

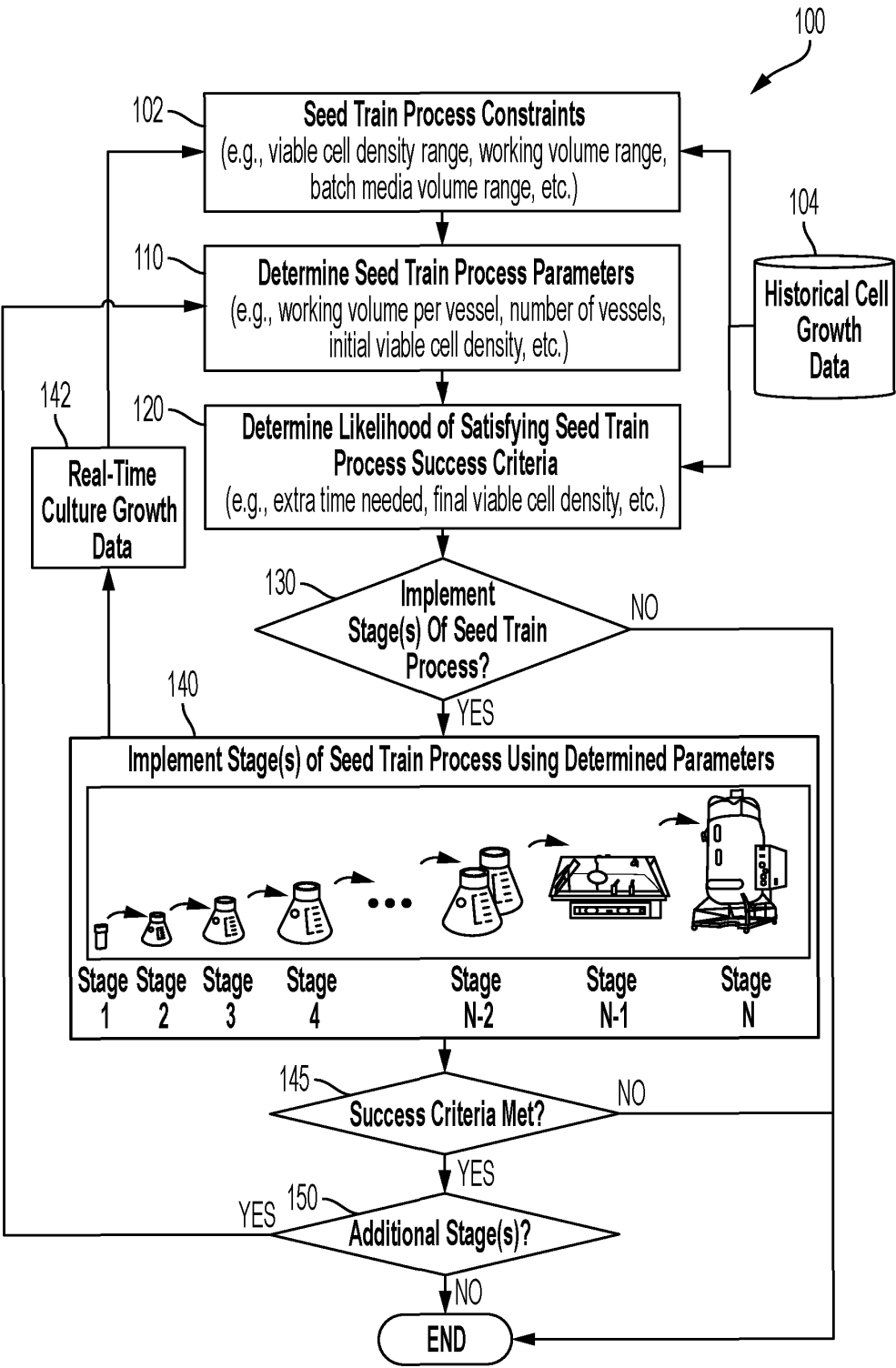


FIG. 1A

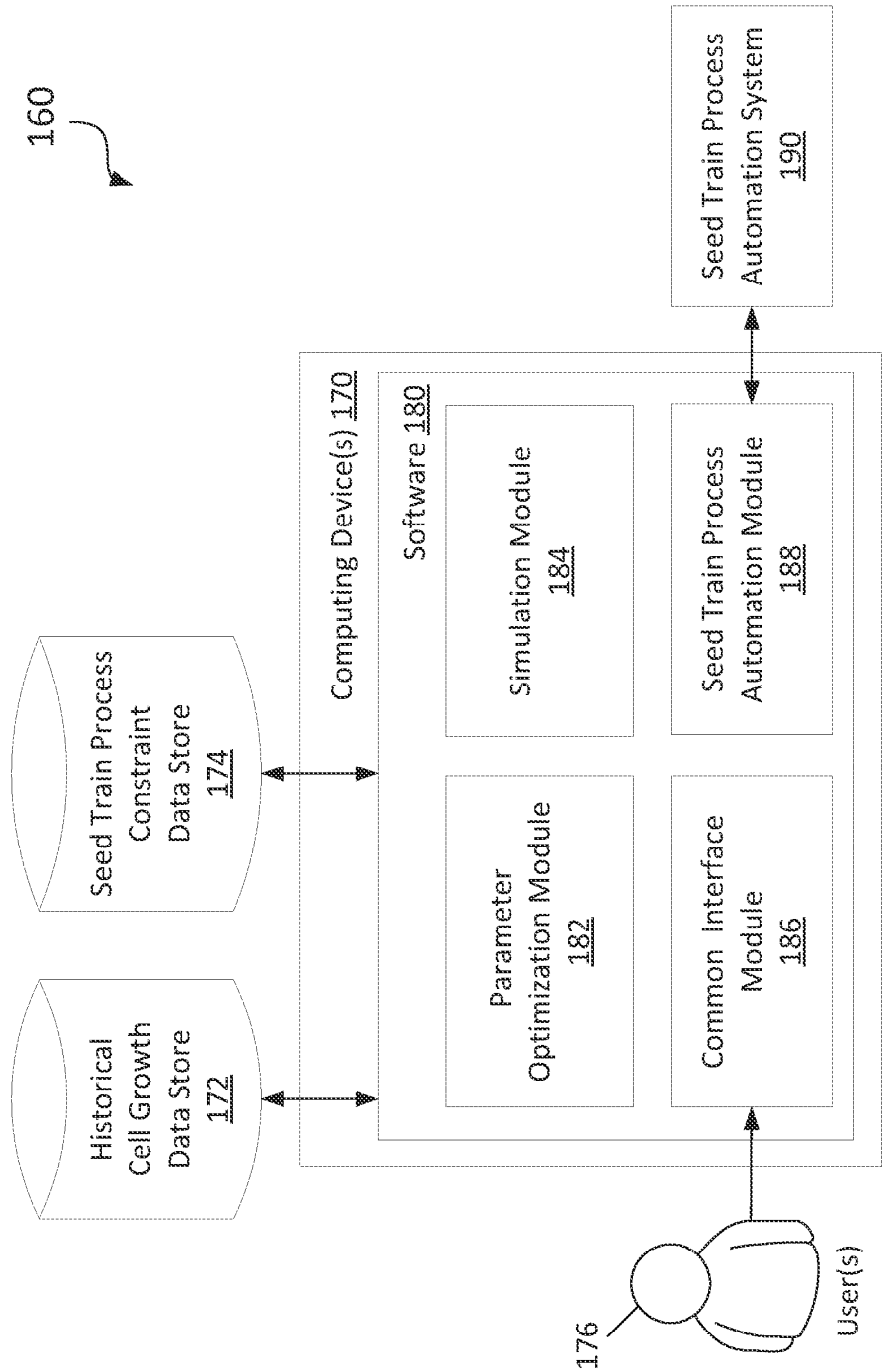


FIG. 1B

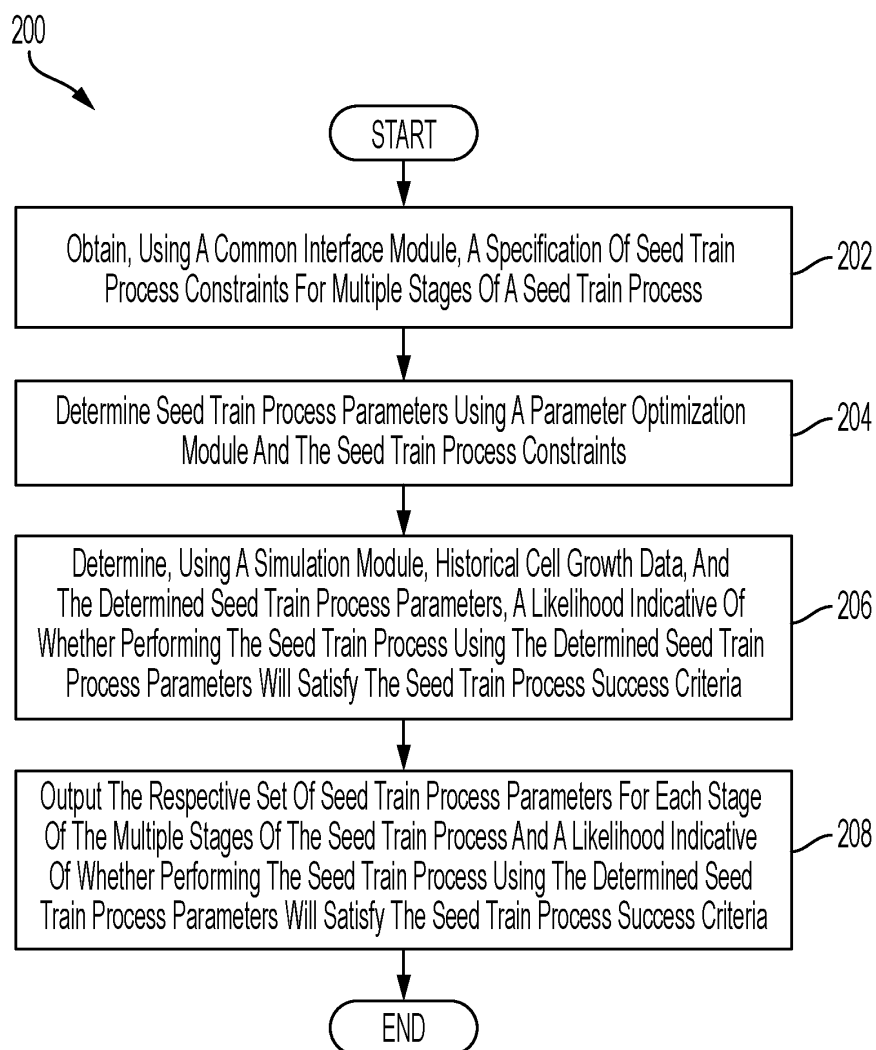


FIG. 2

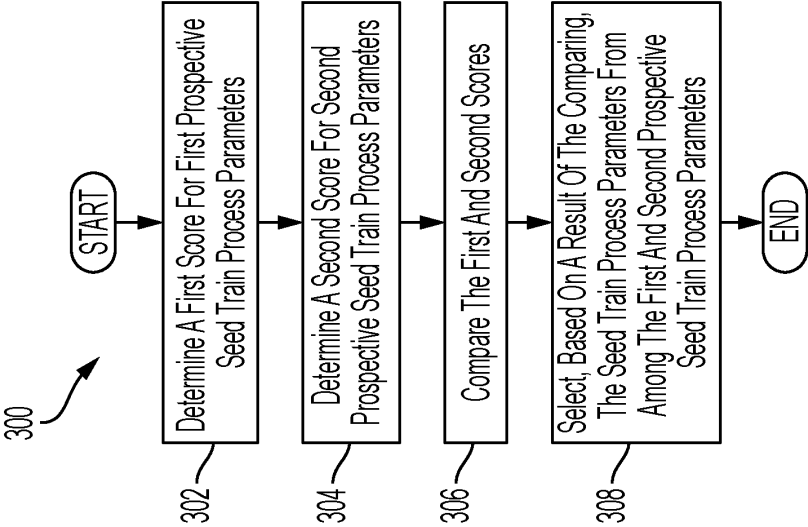


FIG. 3A

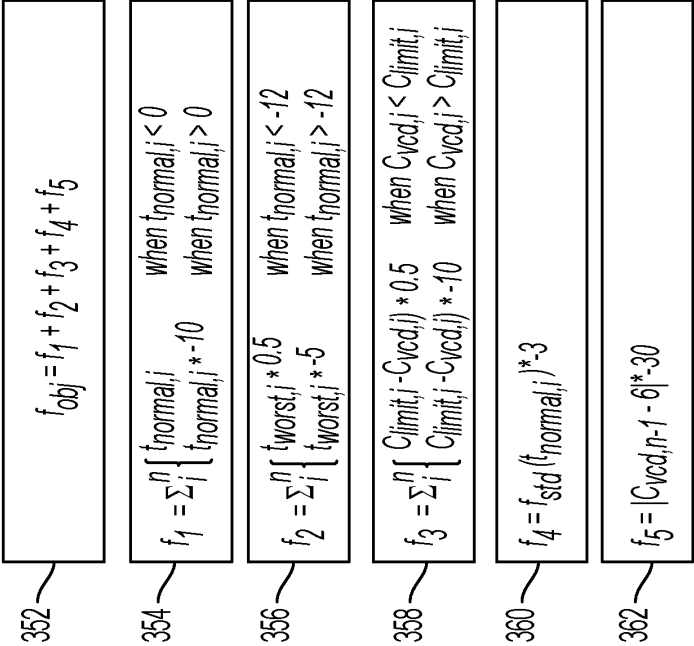


FIG. 3B

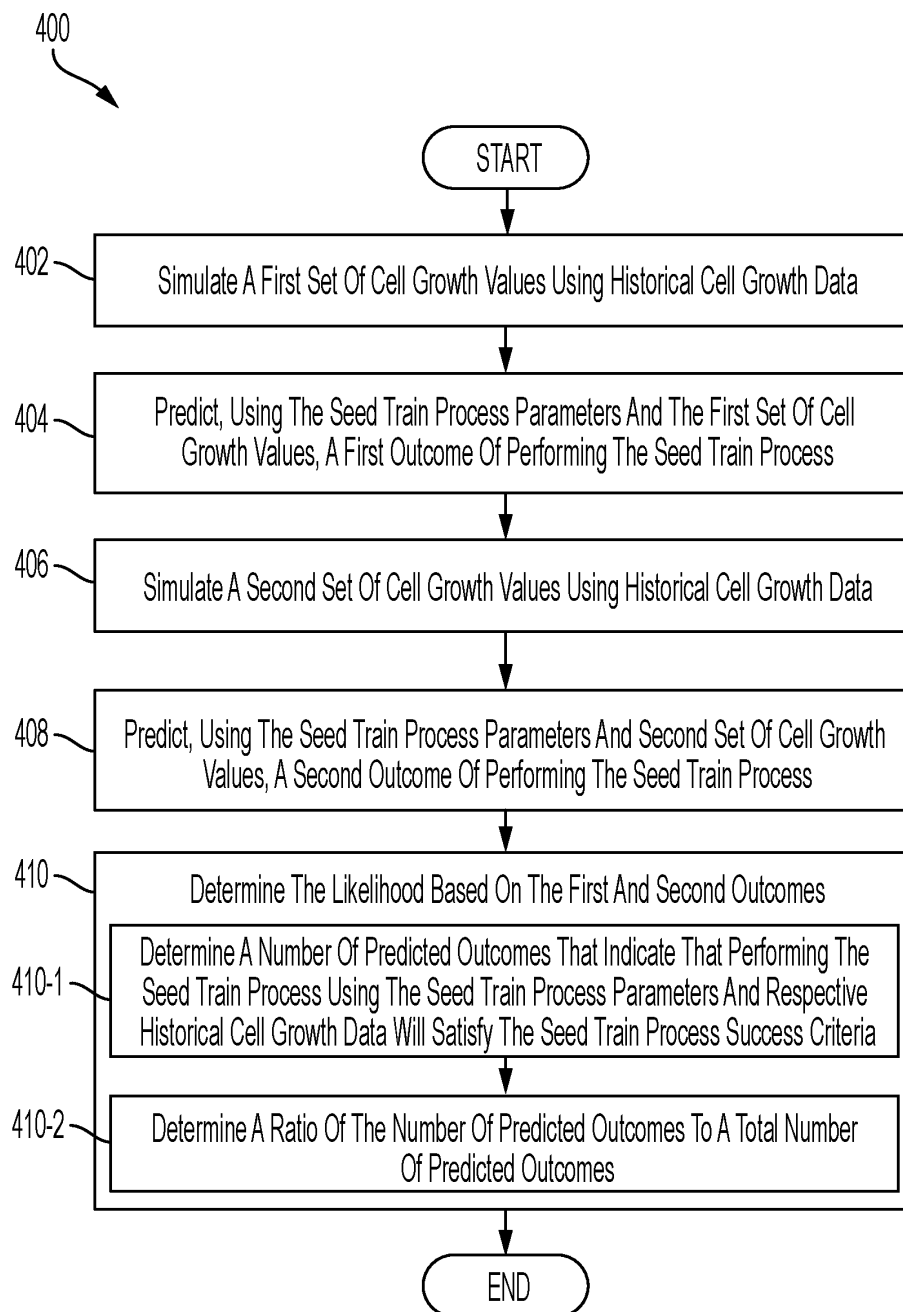


FIG. 4

Container	Passage #	Stage	Container Volume (ml)	Standard Batch Medium Volume (ml)	Batch Volume Lower Limit	Batch Volume Upper Limit (ml)	Standard Working Volume (ml)	Working Volume Lower Limit
Shake flask 1	1	N-8	250	0	0	0	60	50
Shake flask 2	2	N-7	1000	0	0	0	250	150
Shake flask 3	3	N-6	3000	0	0	0	1000	750
Shake flask 4	4	N-5	3000	0	0	0	1000	750
Shake flask 5	5	N-4	3000	0	0	0	1000	750
Bag	6	N-3	50000	5500	4000	6000	N/A	N/A
Bag	7	N-2	50000	0	0	0	25000	25000
Reactor	8	N-1	500000	90000	90000	115000	N/A	N/A
Reactor	9	N-0	500000	400000	380000	420000	500000	500000

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LEGEND

Seed Train Process Stage Information

Seed Train Process Constraints

FIG. 5A-1

Container	Passage #	Stage	Container Volume (ml)	Working Volume Upper Limit (ml)	Standard Initial VCD (e5)	Initial VCD Lower Limit (e5)	Initial VCD Upper Limit (e5)	Evaporative Loss Fraction
Shake flask 1	1	N-8	250	75	5.00	4.00	8.00	10 ml
Shake flask 2	2	N-7	1000	300	5.00	4.00	8.00	0.10
Shake flask 3	3	N-6	3000	1400	5.00	4.00	8.00	0.10
Shake flask 4	4	N-5	3000	1400	5.00	4.00	8.00	0.10
Shake flask 5	5	N-4	3000	1400	5.00	4.00	8.00	0.10
Bag	6	N-3	50000	N/A	5.00	4.00	8.00	0.05
Bag	7	N-2	50000	25000	N/A	N/A	N/A	0.05
Reactor	8	N-1	500000	N/A	6.00	4.00	9.00	0.05
Reactor	9	N-0	500000	500000	10.00	7.50	12.50	0.05

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LEGEND

Seed Train Process Stage Information

Seed Train Process Constraints

FIG. 5A-2

Container	Passage #	Stage	Container Volume (ml)	Standard Culture Time (h)	Doubling Time - normal (h)	Doubling Time - Worst (h)	Doubling Time - Best (h)	Passage Date
Shake flask 1	1	N-8	250	72	29.00	34.3	22.3	9/6/2021
Shake flask 2	2	N-7	1000	72	28.00	31.8	23.0	9/9/2021
Shake flask 3	3	N-6	3000	72	27.00	31.4	22.9	9/12/2021
Shake flask 4	4	N-5	3000	72	27.00	33.0	22.9	9/15/2021
Shake flask 5	5	N-4	3000	72	27.00	32.7	21.9	9/18/2021
Bag	6	N-3	50000	72	27.00	33.1	22.8	9/21/2021
Bag	7	N-2	50000	72	29.00	34.7	22.7	9/24/2021
Reactor	8	N-1	500000	96	32.00	39.9	24.6	9/27/2021
Reactor	9	N-0	500000	N/A	#N/A	#N/A	#N/A	10/1/2021

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LEGEND	
	Seed Train Process Stage Information
	Seed Train Process Constraints
	Seed Train Process Parameters

FIG. 5B-1

Container	Passage #	Stage	Container Volume (ml)	Cell Bank Vial VCD (e5)	Skip Stage?	Batch Medium Volume (ml)	Working Volume per Vessel (ml)	Number of Vessels	Initial VCD (e5)
Shake flask 1	1	N-8	250	300	N	0	60	1	5.00
Shake flask 2	2	N-7	1000		N	0	250	1	4.00
Shake flask 3	3	N-6	3000		N	0	1000	1	4.00
Shake flask 4	4	N-5	3000		N	0	1000	1	4.00
Shake flask 5	5	N-4	3000		N	0	1000	2	4.00
Bag	6	N-3	50000		N	5000	6400	1	5.50
Bag	7	N-2	50000		N	0	25000	1	8.45
Reactor	8	N-1	500000		N	100000	114500	1	6.00
Reactor	9	N-0	500000		N	0	500000	1	10.00

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LEGEND

Seed Train Process Stage Information

Seed Train Process Constraints

Seed Train Process Parameters

FIG. 5B-2

Container	Passage #	Stage	Container Volume (ml)	Growth constant - normal (1/h)	Growth constant - Worst (1/h)	Growth constant - Best (1/h)	Total Volume After Loss (ml)
Shake flask 1	1	N-8	250	0.0239	0.0202	0.0311	50
Shake flask 2	2	N-7	1000	0.0248	0.0218	0.0302	220
Shake flask 3	3	N-6	3000	0.0257	0.0221	0.0303	895
Shake flask 4	4	N-5	3000	0.0257	0.0210	0.0302	895
Shake flask 5	5	N-4	3000	0.0257	0.0212	0.0316	1790
Bag	6	N-3	50000	0.0257	0.0210	0.0304	6050
Bag	7	N-2	50000	0.0239	0.0200	0.0305	23720
Reactor	8	N-1	500000	0.0217	0.0174	0.0282	108275
Reactor	9	N-0	500000	#N/A	#N/A	#N/A	#N/A

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LEGEND	
	Seed Train Process Stage Information
	Calculated Seed Train Process Parameters
	Seed Train Process Constraints

FIG. 5C-1

Container	Passage #	Stage	Container Volume (ml)	Minimum Final VCD Required (e5)	Predicted Final VCD - Normal (e5)	Split Ratio	Time Needed - Normal (h)
Shake flask 1	1	N-8	250	20.00	27.95	4.00	54.36
Shake flask 2	2	N-7	1000	18.18	23.78	3.55	56.91
Shake flask 3	3	N-6	3000	12.00	25.40	2.00	38.69
Shake flask 4	4	N-5	3000	12.00	25.40	2.00	38.69
Shake flask 5	5	N-4	3000	20.86	25.40	2.79	60.13
Bag	6	N-3	50000	25.35	34.92	2.00	57.37
Bag	7	N-2	50000	31.30	47.24	4.22	52.58
Reactor	8	N-1	500000	46.18	48.00	3.62	91.64
Reactor	9	N-0	500000	#N/A	#N/A	#N/A	#N/A

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LEGEND	
	Seed Train Process Stage Information
	Calculated Seed Train Process Parameters
	Seed Train Process Constraints

FIG. 5C-2

Container	Passage #	Stage	Container Volume (ml)	Extra Time Needed- Normal (h)	Extra Time Needed- Worst (h)	Final VCD - Best (e5)
Shake flask 1	1	N-8	250	-17.64	-7.71	46.82
Shake flask 2	2	N-7	1000	-15.09	-7.44	35.16
Shake flask 3	3	N-6	3000	-33.31	-27.08	35.40
Shake flask 4	4	N-5	3000	-33.31	-24.74	35.21
Shake flask 5	5	N-4	3000	-11.87	0.75	38.95
Bag	6	N-3	50000	-14.63	-1.72	48.92
Bag	7	N-2	50000	-19.42	4.98	112.53
Reactor	8	N-1	500000	-4.36	18.15	89.77
Reactor	9	N-0	500000	#N/A	#N/A	#N/A

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LEGEND

Seed Train Process Stage Information

Success Criteria Satisfied

Success Criteria Not Satisfied

FIG. 5D

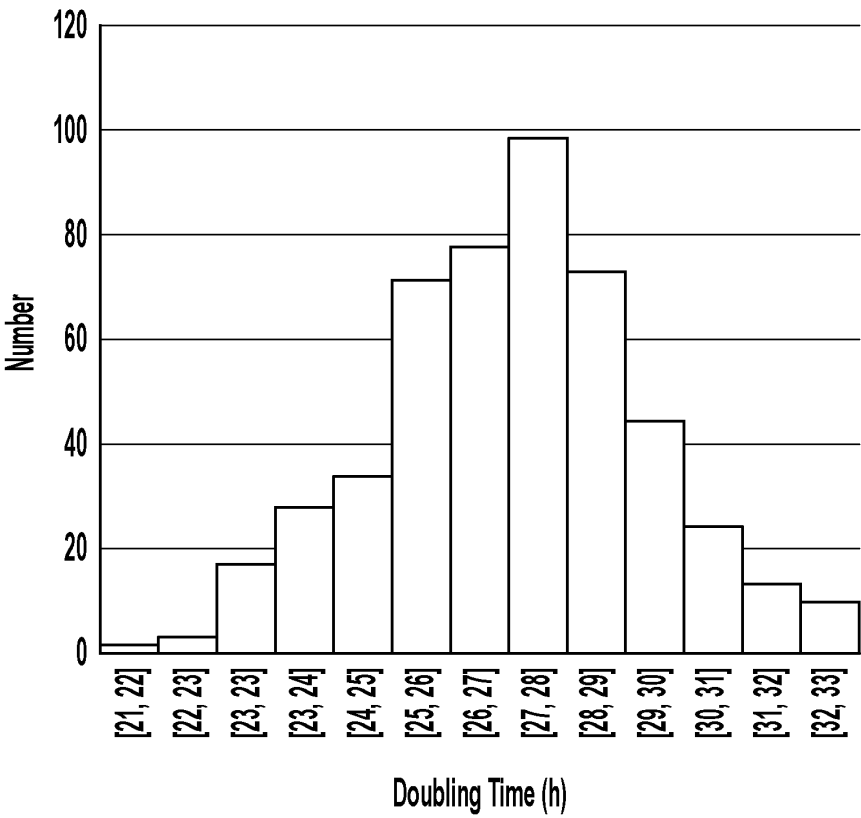


FIG. 6

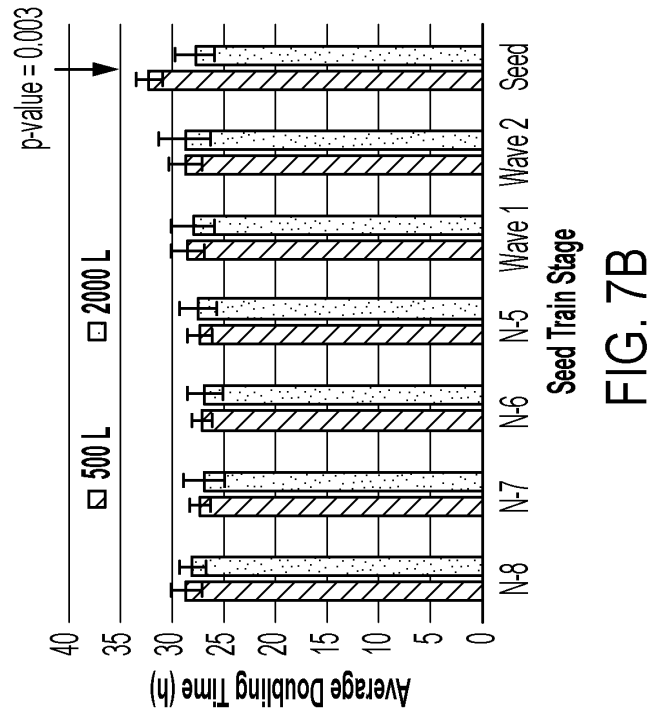


FIG. 7B

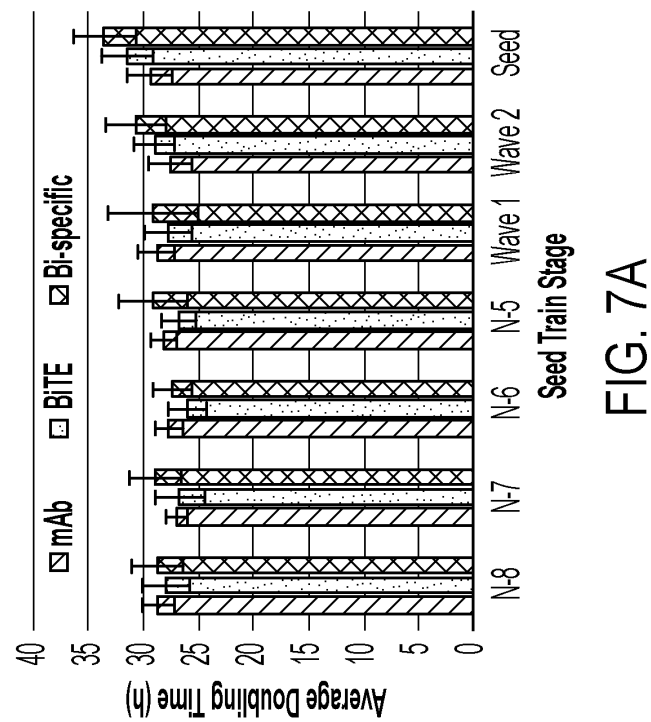


FIG. 7A

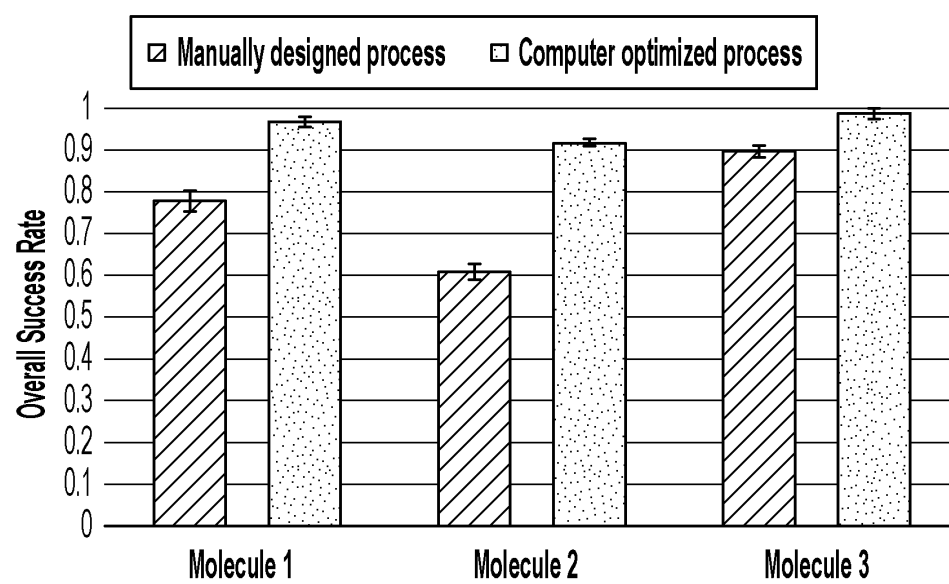


FIG. 8A

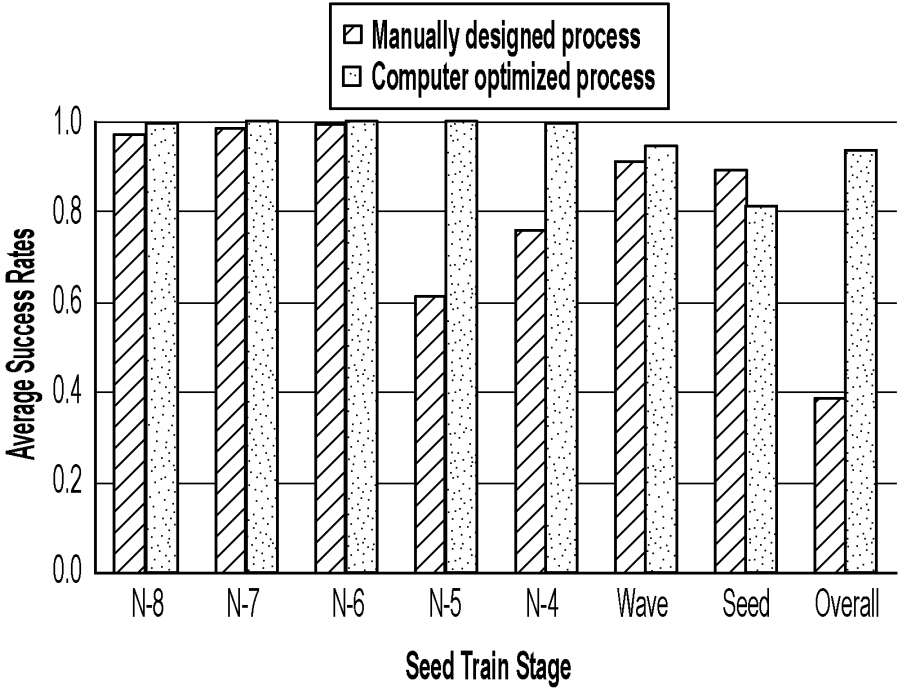


FIG. 8B

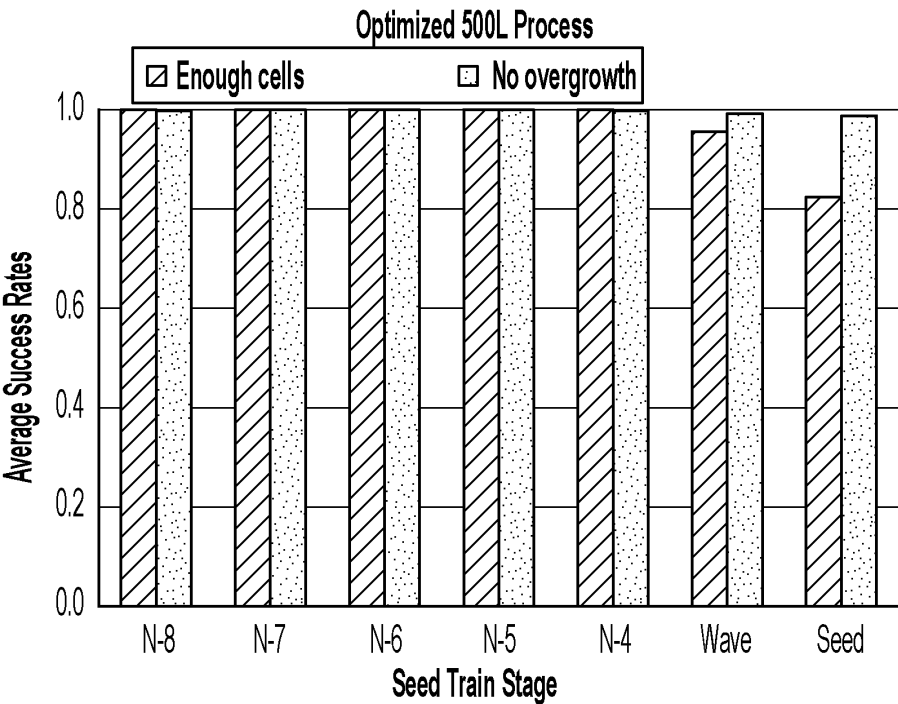


FIG. 8C

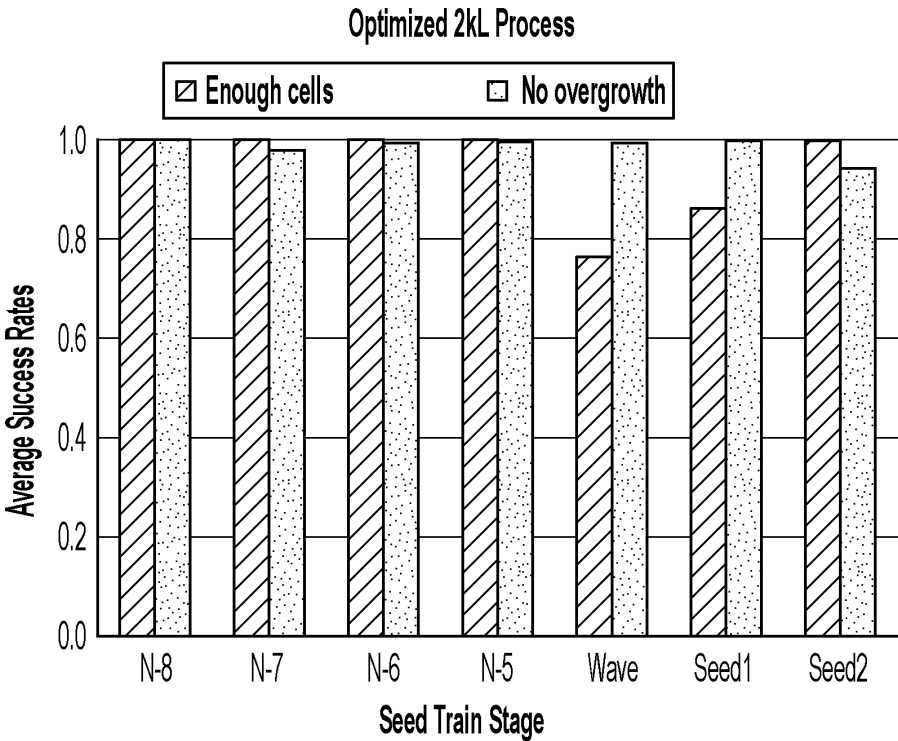


FIG. 8D

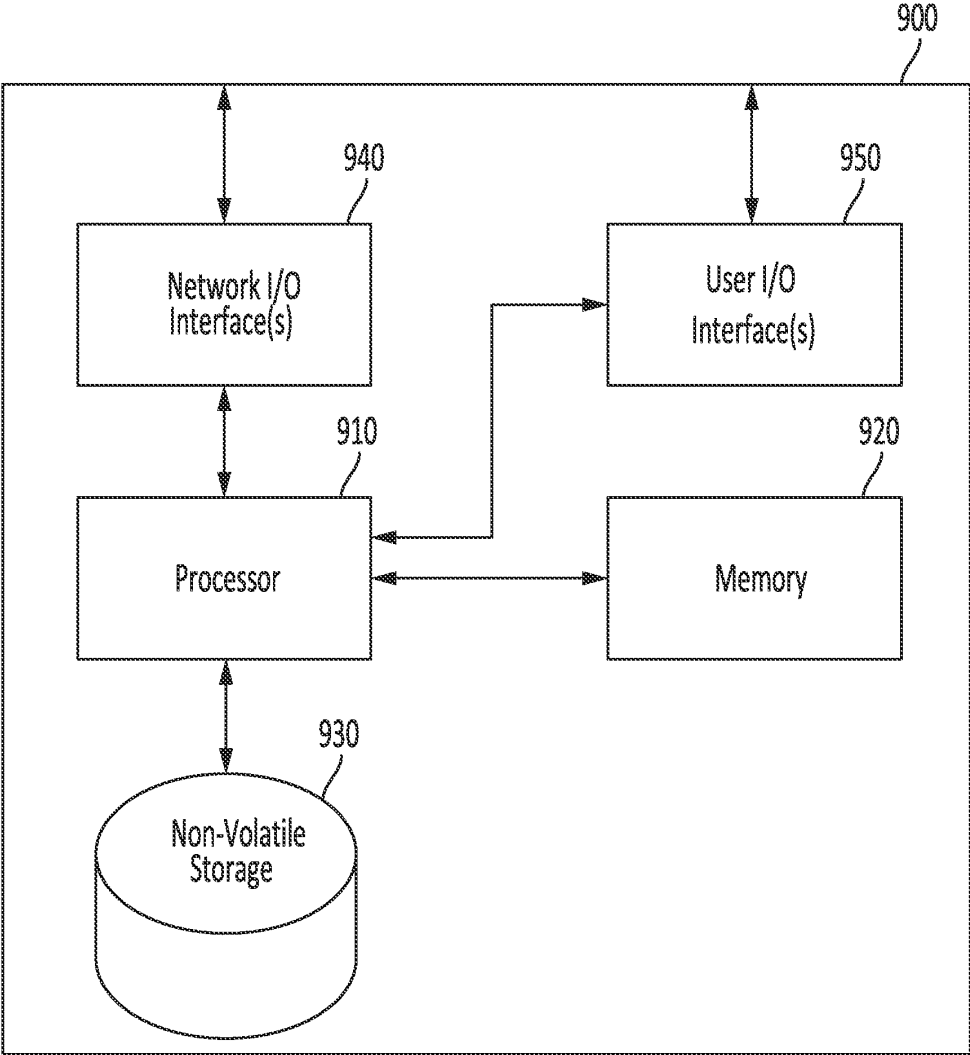


FIG. 9