

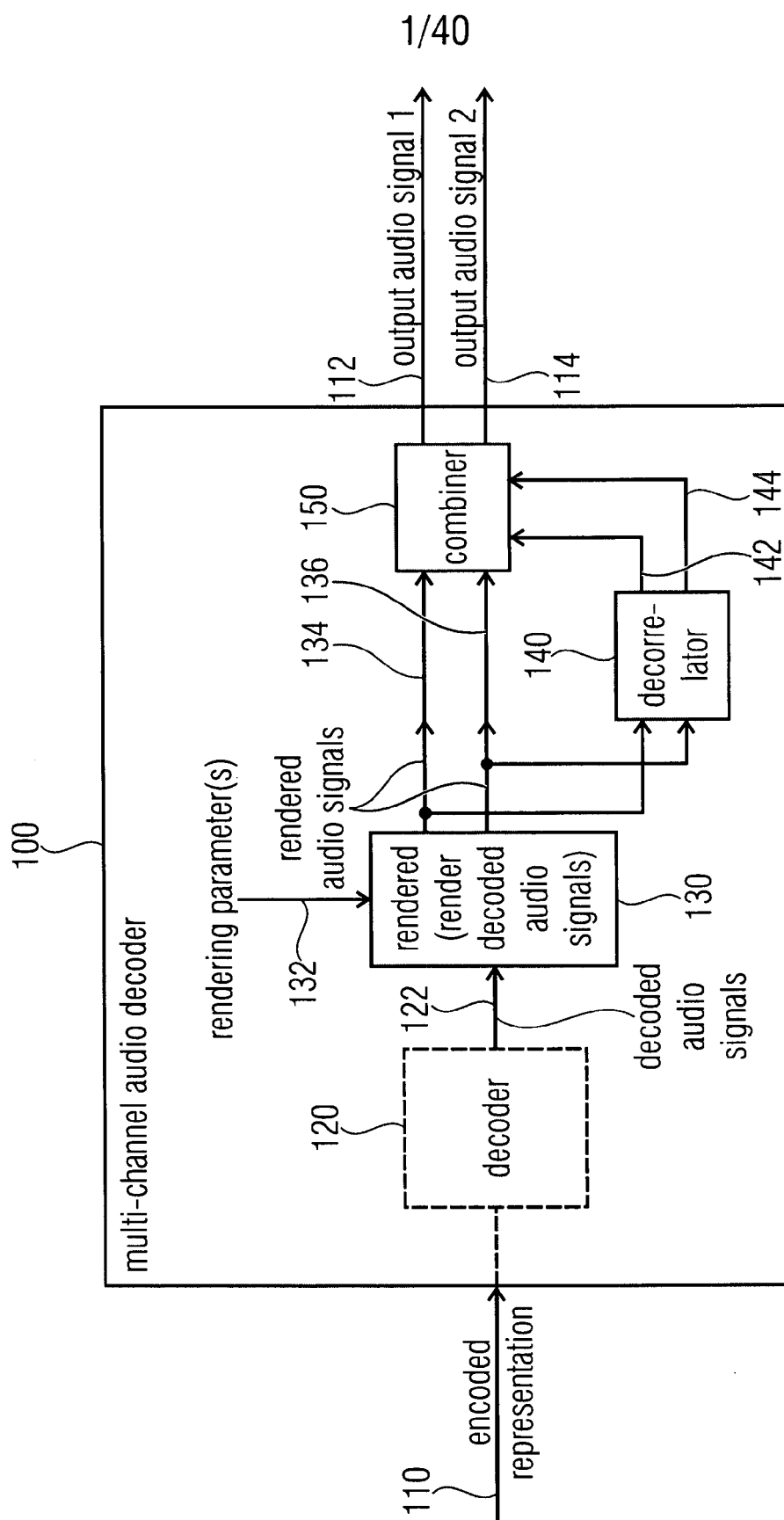


FIG 1

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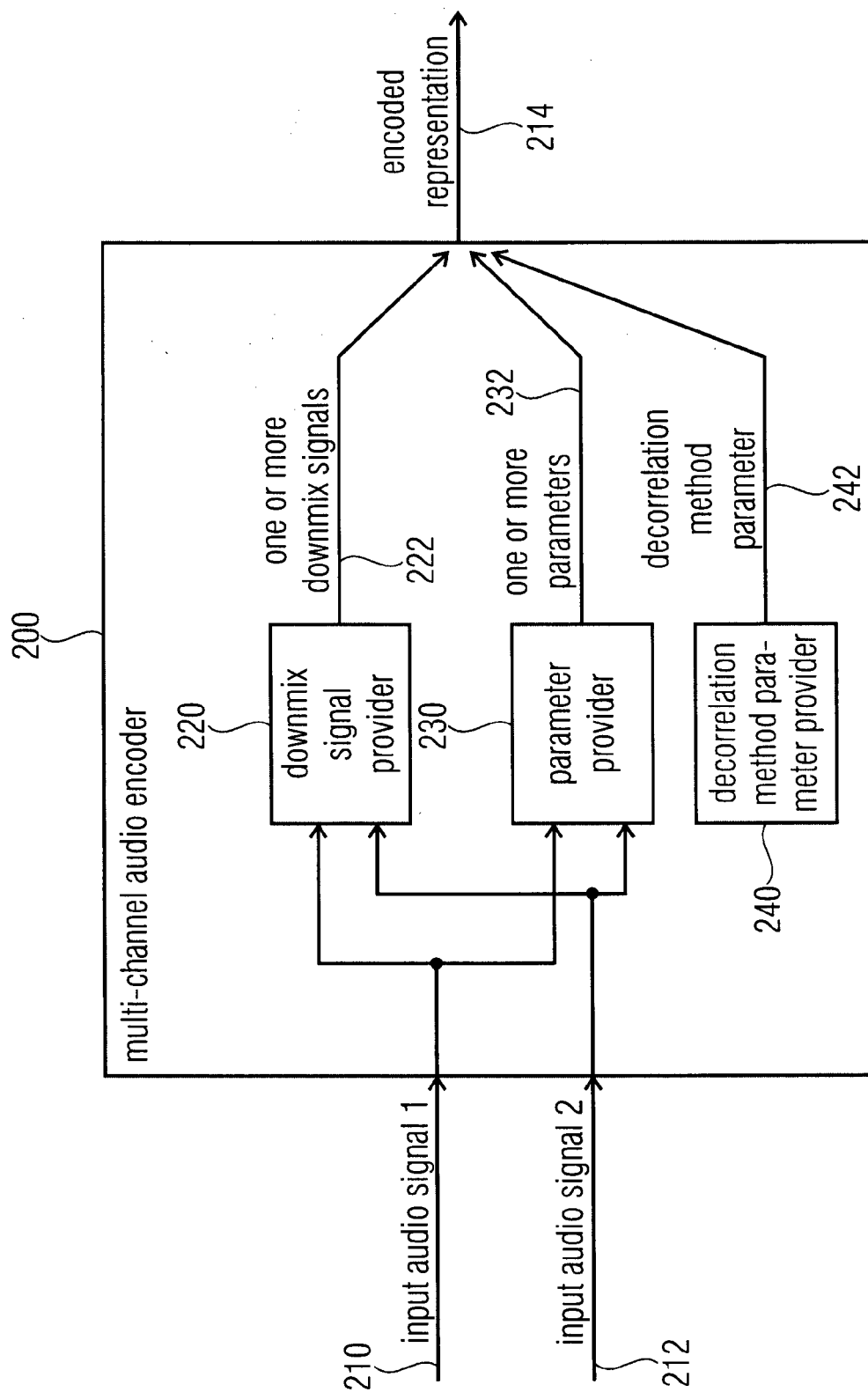


FIG 2

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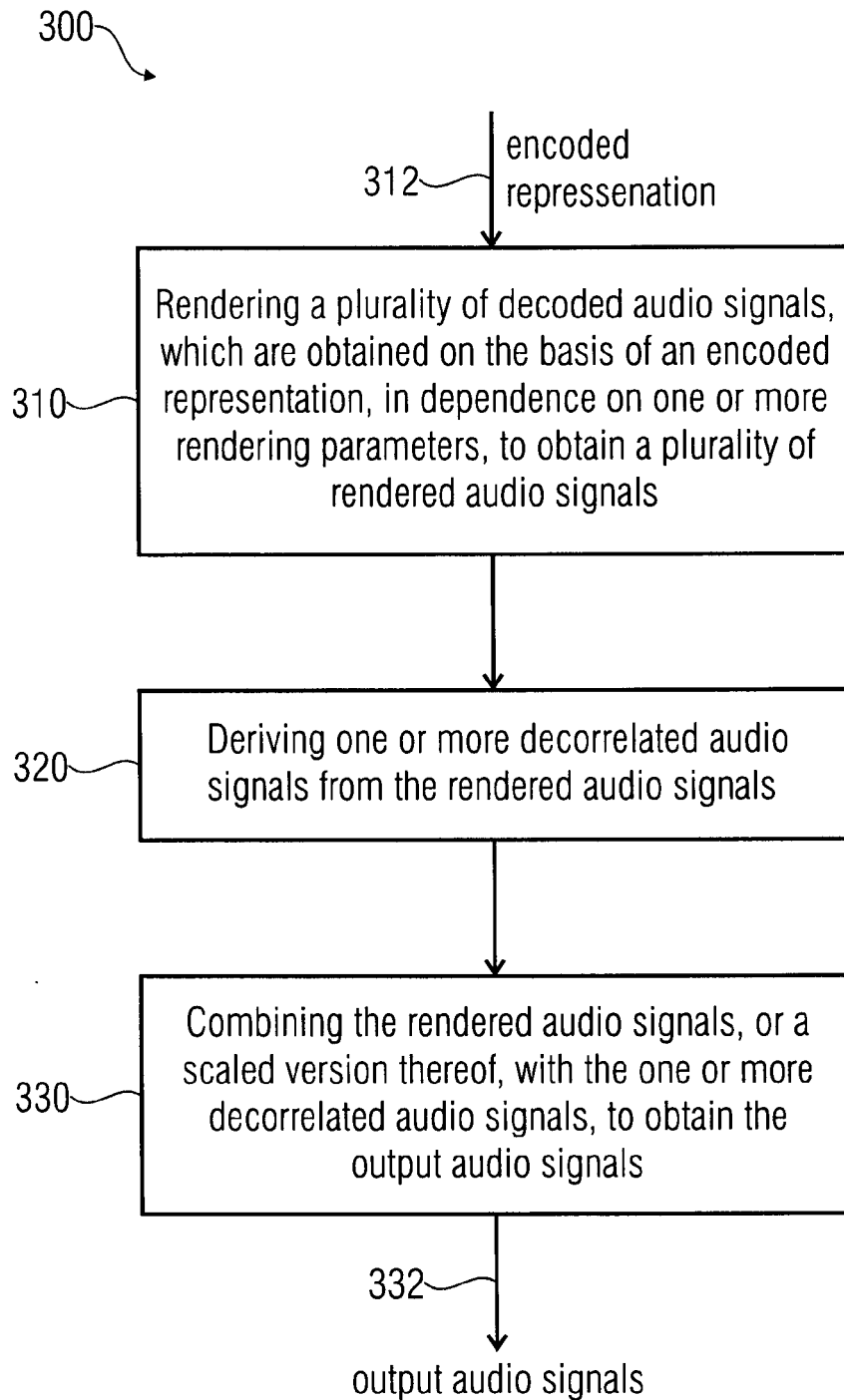


FIG 3

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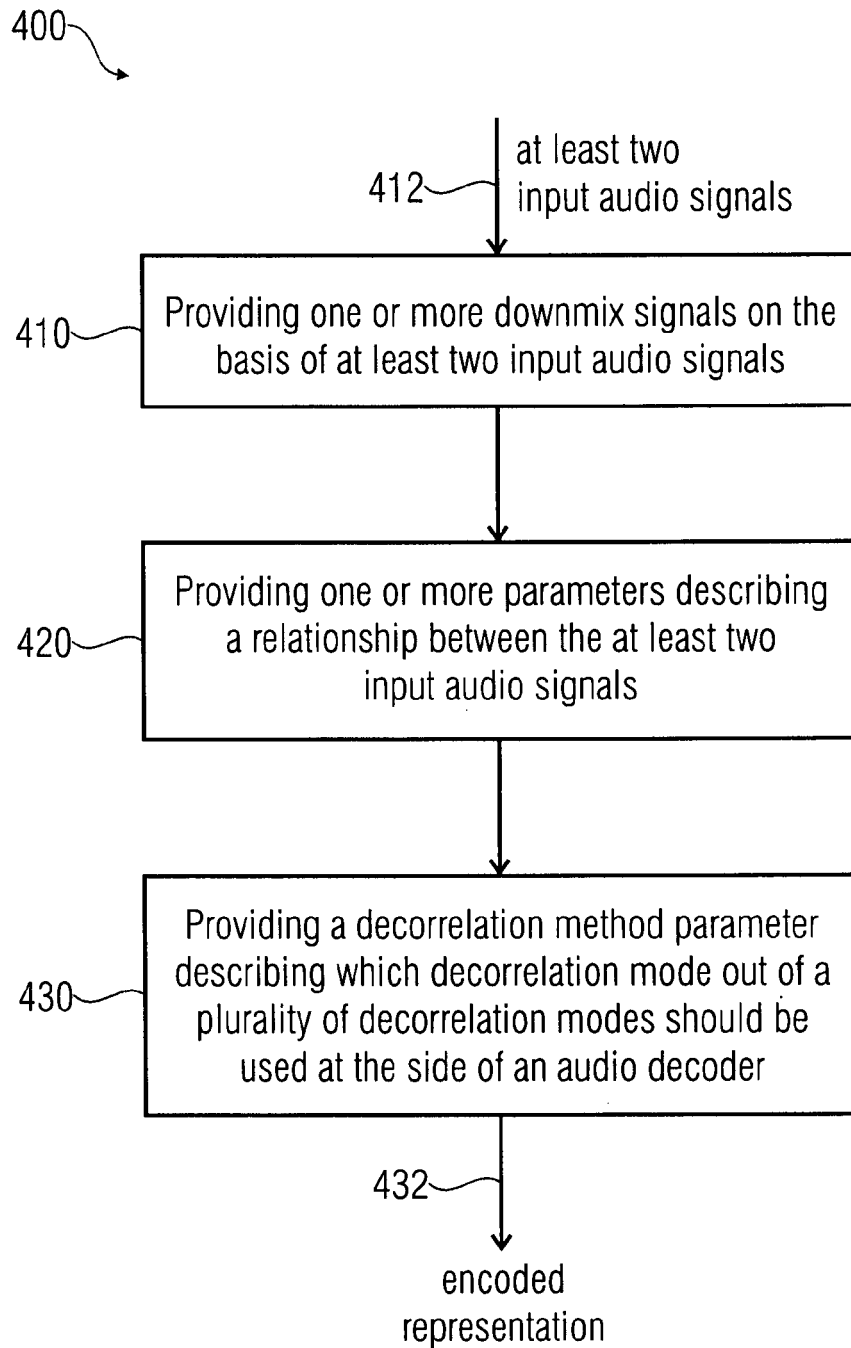


FIG 4

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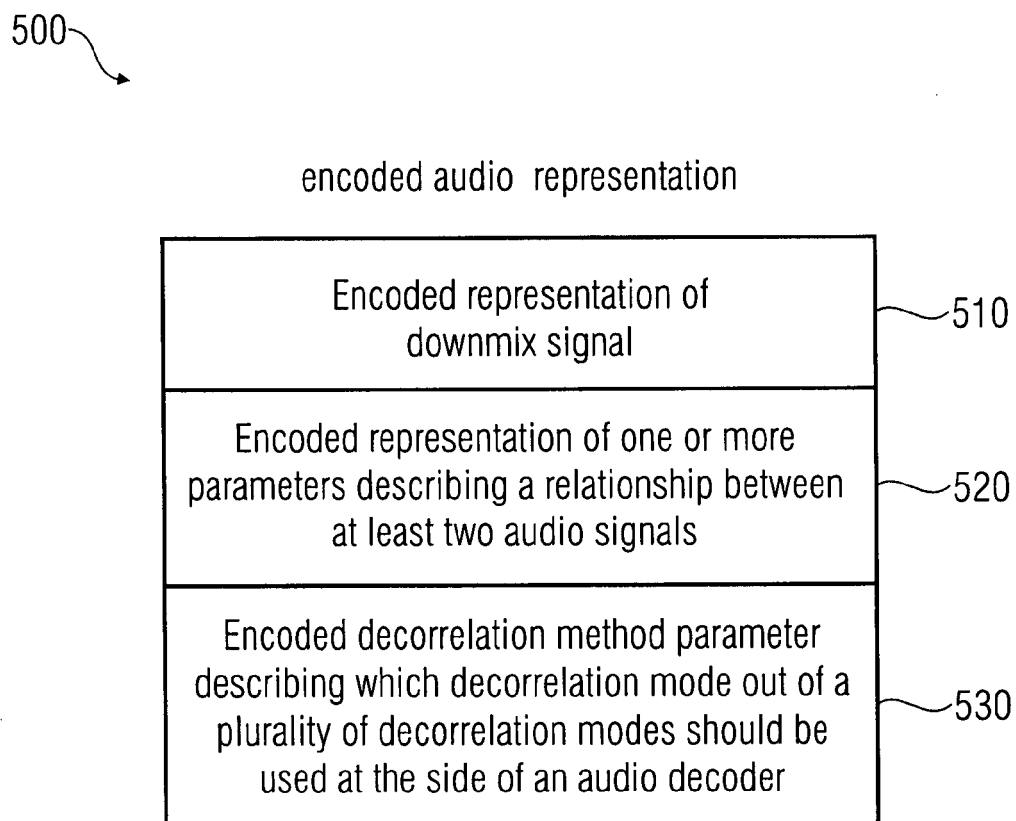


FIG 5

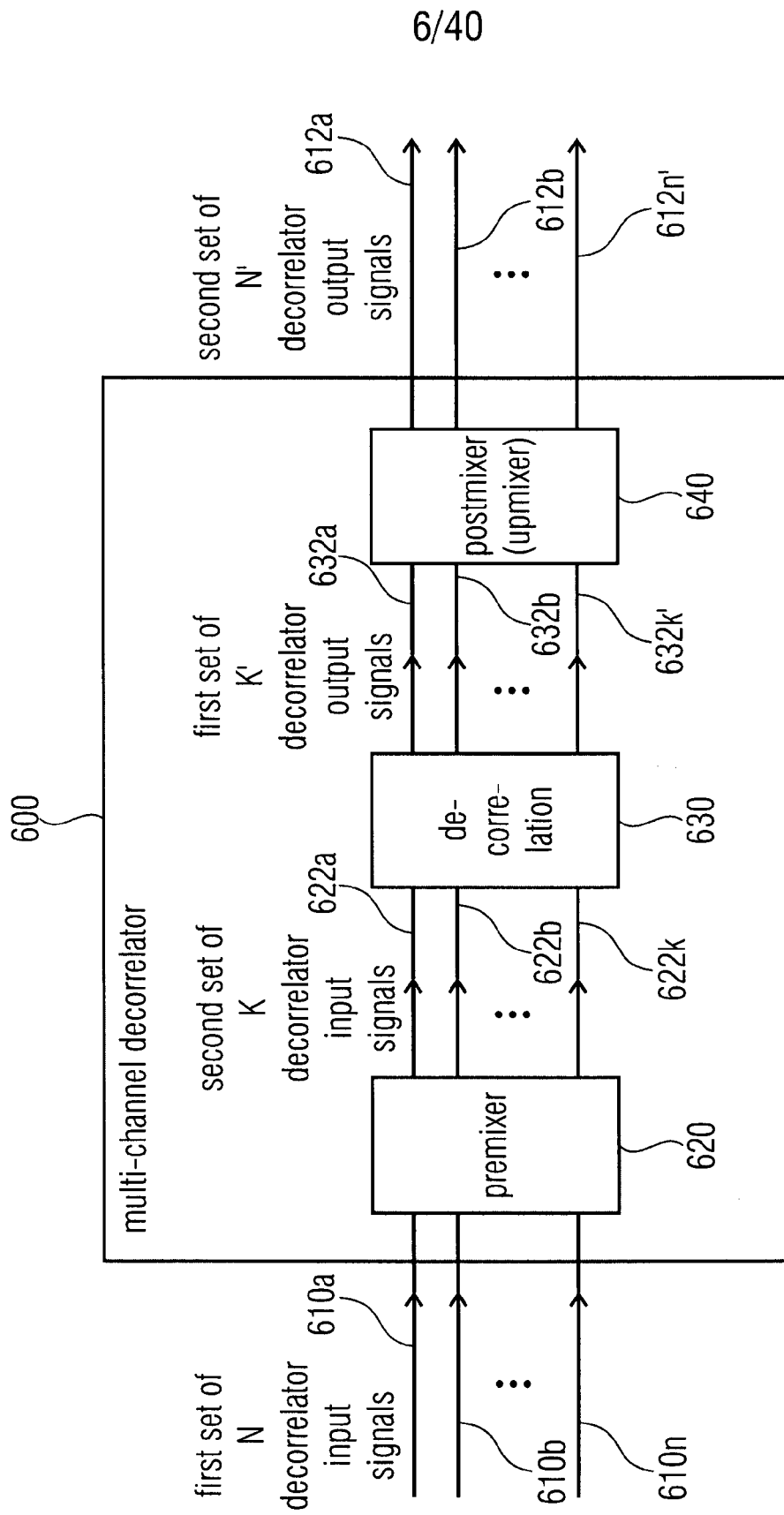


FIG 6

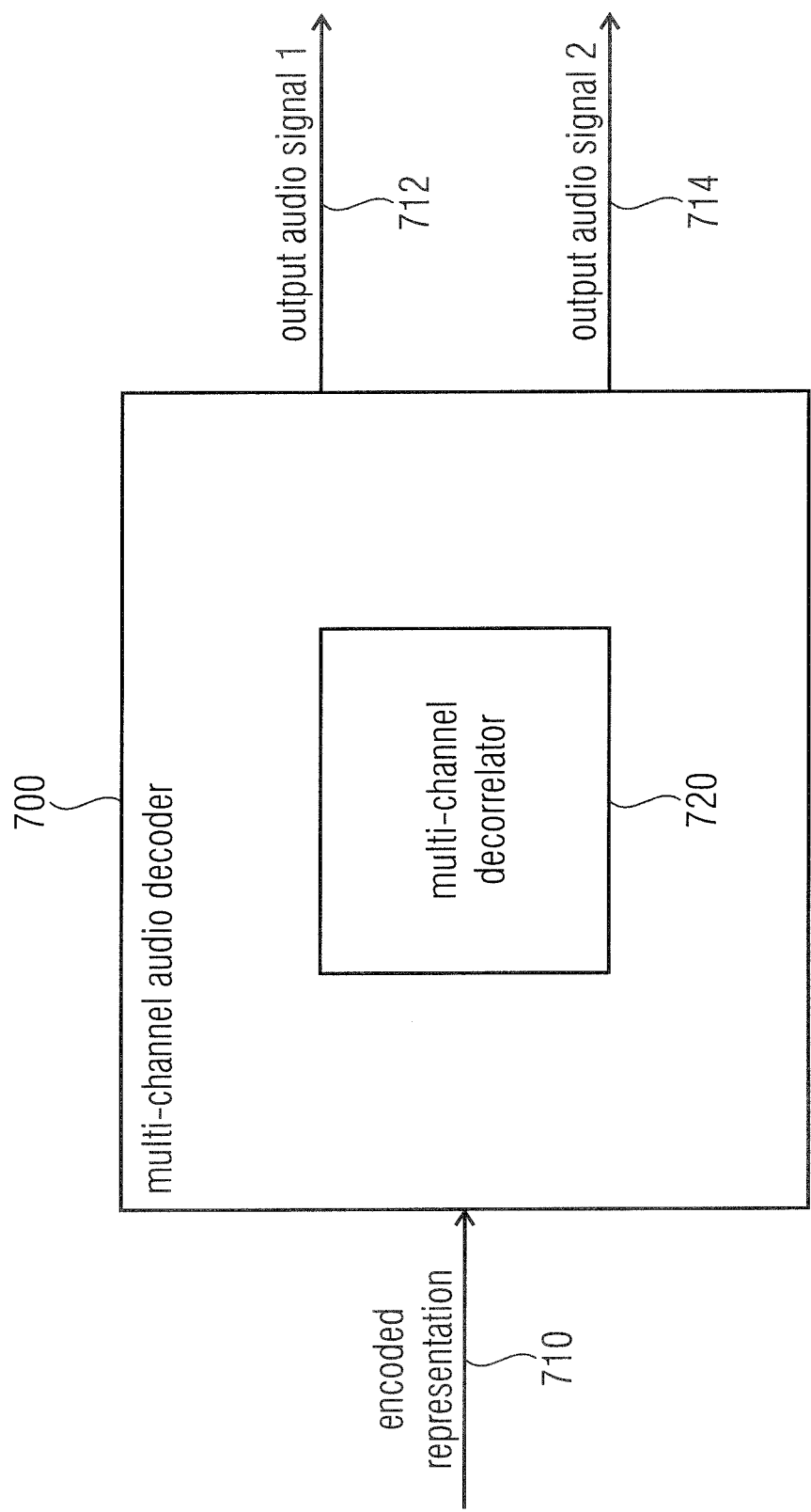


FIG 7

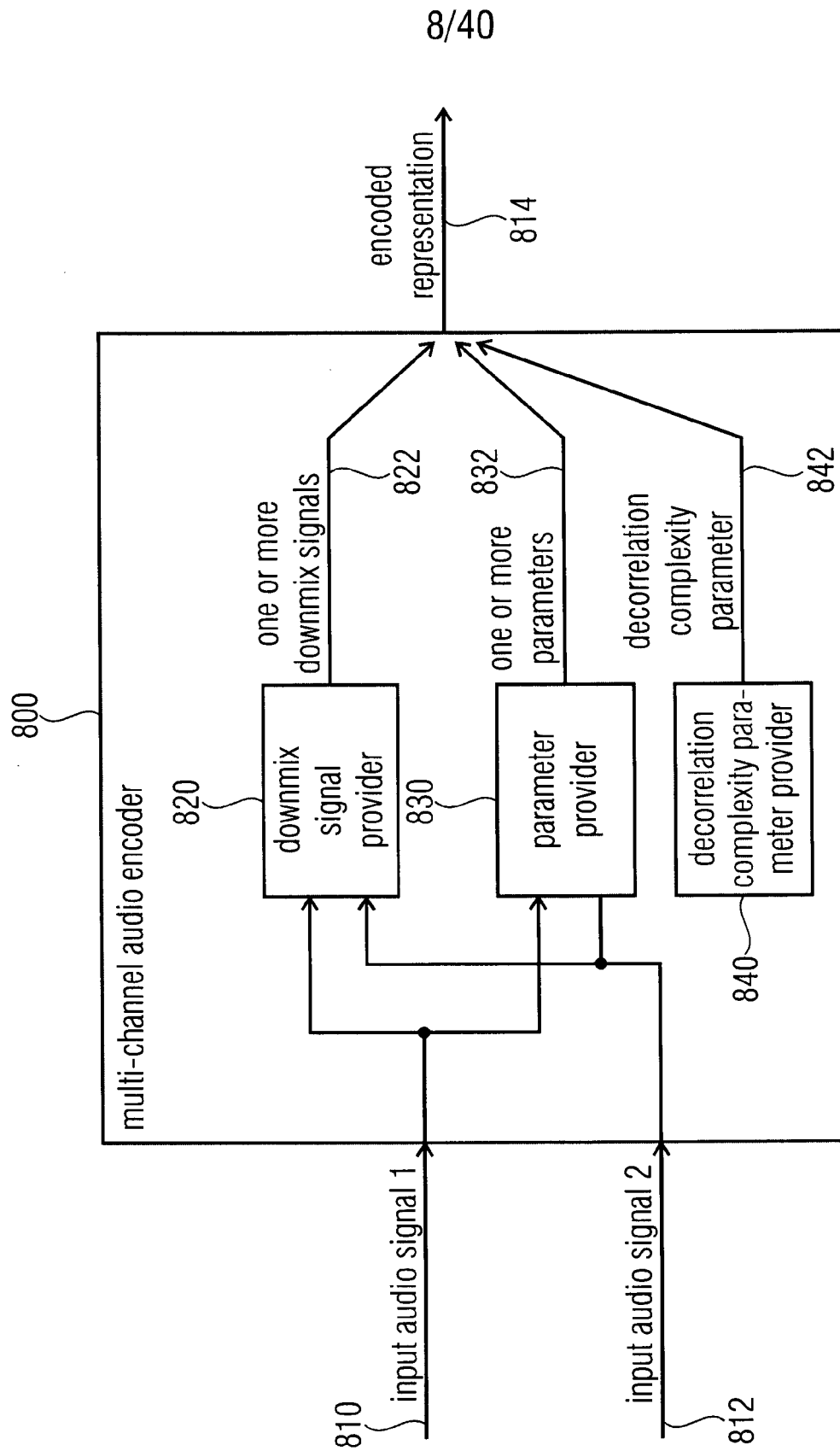


FIG 8

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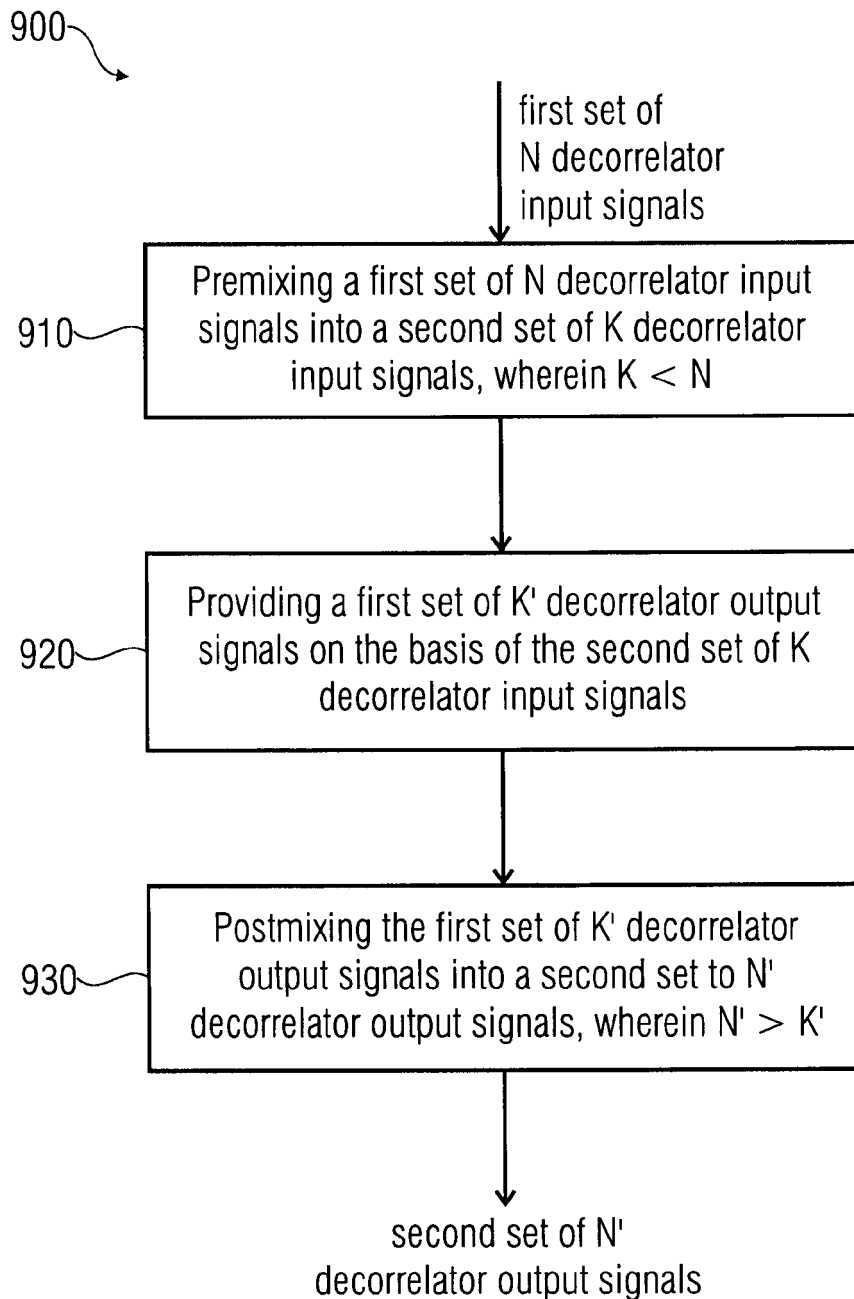


FIG 9

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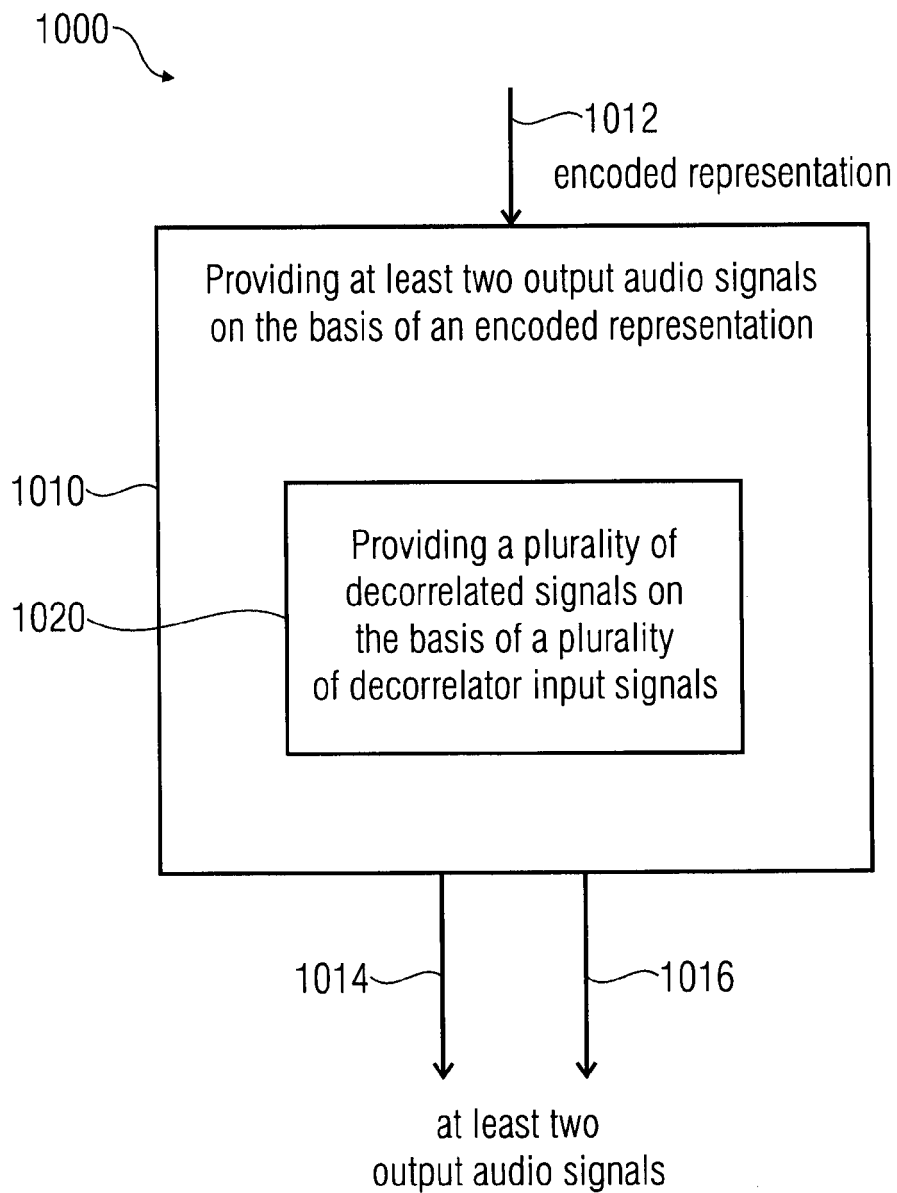


FIG 10

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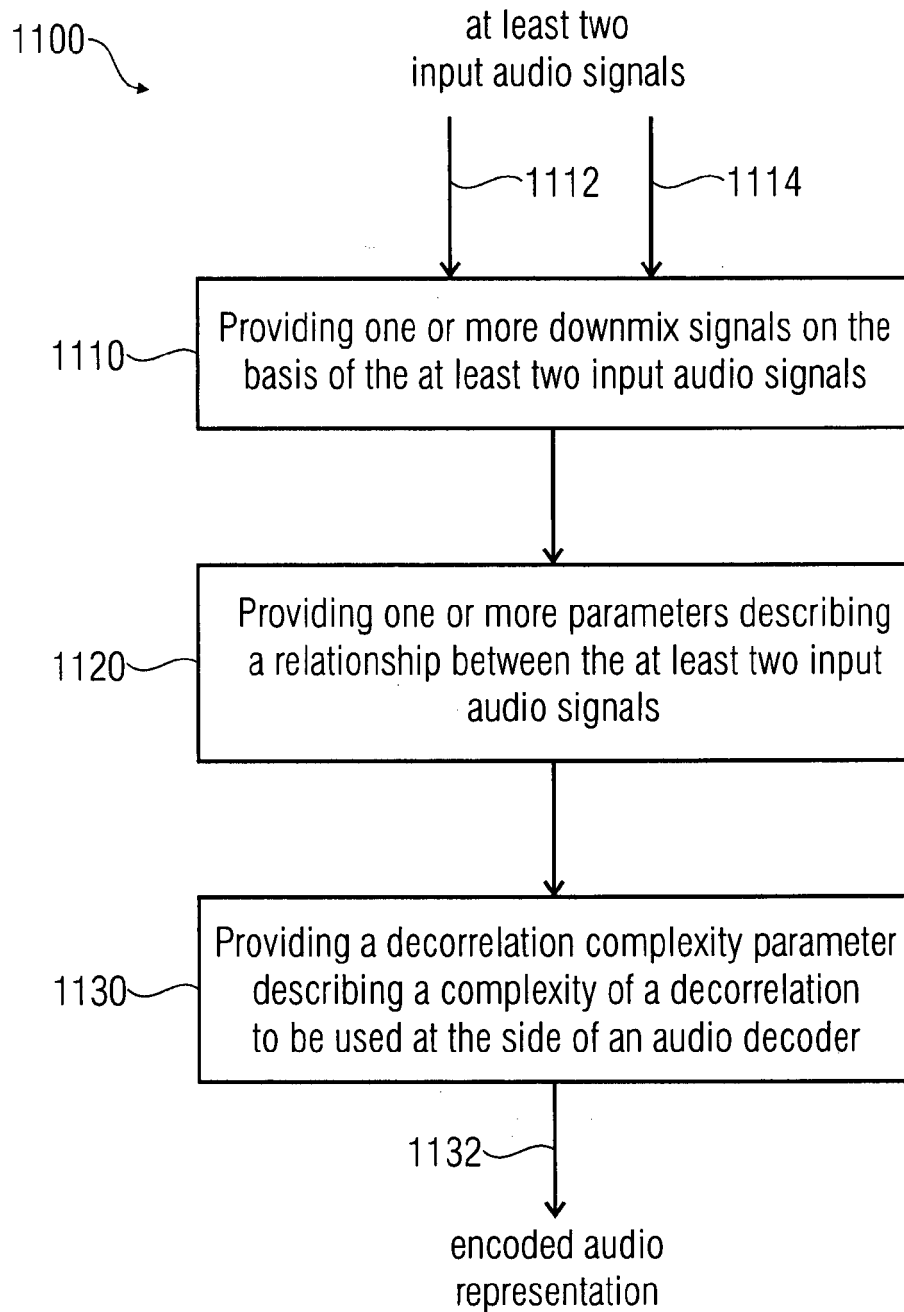


FIG 11

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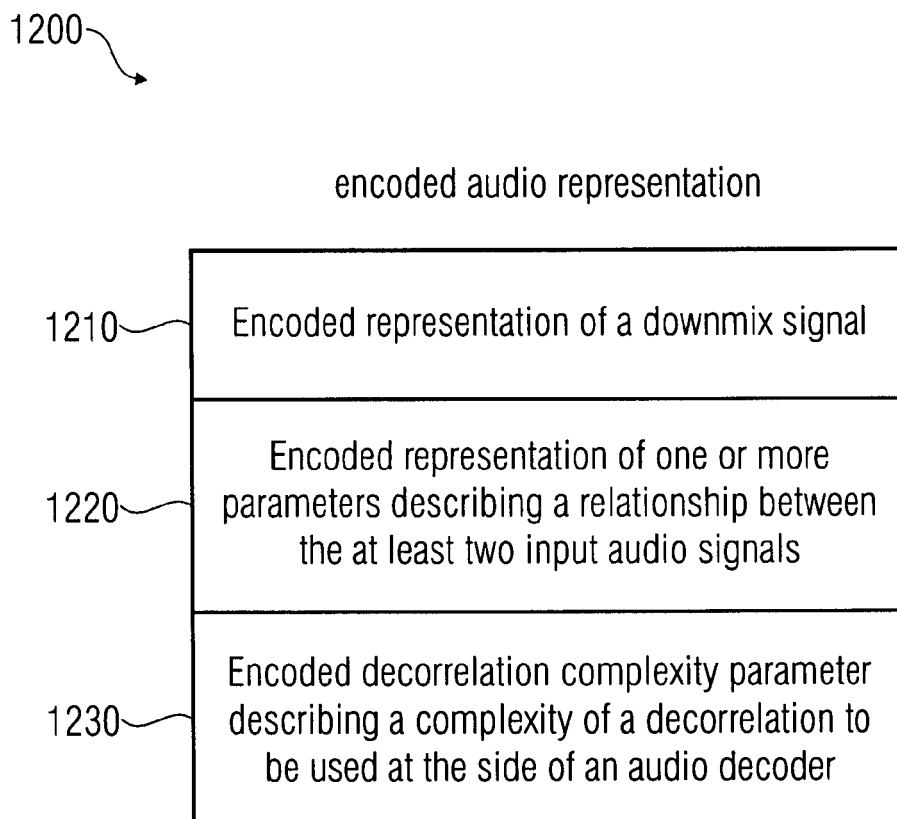


FIG 12

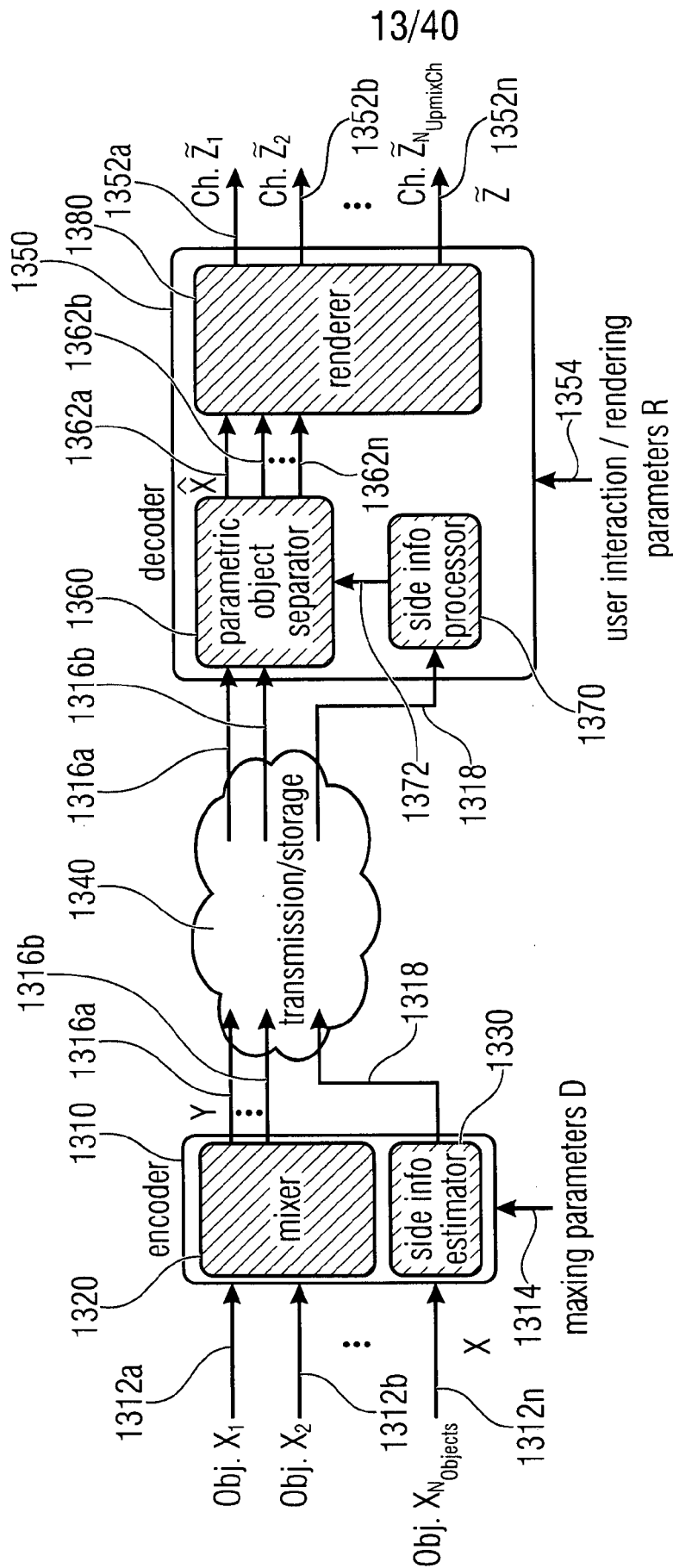
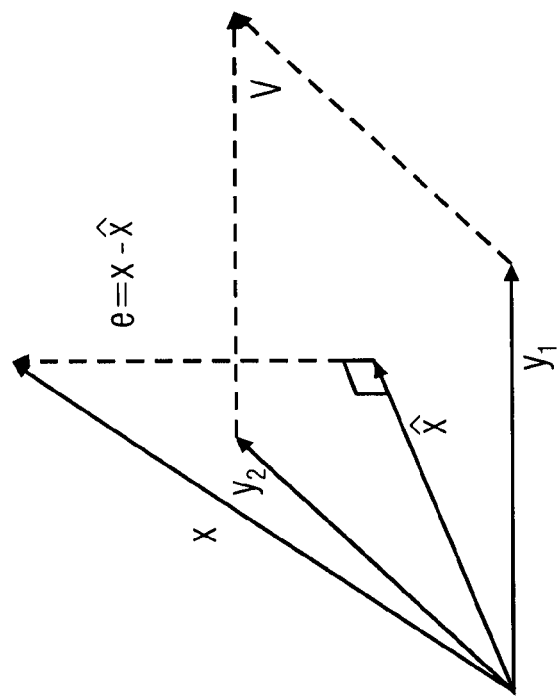


FIG 13

OVERVIEW OF AN MMSE BASED PARAMETRIC DOWNMIX/UPMIX CONCEPT



Geometric representation for orthogonality principle in three-dimensional space

FIG 14

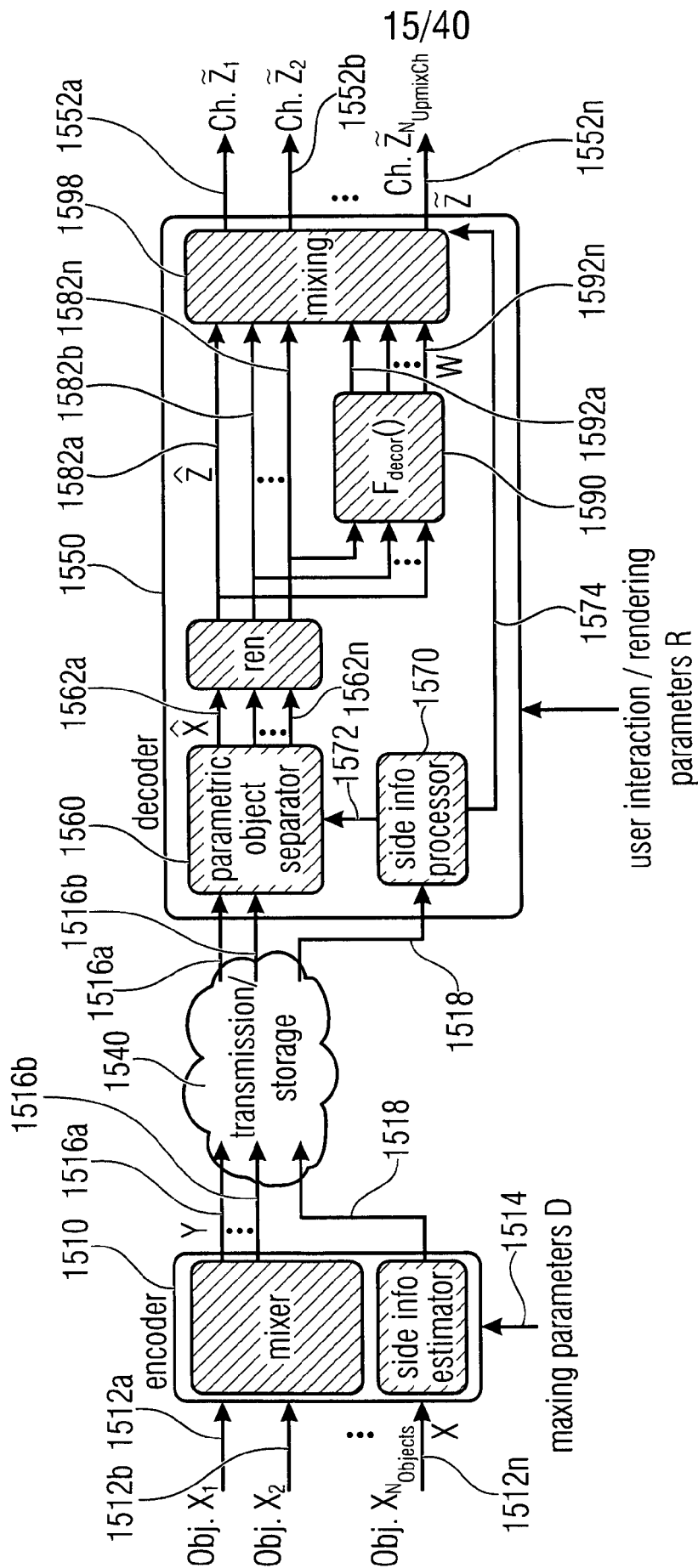
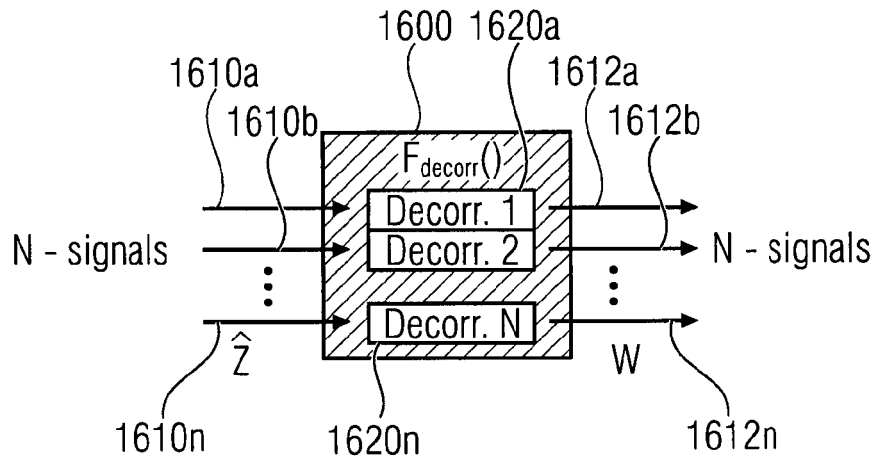


FIG 15

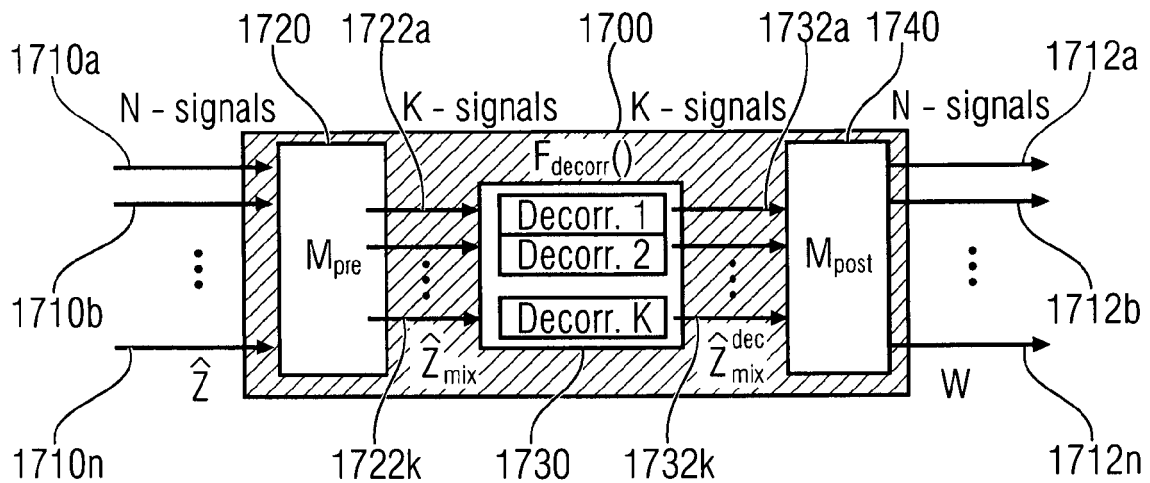
PARAMETRIC RECONSTRUCTION SYSTEM WITH DECORRELATION APPLIED ON RENDERED OUTPUT

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DECORRELATAION UNIT

FIG 16



REDUCED COMPLEXITY DECORRELATAION UNIT

FIG 17

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Loudspeaker positions and output formats

1800

No.	LS Label	Az. °	Az. Tol. °	El. °	El. Tol. °	output formats					
						0-2.0	0-5.1	0-7.1	0-8.1	0-10.1	0-22.2
1	CH_M_000	0	±2	0	±2		3	3		3	3
2	CH_M_L030	30	±2	0	±2	1	1	1	1	1	7
3	CH_M_R030	-30	±2	0	±2	2	2	2	2	2	8
4	CH_M_L060	60	±2	0	±2						1
5	CH_M_R060	-60	±2	0	±2						2
6	CH_M_L090	90	±5	0	±2						11
7	CH_M_R090	-90	±5	0	±2						12
8	CH_M_L110	110	±5	0	±2		5	5	5	5	
9	CH_M_R110	-110	±5	0	±2		6	6	6	6	
10	CH_M_L135	135	±5	0	±2						5
11	CH_M_R135	-135	±5	0	±2						6
12	CH_M_180	180	±5	0	±2						9
13	CH_U_000	0	±2	35	±10				3		15
14	CH_U_L045	45	±5	35	±10						13
15	CH_U_R045	-45	±5	35	±10						14
16	CH_U_L030	30	±5	35	±10			7	7	7	
17	CH_U_R030	-30	±5	35	±10			8	8	8	
18	CH_U_L090	90	±5	35	±10						19
19	CH_U_R090	-90	±5	35	±10						20
20	CH_U_L110	110	±5	35	±10					9	
21	CH_U_R110	-110	±5	35	±10					10	
22	CH_U_L135	135	±5	35	±10						17
23	CH_U_R135	-135	±5	35	±10						18
24	CH_U_180	180	±5	35	±10						21
25	CH_T_000	0	±2	90	±10					11	16
26	CH_L_000	0	±2	-15	+5-25				9		22
27	CH_L_L045	45	±5	-15	+5-25						23
28	CH_L_R045	-45	±5	-15	+5-25						24
29	CH_LFE1	45	±15	-15	±15		4	4	4	4	4
30	CH_LFE2	-45	±15	-15	±15						10

1810 1820 1830 1832 1840 1842 1850 1860 1864 1870 1880 1890

FIG 18

Complexity reduction for 22.2 output format

- Premixing coefficients for $N=22$ and $K=11$, $\text{cond}(M_{\text{pre}}^H M_{\text{pre}}^H) = 1$.

Ch. ID	CH_M_000	CH_L_000	CH_U_000	CH_T_000	CH_M_L135	CH_U_L135	CH_M_R135	CH_U_R135	CH_M_180	CH_U_180	CH_M_L030	CH_L_L045	CH_M_R030	CH_L_R045	CH_M_L090	CH_U_L090	CH_M_R090	CH_U_R090	CH_M_L060	CH_U_L045	CH_M_R060	CH_U_R045
M_{pre}^{ij}	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

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1910

FIG 19A

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- Premixing coefficients for $N=22$ and $K=10$, $\text{cond}(M_{\text{pre}}^H M_{\text{pre}}^H) = 2$.

Ch. ID	$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
CH_M_000	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_000	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_T_000	4	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L135	5	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
CH_U_L135	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0
CH_M_R135	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
CH_U_R135	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
CH_M_180	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_180	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L030	11	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
CH_L_L045	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R030	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_R045	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L090	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
CH_U_L090	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
CH_M_R090	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
CH_U_R090	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L060	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L045	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R060	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R045	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

FIG 19B

- Premixing coefficients for N=22 and K=9, $\text{cond}(M_{\text{pre}}^H)=2$.

Ch. ID	$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
CH_M_000		1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_000		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_000		1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_T_000		1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L135		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L135		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R135		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R135		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_180		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_180		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L030		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_L045		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R030		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_R045		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L090		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L090		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R090		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R090		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L060		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L045		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R060		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R045		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

FIG 19C

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- Premixing coefficients for $N=22$ and $K=8$, $\text{cond}(M_{\text{pre}}^H M_{\text{pre}}^H) = 2$.

Ch. ID	$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
CH_M_000	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_000	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_000	3	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_T_000	4	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L135	5	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L135	6	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R135	7	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R135	8	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_180	9	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_180	10	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L030	11	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_L045	12	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R030	13	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_R045	14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L090	15	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L090	16	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R090	17	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R090	18	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L060	19	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L045	20	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R060	21	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R045	22	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

FIG 19D

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- Premixing coefficients for $N=22$ and $K=7$, $\text{cond}(M_{\text{pre}}^H M_{\text{pre}}^H) = 2$.

Ch. ID	$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
CH_M_000	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_000	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_000	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_T_000	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L135	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L135	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R135	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R135	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_180	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_180	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L030	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_L045	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R030	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_R045	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L090	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L090	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R090	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R090	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L060	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L045	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R060	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R045	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

FIG 19E

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- Premixing coefficients for $N=22$ and $K=6$, $\text{cond}(M_{\text{pre}}^H M_{\text{pre}}^H) = 2$.

Ch. ID	M_{pre}^{ij}	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
CH_M_000	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_000	2	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_000	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_T_000	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L135	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L135	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R135	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R135	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_180	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_180	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L030	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_L045	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R030	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_L_R045	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L090	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L090	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R090	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R090	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_L060	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_L045	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_M_R060	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_U_R045	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

FIG 19F

- Premixing coefficients for $N=22$ and $K=5$, $\text{cond}(M_{\text{pre}}^H M_{\text{pre}}^H)^{-1} = 1.5$.

Ch. ID	$M_{\text{pre}}^{i,j}$	CH_M_000	CH_L_000	CH_U_000	CH_T_000	CH_M_L135	CH_U_L135	CH_M_R135	CH_U_R135	CH_M_180	CH_U_180	CH_M_L030	CH_L_L045	CH_M_R030	CH_L_R045	CH_M_L090	CH_U_L090	CH_M_R090	CH_U_R090	CH_M_L060	CH_U_L045	CH_M_R060	CH_U_R045
1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1

FIG 19G

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Complexity reduction for 10.1 output format

- Premixing coefficients for $N=10$ and $K=5$, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 1$.

Ch. ID	CH_M_L030	CH_U_L030	CH_M_R030	CH_U_R030	CH_M_000	CH_T_000	CH_M_L110	CH_U_L110	CH_M_R110	CH_U_R110
$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7	8	9	10
1	1	1	0	0	0	0	0	0	0	0
2	0	0	1	1	0	0	0	0	0	0
3	0	0	0	0	1	1	0	0	0	0
4	0	0	0	0	0	0	1	1	0	0
5	0	0	0	0	0	0	0	0	1	1

FIG 20A

- Premixing coefficients for $N=10$ and $K=4$, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 2$.

Ch. ID	CH_M_L030	CH_U_L030	CH_M_R030	CH_U_R030	CH_M_000	CH_T_000	CH_M_L110	CH_U_L110	CH_M_R110	CH_U_R110
$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7	8	9	10
1	1	1	0	0	0	0	0	0	0	0
2	0	0	1	1	0	0	0	0	0	0
3	0	0	0	0	1	1	0	0	0	0
4	0	0	0	0	0	0	1	1	1	1

FIG 20B

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- Premixing coefficients for $N=10$ and $K=3$, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 2$.

Ch. ID	CH_M_L030	CH_U_L030	CH_M_R030	CH_U_R030	CH_M_000	CH_T_000	CH_M_L110	CH_U_L110	CH_M_R110	CH_U_R110
$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7	8	9	10
1	1	1	1	1	0	0	0	0	0	0
2	0	0	0	0	1	1	0	0	0	0
3	0	0	0	0	0	0	1	1	1	1

FIG 20C

- Premixing coefficients for $N=10$ and $K=2$, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 1.5$.

Ch. ID	CH_M_L030	CH_U_L030	CH_M_R030	CH_U_R030	CH_M_000	CH_T_000	CH_M_L110	CH_U_L110	CH_M_R110	CH_U_R110
$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7	8	9	10
1	1	1	1	1	1	1	0	0	0	0
2	0	0	0	0	0	0	1	1	1	1

FIG 20D

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Complexity reduction for 8.1 output format

- Premixing coefficients for N=8 and K=4, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 1$.

Ch. ID	CH M L030	CH U L030	CH M R030	CH U R030	CH M 000	CH T 000	CH M L110	CH M R110
$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7	8
1	1	1	0	0	0	0	0	0
2	0	0	1	1	0	0	0	0
3	0	0	0	0	1	1	0	0
4	0	0	0	0	0	0	1	1

FIG 21A

- Premixing coefficients for N=8 and K=3, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 2$.

Ch. ID	CH M L030	CH U L030	CH M R030	CH U R030	CH M 000	CH T 000	CH M L110	CH M R110
$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7	8
1	1	1	1	1	0	0	0	0
2	0	0	0	0	1	1	0	0
3	0	0	0	0	0	0	1	1

FIG 21B

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- Premixing coefficients for $N=8$ and $K=2$, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 3$.

Ch. ID	CH_M_L030	CH_U_L030	CH_M_R030	CH_U_R030	CH_M_000	CH_T_000	CH_M_L110	CH_M_R110
$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7	8
1	1	1	1	1	1	1	0	0
3	0	0	0	0	0	0	1	1

FIG 21C

Complexity reduction for 7.1 output format

- Premixing coefficients for $N=7$ and $K=4$, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 1$.

Ch. ID	CH_M_L030	CH_U_L030	CH_M_R030	CH_U_R030	CH_M_000	CH_M_L110	CH_M_R110
$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7
1	1	1	0	0	0	0	0
2	0	0	1	1	0	0	0
3	0	0	0	0	1	0	0
4	0	0	0	0	0	1	1

FIG 21D

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- Premixing coefficients for $N=7$ and $K=3$, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 2$.

Ch. ID	CH_M_L030	CH_U_L030	CH_M_R030	CH_U_R030	CH_M_000	CH_M_L110	CH_M_R110
$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7
1	1	1	1	1	0	0	0
2	0	0	0	0	1	0	0
3	0	0	0	0	0	1	1

FIG 21E

- Premixing coefficients for $N=7$ and $K=2$, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 2.5$.

Ch. ID	CH_M_L030	CH_U_L030	CH_M_R030	CH_U_R030	CH_M_000	CH_M_L110	CH_M_R110
$M_{\text{pre}}^{i,j}$	1	2	3	4	5	6	7
1	1	1	1	1	1	0	0
2	0	0	0	0	0	1	1

FIG 21F

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Complexity reduction for 5.1 output format

- Premixing coefficients for N=5 and K=3, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 2$.

Ch. ID	CH M _{L030}	CH M _{R030}	CH M ₀₀₀	CH M _{L110}	CH M _{R110}
$M_{\text{pre}}^{i,j}$	1	2	3	4	5
1	1	1	0	0	0
2	0	0	1	0	0
3	0	0	0	1	1

FIG 22A

- Premixing coefficients for N=5 and K=2, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 1.5$.

Ch. ID	CH M _{L030}	CH M _{R030}	CH M ₀₀₀	CH M _{L110}	CH M _{R110}
$M_{\text{pre}}^{i,j}$	1	2	3	4	5
1	1	1	1	0	0
2	0	0	0	1	1

FIG 22B

Complexity reduction for 2.0 output format

- Premixing coefficients for N=2 and K=1, $\text{cond}(M_{\text{pre}} M_{\text{pre}}^H) = 2$.

Ch. ID	CH_M_L030	CH_M_R030
$M_{\text{pre}}^{i,j}$	1	2
1	1	1

FIG 23

2410	Group 1	CH_M_000	CH_L_000	CH_U_000	CH_T_000		
		(Ch. ID. 3)	(Ch. ID. 22)	(Ch. ID. 15)	(Ch. ID. 16)		
2412	Group 2	CH_M_L135	CH_U_L135	CH_M_R135	CH_U_R135	CH_M_180	CH_U_180
		(Ch. ID. 5)	(Ch. ID. 17)	(Ch. ID. 6)	(Ch. ID. 18)	(Ch. ID. 9)	(Ch. ID. 21)
2414	Group 3	CH_M_L030	CH_L_L045	CH_M_R030	CH_L_R045		
		(Ch. ID. 7)	(Ch. ID. 23)	(Ch. ID. 8)	(Ch. ID. 24)		
2416	Group 4	CH_M_L090	CH_U_L090	CH_M_R090	CH_U_R090		
		(Ch. ID. 11)	(Ch. ID. 19)	(Ch. ID. 12)	(Ch. ID. 20)		
2418	Group 5	CH_M_L060	CH_U_L045	CH_M_R060	CH_U_R045		
		(Ch. ID. 1)	(Ch. ID. 13)	(Ch. ID. 2)	(Ch. ID. 14)		

FIG 24

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bsDecorrelationMethod;	2	uimsbf
bsDecorrelationLevel;	2	uimsbf

FIG 25**bsDecorrelationMethod**

Indicates the decoder decorrelation operating mode according to:

bsDecorrelationMethod

bsDecorrelationMethod	Meaning
0	Energy compensation mode
1	Limited covariance adjustment mode
2	General covariance adjustment mode
3	N/A

FIG 26**bsDecorrelationLevel**

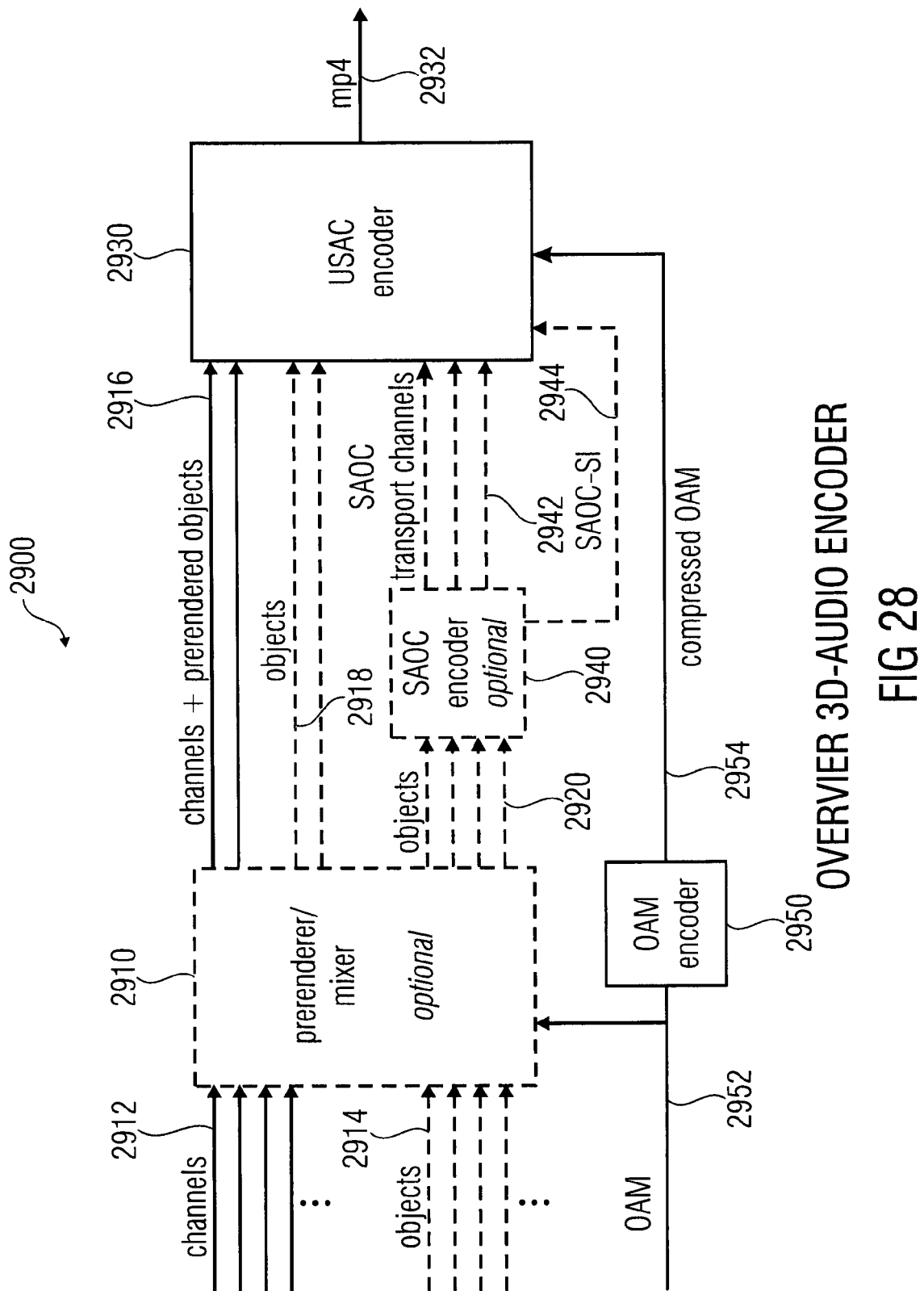
Defines the decorrelation level according to:

bsDecorrelationLevel

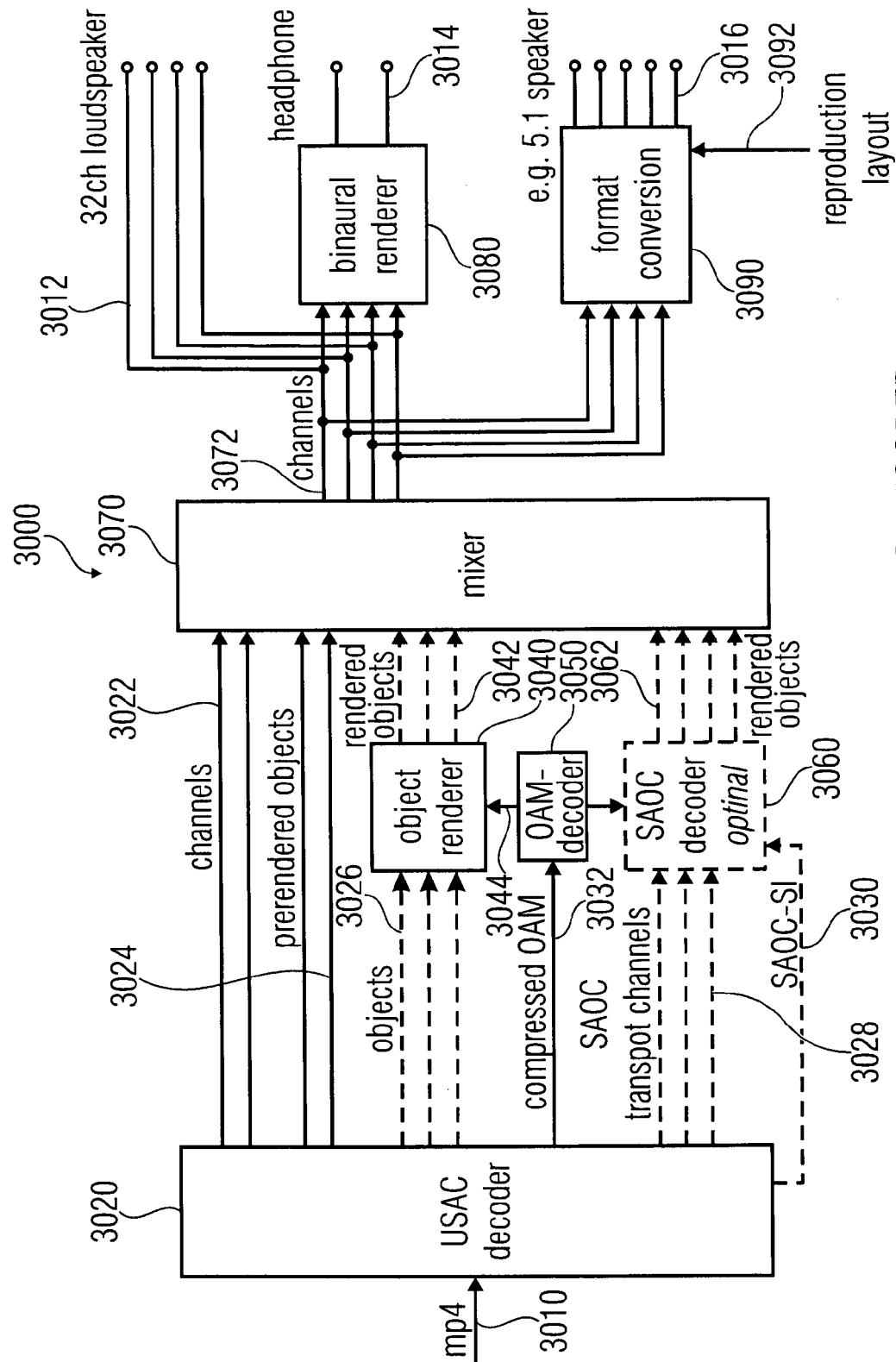
bsDecorrelationLevel	22.2	10.1	8.1	7.1	5.1	2.1
0	11	10	8	7	5	2
1	9	5	4	4	3	1
2	7	3	3	3	2	0
3	5	2	2	2	0	0

FIG 27

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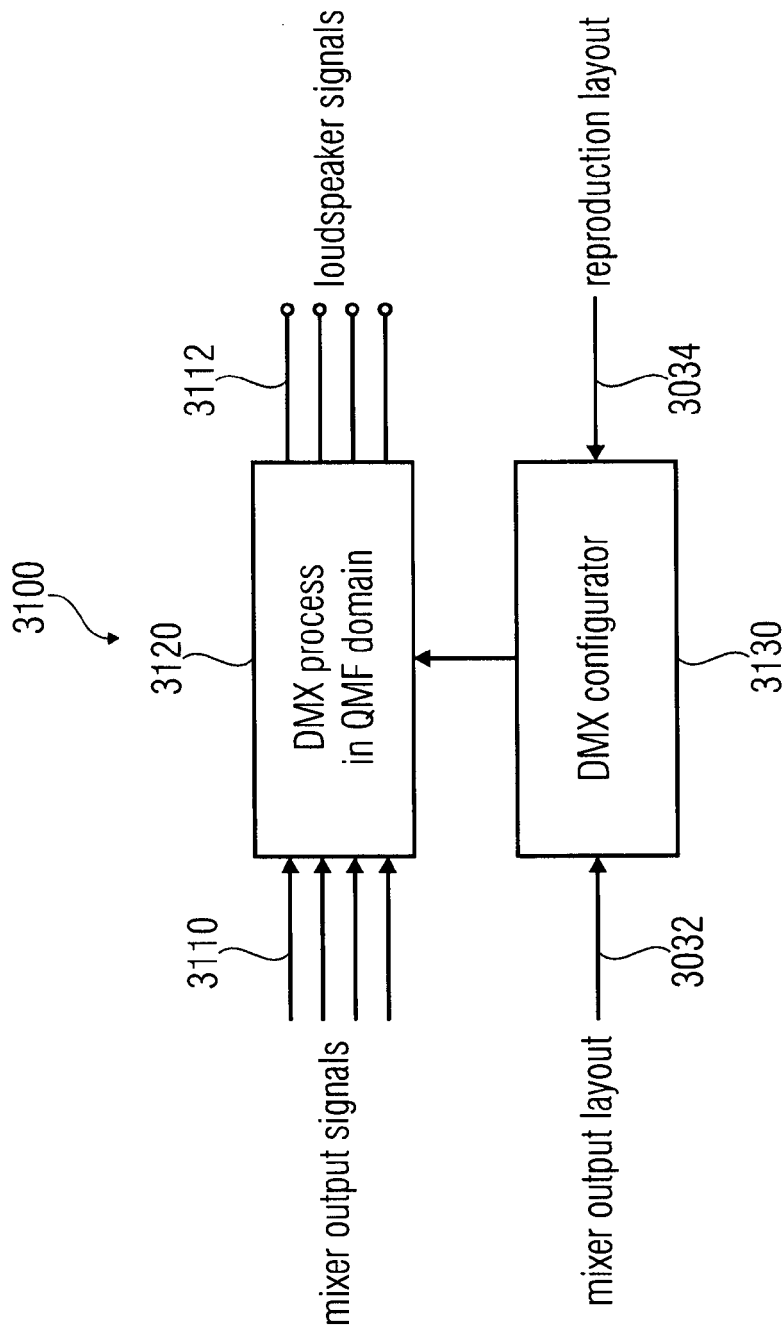


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OVERVIEW 3D-AUDIO DECODER

FIG 29



STRUCTUR OF FORMAT CONVERTER
FIG 30

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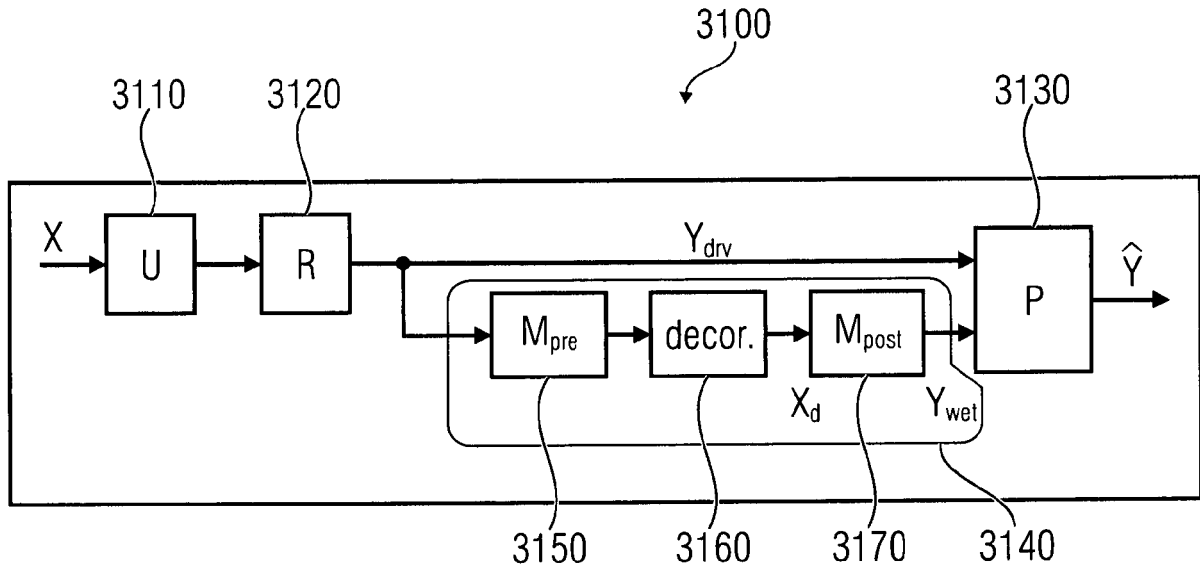


FIG 31

bsNumSaocDmxObjects	decoding mode	meaning
0	combined	The input channel based signals and the input object based signals are downmixed together into N_{ch} channels.
≥ 1	independent	The input channel based signals are downmixed into N_{ch} channels. The input object based signals are downmixed into N_{obj} channels.

FIG 32

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- Syntax of SAOC3DSpecificConfig()

Syntax	No. of bits	Mnemonic
SAOC3DSpecificConfig() {		
bsSamplingFrequencyIndex;	4	uimsbf
if (bsSamplingFrequencyIndex == 15) {		
bsSamplingFrequency;	24	uimsbf
}		
bsFreqRes;	3	uimsbf
bsFrameLenth;	7	uimsbf
bsNumSaocDmxChannels;	5	uimsbf
bsNumSaocDmxObjects;	5	uimsbf
bsDecorrelationMethod;	2	uimsbf
NumInputSignals = 0;		
if (bsNumSaocDmxChannels < 0) {		
bsNumSaocChannels;	6	uimsbf
bsNumSaocLFEs;	2	uimsbf
NumInputSigns += bsNumSaocChannels;		
}		
bsNumSaocObjects;	8	uimsbf
bsDecorrelationLevel;	2	uimsbf
NumInputSignals += bsNumSaocObjects;		
for (i=0; i<bsNumSaocChannels; i++) {		
bsRelatedTo[i][j] = 1;		
for(j=i+1; j< bsNumSaocChannels; j++) {		
bsRelatedTo[i][j];	1	uimsbf
bsRelatedTo[j][i] = bsRelatedTo[i][j];		
}		
}		
}		

FIG 33A

FIG 33A-1

FIG 33A-2

FIG 33A-1

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```

for ( i=bsNumSaocChannels; i<NumInputSignals; i++ ) {
    for ( j=0; j<bsNumSaocChannels; j++ ) {
        bsRelatedTo[i][j] = 0;
        bsRelatedTo[j][i] = 0;
    }
}
for ( i=bsNumSaocChannels; i<NumInputSignals; i++ ) {
    bsRelatedTo[i][j] = 1;
    for ( j=i+1; j<NumInputSignals; j++ ) {
        bsRelatedTo[i][j];
        bsRelatedTo[j][i] = bsRelatedTo[i][j];
    }
}
bsOneIOC;
bsSaocDmxMethod;
if (bsSaocDmxMethod == 15) {
    bsNumPremixedChannels;
}
bsDualMode;
if (bsDualMode) {
    bsBandsLow;
    bsBandsHigh = numBands;
} else {
    bsBandsLow = numBands;

```

1	uimbsf
1	uimbsf
4	uimbsf
5	uimbsf
1	uimbsf
5	uimbsf Note 1

FIG 33A	FIG 33A-1
	FIG 33A-2

FIG 33A-2

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}		
bsDcuFlag;	1	uimsbf
if (bsDcuFlag == 1) {		
bsDcuMandatory;	1	uimsbf
bsDcuDynamic;	1	uimsbf
if (bsDcuDynamic == 0) {		
bsDcuMode;	1	uimsbf
bsDcuParam;	4	uimsbf
}		
} ele {		
bsDcuMandatory = 0;		
bsDcuDynamic = 0;		
bsDcuMode = 0;		
bsDcuParam = 0;		
}		
bsSaocReserved;	3	uimsbf
ByteAlign();		
SAOC3DExtensionConfig();		
}		
Note 1: numBands is defined in Table 33 in ISO/IEC 23003-2:2010.		

FIG 33B