,s1,s2,s3)
W'
(p1,p2,p3)
(d1,d2,d3)
604
CORE CODING UNIT
603
SIDE INFORMATION CODING
SIDE INFORMATION BIT STREAM
605
BIT PACKING
SPAR BIT STREAM

FIG. 6

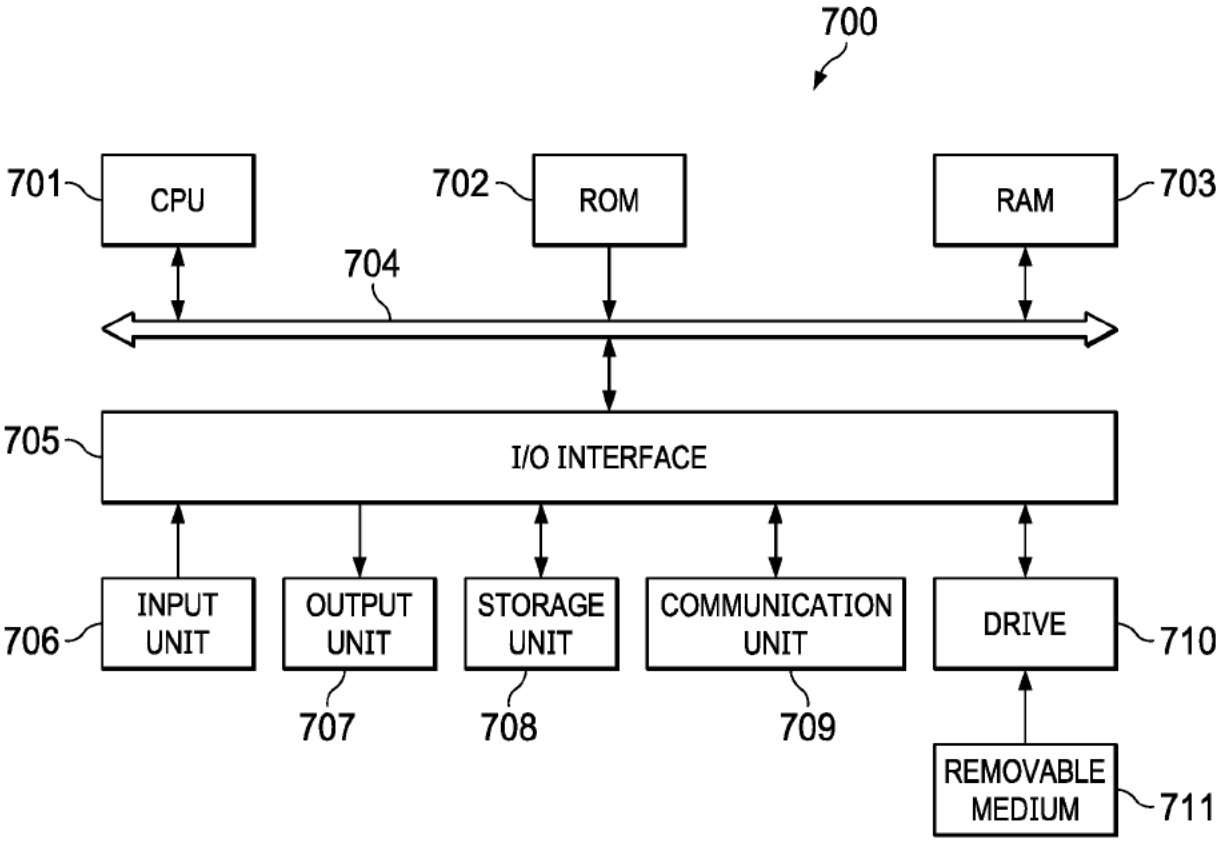

700
701
CPU
702
ROM
703
RAM
704
705
I/O INTERFACE
706
INPUT UNIT
OUTPUT UNIT
707
STORAGE UNIT
708
COMMUNICATION UNIT
709
DRIVE
710
REMOVABLE MEDIUM
711

FIG. 7