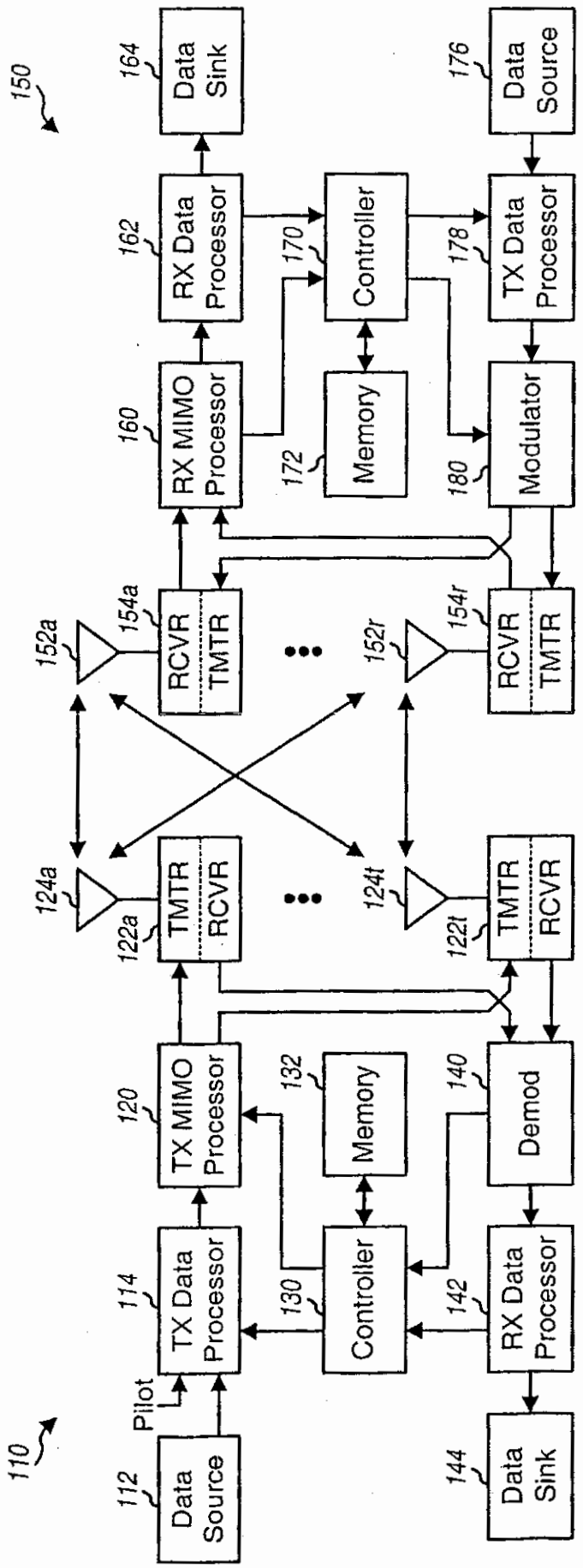

150
164
Data Sink
176
Data Source
162
RX Data Processor
170
Controller
178
TX Data Processor
160
RX MIMO Processor
172
Memory
180
Modulator
152a
154a
RCVR
TMTR
152r
154r
RCVR
TMTR
124a
122a
TMTR
RCVR
124t
122t
TMTR
RCVR
120
TX MIMO Processor
132
Memory
140
Demod
114
TX Data Processor
130
Controller
142
RX Data Processor
Pilot
110
112
Data Source
144
Data Sink

FIG. 1

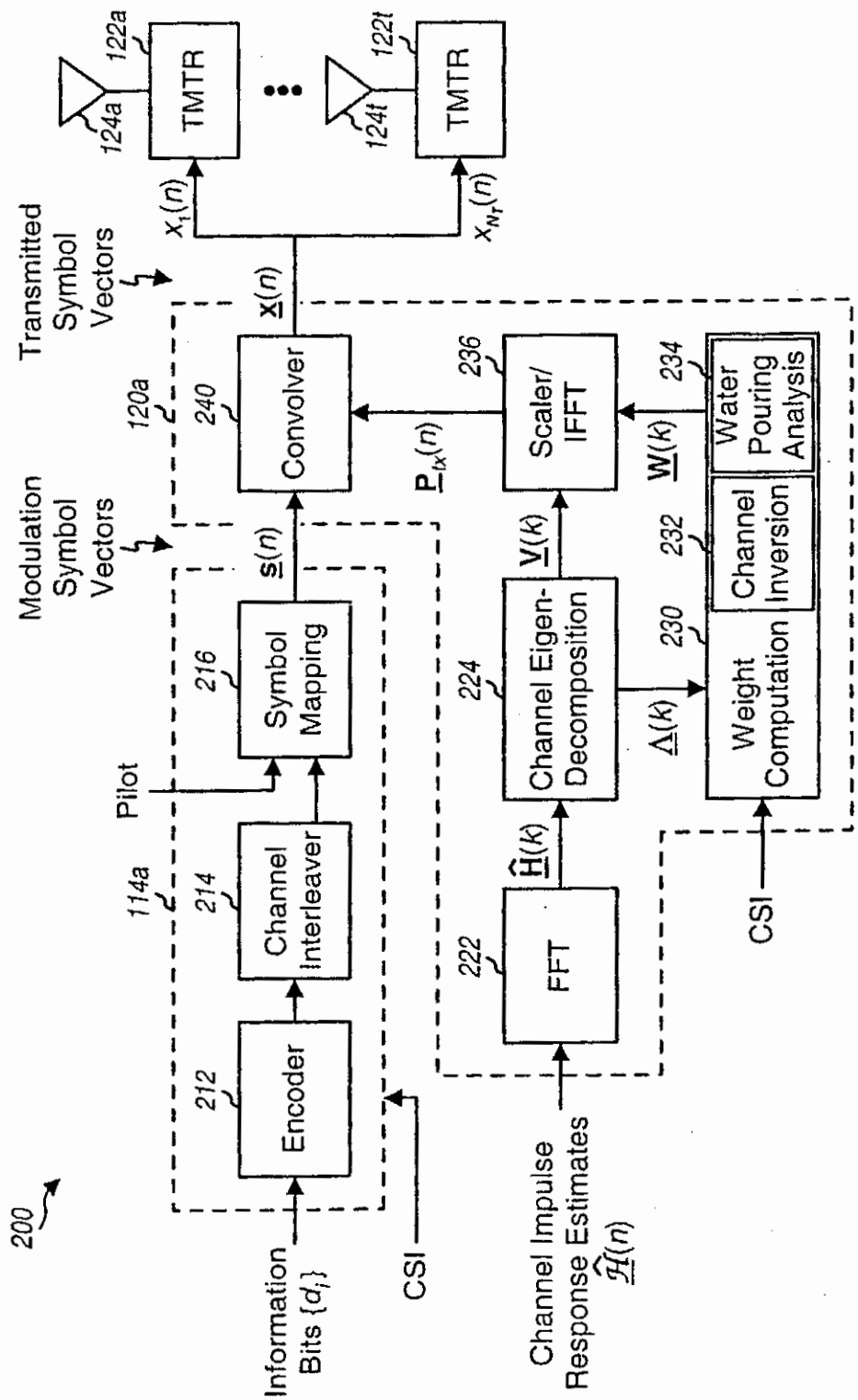

200
Information Bits $\{d_i\}$
Encoder
212
Channel Interleaver
214
Pilot
Symbol Mapping
216
114a
Modulation Symbol Vectors
$\underline{s}(n)$
CSI
120a
Convolver
240
Transmitted Symbol Vectors
$\underline{x}(n)$
$x_1(n)$
$x_{N_T}(n)$
TMTR
122a
TMTR
122t
124a
124t
$\underline{P}_{tx}(n)$
Channel Impulse Response Estimates $\hat{\underline{H}}(n)$
FFT
222
$\hat{\underline{H}}(k)$
Channel Eigen-Decomposition
224
$\underline{V}(k)$
$\underline{\Lambda}(k)$
Scaler/ IFFT
236
$\underline{W}(k)$
Weight Computation
230
Channel Inversion
232
Water Pouring Analysis
234
CSI

FIG. 2

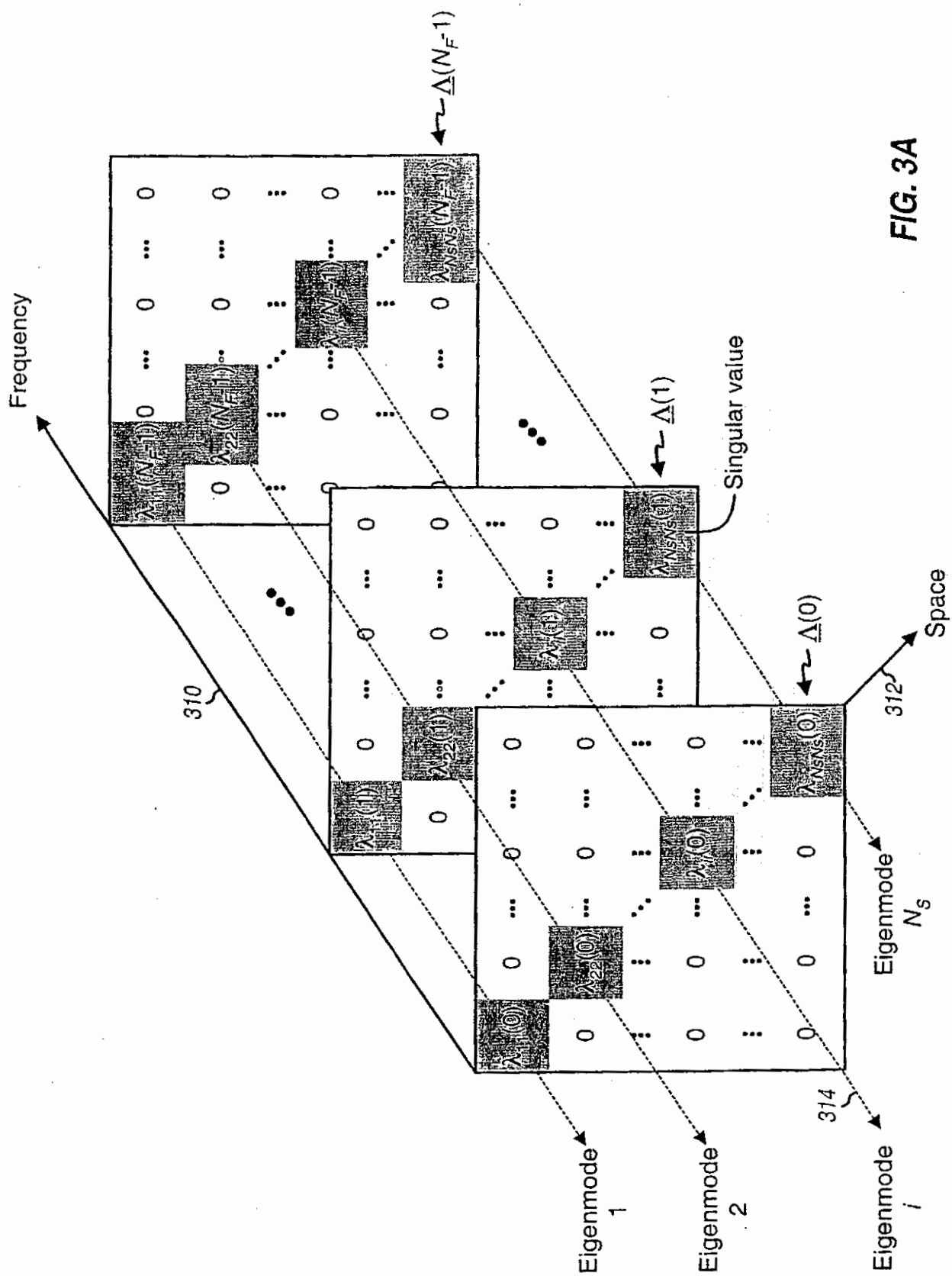

Frequency
Singular value
Space
310
312
314
$\underline{\Delta}(N_F-1)$
$\underline{\Delta}(1)$
$\underline{\Delta}(0)$
Eigenmode 1
Eigenmode 2
Eigenmode $i$
Eigenmode $N_S$

FIG. 3A

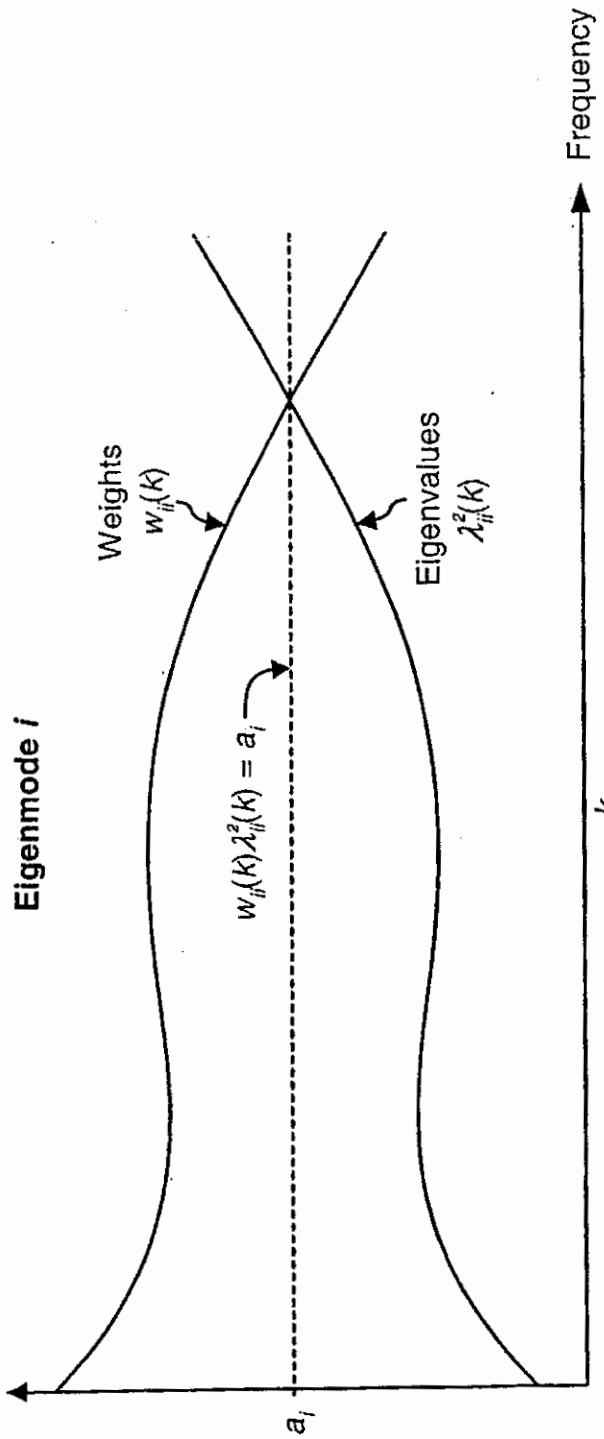

Frequency
Weights
$w_{ii}(k)$
Eigenvalues
$\lambda^2_{ii}(k)$
Eigenmode *i*
$w_{ii}(k)\lambda^2_{ii}(k) = a_i$
$k$
$a_i$

FIG. 3B

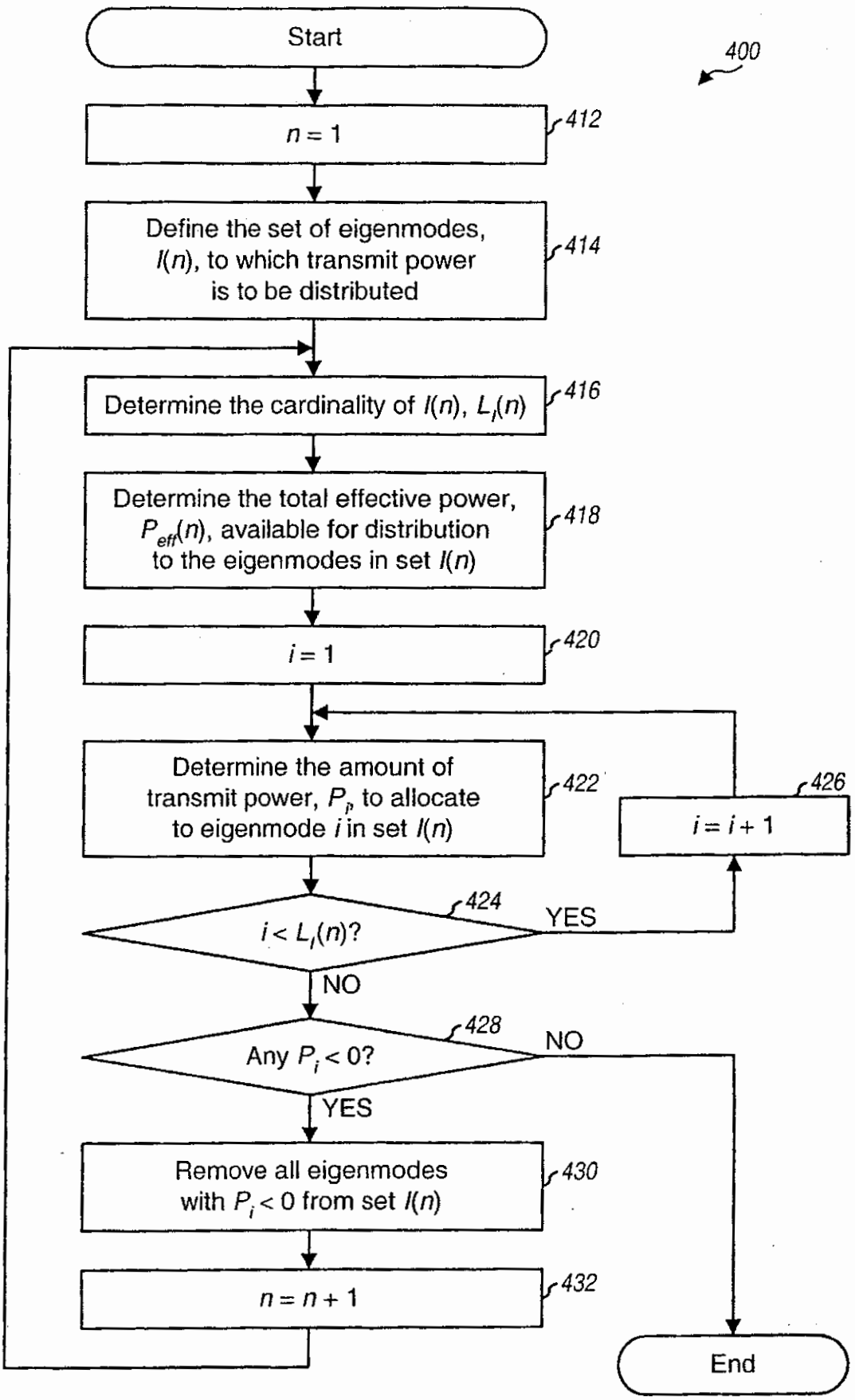

Start
400
$n = 1$
412
Define the set of eigenmodes, $I(n)$, to which transmit power is to be distributed
414
Determine the cardinality of $I(n)$, $L_I(n)$
416
Determine the total effective power, $P_{eff}(n)$, available for distribution to the eigenmodes in set $I(n)$
418
$i = 1$
420
Determine the amount of transmit power, $P_i$, to allocate to eigenmode $i$ in set $I(n)$
422
$i = i + 1$
426
$i < L_I(n)$?
424
YES
NO
Any $P_i < 0$?
428
NO
YES
Remove all eigenmodes with $P_i < 0$ from set $I(n)$
430
$n = n + 1$
432
End

FIG. 4

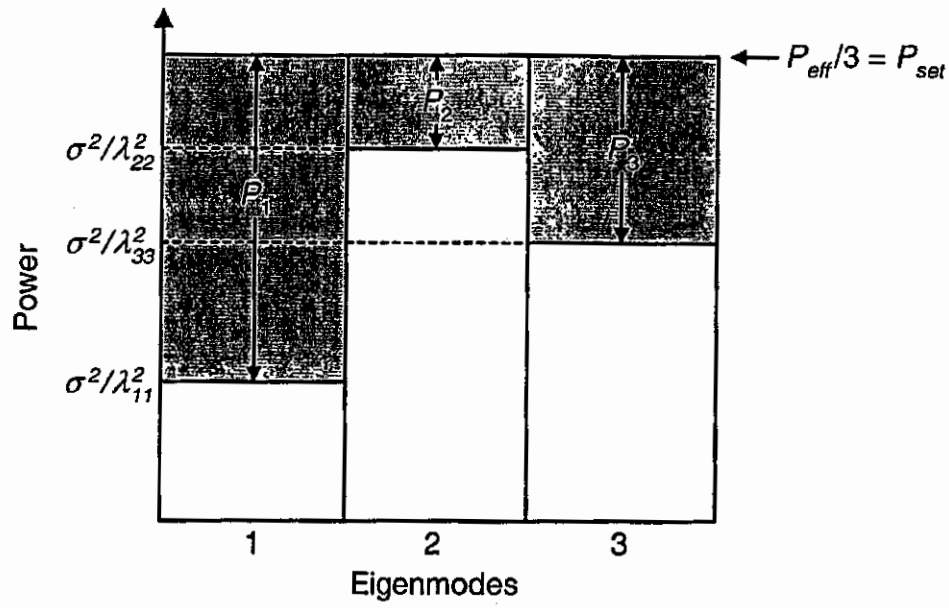

$P_{eff}/3 = P_{set}$
$P_2$
$P_3$
$P_1$
$\sigma^2/\lambda_{22}^2$
$\sigma^2/\lambda_{33}^2$
$\sigma^2/\lambda_{11}^2$
Power
1
2
3
Eigenmodes

FIG. 5A

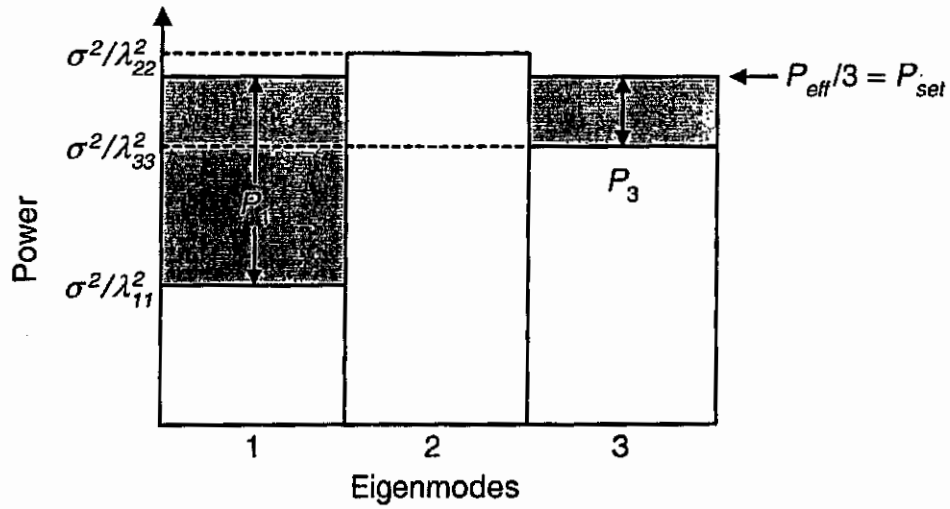

$P_{eff}/3 = P_{set}$
$P_3$
$P_1$
$\sigma^2/\lambda_{22}^2$
$\sigma^2/\lambda_{33}^2$
$\sigma^2/\lambda_{11}^2$
Power
1
2
3
Eigenmodes

FIG. 5B

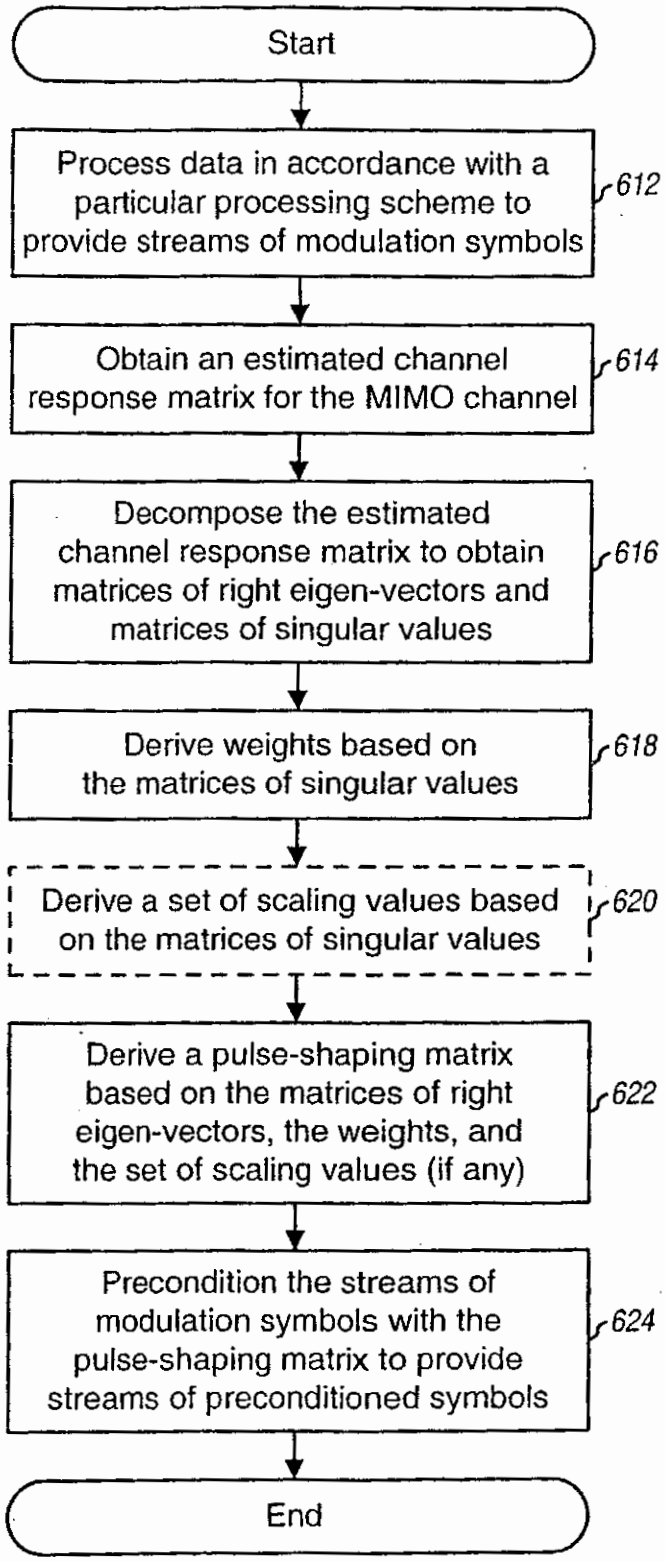

Start
600
Process data in accordance with a particular processing scheme to provide streams of modulation symbols
612
Obtain an estimated channel response matrix for the MIMO channel
614
Decompose the estimated channel response matrix to obtain matrices of right eigen-vectors and matrices of singular values
616
Derive weights based on the matrices of singular values
618
Derive a set of scaling values based on the matrices of singular values
620
Derive a pulse-shaping matrix based on the matrices of right eigen-vectors, the weights, and the set of scaling values (if any)
622
Precondition the streams of modulation symbols with the pulse-shaping matrix to provide streams of preconditioned symbols
624
End

FIG. 6

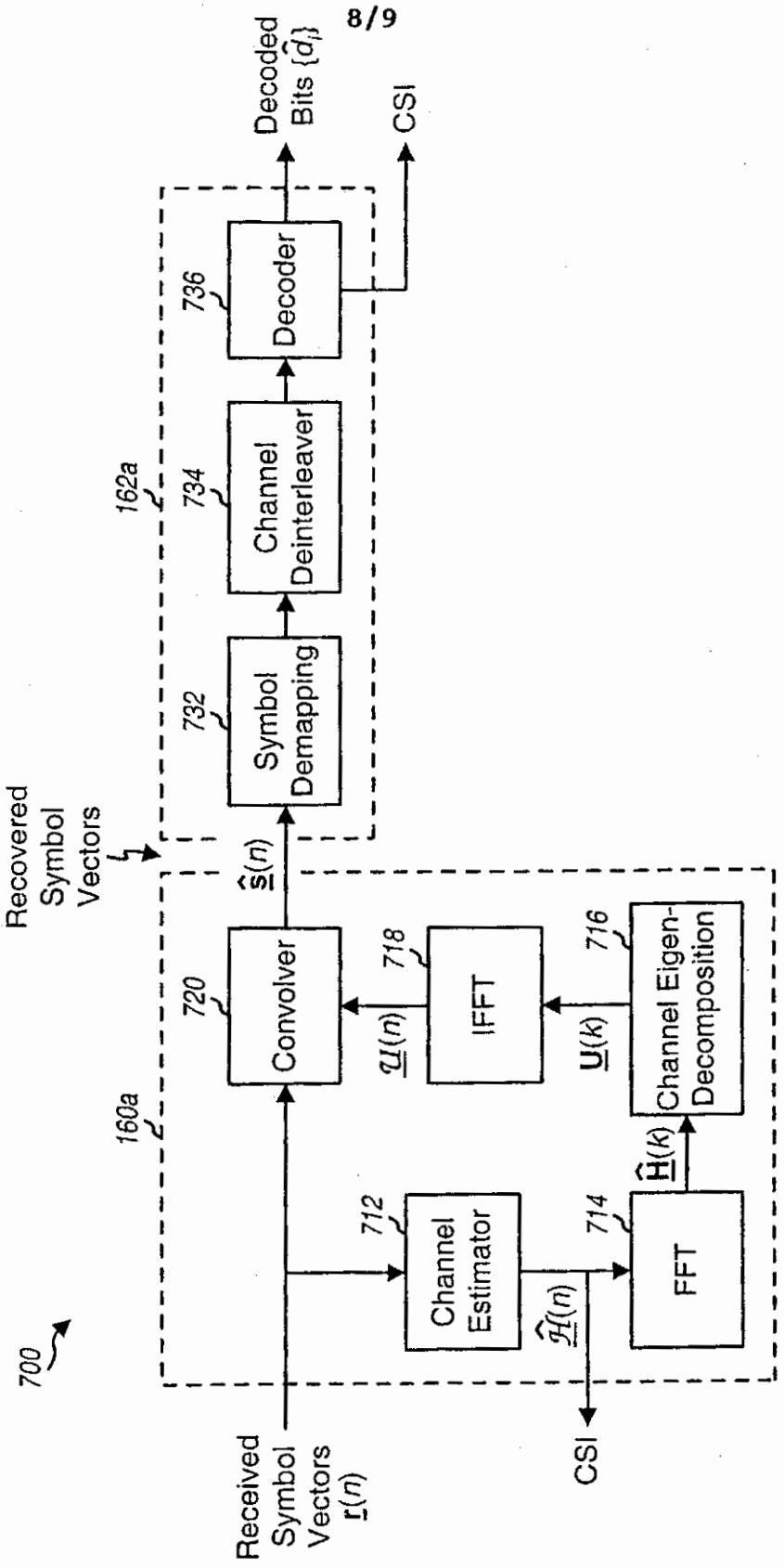

700
Received Symbol Vectors r(n)
160a
Recovered Symbol Vectors
162a
Convolver
720
IFFT
718
Channel Eigen-Decomposition
716
Channel Estimator
712
FFT
714
Channel Deinterleaver
734
Symbol Demapping
732
Decoder
736
Decoded Bits {d̂j}
CSI
CSI

FIG. 7

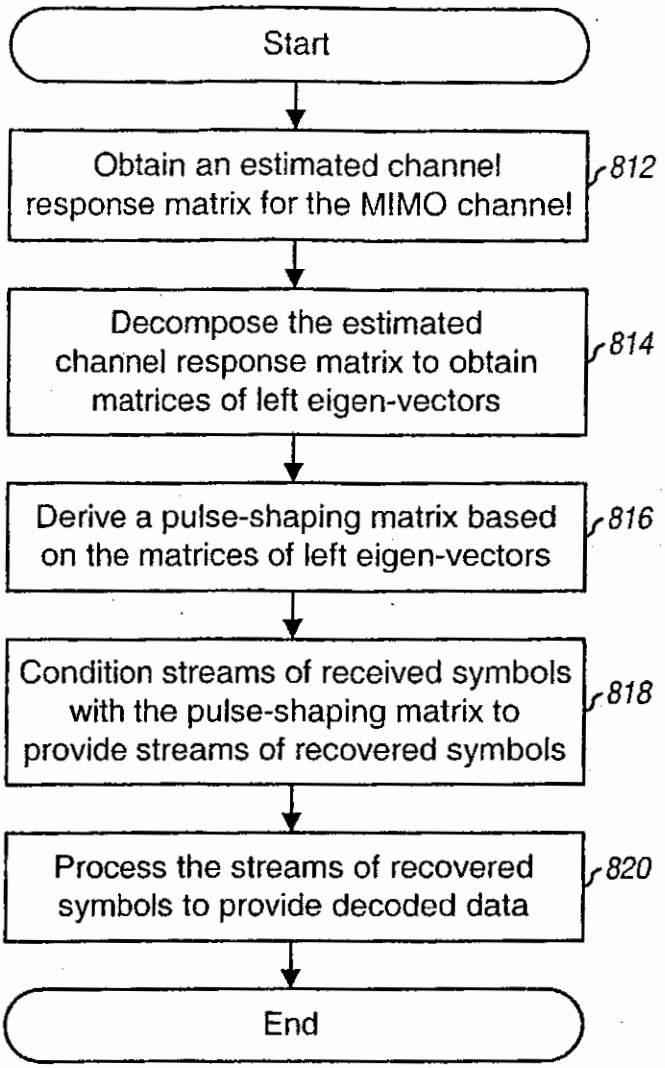

Start
800
Obtain an estimated channel response matrix for the MIMO channel
812
Decompose the estimated channel response matrix to obtain matrices of left eigen-vectors
814
Derive a pulse-shaping matrix based on the matrices of left eigen-vectors
816
Condition streams of received symbols with the pulse-shaping matrix to provide streams of recovered symbols
818
Process the streams of recovered symbols to provide decoded data
820
End

FIG. 8