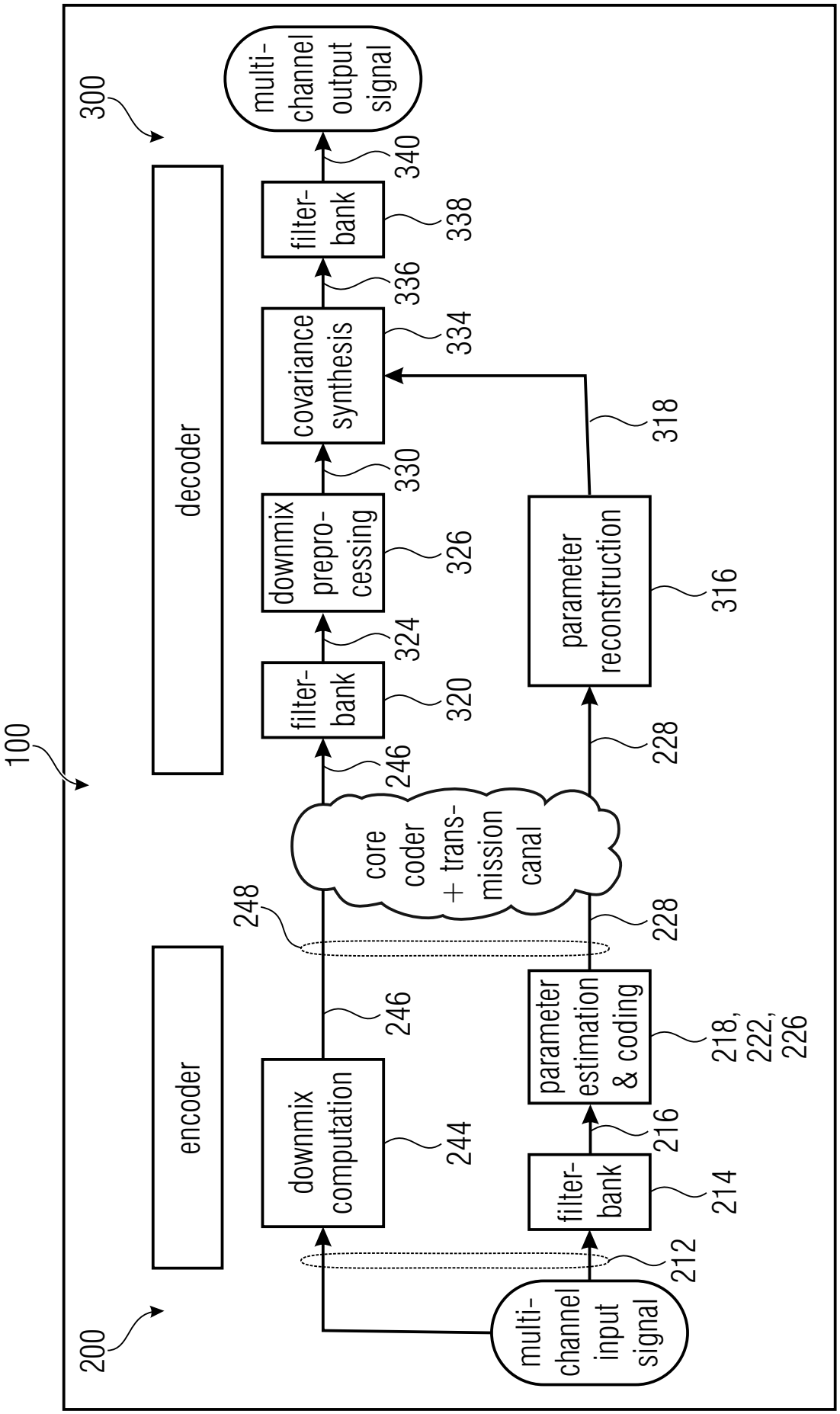


Fig. 1
simplified overview of the whole processing

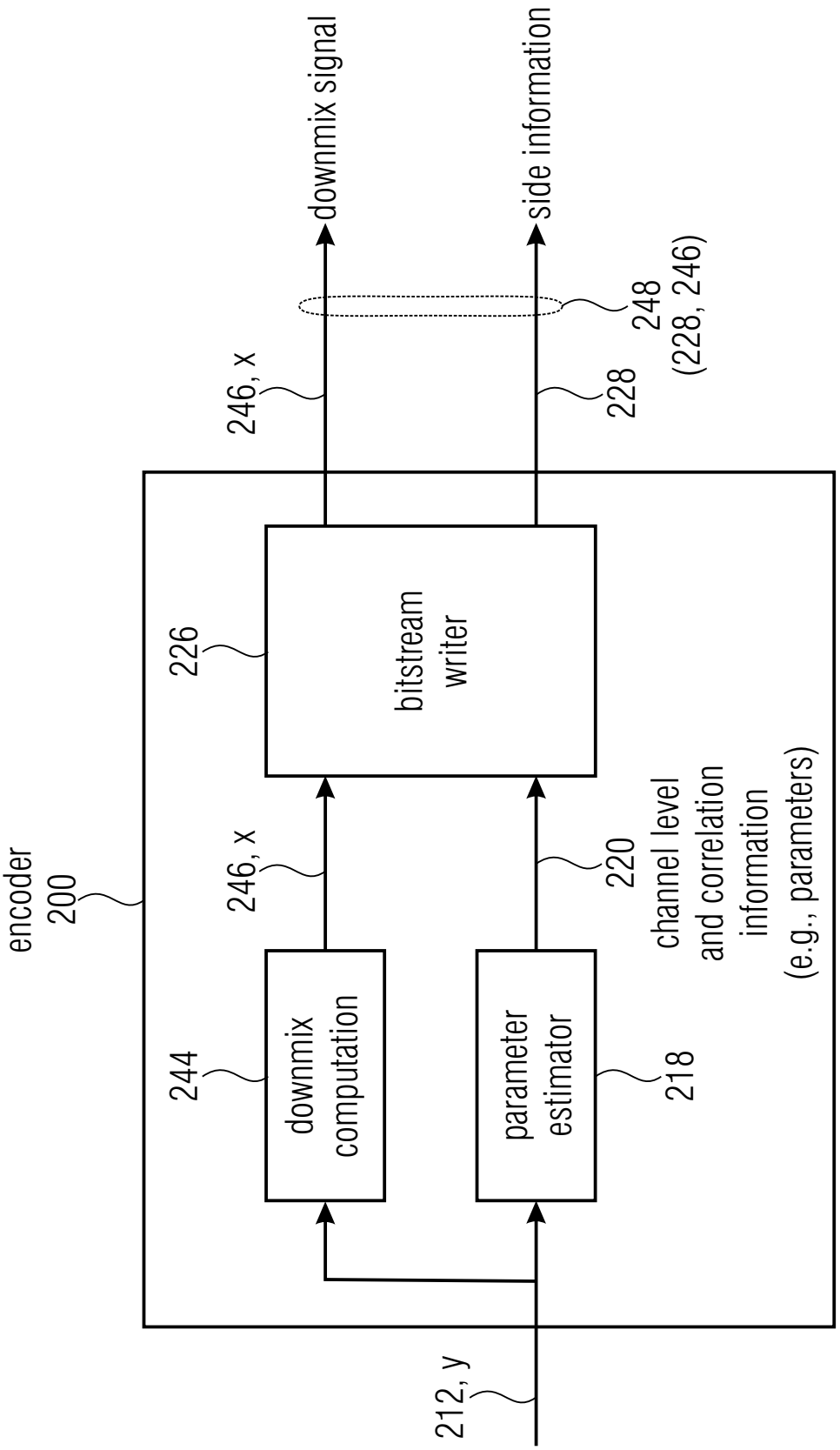

encoder
200
212, y
downmix computation
244
246, x
parameter estimator
218
220
channel level and correlation information (e.g., parameters)
bitstream writer
226
246, x
228
248
(228, 246)
downmix signal
side information

Fig. 2a

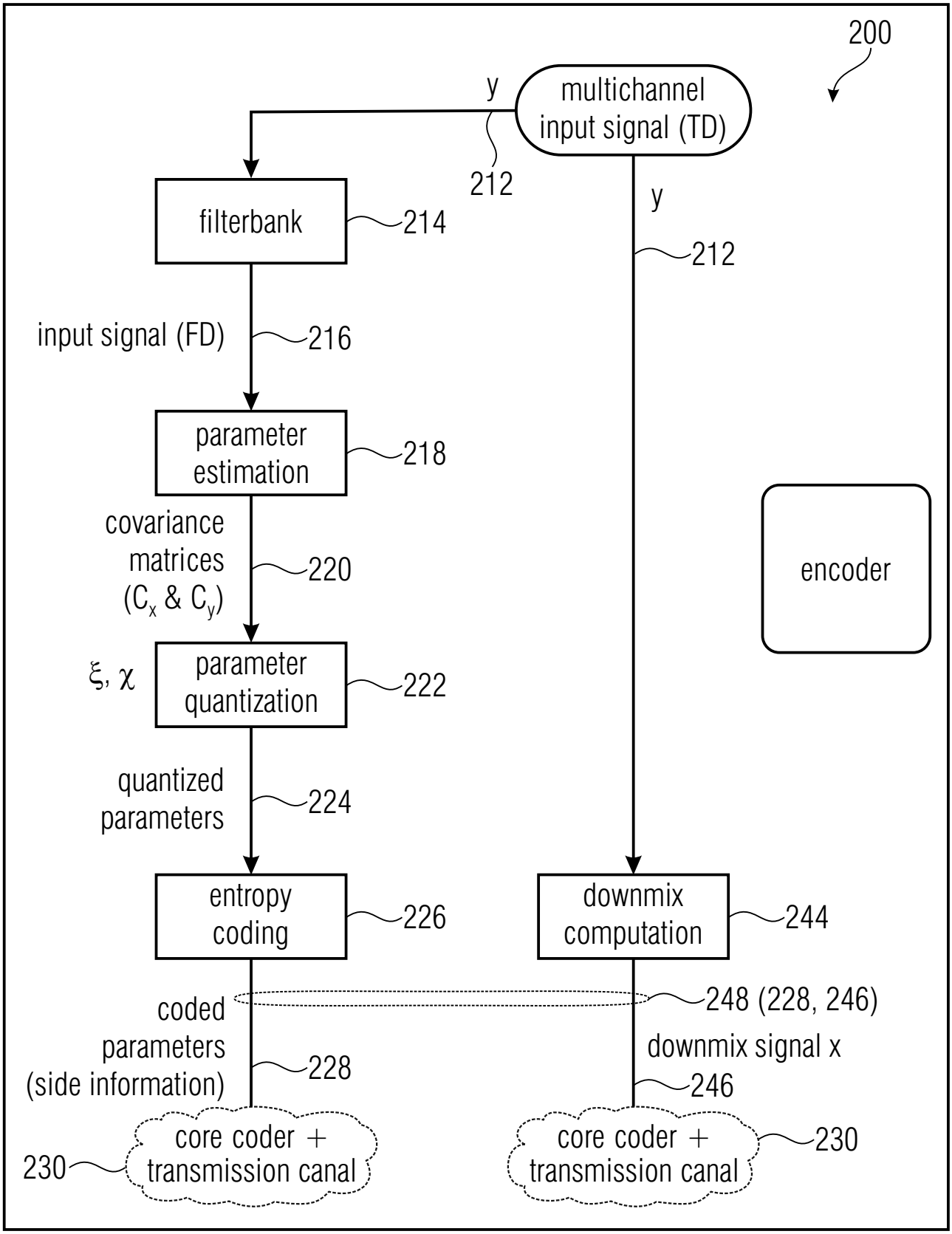


Fig. 2b
detailed overview of encoder

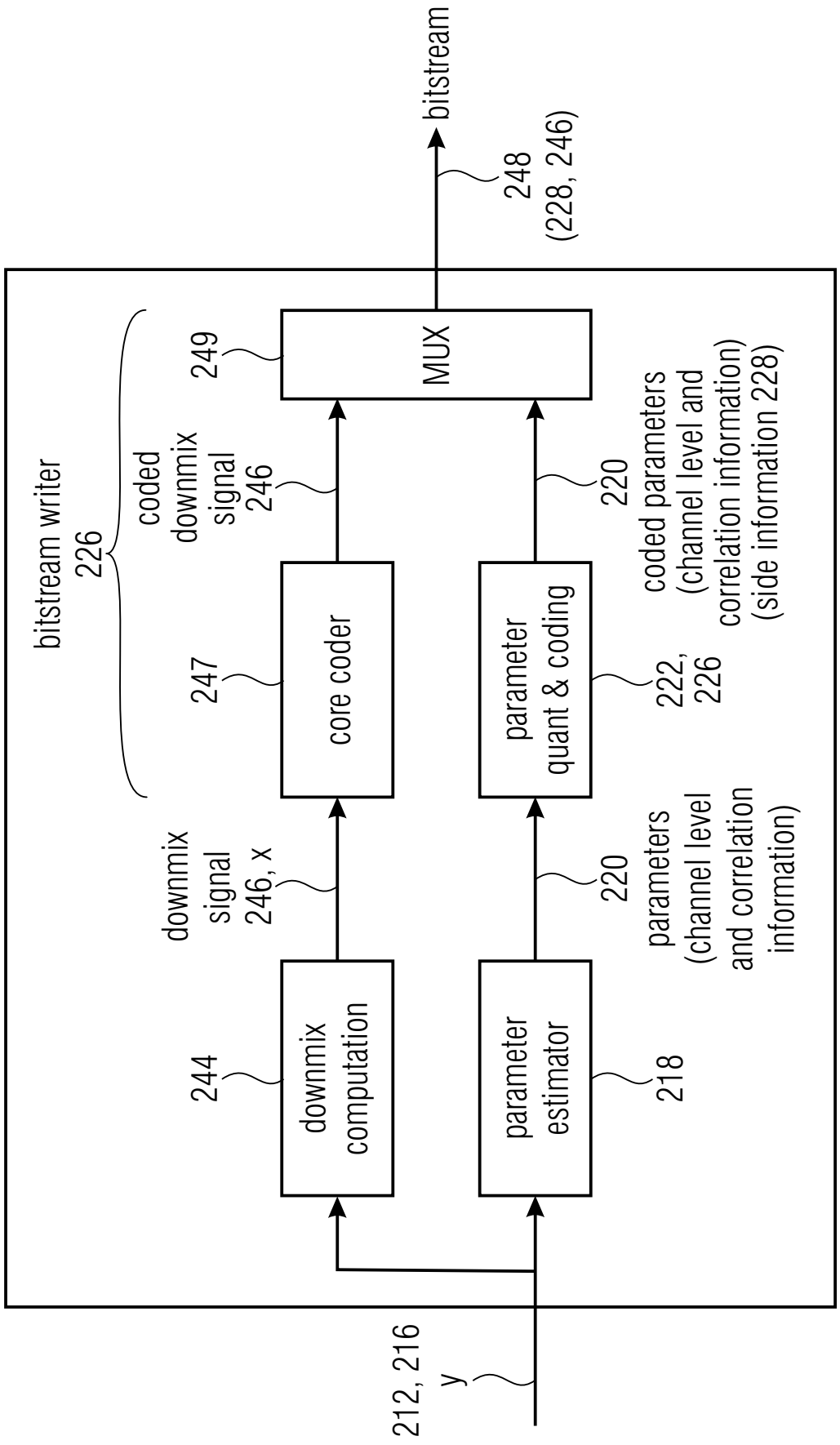

bitstream writer
226
coded downmix signal 246
249
MUX
bitstream
248
(228, 246)
247
core coder
parameter quant & coding
222, 226
coded parameters (channel level and correlation information) (side information 228)
220
downmix signal 246, x
220
parameters (channel level and correlation information)
244
downmix computation
parameter estimator
218
212, 216
y

Fig. 2c

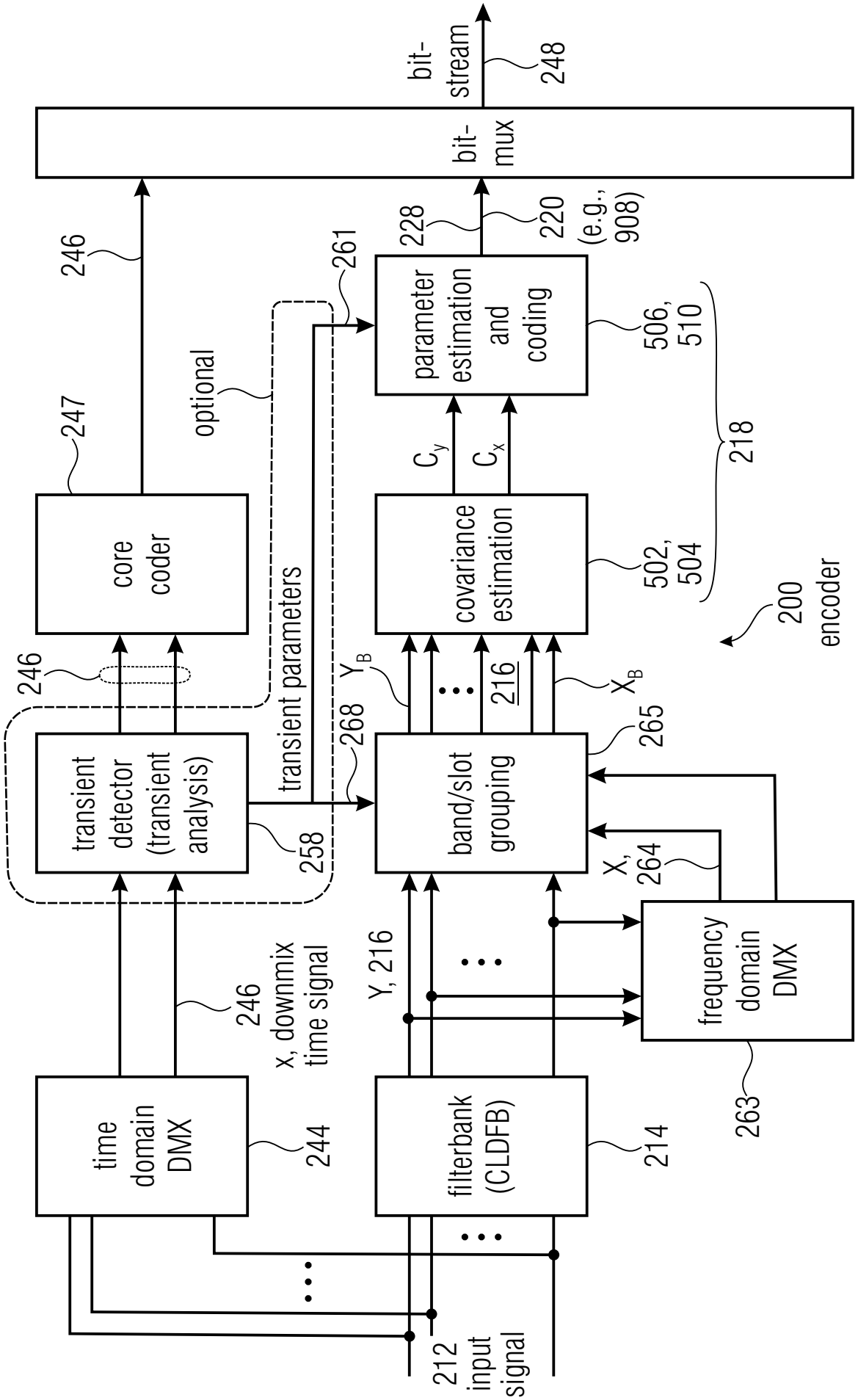

bit-stream
248
bit-mux
246
228
220
(e.g., 908)
261
parameter estimation and coding
506, 510
optional
247
C_y
C_x
218
core coder
covariance estimation
502, 504
200 encoder
246
transient parameters
Y_B
216
X_B
transient detector (transient analysis)
268
band/slot grouping
265
258
X, 264
246 x, downmix time signal
Y, 216
frequency domain DMX
time domain DMX
244
filterbank (CLDFB)
214
263
212 input signal

Fig. 2d

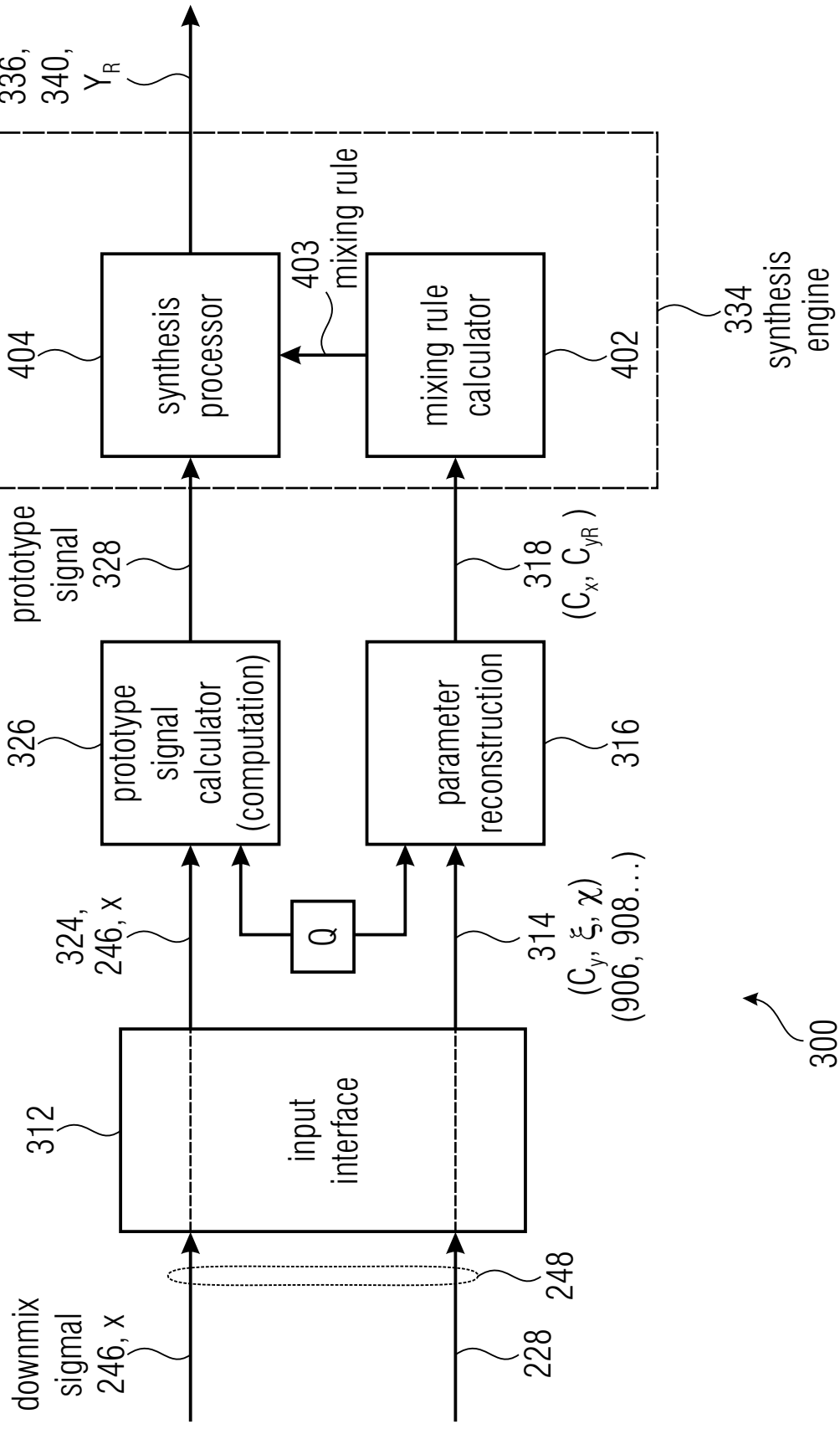

downmix signal 246, x
228
248
312
input interface
324, 246, x
Q
314
(C_y, ξ, χ) (906, 908...)
326
prototype signal calculator (computation)
parameter reconstruction
316
prototype signal 328
318 (C_x, C_{yR})
404
synthesis processor
403 mixing rule
mixing rule calculator
402
334 synthesis engine
336, 340, Y_R
300

Fig. 3a

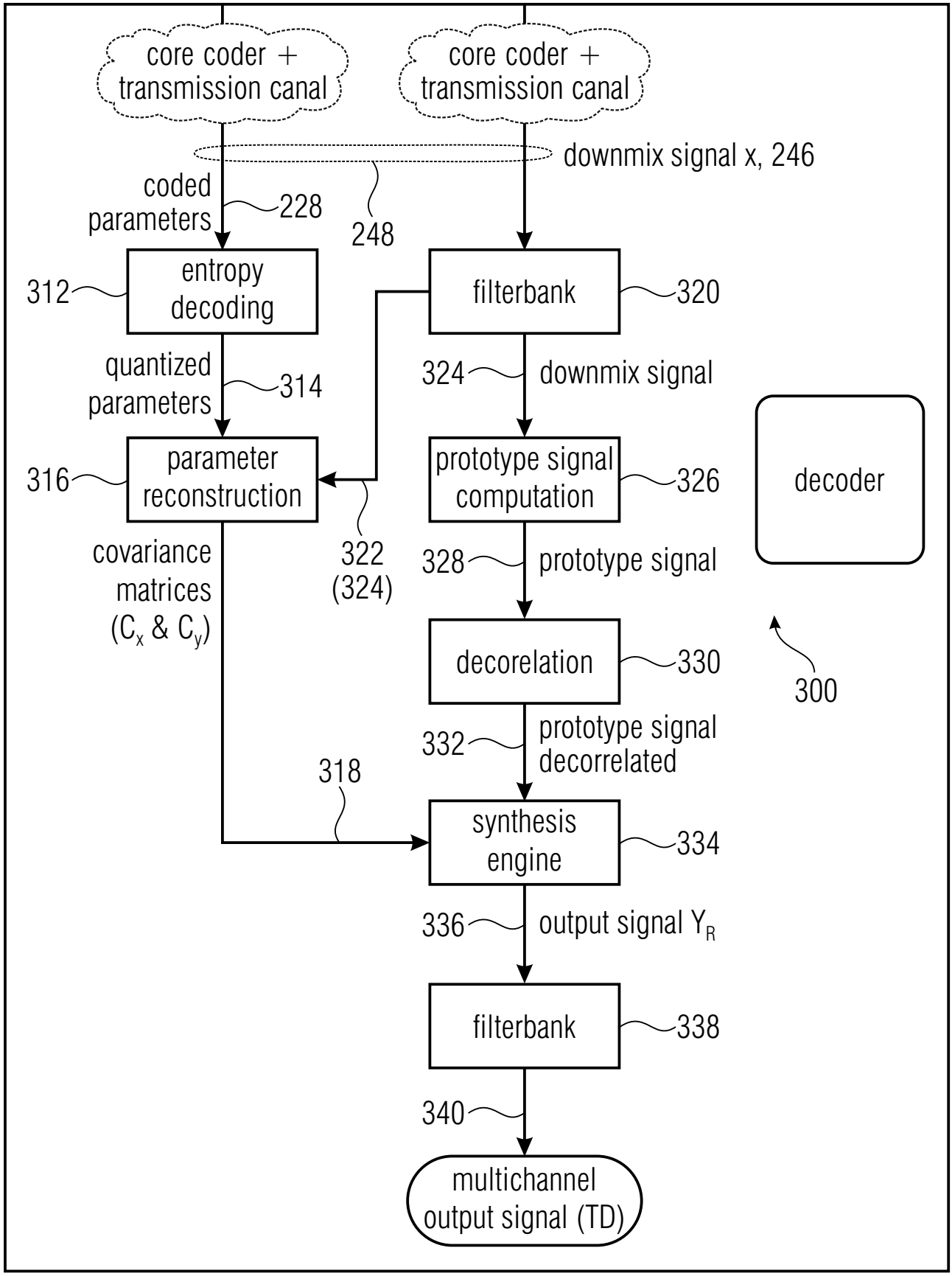


Fig. 3b
overview of decoder modules

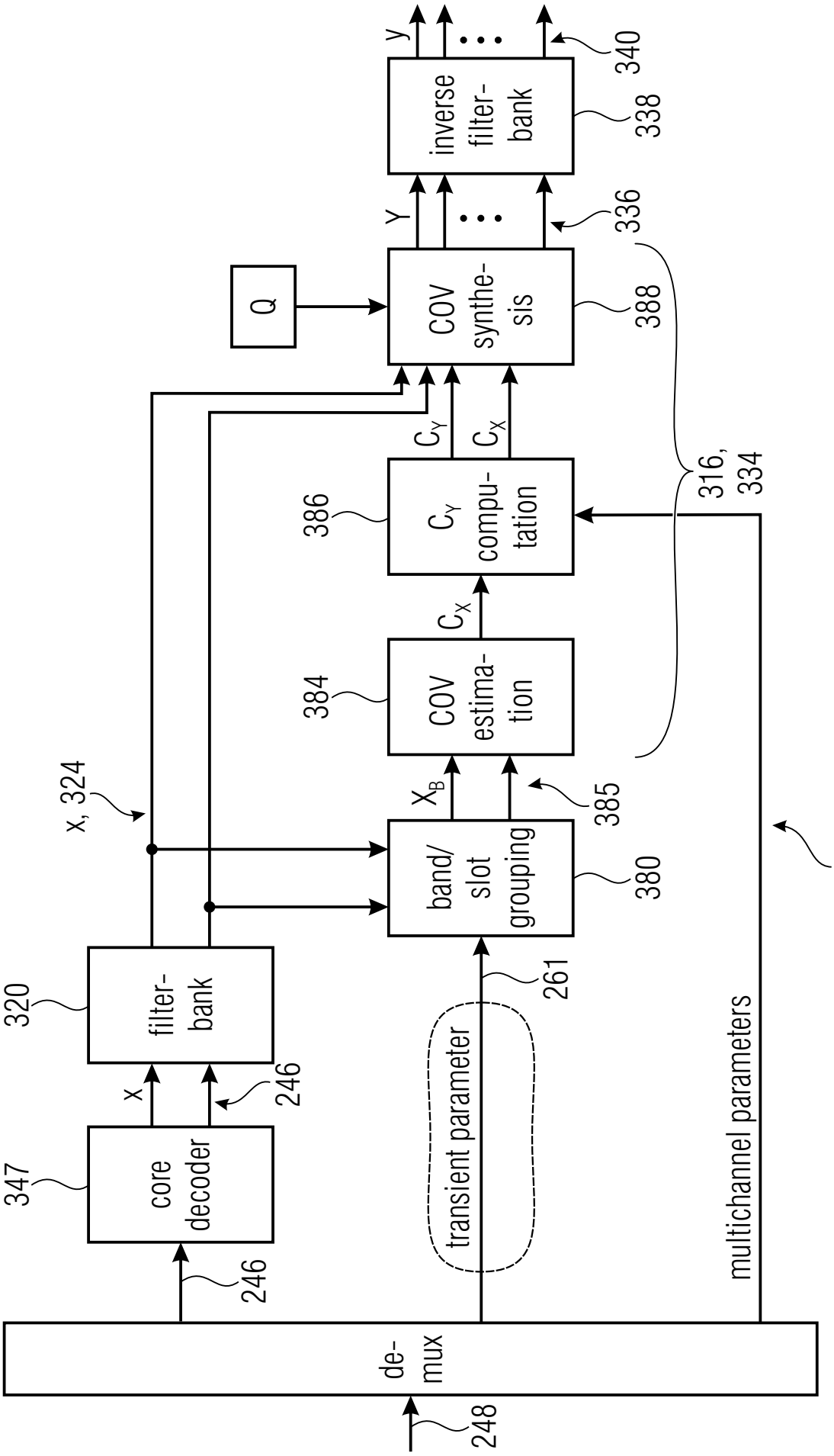

de-mux
248
core decoder
347
246
x
246
filter-bank
320
x, 324
band/ slot grouping
380
X_B
385
261
transient parameter
multichannel parameters
300 decoder
COV estima-tion
384
C_X
C_Y compu-tation
386
316, 334
Q
COV synthe-sis
388
C_Y
C_X
Y
336
inverse filter-bank
338
y
340

Fig. 3c

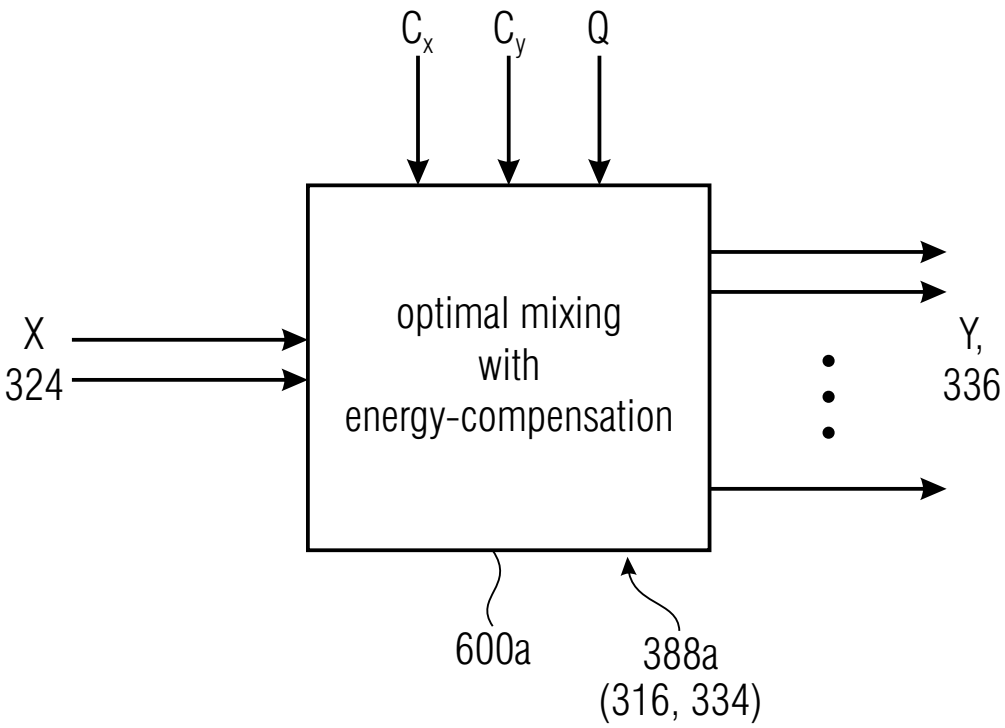

C_x
C_y
Q
X
324
optimal mixing
with
energy-compensation
Y,
336
600a
388a
(316, 334)

Fig. 4a

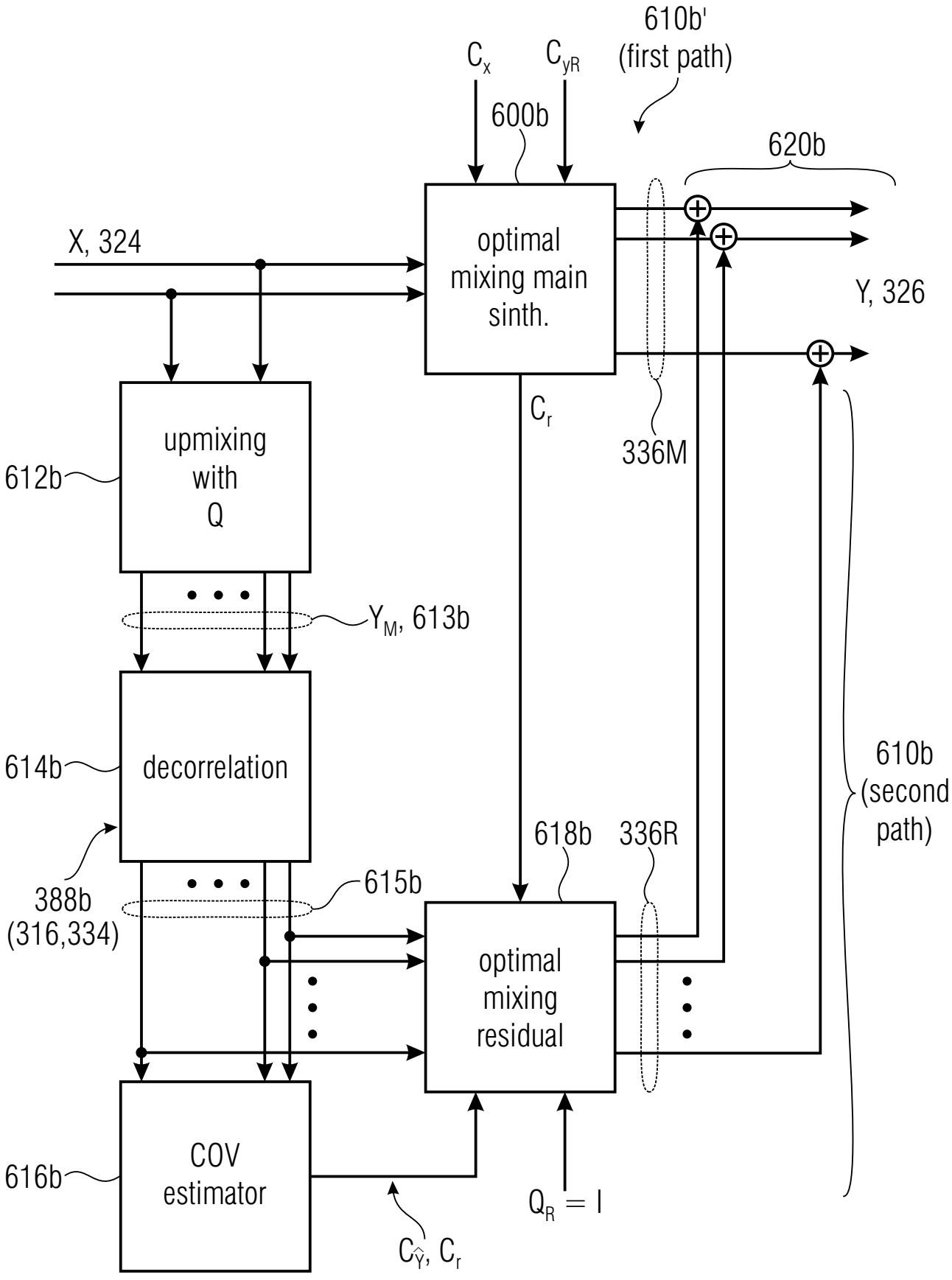

610b'
(first path)
C_x
C_{yR}
600b
620b
X, 324
optimal
mixing main
sinth.
Y, 326
C_r
336M
upmixing
with
Q
612b
Y_M, 613b
614b
decorrelation
618b
336R
610b
(second
path)
388b
(316,334)
615b
optimal
mixing
residual
COV
estimator
616b
$Q_R = I$
$C_{\hat{Y}}$, C_r

Fig. 4b

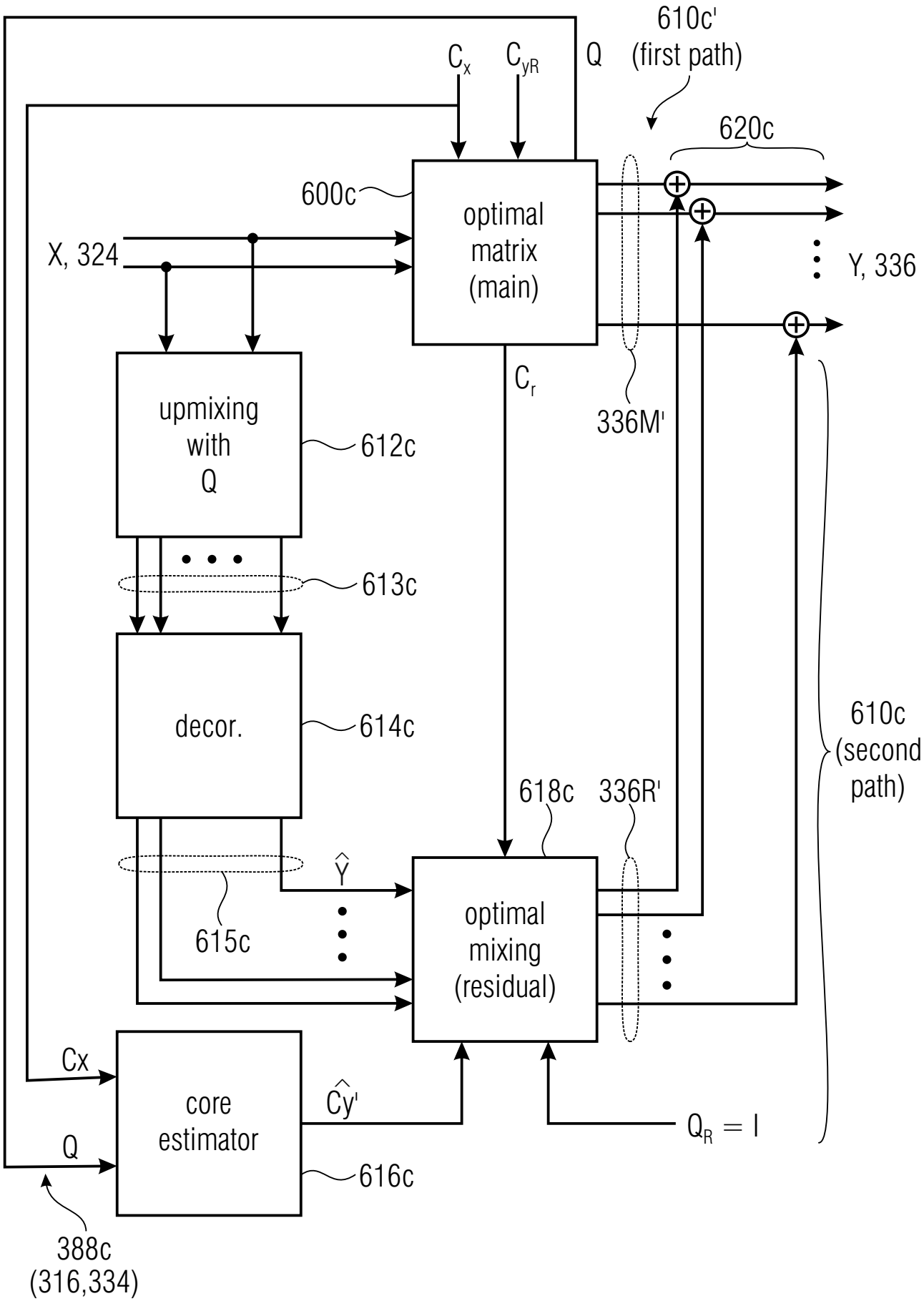

610c'
(first path)
C_x
C_{yR}
Q
620c
600c
optimal
matrix
(main)
X, 324
Y, 336
upmixing
with
Q
612c
C_r
336M'
613c
decor.
614c
610c
(second
path)
618c
336R'
$\hat{Y}$
615c
optimal
mixing
(residual)
Cx
core
estimator
$\hat{Cy}'$
$Q_R = I$
Q
616c
388c
(316,334)

Fig. 4c

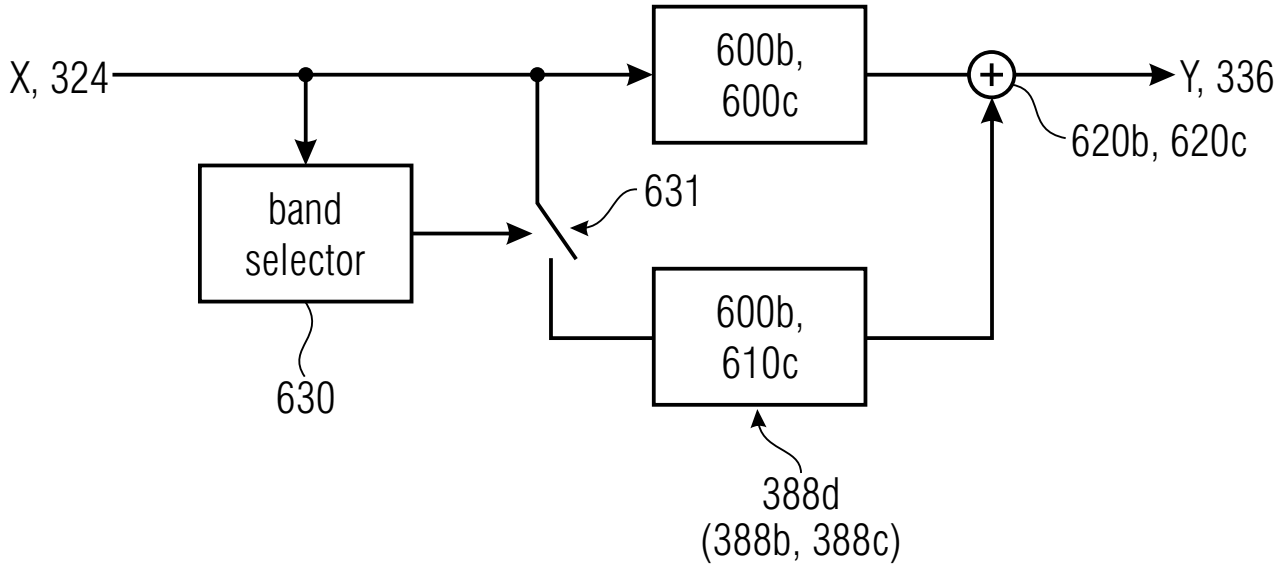

X, 324
600b,
600c
Y, 336
620b, 620c
band
selector
631
630
600b,
610c
388d
(388b, 388c)

Fig. 4d

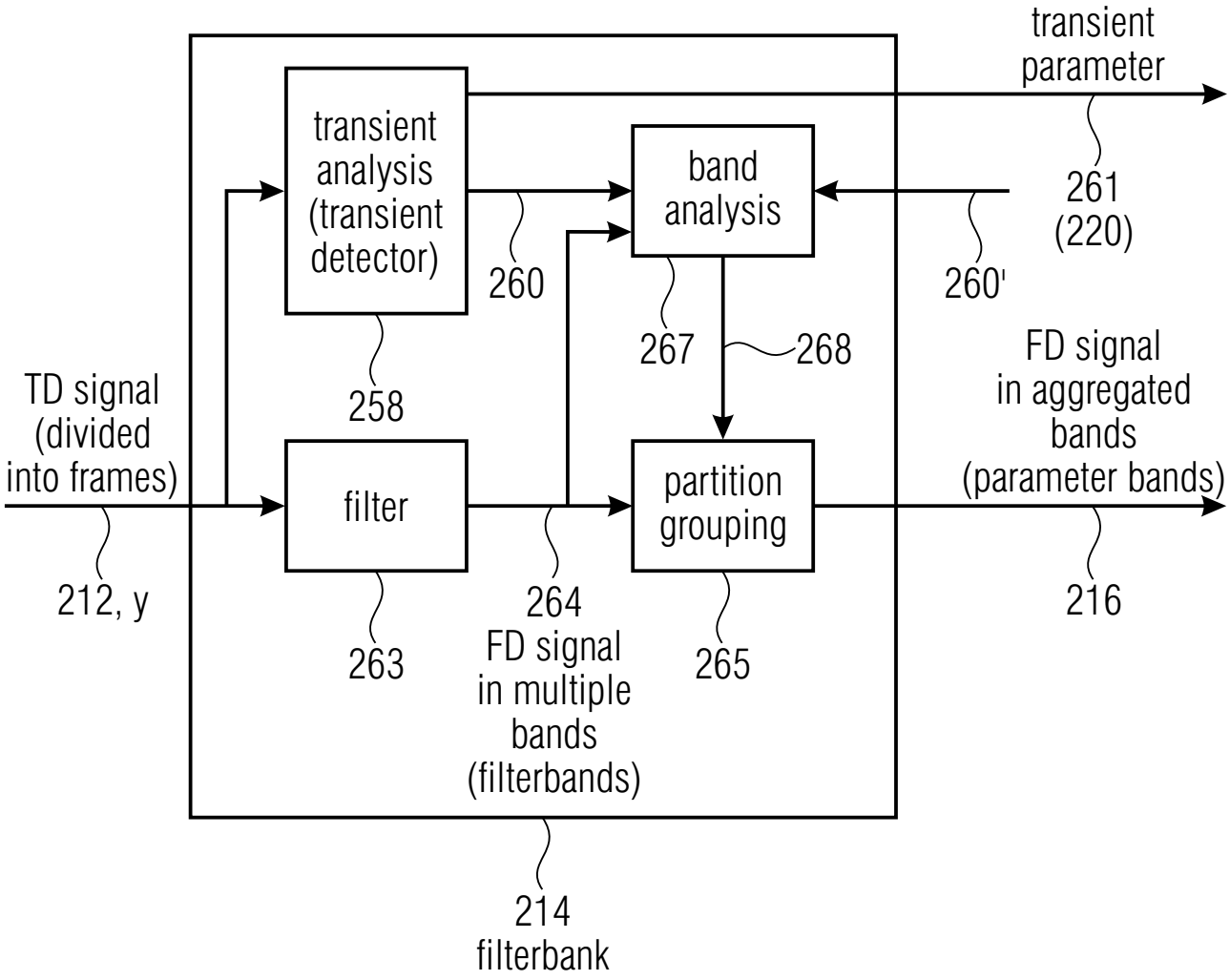

transient
parameter
transient
analysis
(transient
detector)
band
analysis
261
(220)
260
260'
267
268
258
TD signal
(divided
into frames)
FD signal
in aggregated
bands
(parameter bands)
filter
partition
grouping
212, y
263
264
FD signal
in multiple
bands
(filterbands)
265
216
214
filterbank

Fig. 5

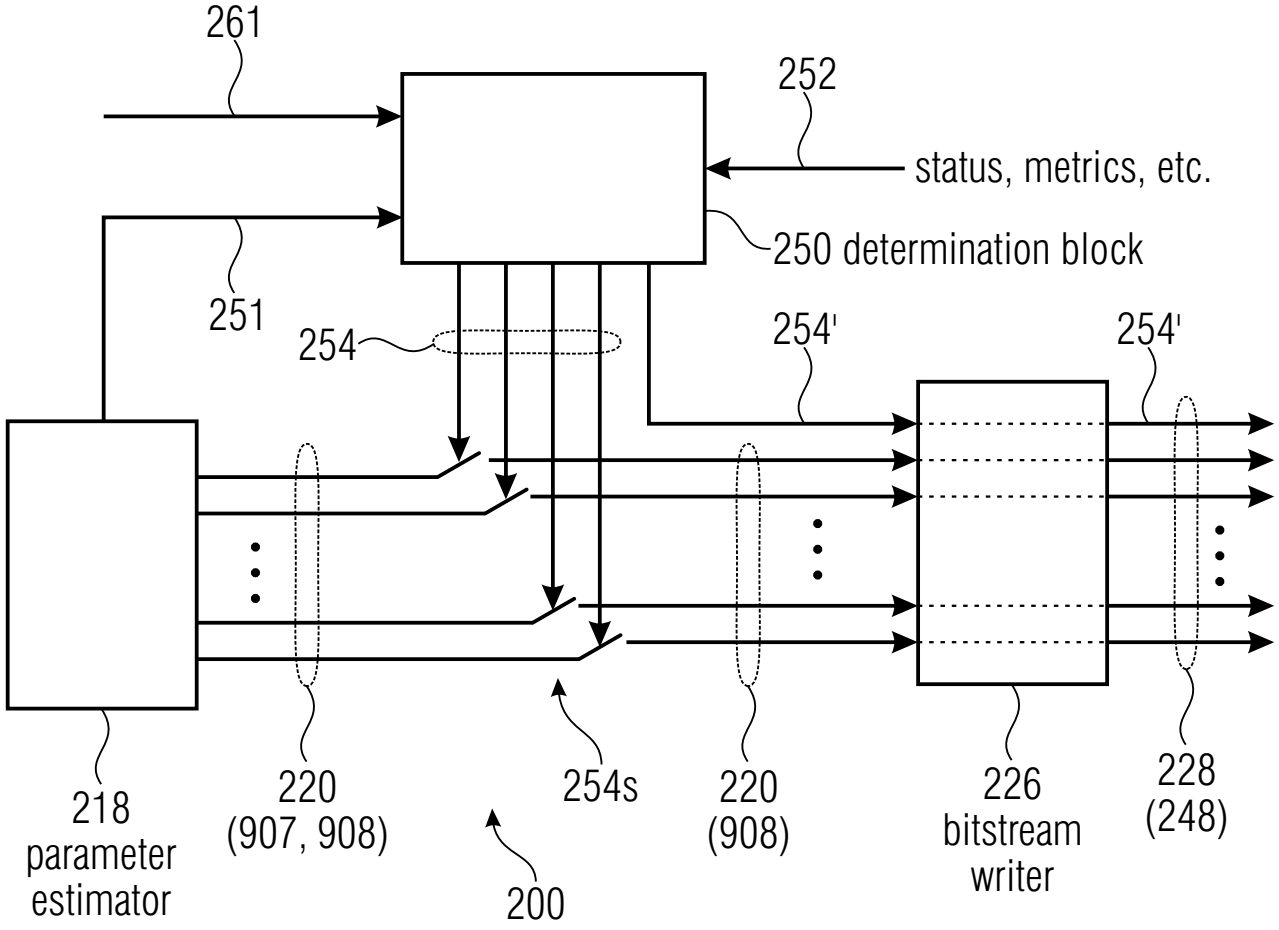

261
252
status, metrics, etc.
250 determination block
251
254
254'
254'
218
parameter
estimator
220
(907, 908)
254s
220
(908)
226
bitstream
writer
228
(248)
200

Fig. 6a

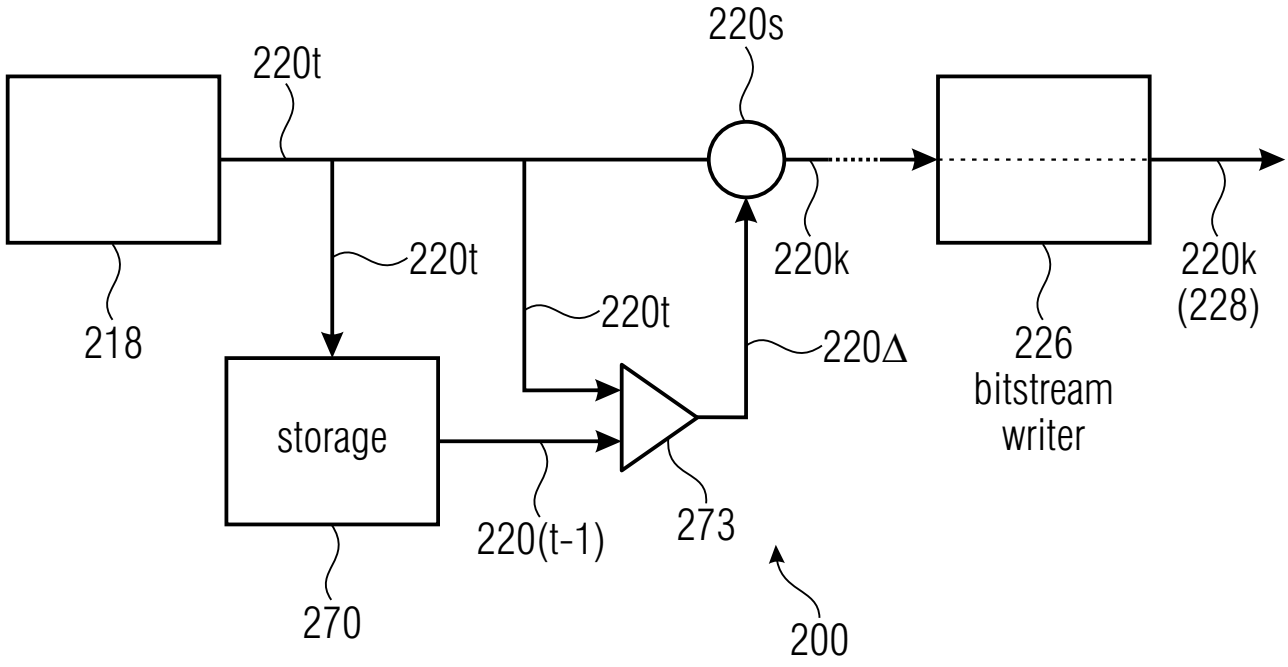

220s
220t
220t
220t
220k
220k
(228)
218
storage
220Δ
226
bitstream
writer
220(t-1)
273
270
200

Fig. 6b

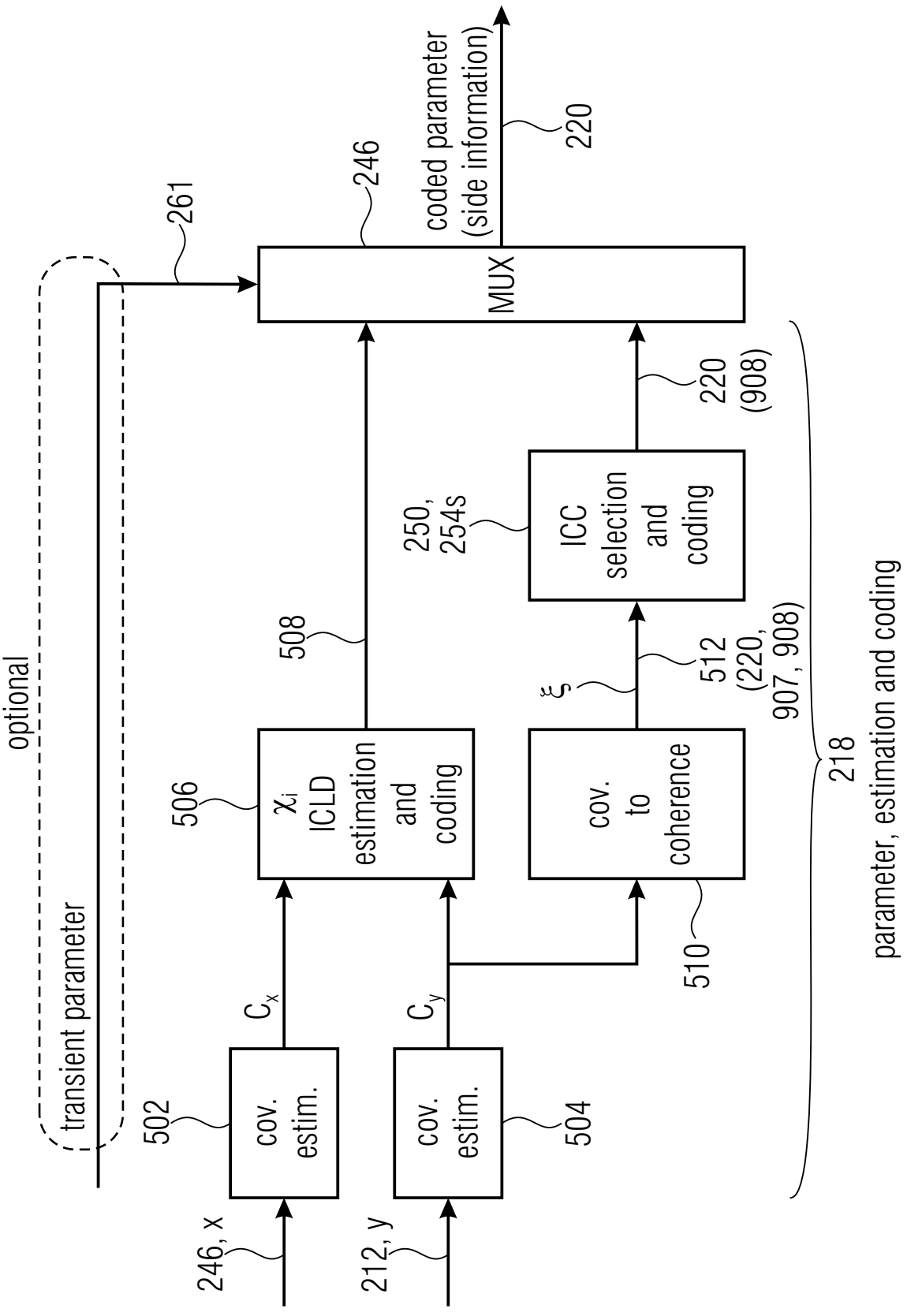

optional
transient parameter
261
246
coded parameter
(side information)
220
MUX
220
(908)
250,
254s
ICC
selection
and
coding
508
512
(220,
907, 908)
ξ
506
χ_i
ICLD
estimation
and
coding
cov.
to
coherence
510
218
parameter, estimation and coding
C_x
C_y
502
cov.
estim.
504
cov.
estim.
246, x
212, y

Fig. 6c

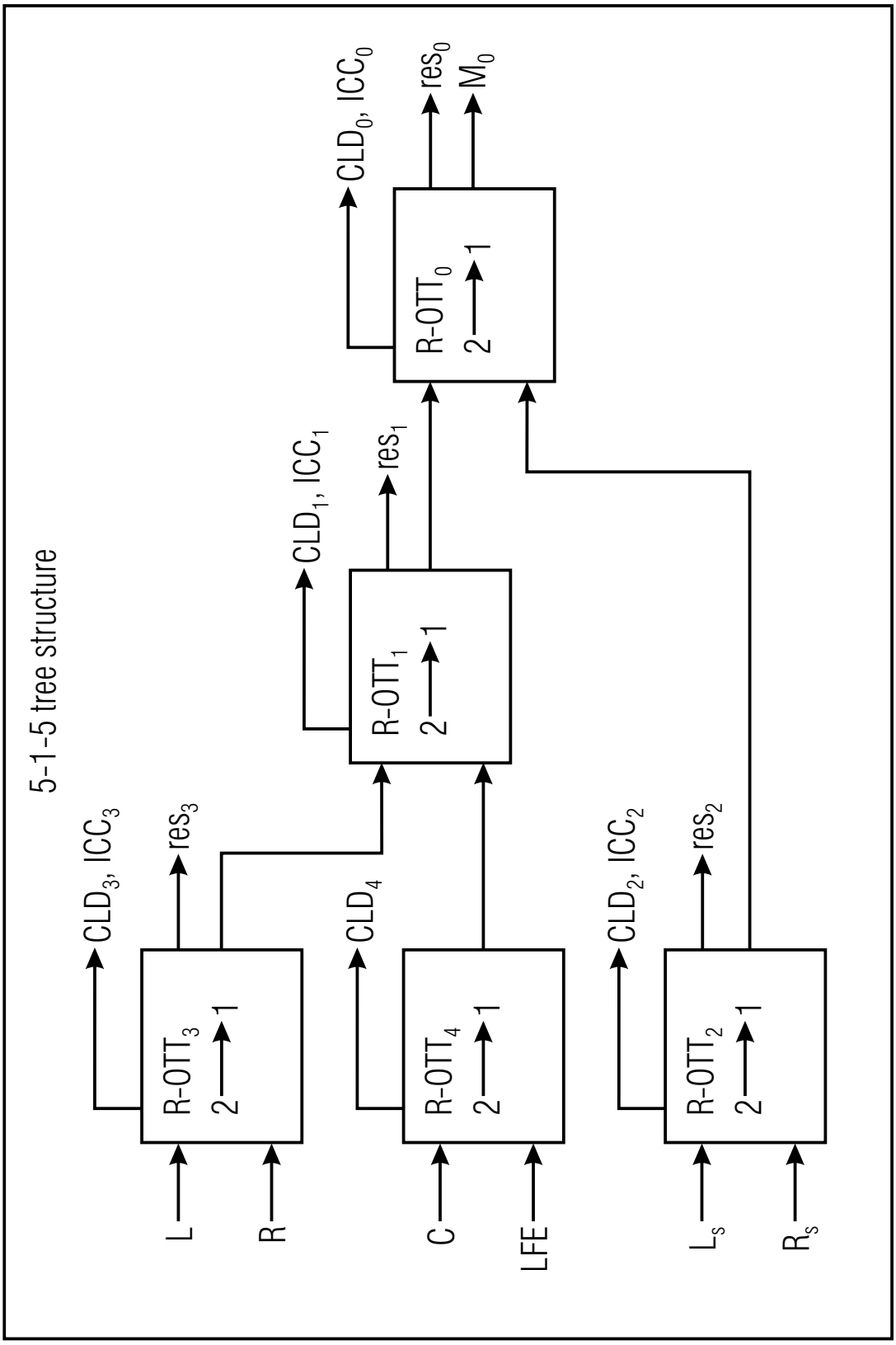


Fig. 7
(PRIOR ART)

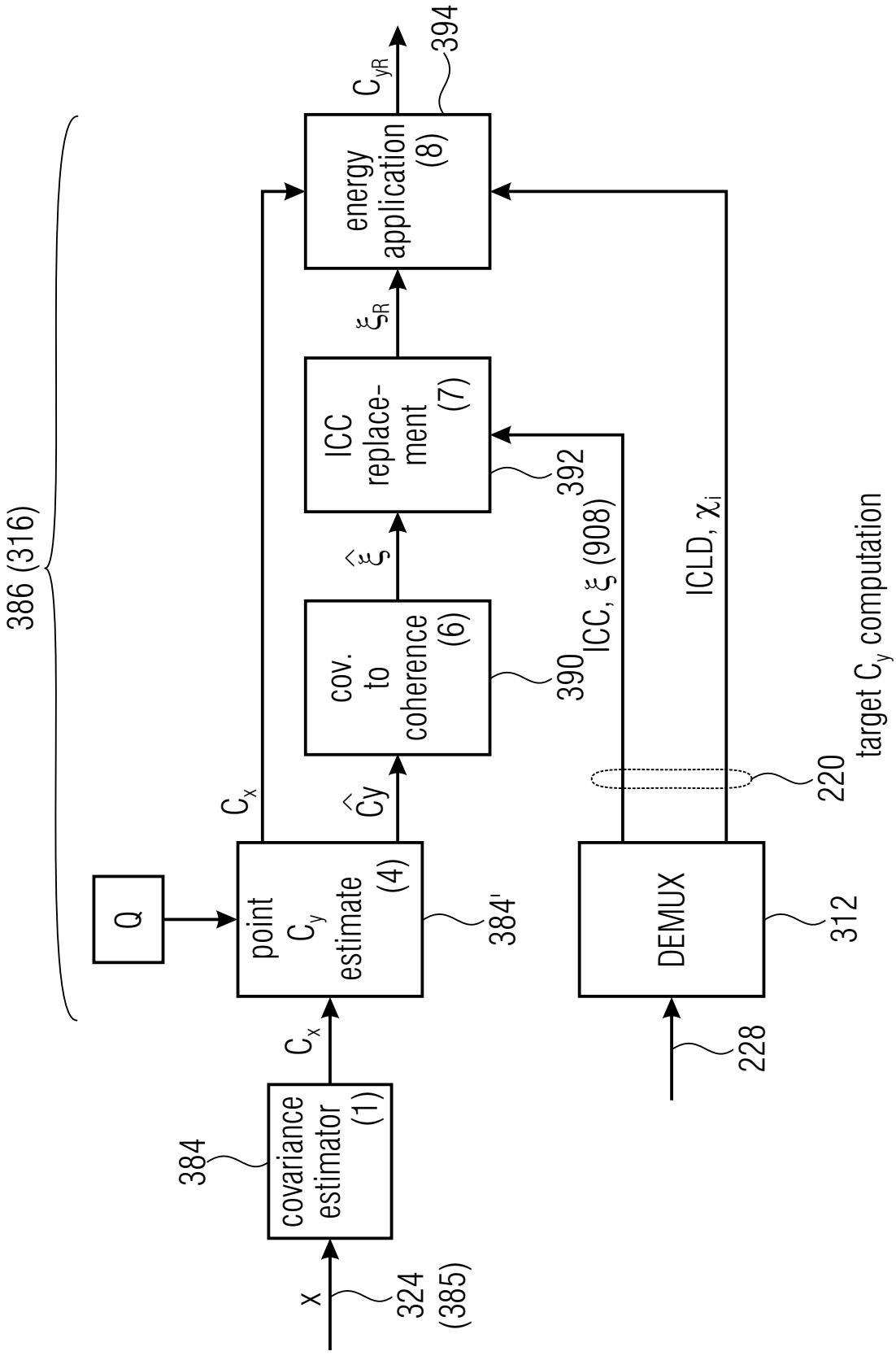

386 (316)
x
324
(385)
covariance estimator (1)
384
C_x
Q
point C_y estimate (4)
384'
$\hat{C}y$
cov. to coherence (6)
390
$\hat{\xi}$
ICC replace-ment (7)
392
ξ_R
energy application (8)
394
C_{yR}
C_x
ICC, ξ (908)
ICLD, χ_i
220
target C_y computation
DEMUX
312
228

Fig. 8a

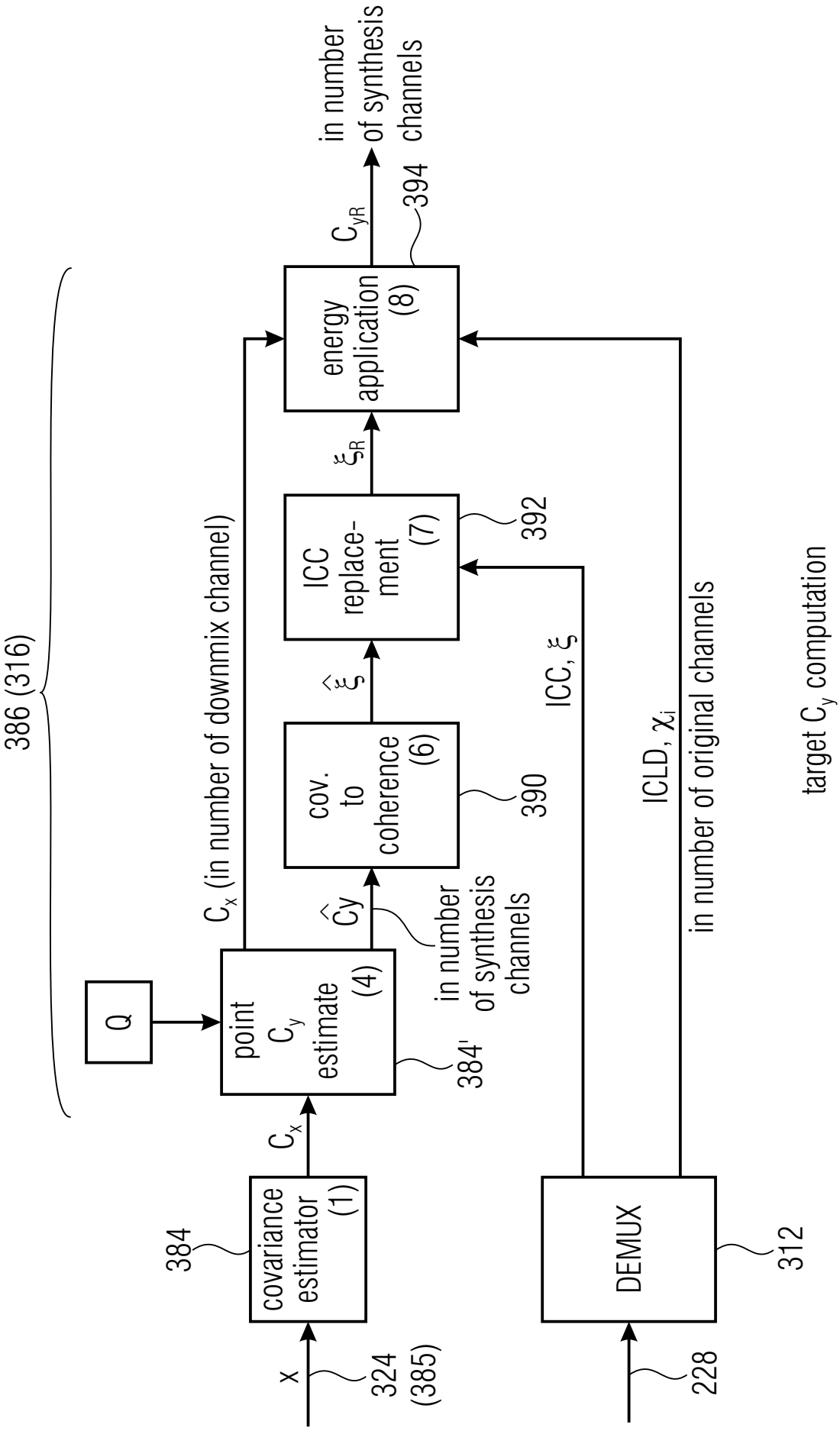

386 (316)
Q
point C_y estimate (4)
384'
C_x
covariance estimator (1)
384
x
324 (385)
C_x (in number of downmix channel)
$\hat{C}y$
in number of synthesis channels
cov. to coherence (6)
390
$\hat{\xi}$
ICC replace- ment (7)
392
ξ_R
energy application (8)
C_{yR}
394
in number of synthesis channels
ICC, ξ
ICLD, χ_i
in number of original channels
DEMUX
312
228
target C_y computation

Fig. 8b

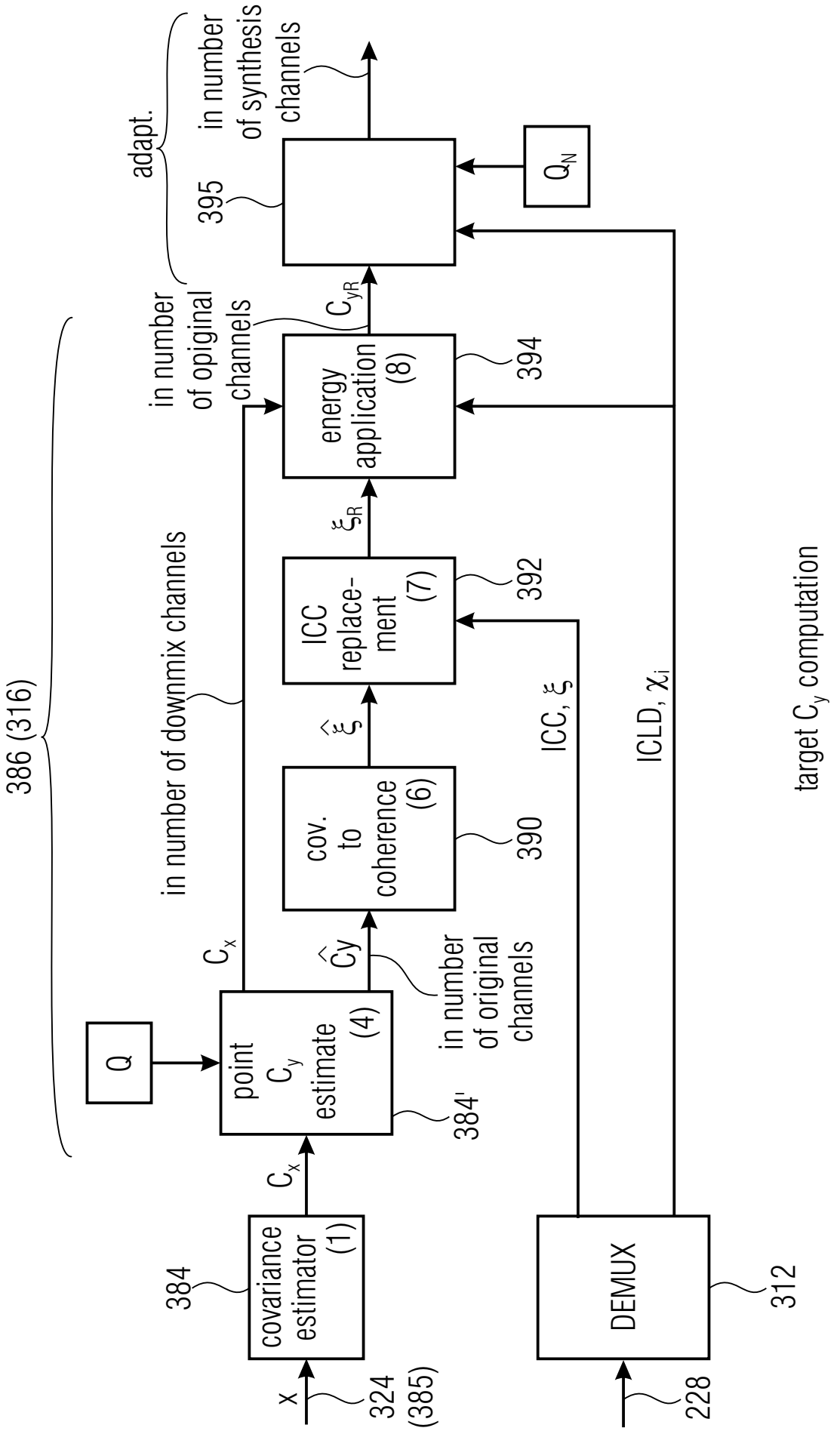

386 (316)
Q
point C_y estimate (4)
384'
C_x
$\hat{C}y$
in number of original channels
cov. to coherence (6)
390
$\hat{\xi}$
ICC replace- ment (7)
392
ξ_R
energy application (8)
394
C_{yR}
in number of opiginal channels
in number of downmix channels
adapt.
395
in number of synthesis channels
Q_N
target C_y computation
ICC, ξ
ICLD, χ_i
DEMUX
312
228
384
covariance estimator (1)
C_x
x
324 (385)

Fig. 8c

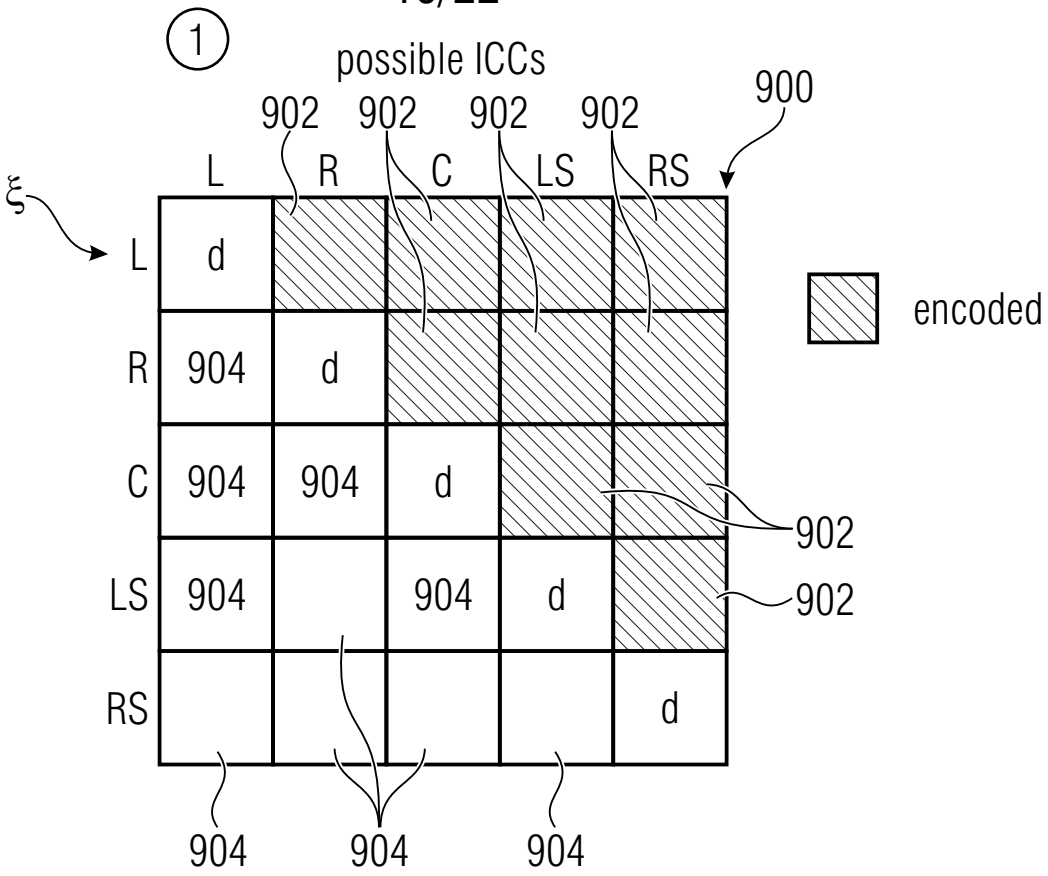

1
possible ICCs
900
902
902
902
902
ξ
L
R
C
LS
RS
L
d
R
904
d
C
904
904
d
LS
904
904
d
RS
d
encoded
902
902
904
904
904

Fig. 9a

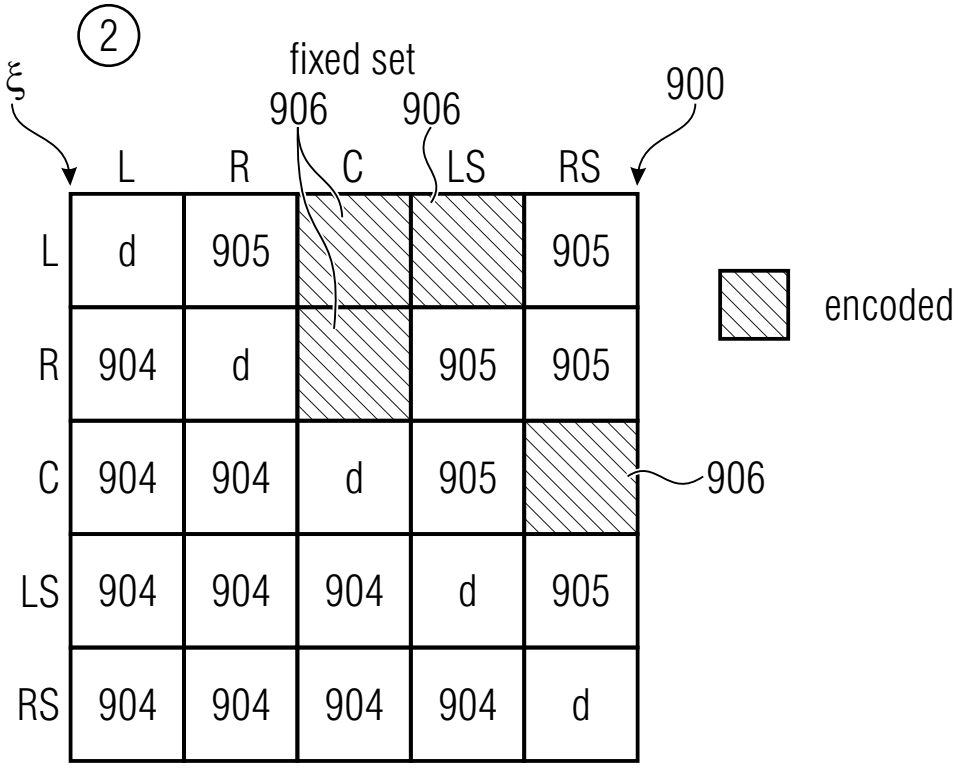

2
fixed set
900
906
906
ξ
L
R
C
LS
RS
L
d
905
905
R
904
d
905
905
C
904
904
d
905
906
LS
904
904
904
d
905
RS
904
904
904
904
d
encoded

Fig. 9b

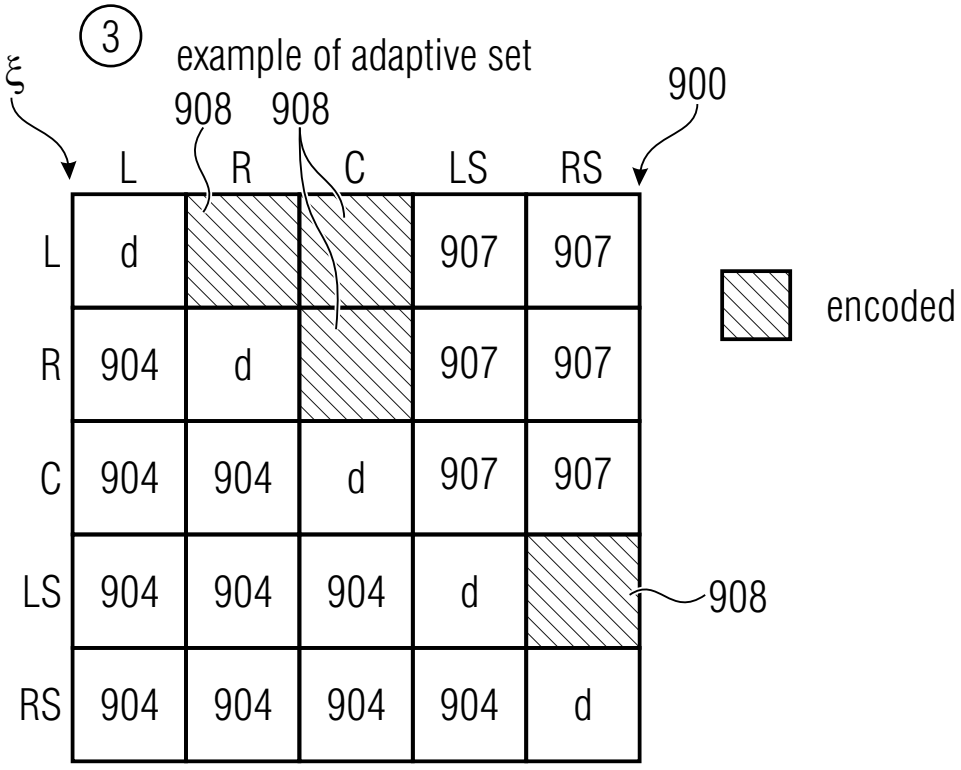

3
example of adaptive set
ξ
908
908
900
L
R
C
LS
RS
L
d
907
907
R
904
d
907
907
C
904
904
d
907
907
LS
904
904
904
d
908
RS
904
904
904
904
d
encoded

Fig. 9c

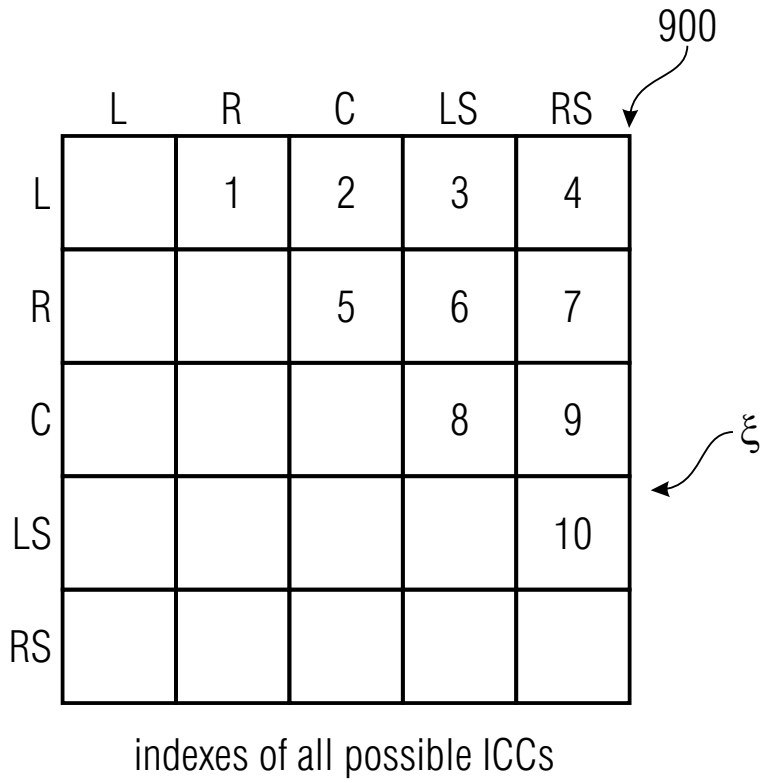

900
L
R
C
LS
RS
L
1
2
3
4
R
5
6
7
C
8
9
ξ
LS
10
RS
indexes of all possible ICCs

Fig. 9d

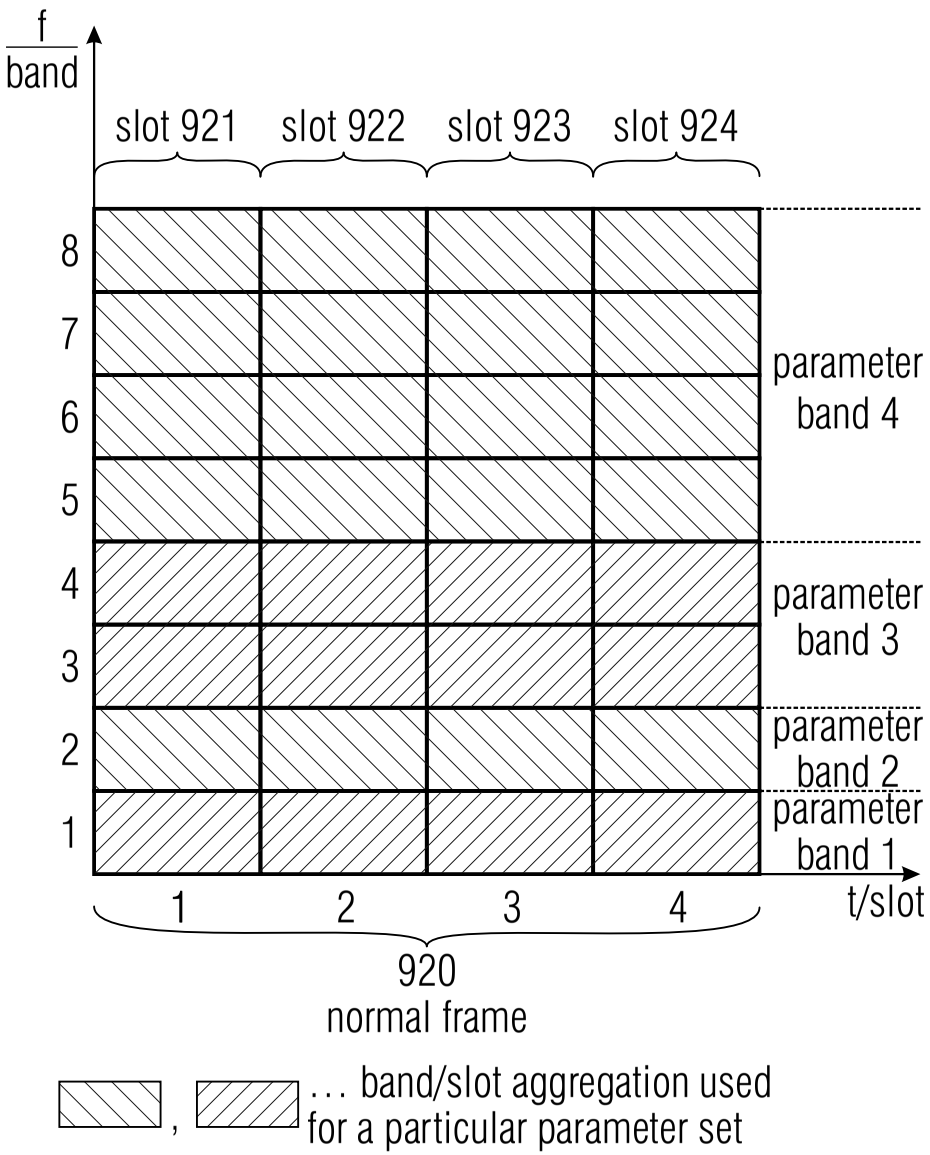


Fig. 10a

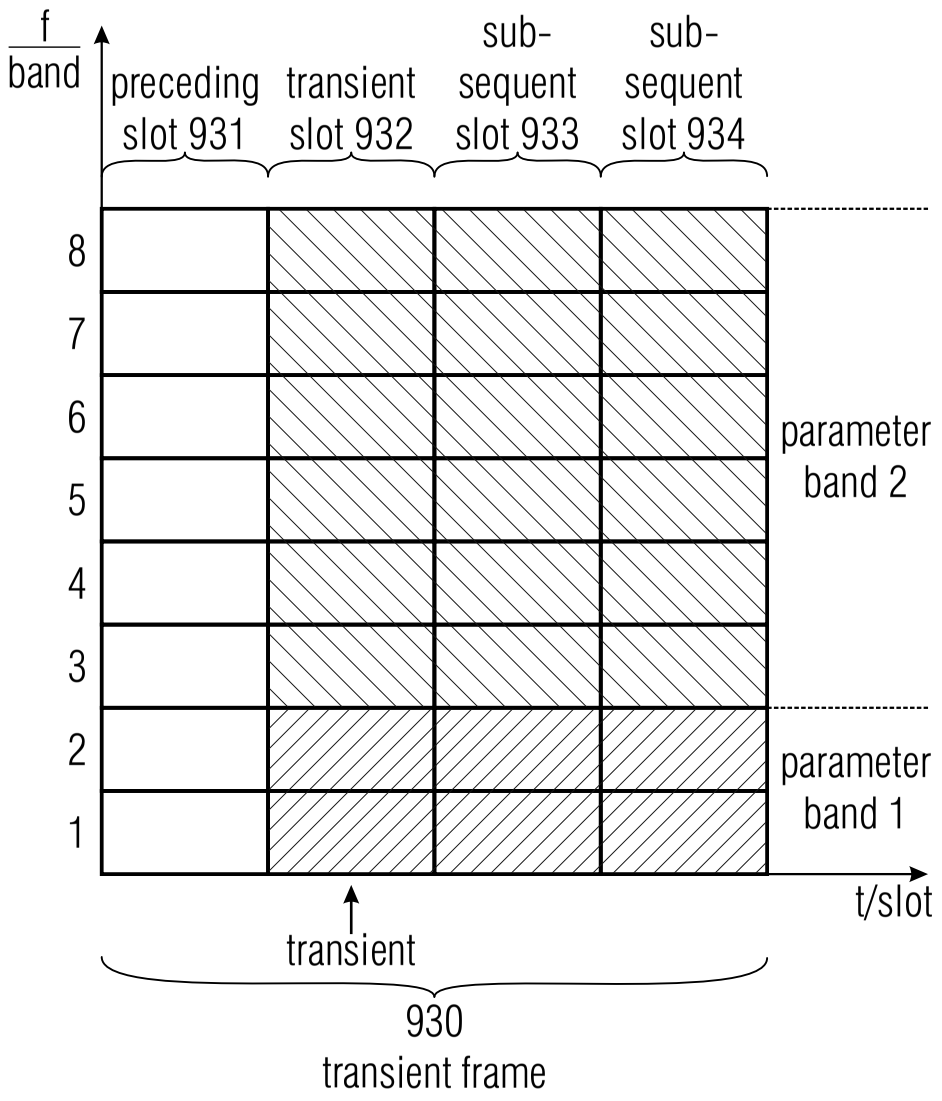


Fig. 10b

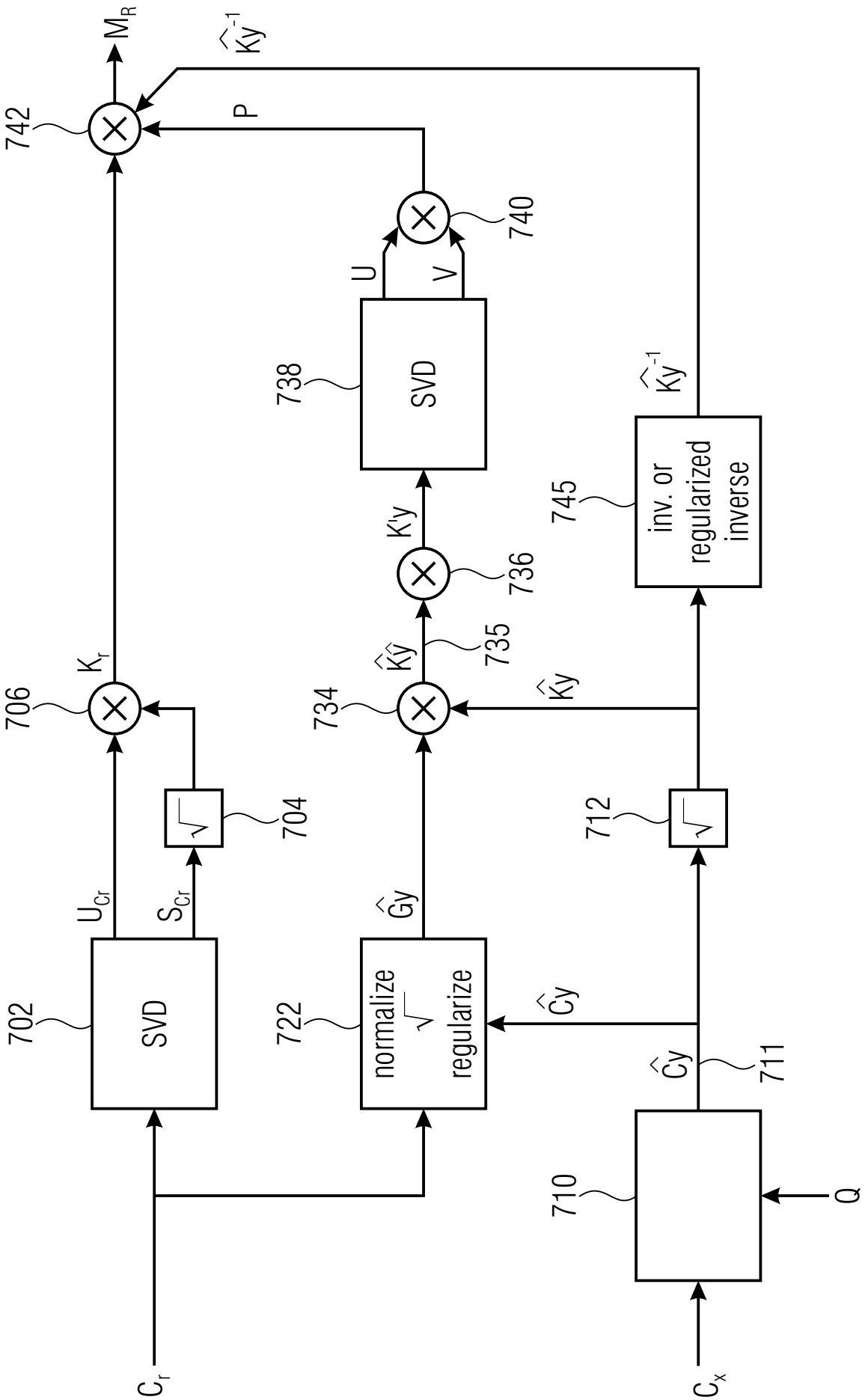

M_R
$\widehat{Ky}^{-1}$
742
P
740
U
V
738
SVD
$\widehat{Ky}^{-1}$
745
inv. or regularized inverse
Ky
736
$\widehat{K\tilde{y}}$
735
$\widehat{Ky}$
734
K_r
706
704
712
U_{Cr}
S_{Cr}
$\widehat{Gy}$
702
SVD
722
normalize
regularize
$\widehat{Cy}$
$\widehat{Cy}$
711
710
Q
C_r
C_x

Fig. 11