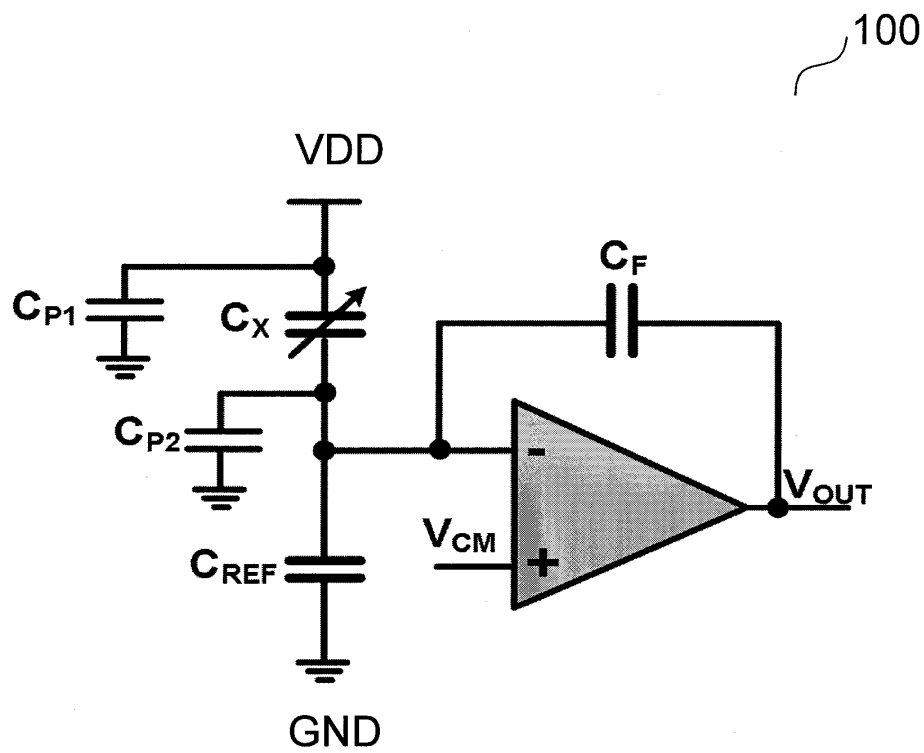
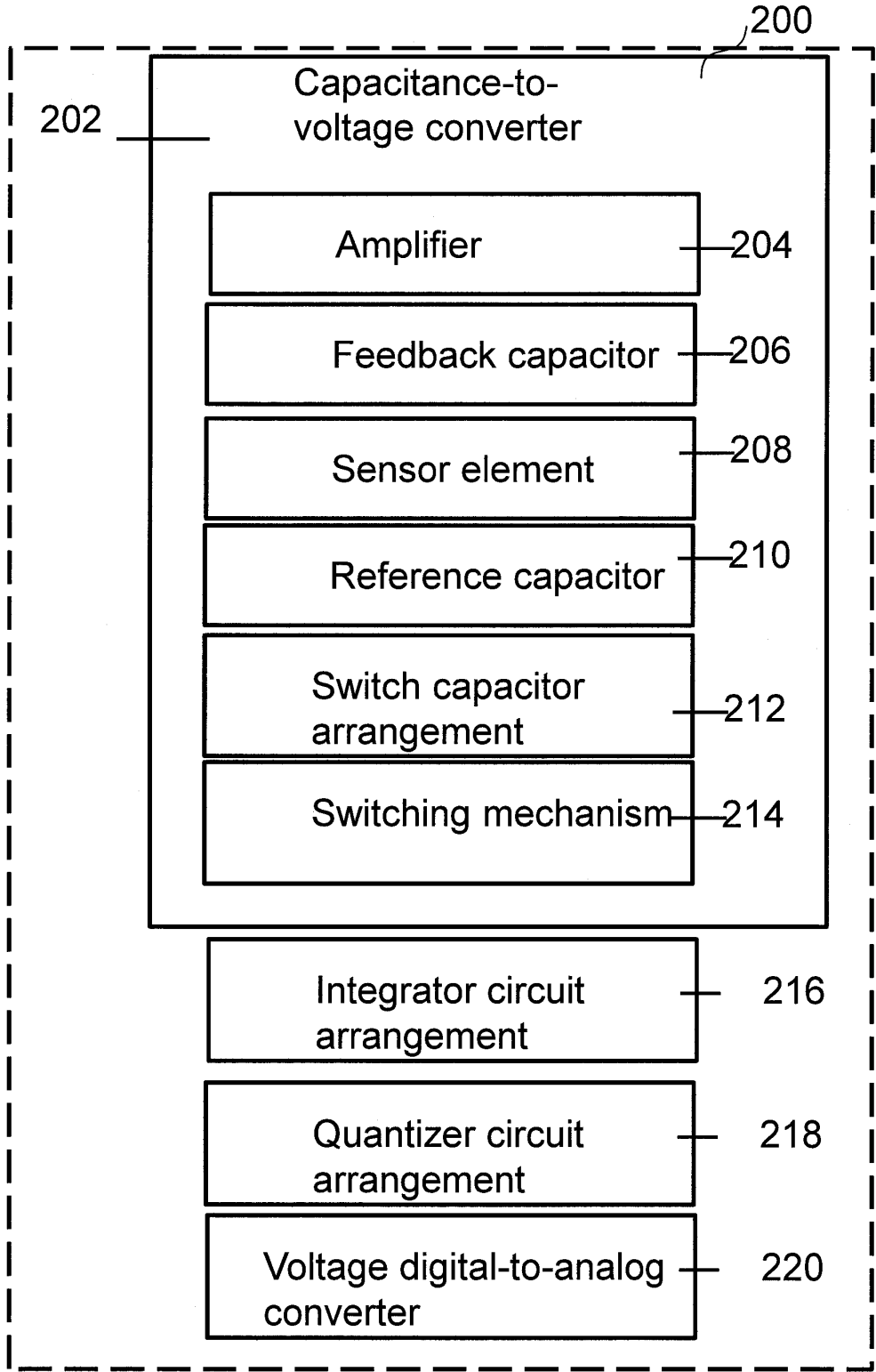
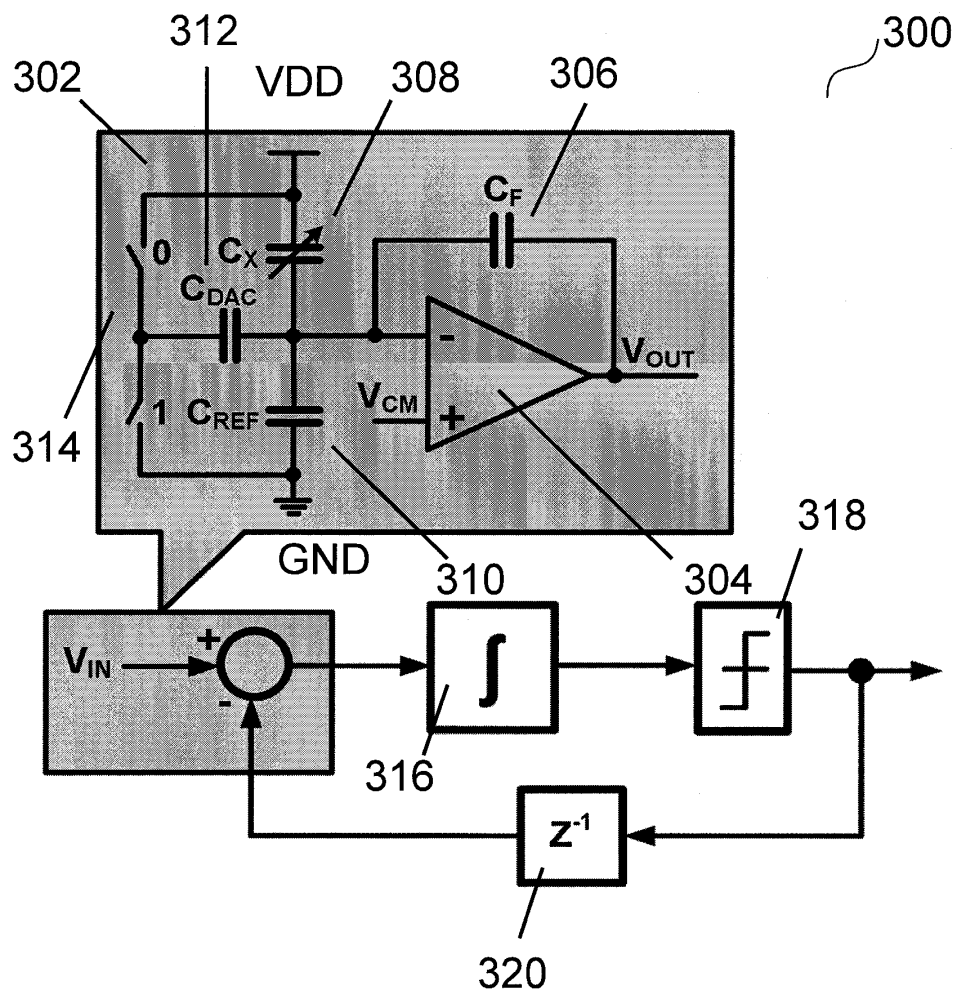
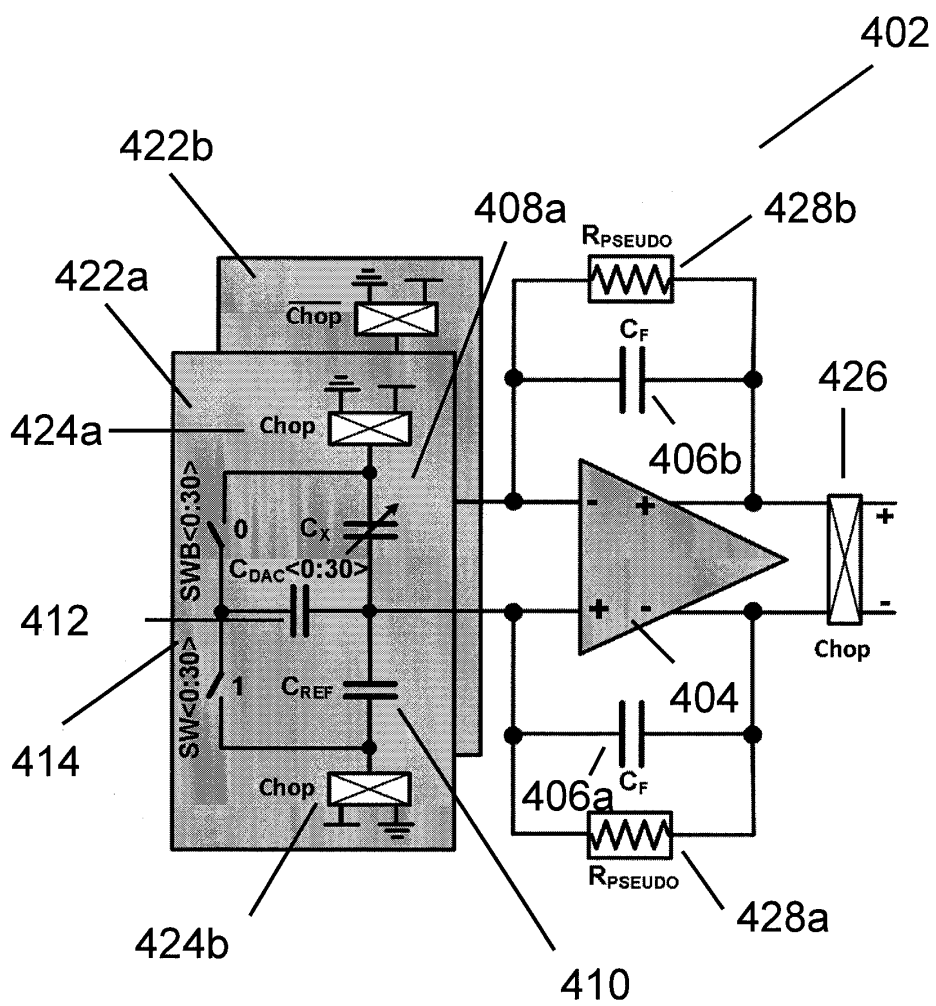


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FIG. 1

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FIG. 2



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FIG. 3

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FIG. 4A

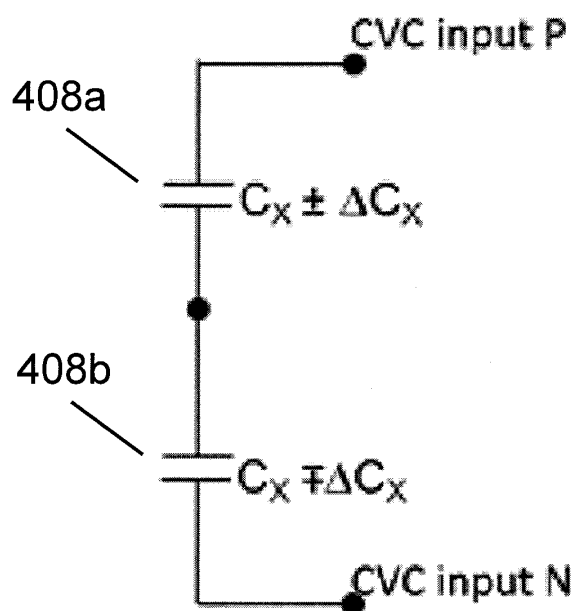
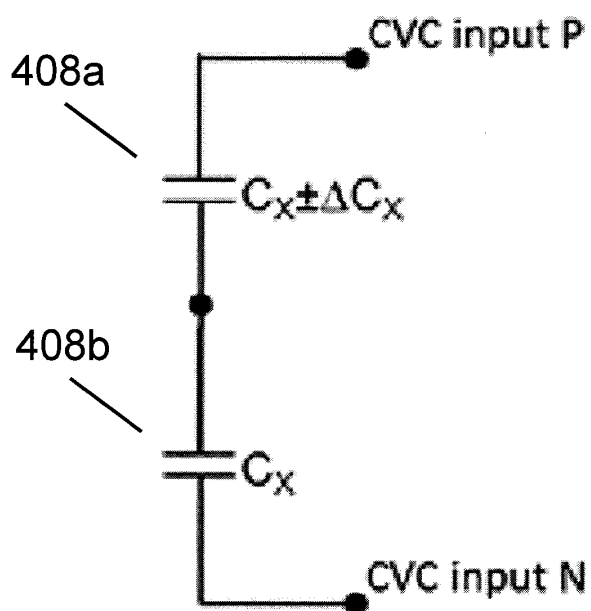
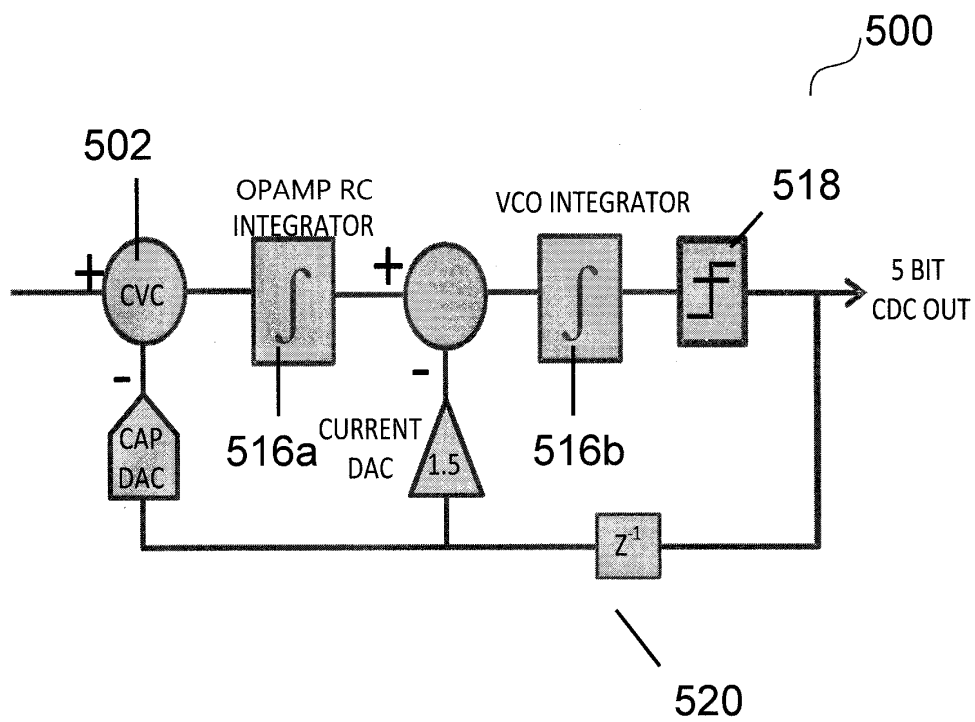
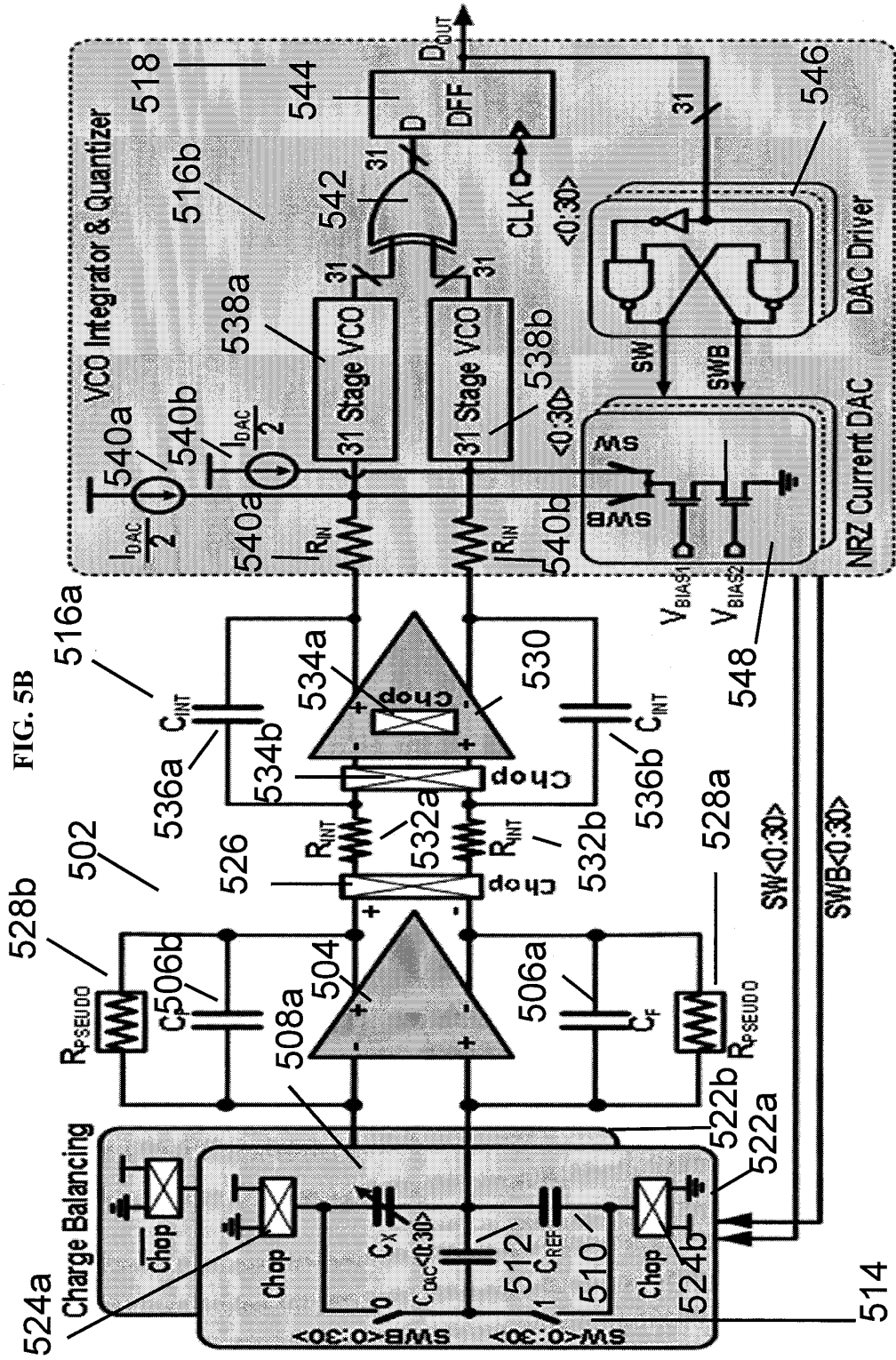
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FIG. 4B

FIG. 4C



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FIG. 5A



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FIG. 5C

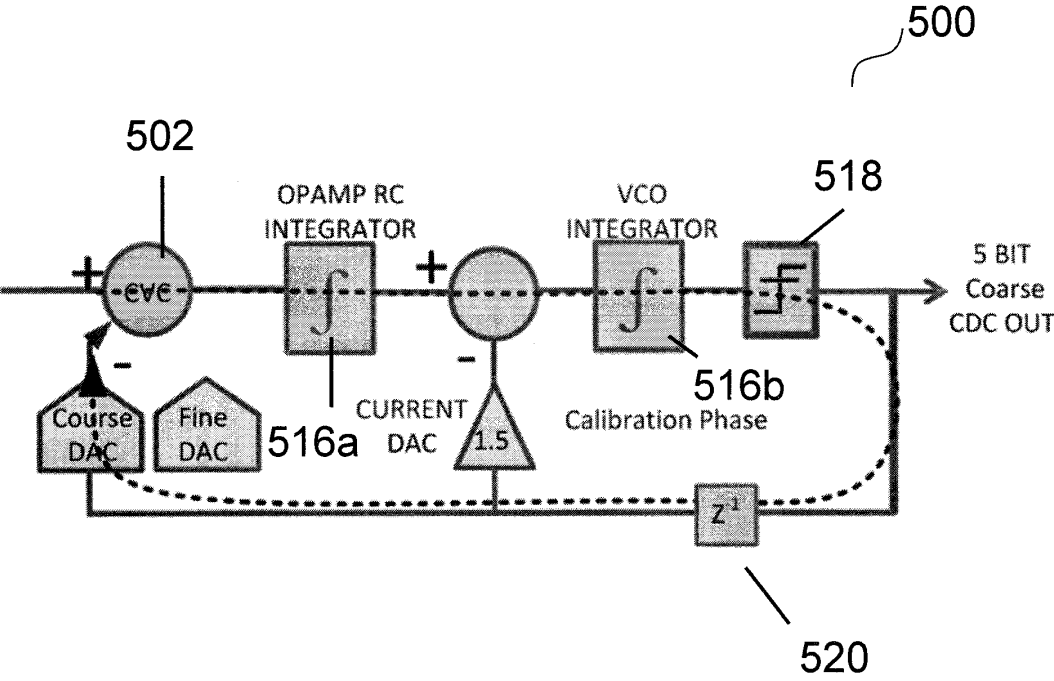
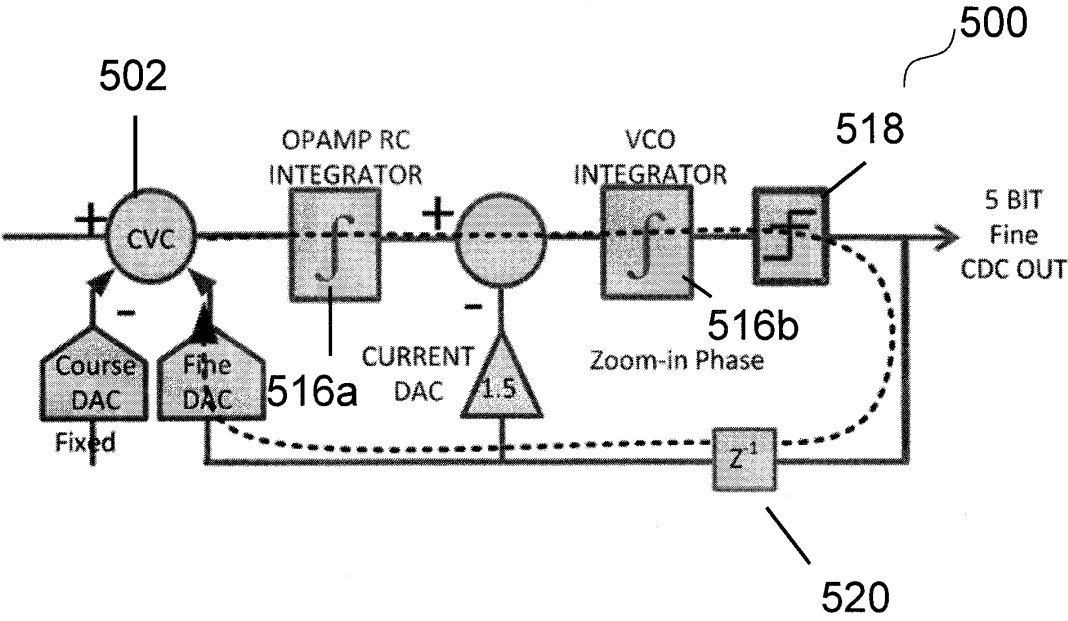
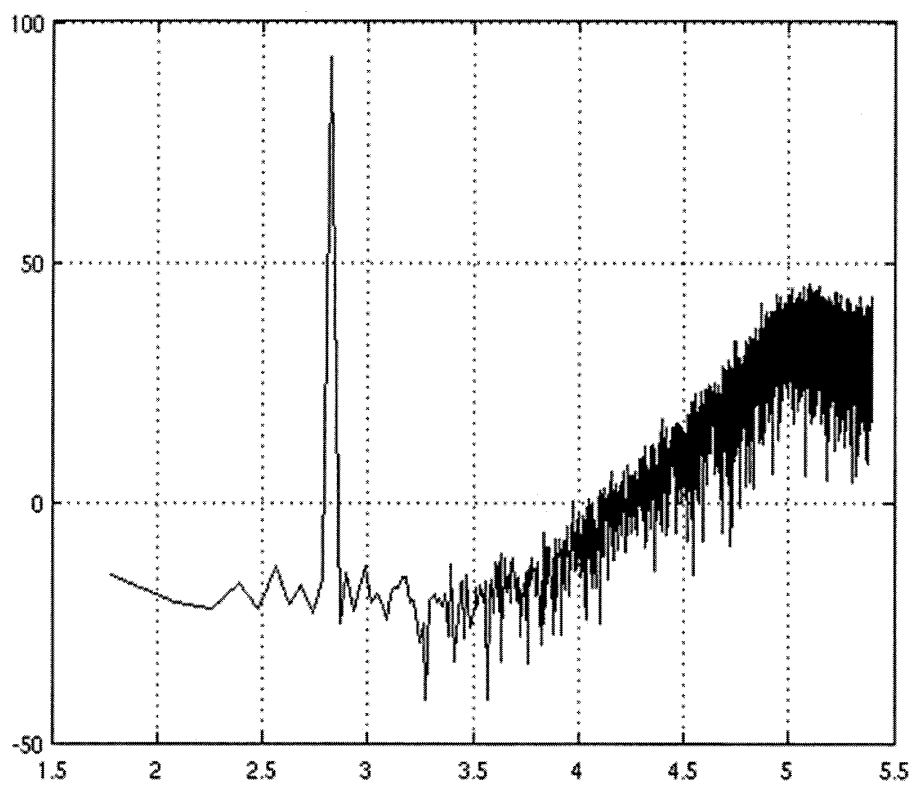
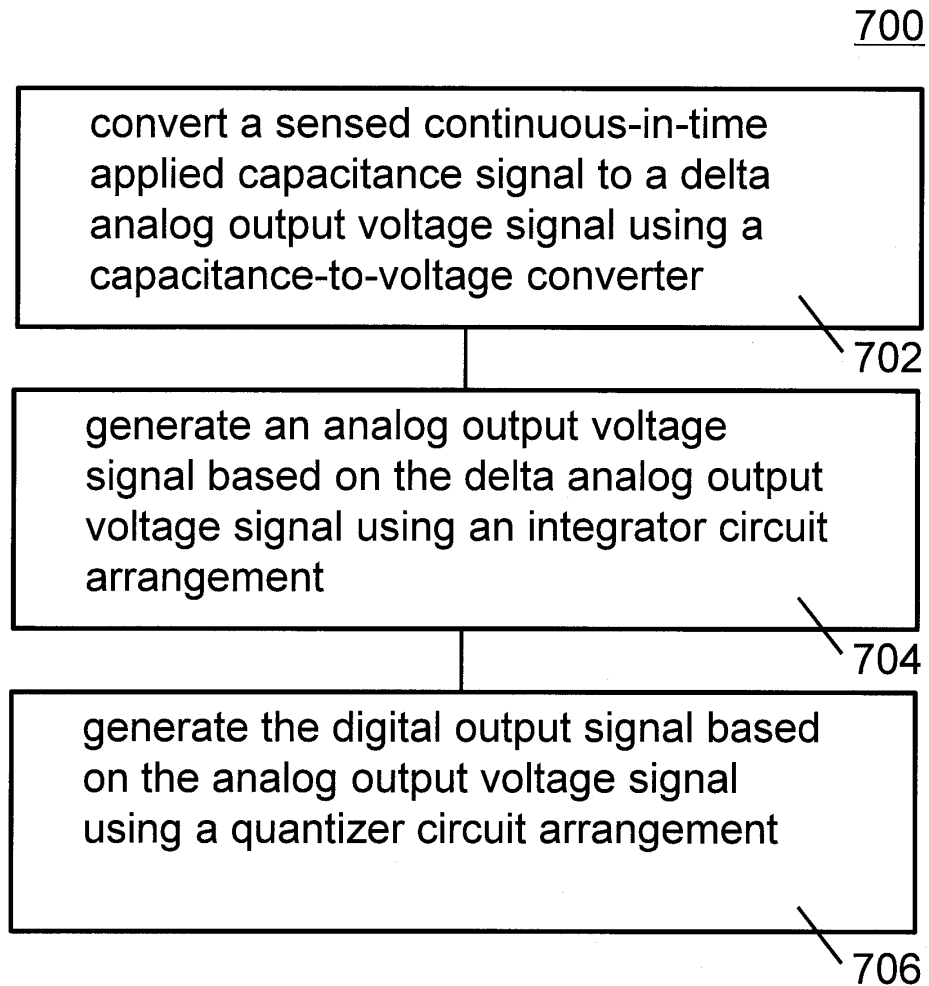


FIG. 5D



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FIG. 6600SNDR
113dB

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FIG. 7



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FIG. 8A

800a

Parameter	Proposed modulator	[1]	[2]	[3]	[4]	[5]
Year/Publication	2016	2015/ISSCC	2014/VLSIC	2015/ISSCC	2013/JSSCC	2012/ISSCC
Description	CT $\Delta\Sigma$ M	Iterative delay line discharge	2nd order DT- $\Delta\Sigma$ + SAR	Period Modulation	3rd order DT- $\Delta\Sigma$	3rd order DT- $\Delta\Sigma$
Process/Technology	0.18um	40nm	0.18um	0.16um	0.16um	0.35um
Input range	0-10pF	0.7pF-10nF	0-24pF	0-8pF	0.54-1.06pF	NA
Resolution (aF)	215	12300	160aF	255	75aF	65aF
ENOB	14	9	15.4	13.1	12.5	17.2
Measurement Time	125us	19us	230us	6.86ms	800uS	20us
Power	48uW	1.84uW	33.7uW	14uW	10.3uW	15mW
Figure of Merit (FoM) (fJ/Conv)	440	141	175	10600	3900	5515
FoM (Schreier) (dB)	178.26	170.5	185.57	160.8	167.85	180

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FIG. 8B

800b

Key Parameters	Proposed	Michigan	Delft	Michigan	Kaust
Year	2015	2015	2013	2014	2014
Product/Publication	NA	ISSCC 2015	JSSC 2013	VLSI 2014	CICC 2014
Description	Continuous time Sigma delta with VCO quantizer	Iterative delay line discharge	SC Sigma delta	SC Sigma delta + SAR	SAR
Process Technology	0.18um	40nm	0.16um	0.18um	0.35um
Input range	0-10pF	0.7 pF – 10nF	0.54-1.06pF	0-24pF	16p
Resolution	100aF	12.3fF	75aF	160aF	NR
ENOB	15	9	12.5	15.4	12.5
Measurement Time	0.125mS	19.06uS	0.8mS	0.23mS	0.65m
Power	48uW*	1.84uW	10.3uW	33.7uW	300u
FOM (pJ/CS)	0.183*	0.141	3.9	0.175	34