

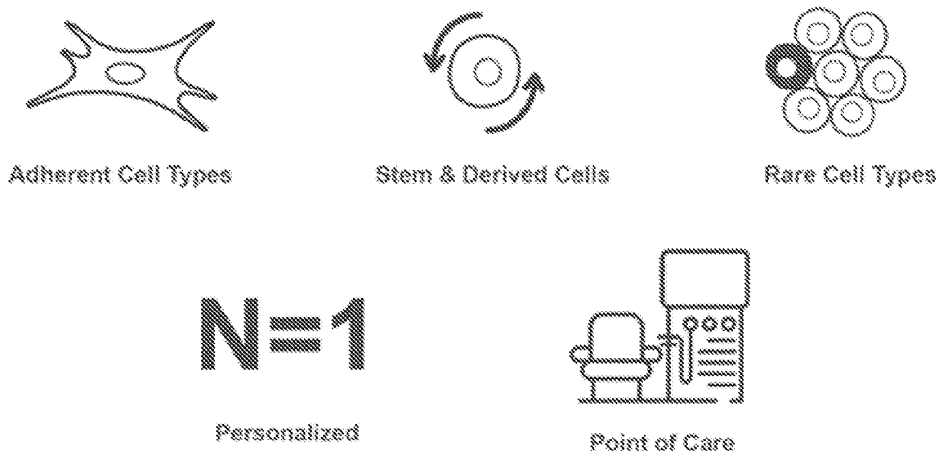


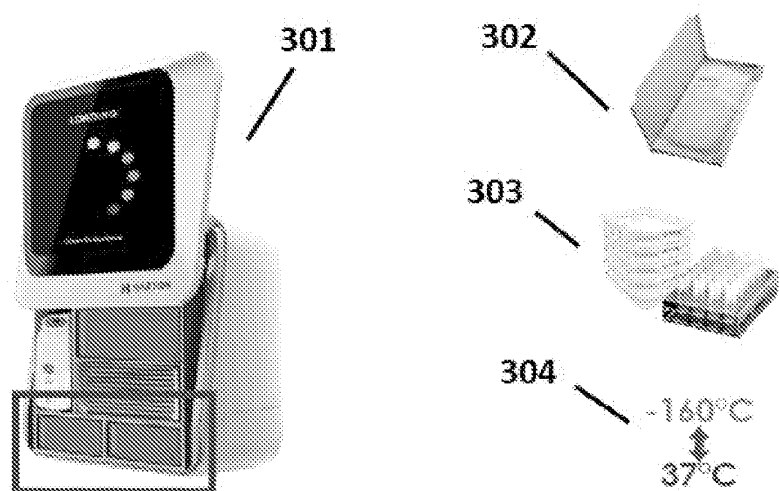
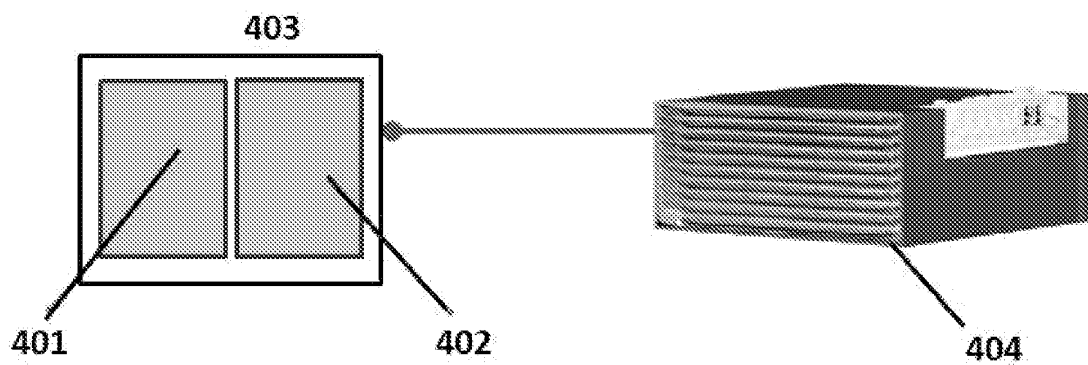
FIG. 1

Cell Therapy Paradigm	Examples	FDA Approved?	Manufacturing Details			Application Fit		
			Time	Scale	Site	Autologous	Allogeneic	Personalized
Rapid	T-Change (Nivolumab) w/PC (SQZ)	X	24 - 48 Hours	10 ⁷ - 10 ⁸ Cells 100 - 400 mL	POC, Distributed, Centralized	✓	X	✓
Other	Abecma, Breyanzi, Carvykti, Kymriah, Tecartus, Yescarta	✓	7 - 14 Days	10 ⁷ - 10 ⁸ Cells 1 - 4 L	Distributed, Centralized	✓	✓	✓

Max Cell Density	Cell Volume - 500 M Cells	Size Reference
20 M / mL	25 mL	~30% Volume of iPhone 14
100 M / mL	5 mL	~5% Volume of iPhone 14

FIG. 2

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*FIG. 3**FIG. 4*

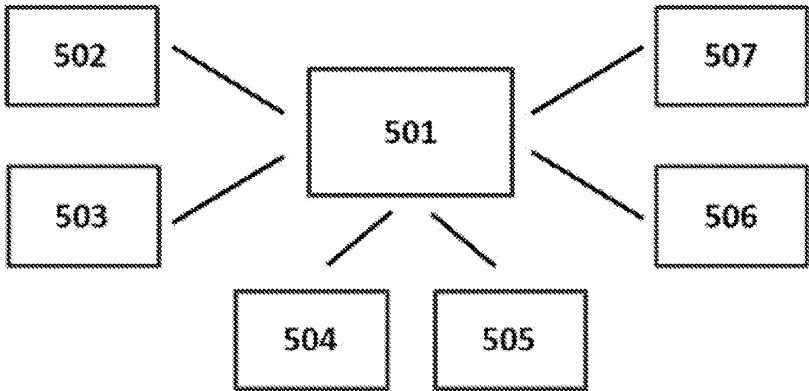


FIG. 5A

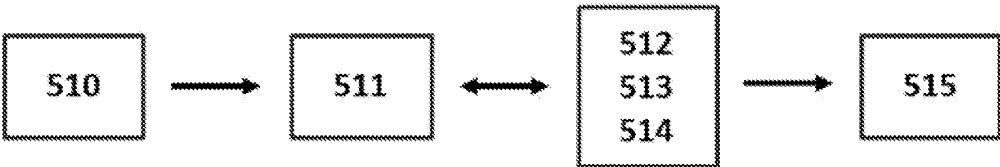


FIG. 5B

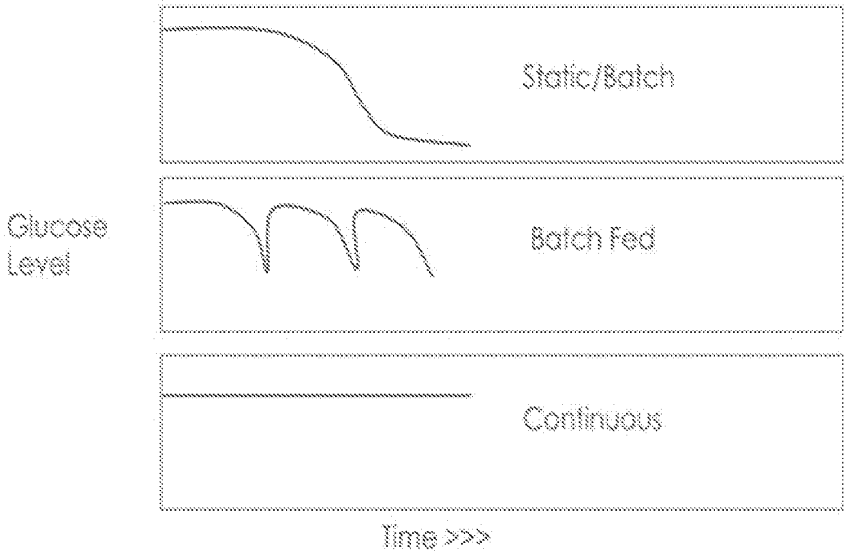


FIG. 6

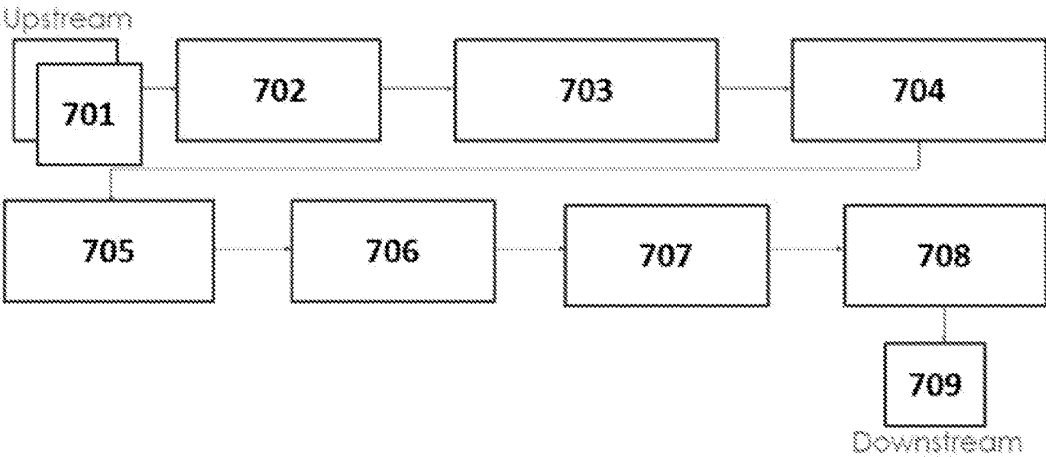


FIG. 7

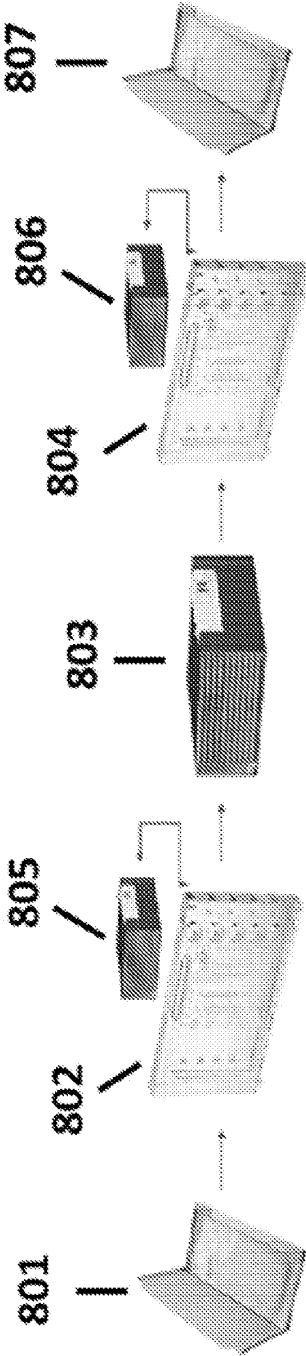
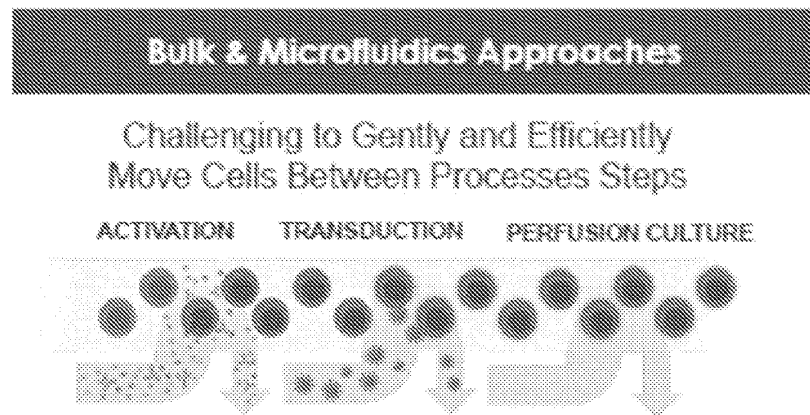
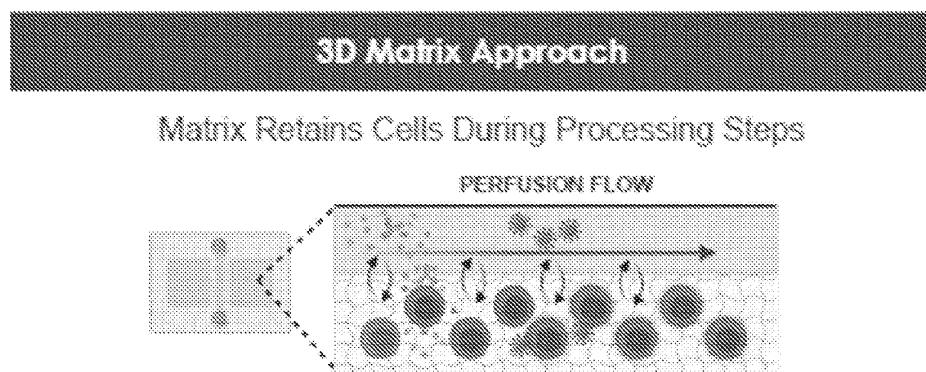
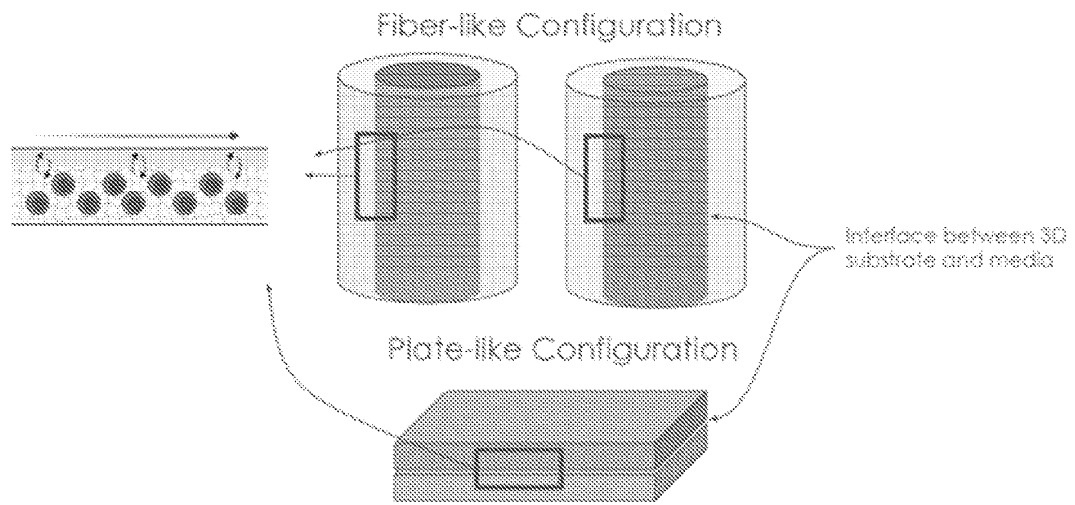
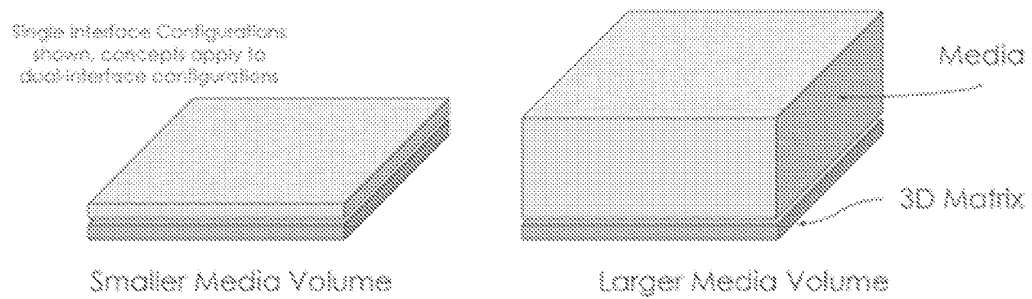


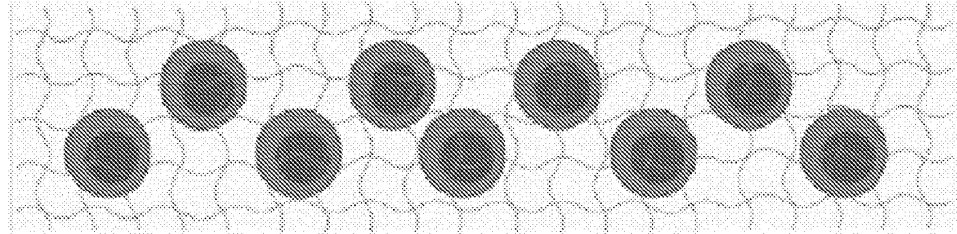
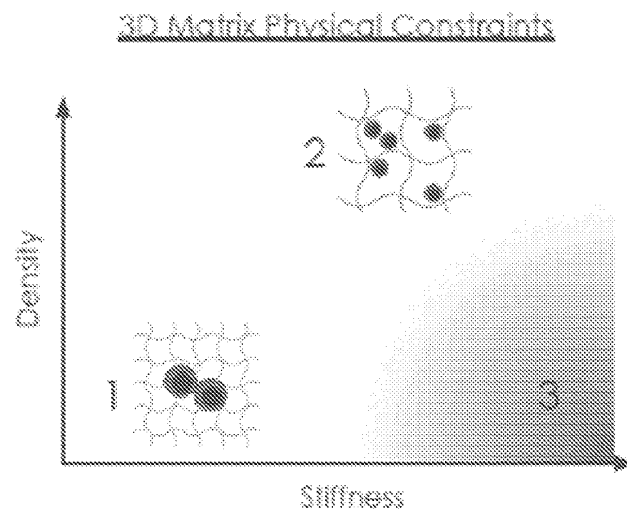
FIG. 8

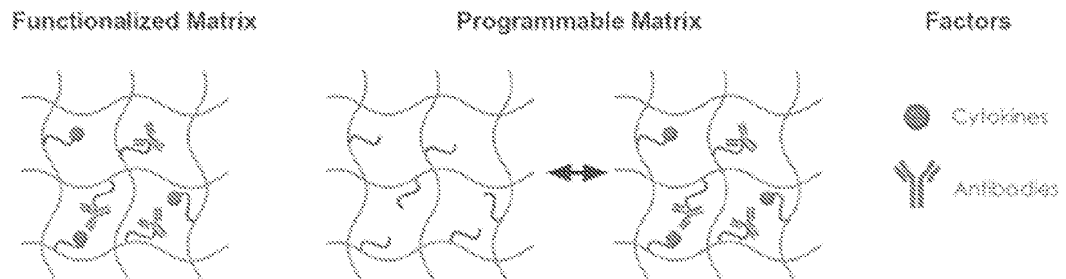
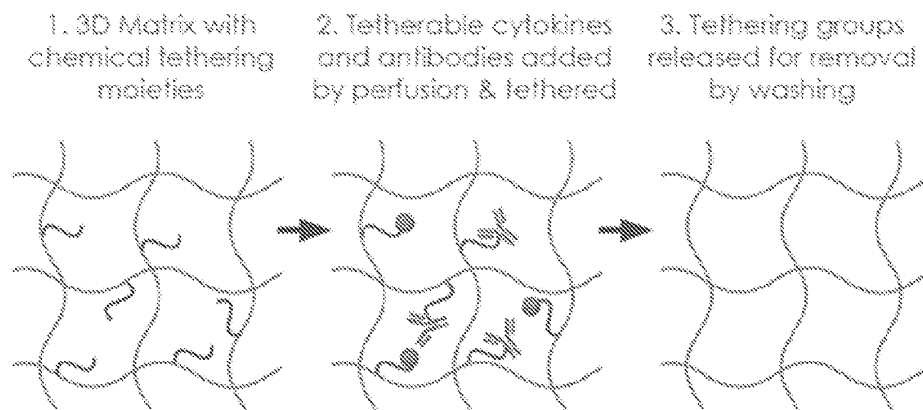
**FIG. 9A****FIG. 9B**

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**FIG. 10A****FIG. 10B**

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**FIG. 11A****FIG. 11B**

**FIG. 12A****FIG. 12B**

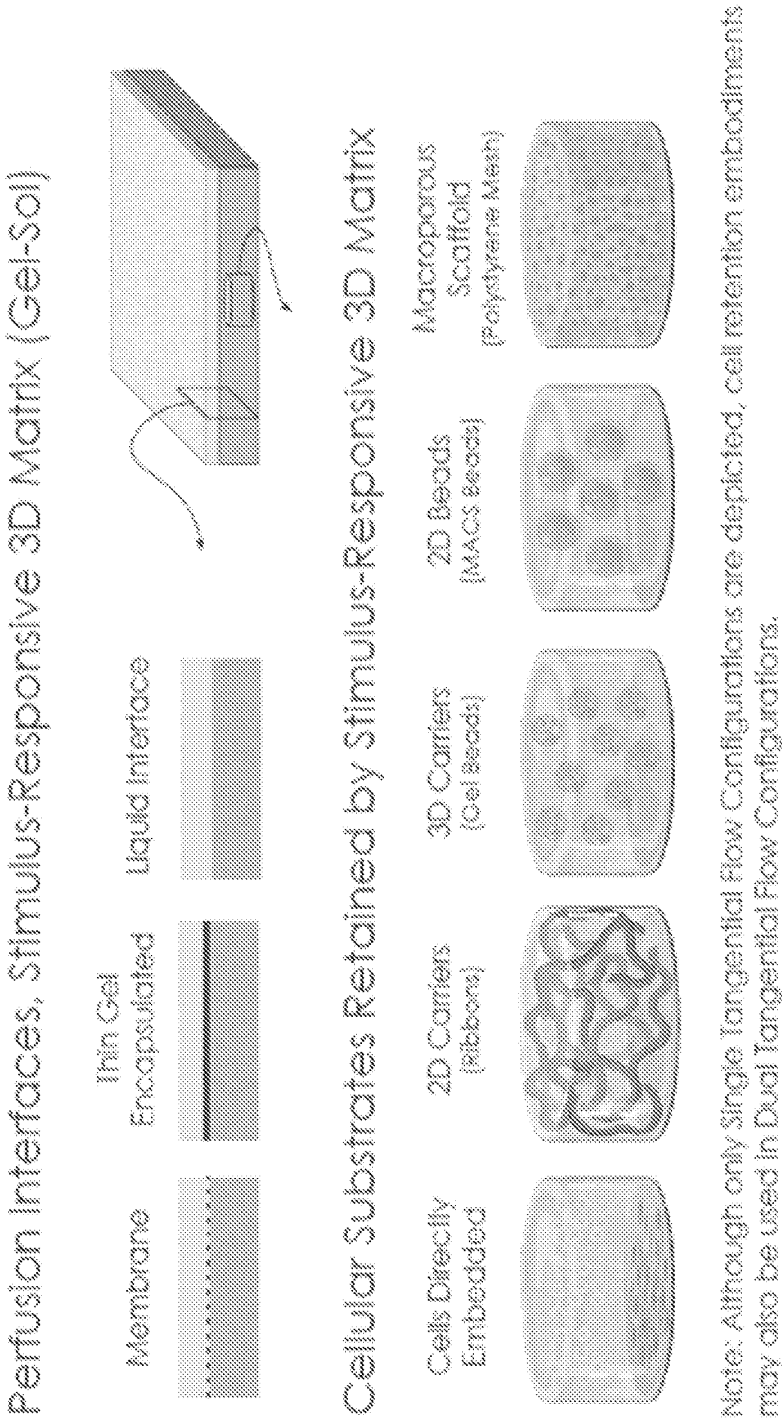


FIG. 13

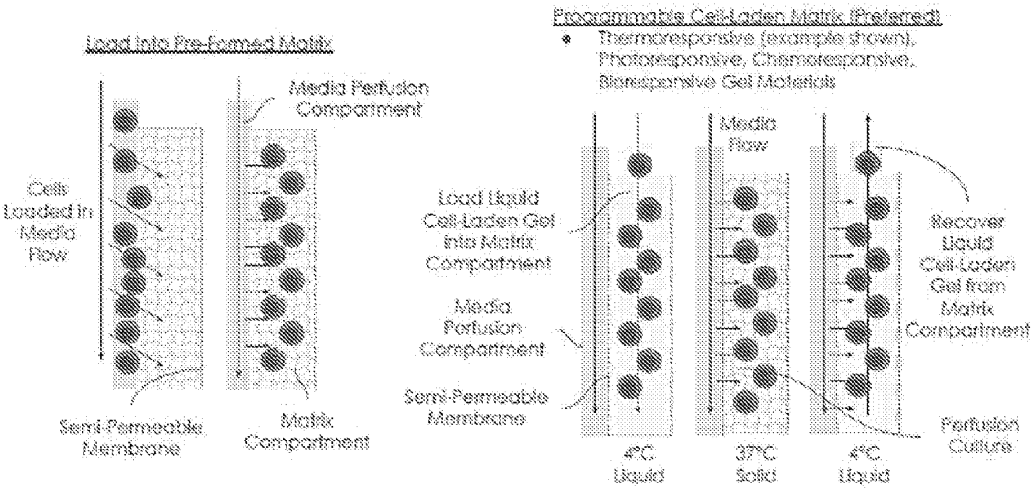


FIG. 14

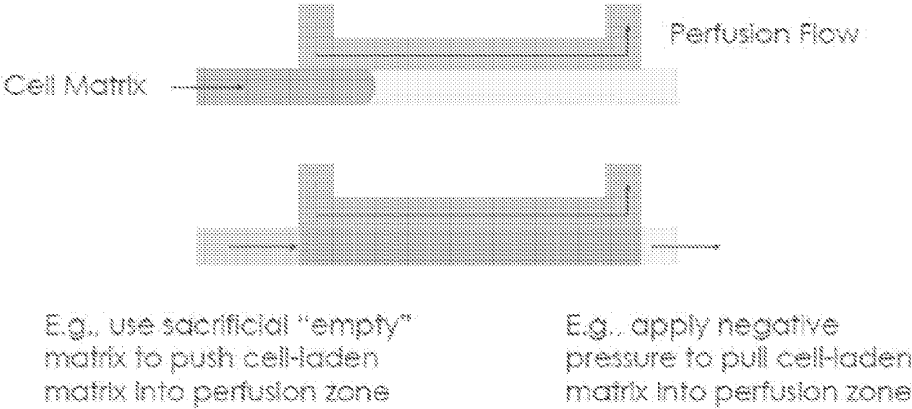


FIG. 15

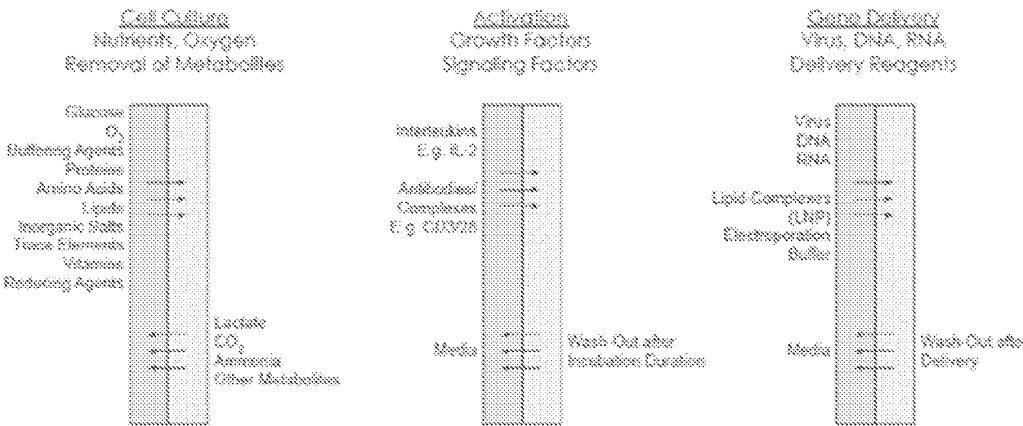


FIG. 16A

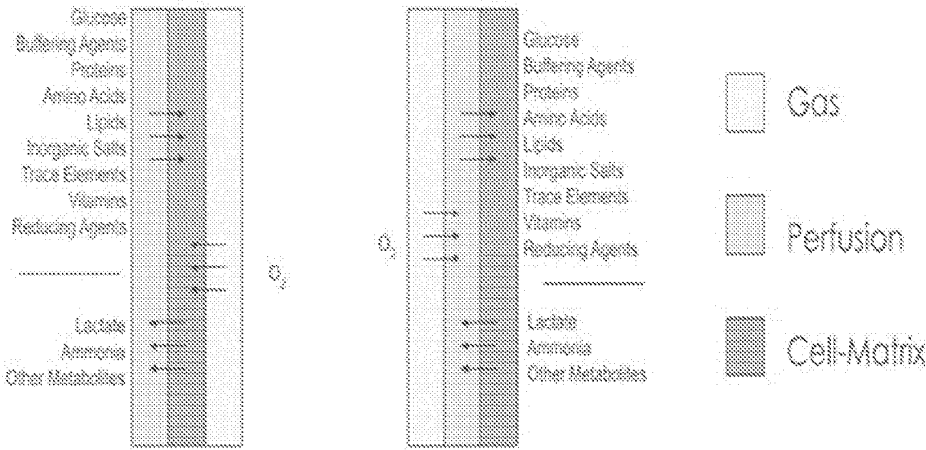


FIG. 16B

Semi-Permeable Membrane Cutoffs			
Class	Example(s)	Approx. Size Range	Example Filter Cutoff (Delivery)
Metabolites	Glucose (180 Da), Lactate (89 Da)	10-100's Da	1 - 10 kDa
Culture Factors	IL-2 (16 kDa), IL-7 (25 kDa), IL-15 (15 kDa) Anti-CD3 (51 kDa), Anti-CD28 (85 kDa)	10-100's kDa	0.2 μ m
Gene Delivery	γ -retroviral, Lentiviral Vectors (~50-150 nm) pDNA, DNA, RNA (~1000's kDa) CAS9 RNP (~200 kDa, ~10 nm)	1000's kDa 10's - 100's nm	0.2 μ m
Beads/Complexes	Anti-CD3/CD28 Tektamers (ImmunoCell) (~500 kDa) Anti-CD3/CD28 Gel Bead (TransACT) (~100 nm)	100's kDa 100+ nm	0.2 μ m
Cells	CD3+ T Cell (6 μ m)	1 - 10+ μ m	N/A

FIG. 17

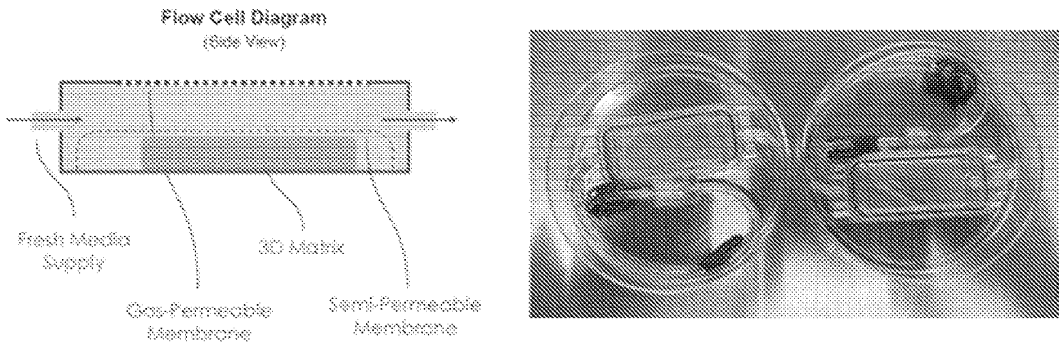


FIG. 18

Single Tangential Flow Configurations & Gas Supply

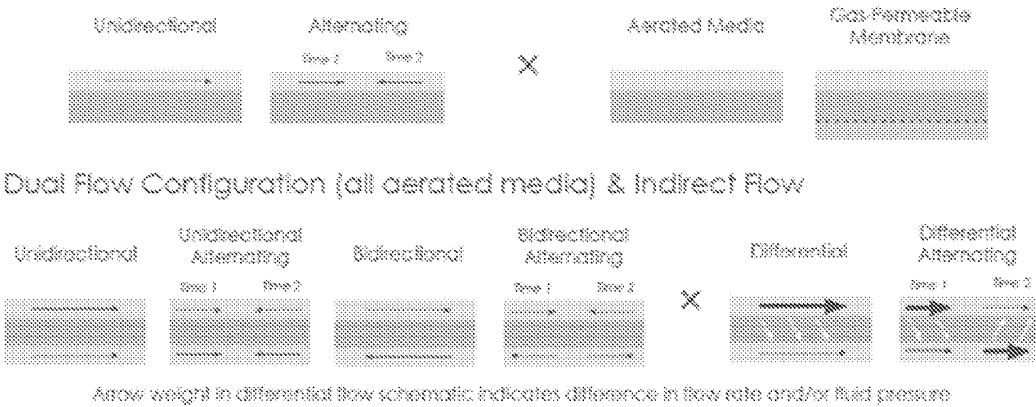
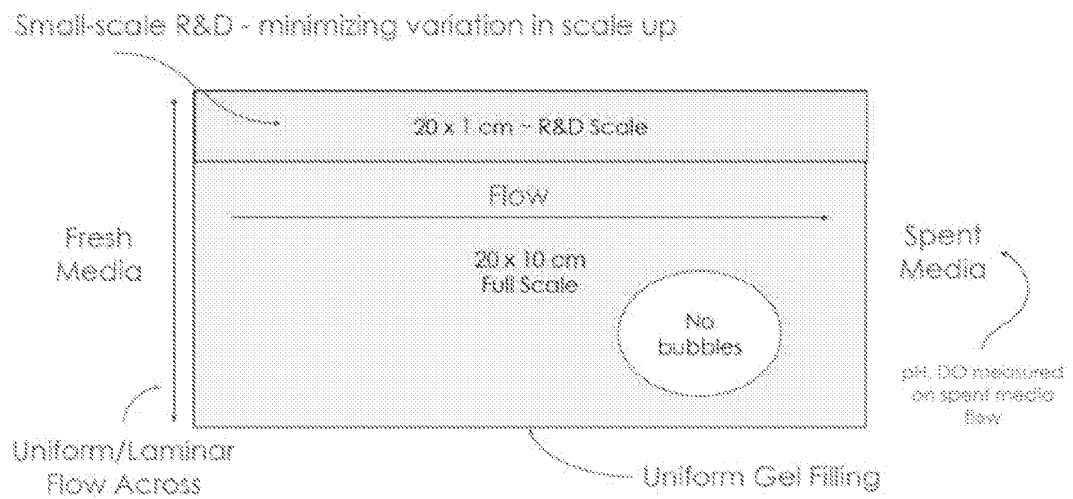


FIG. 19

**FIG. 20**

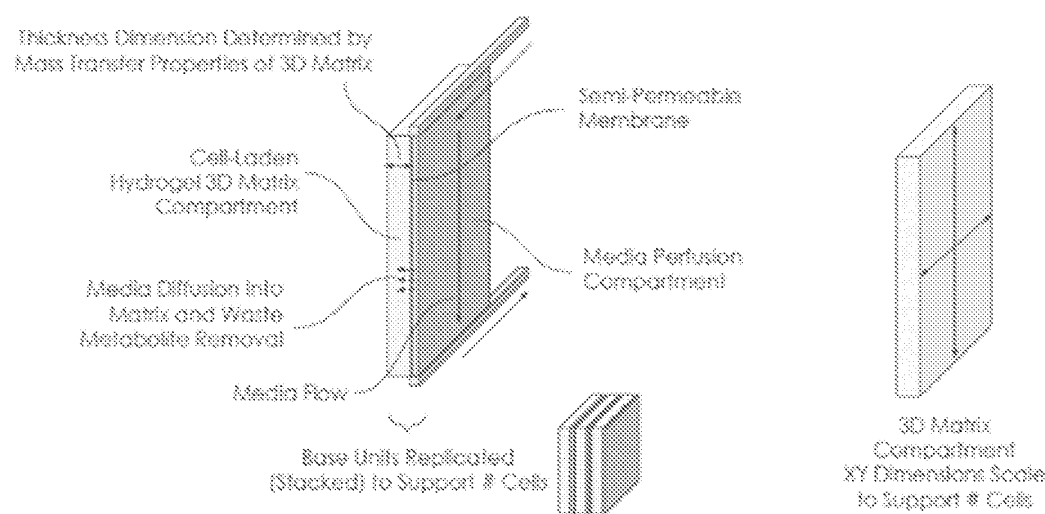


FIG. 21A

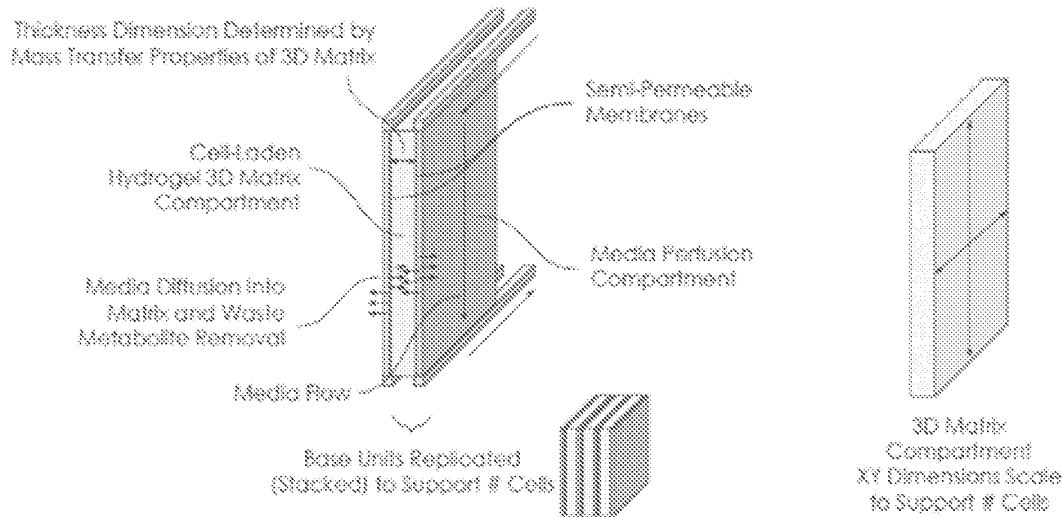
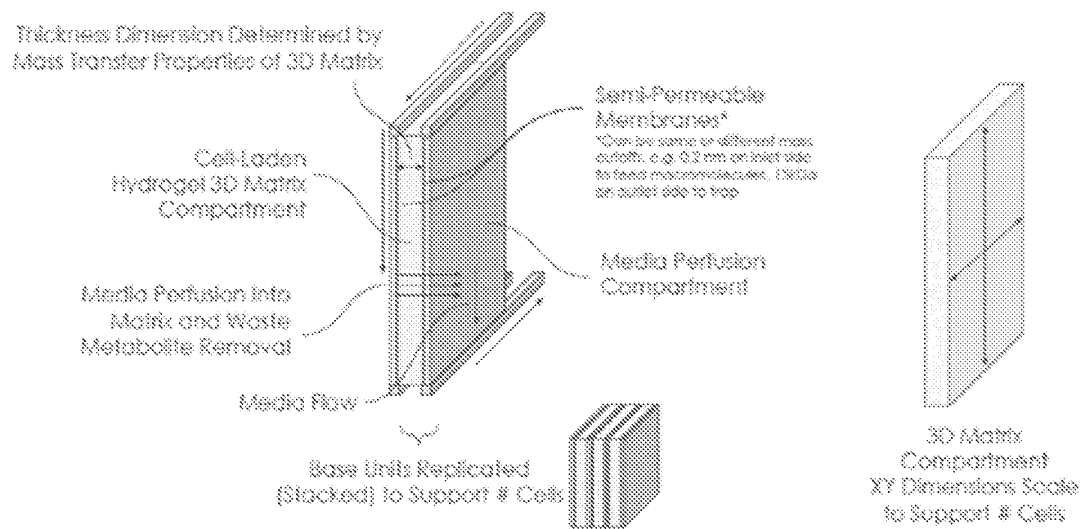


FIG. 21B

**FIG. 21C**

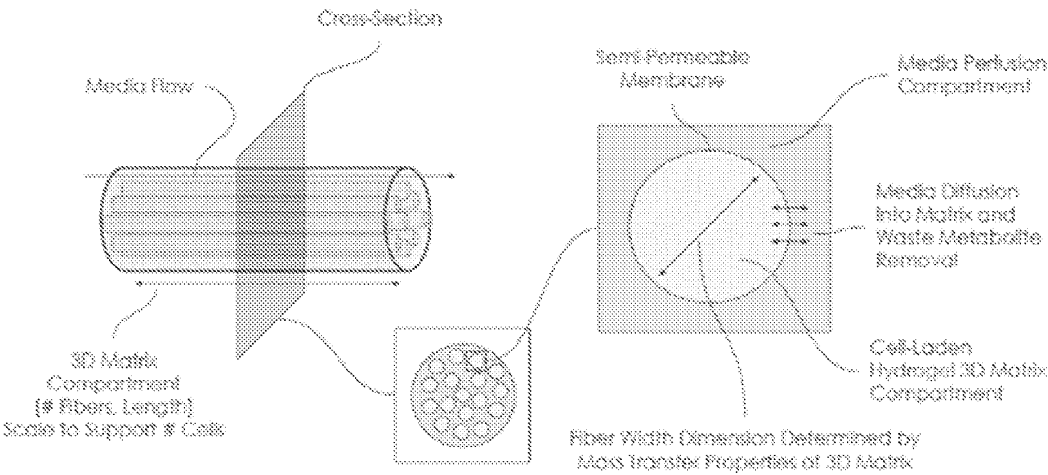


FIG. 22A

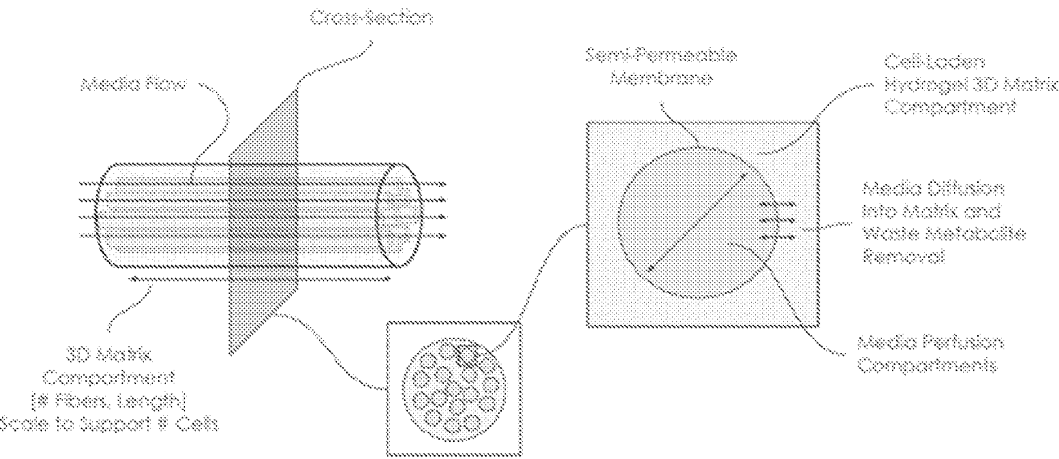
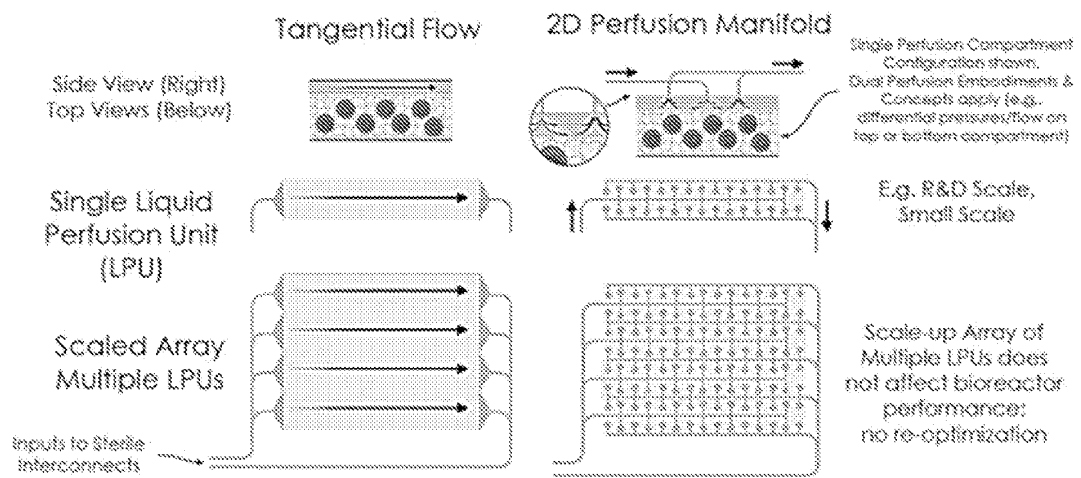
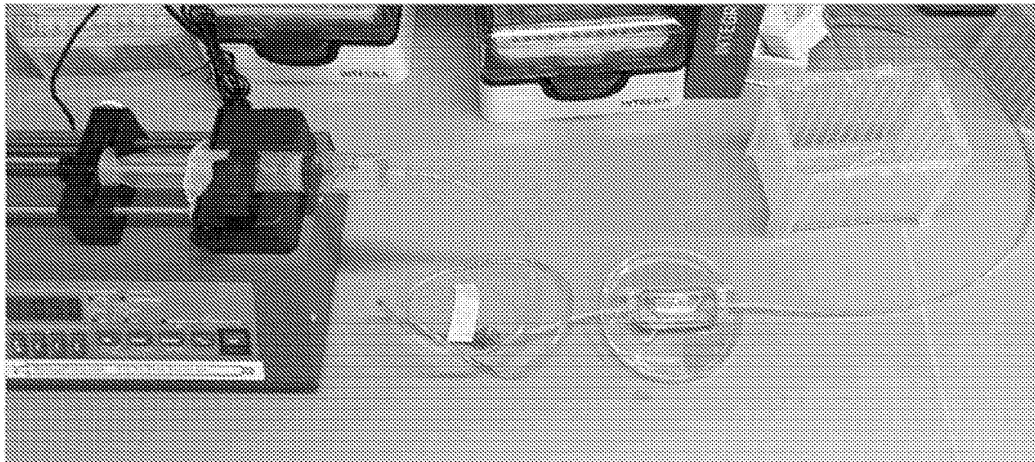
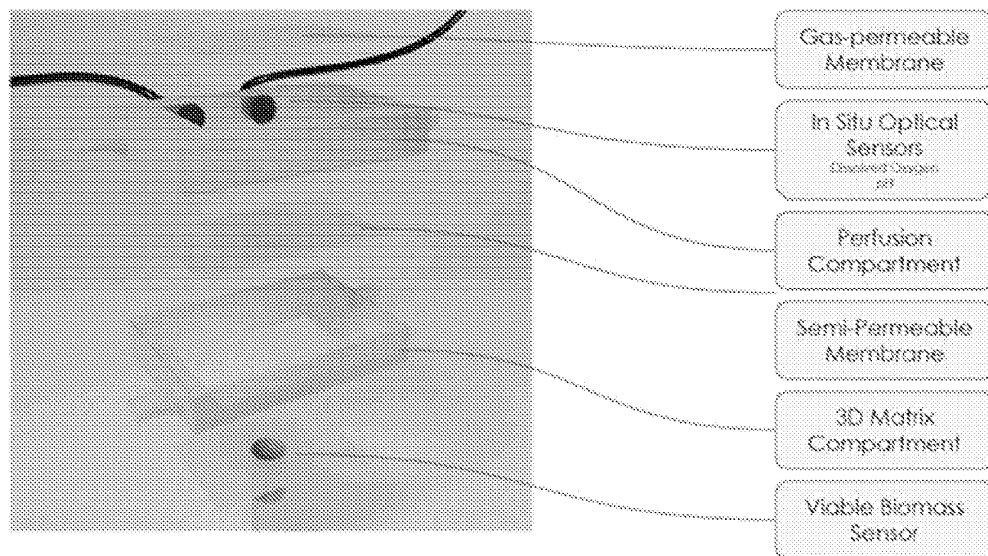
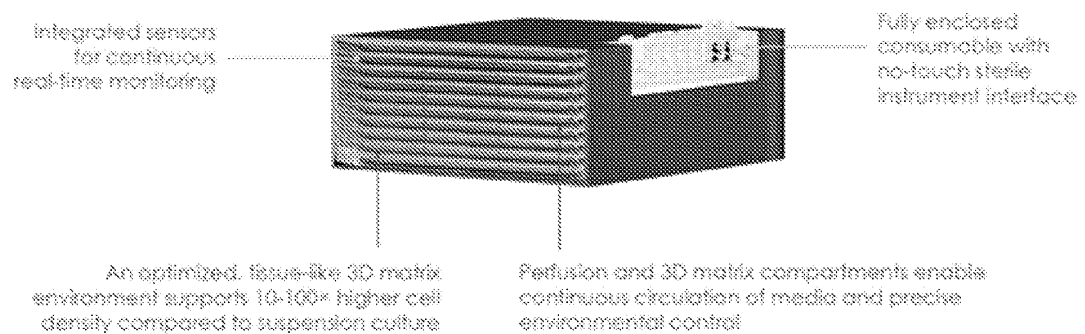


FIG. 22B

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**FIG. 23****FIG. 24**

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**FIG. 25****FIG. 26**

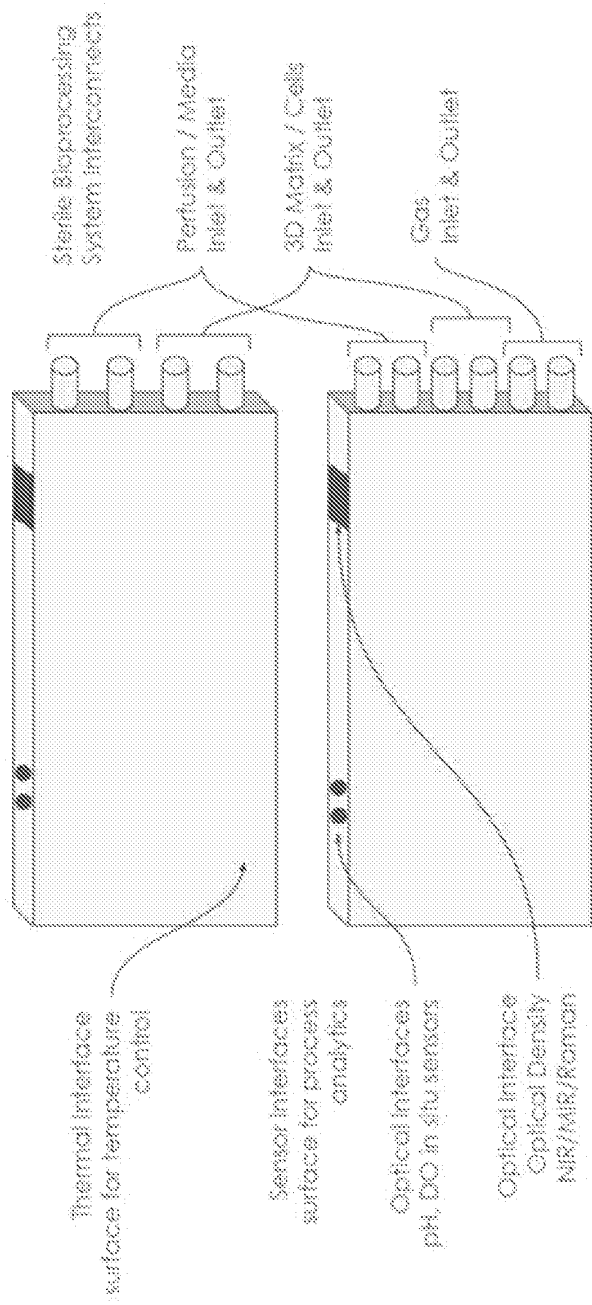


FIG. 27

Example Alt. Vessel Configuration Embodiments

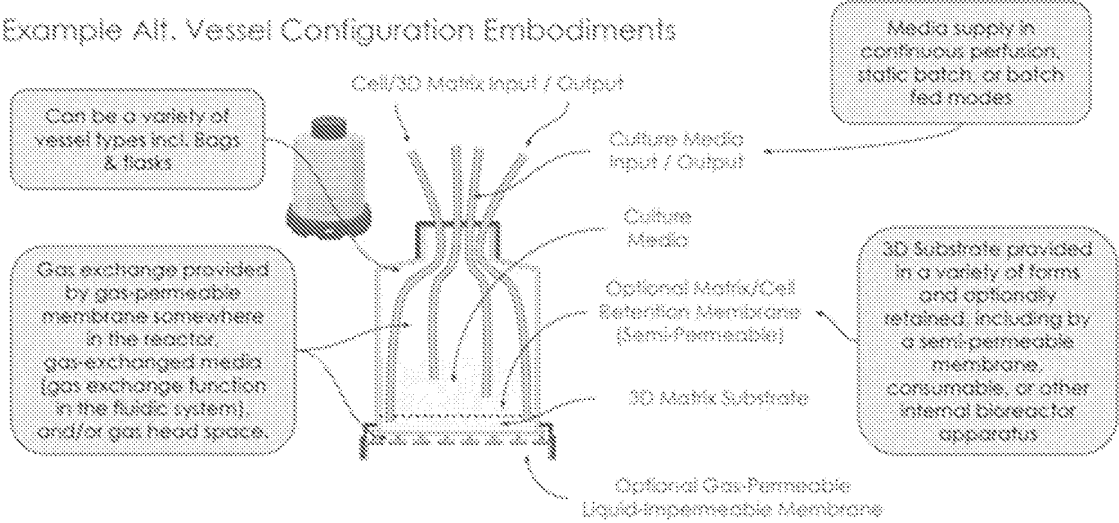


FIG. 28

3D Substrate Configurations
For use in other bioreactor configurations

Alternative Bioreactor Vessel Types

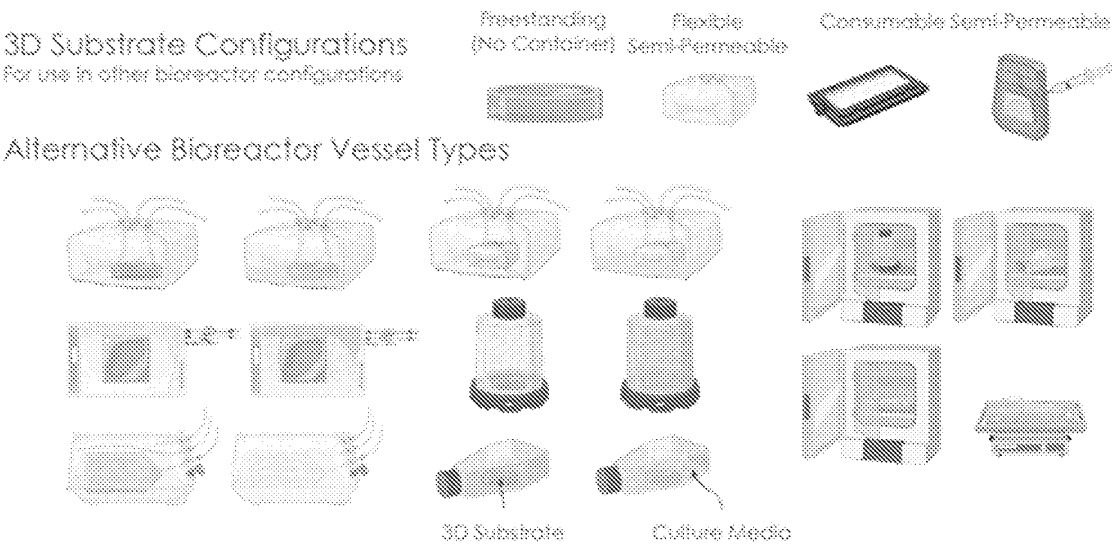


FIG. 29

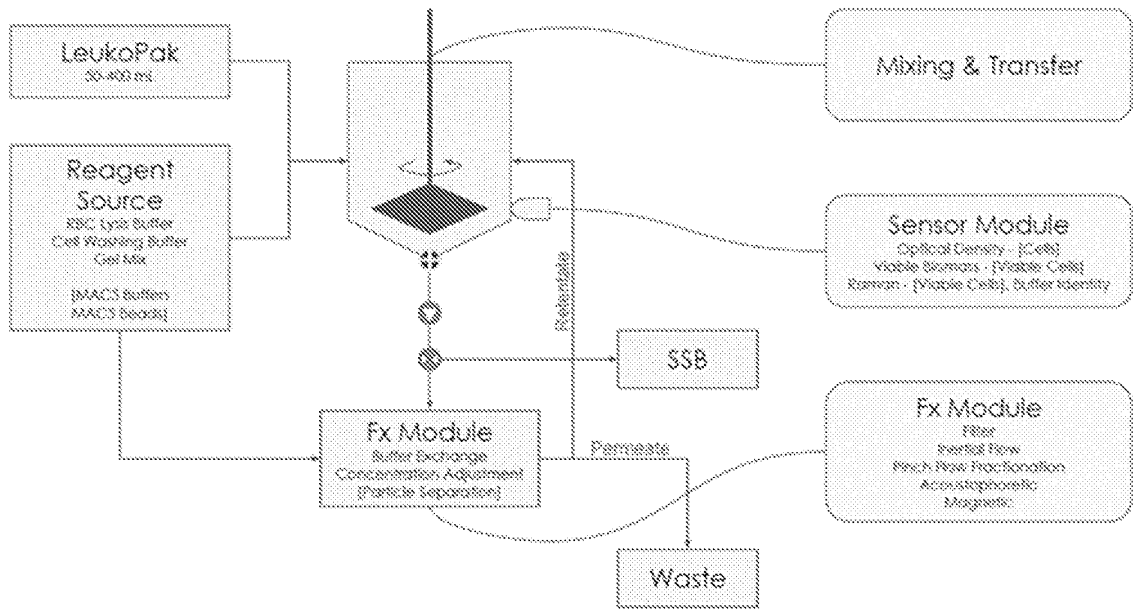


FIG. 30

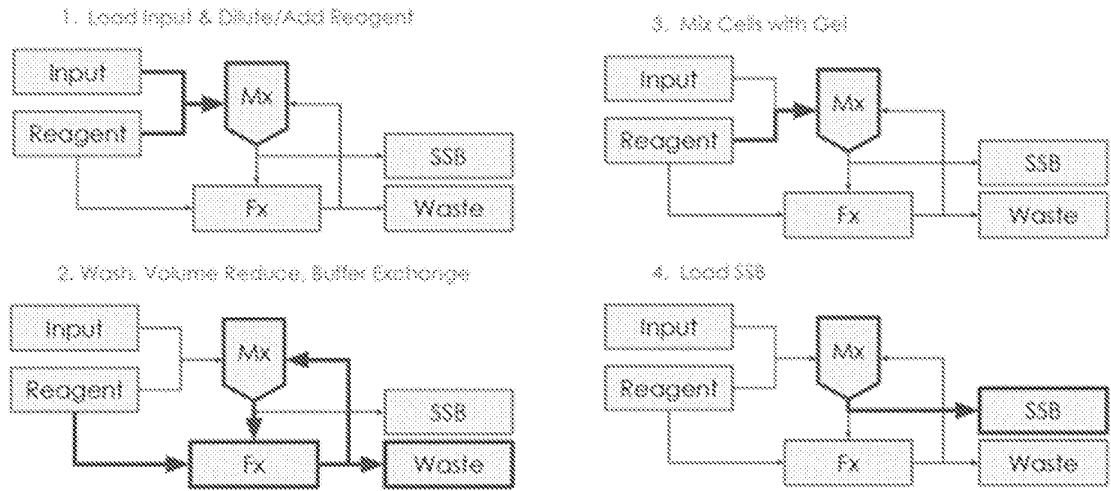


FIG. 31

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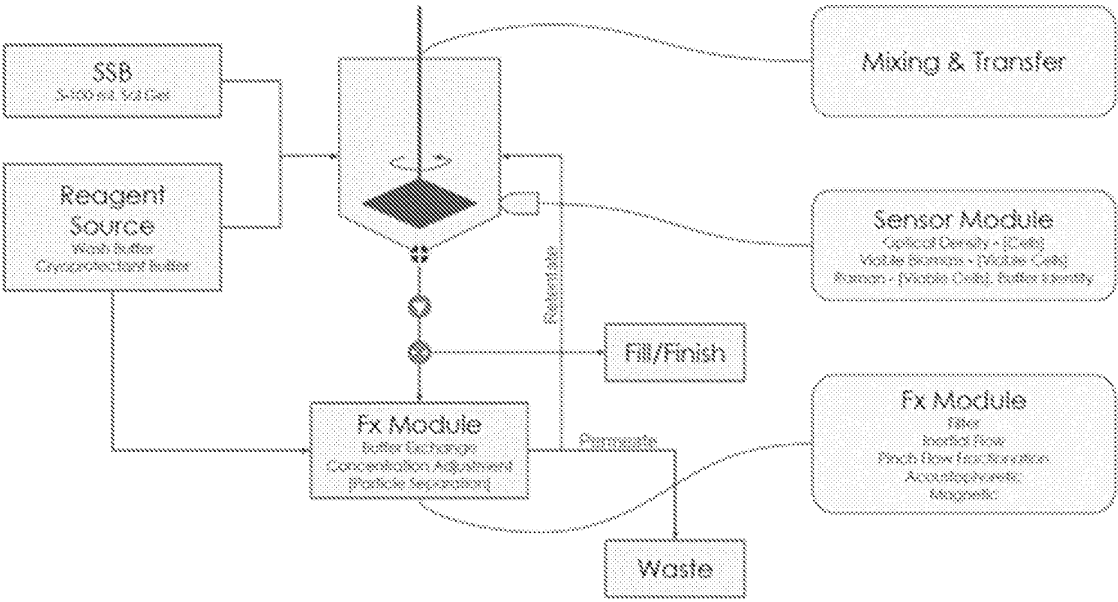


FIG. 32

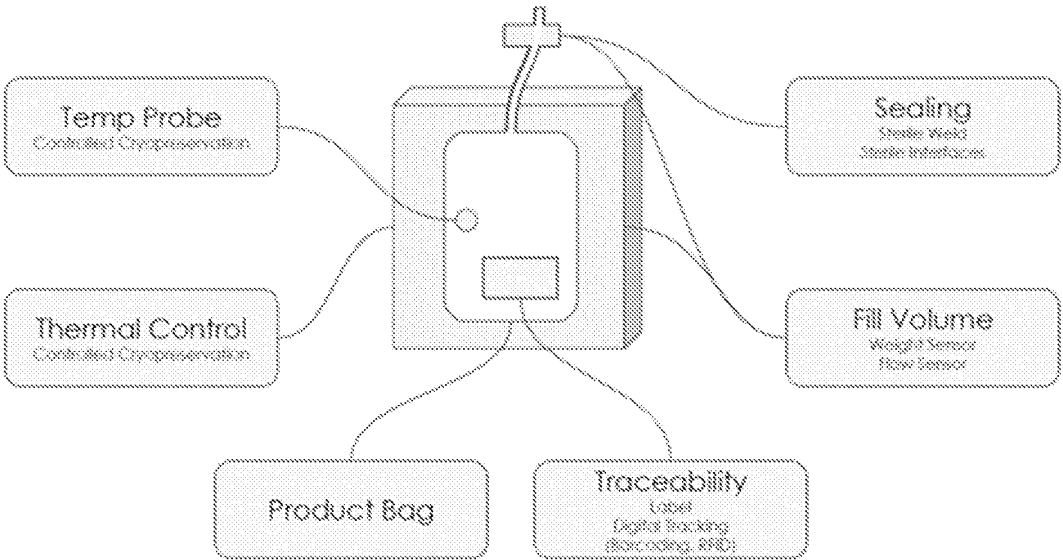


FIG. 33

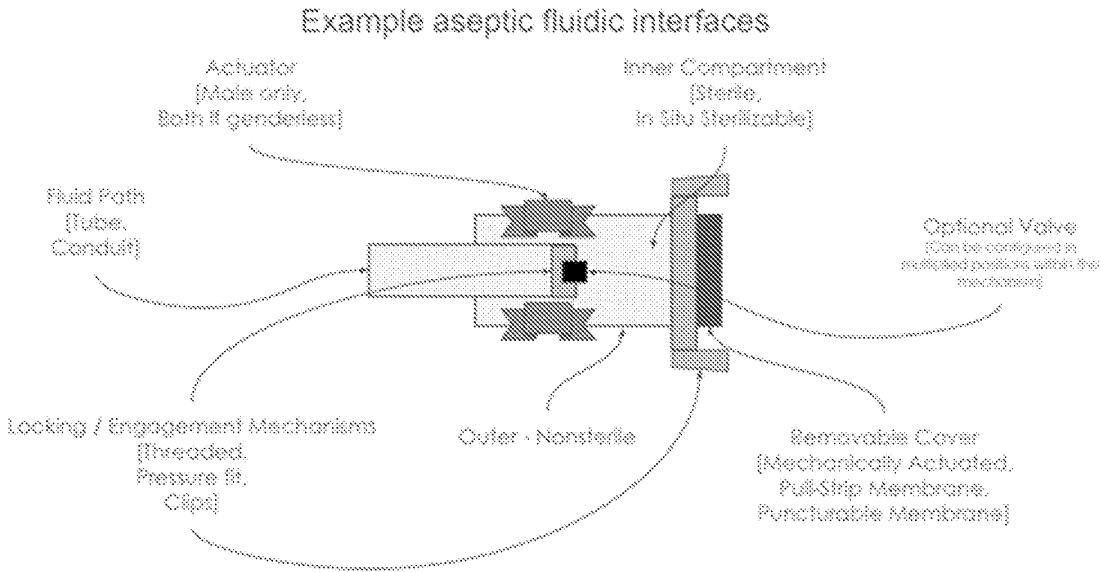


FIG. 34

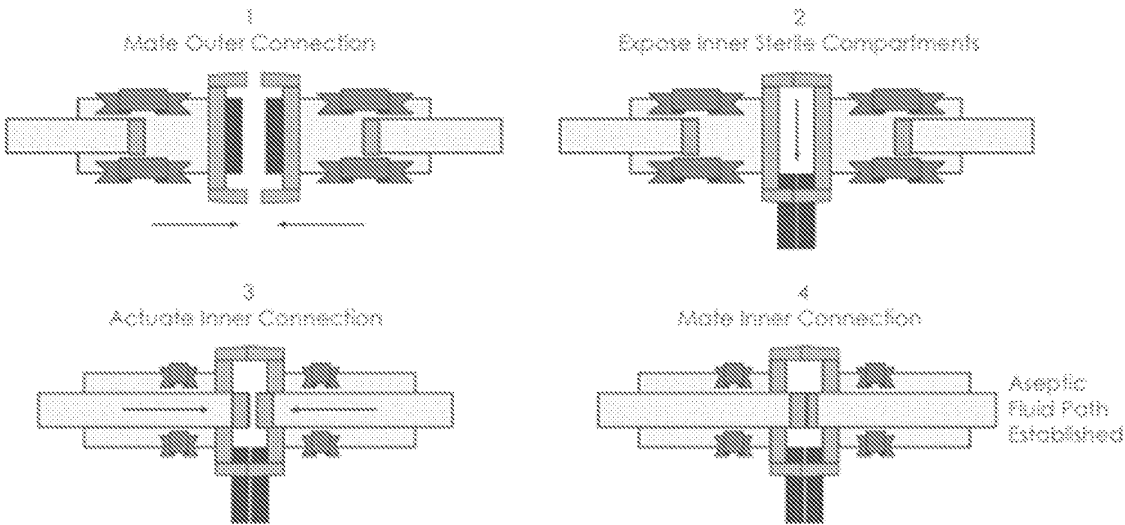
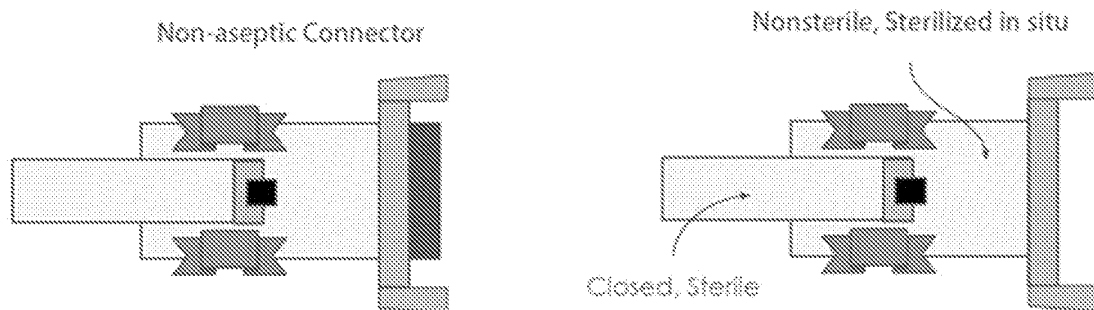
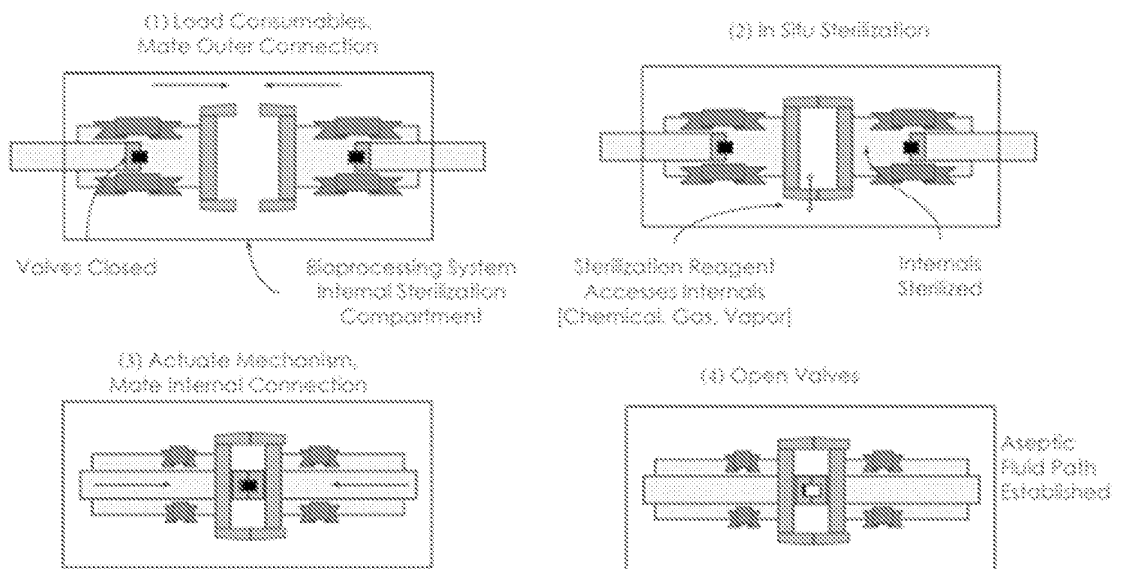
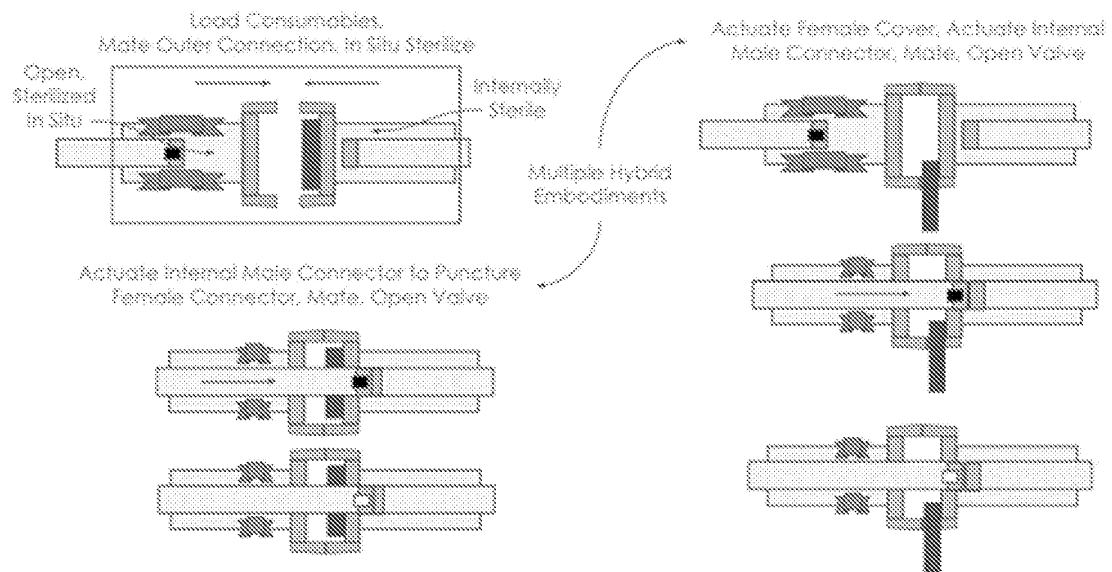
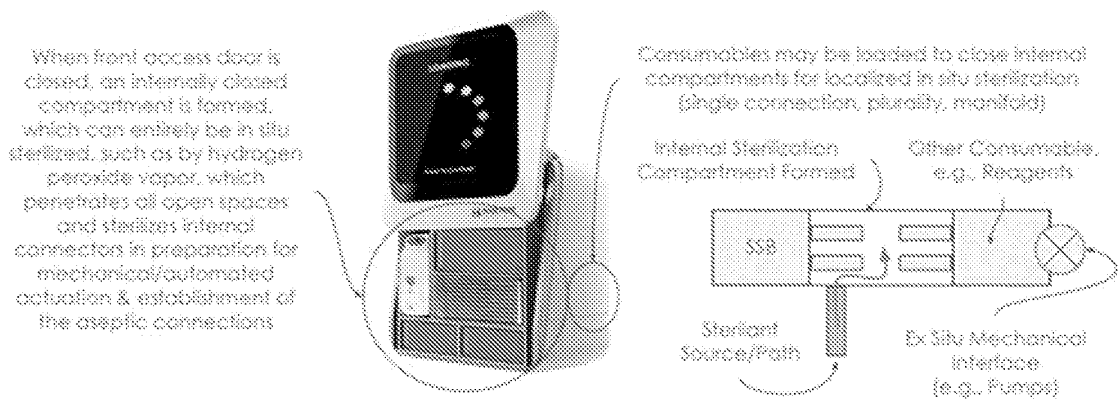


FIG. 35

**FIG. 36****FIG. 37**

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**FIG. 38****FIG. 39**

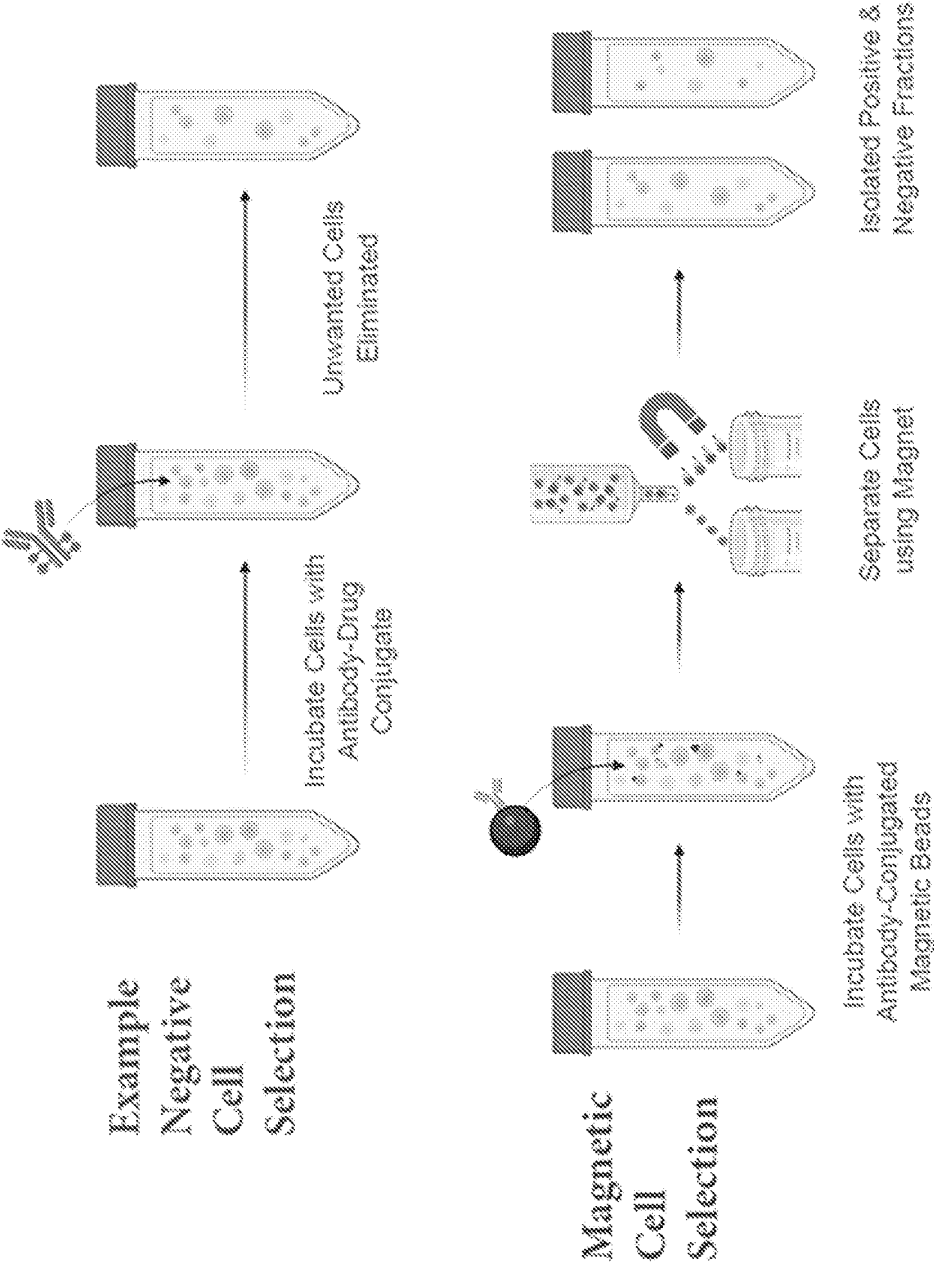


FIG. 40

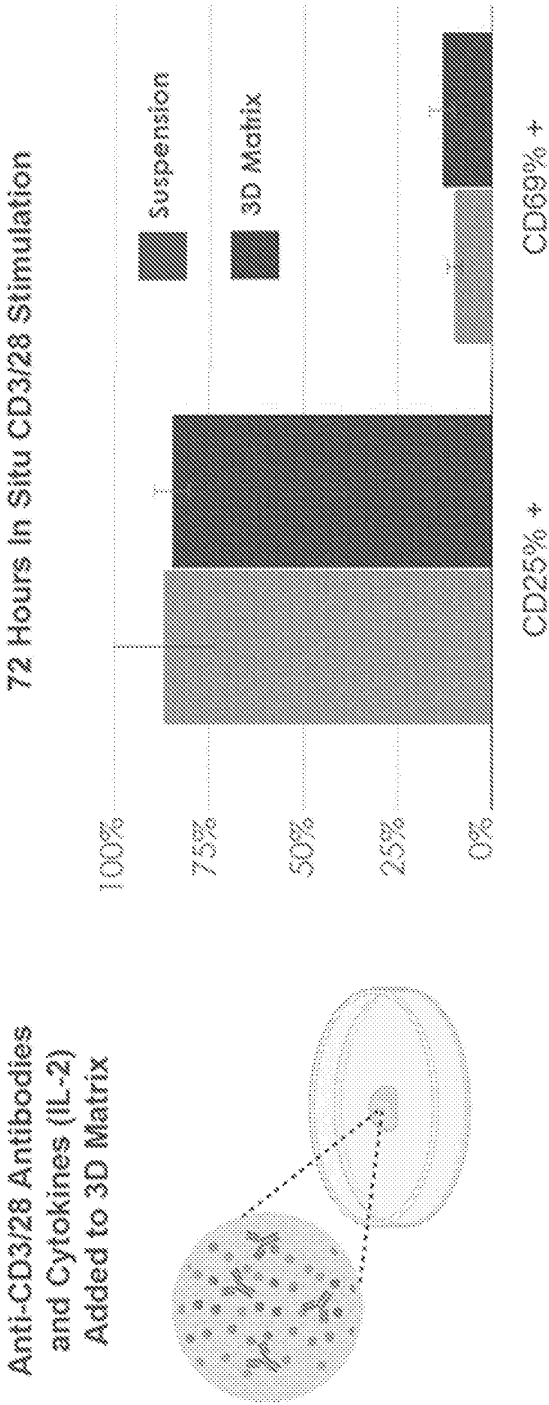


FIG. 4I

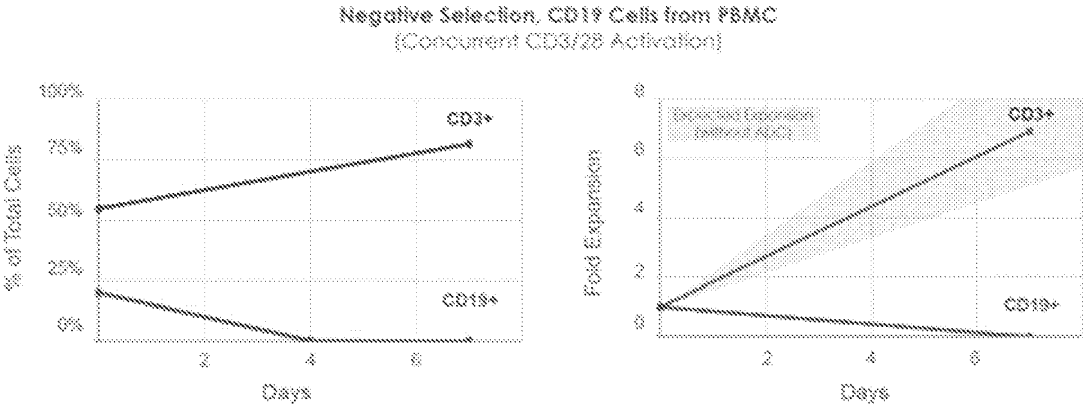


FIG. 42

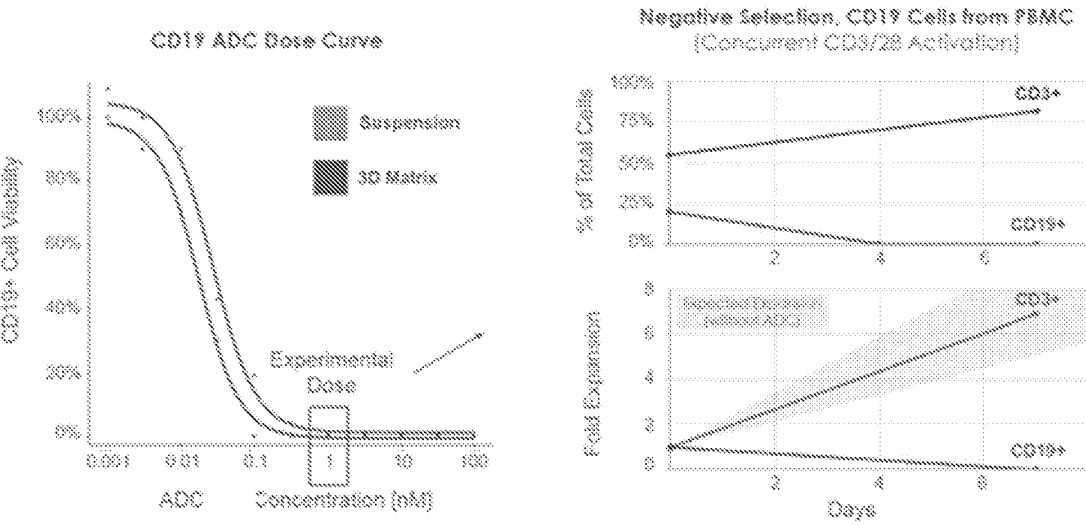


FIG. 43

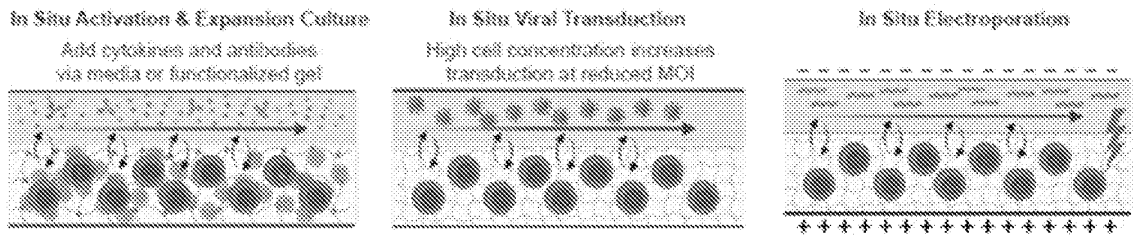


FIG. 44

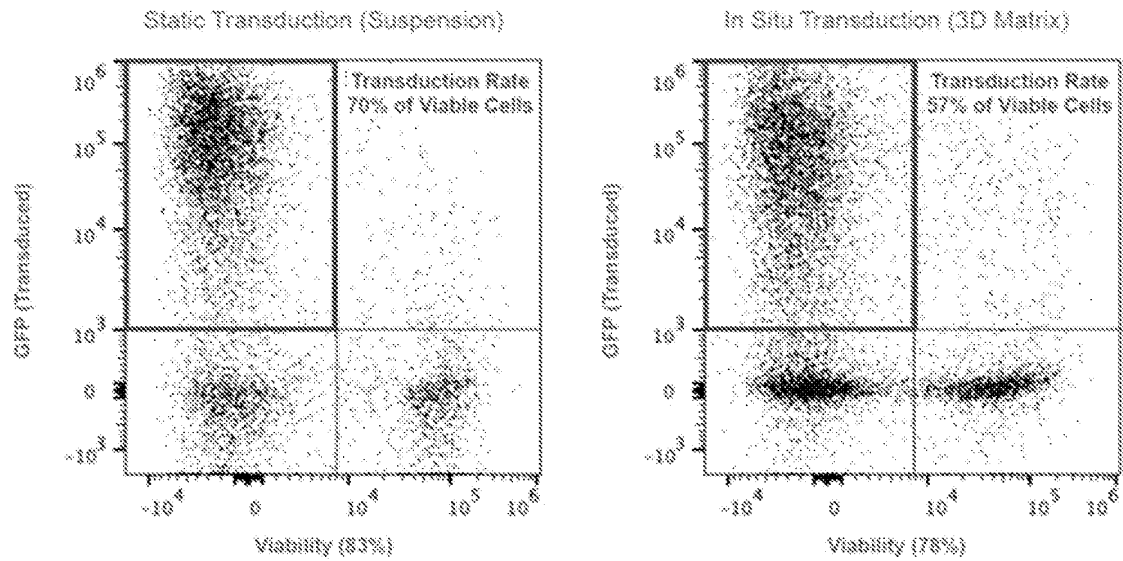


FIG. 45

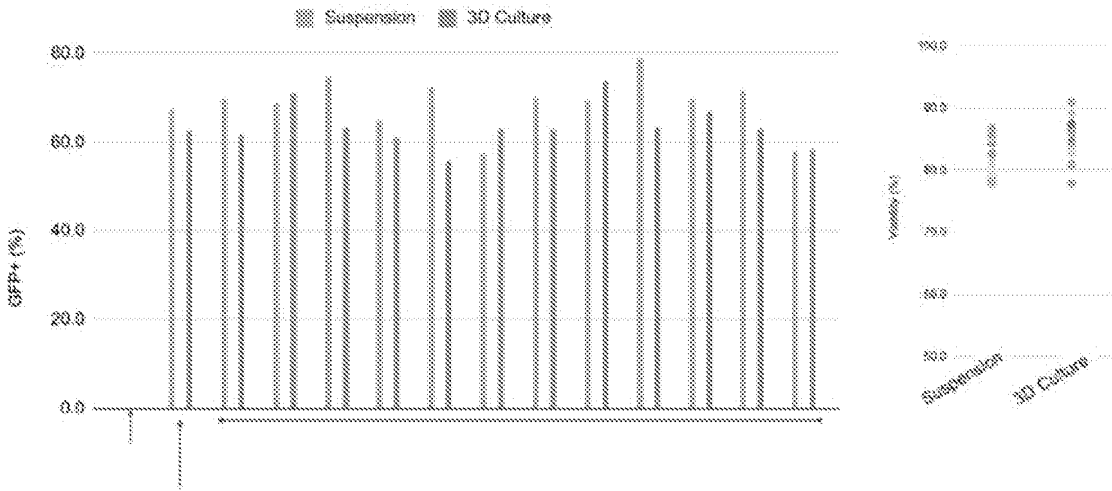


FIG. 46

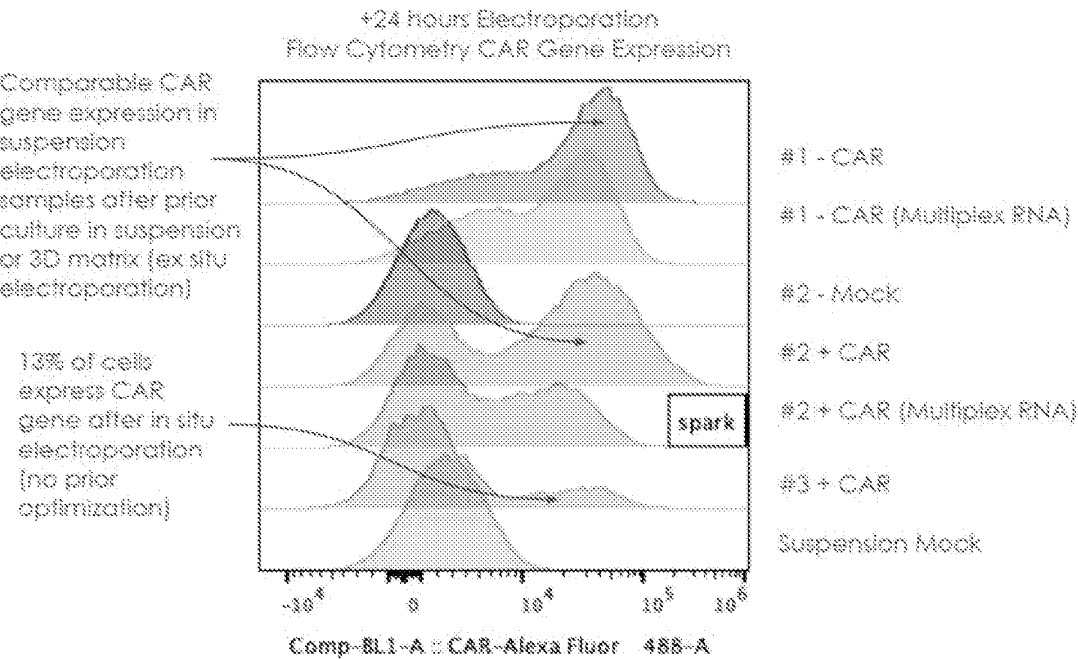
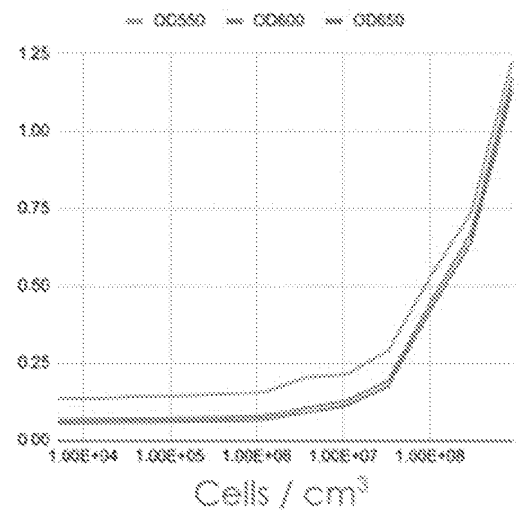


FIG. 47

OD by Wavelength in 3D Matrix



Linearity in 3D Matrix

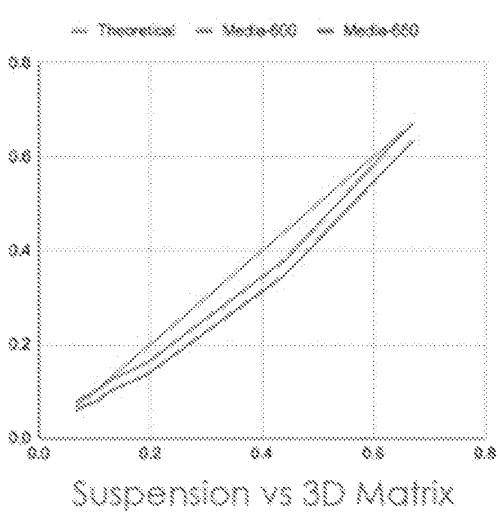
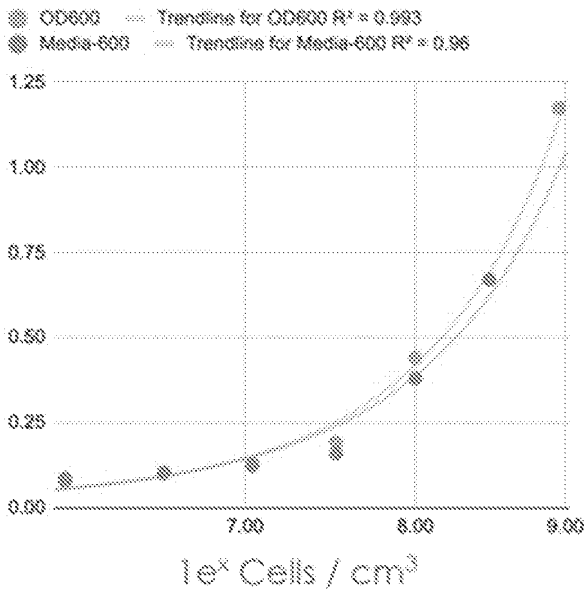
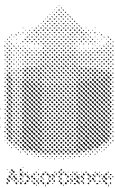


FIG. 48



OD Data Regression
3D Matrix (top)
Suspension (bottom)



Absorbance Plate
Reader Data
Cell-laden 3D Matrix in
Flat-bottom plate

FIG. 49

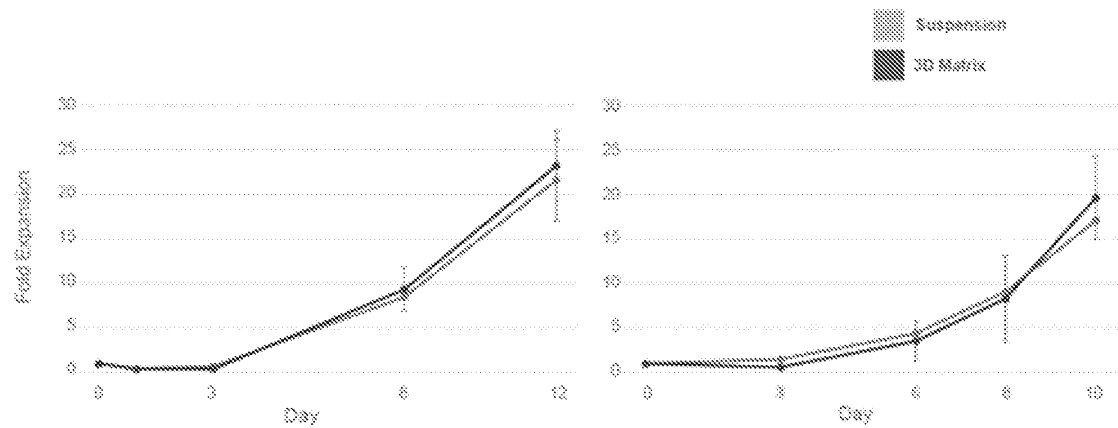


FIG. 50



FIG. 51

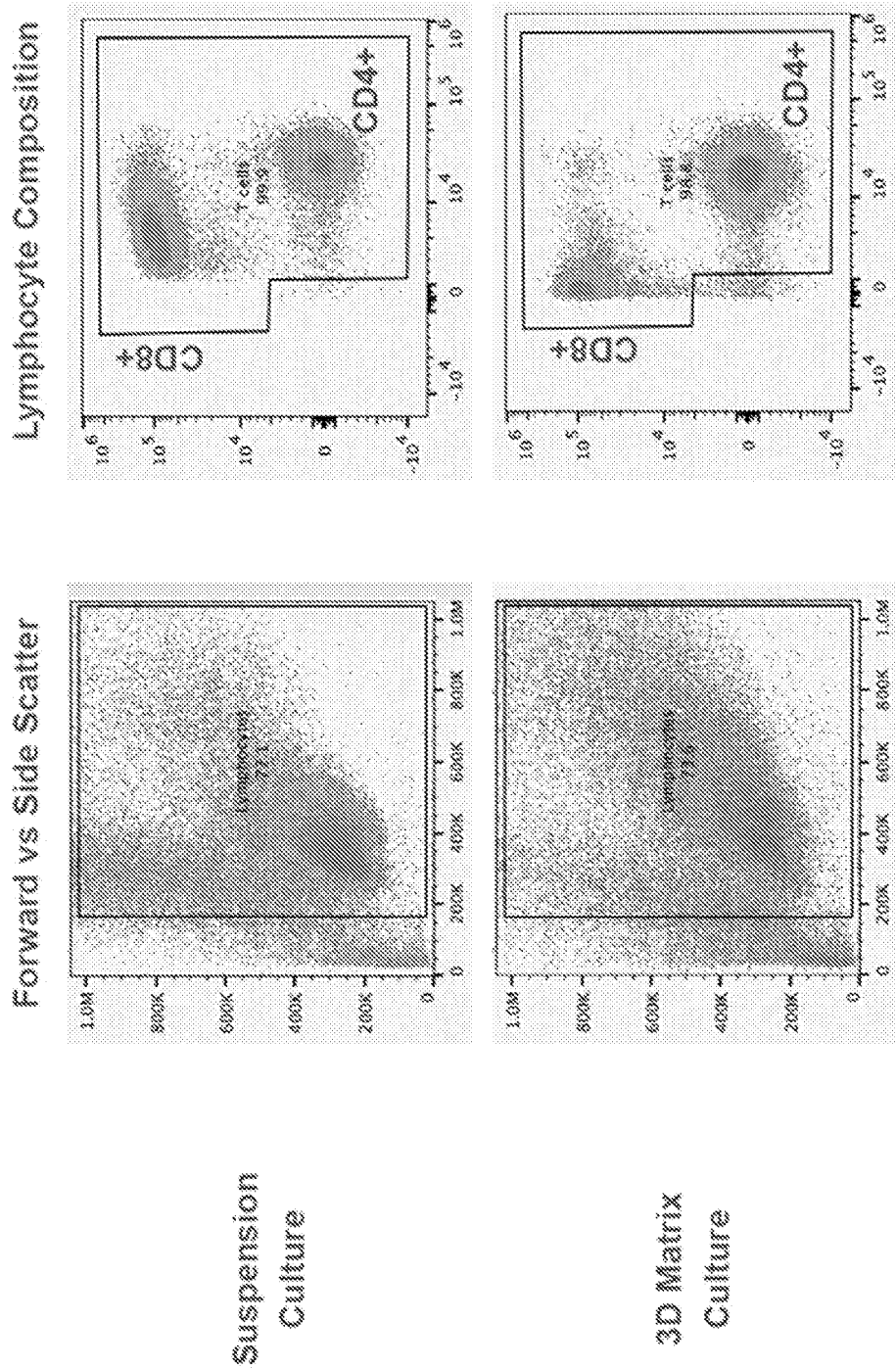


FIG. 52

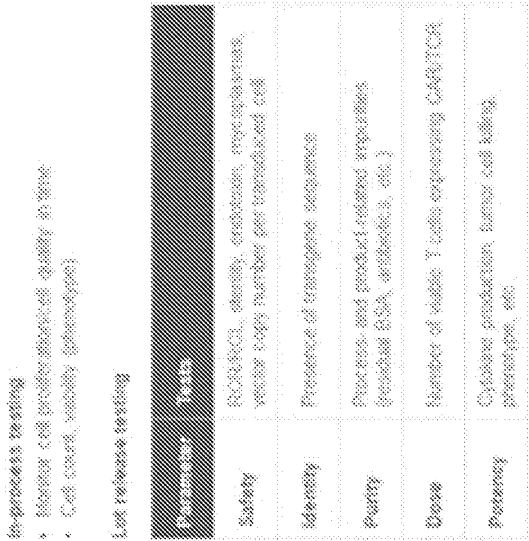


FIG. 53

Fully Integrated CGT Manufacturing

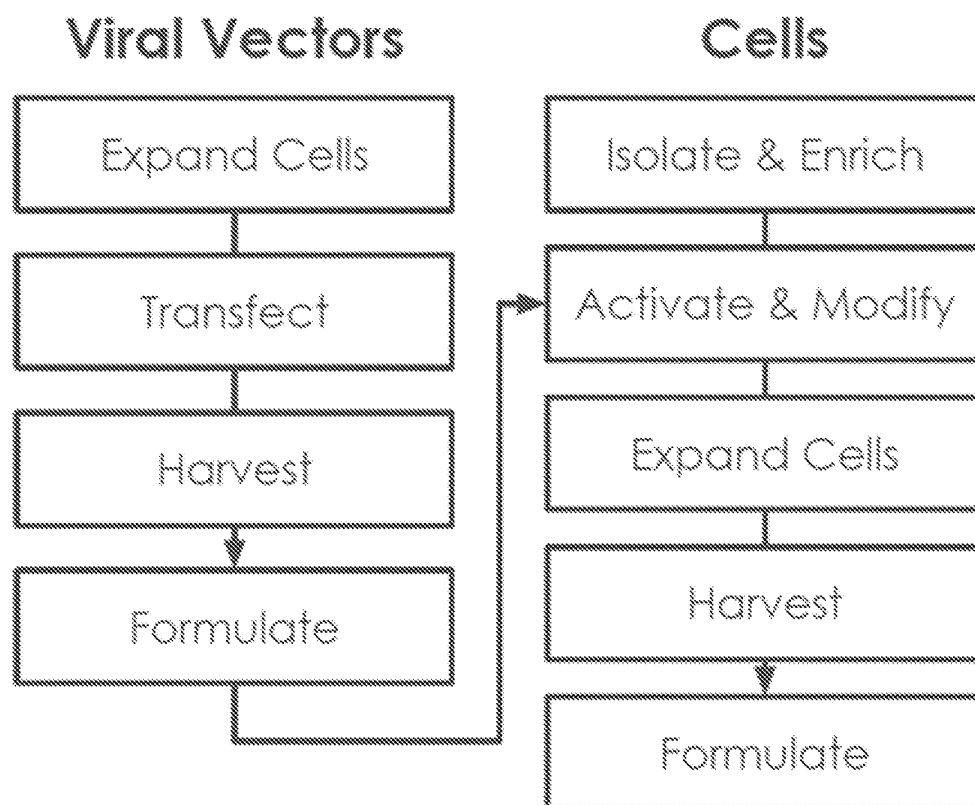


FIG. 54

Product	Input	Upstream	SSB	Downstream	Formulation
CAR-T (CellTx)	- Fresh Cell Source - Frozen Cell Source	- Cell Washing - Concentration - Cell Isolation	- Perfusion Culture - Membrane Transduction - In Situ Selection - Viral Transduction	- Cell Washing - Concentration - Cell Isolation	- Fresh Output - Frozen Output
Viral Vector		- Cell Washing - Concentration	- Perfusion Culture - Transduction or Transfection	Viral Vector purification	

FIG. 55

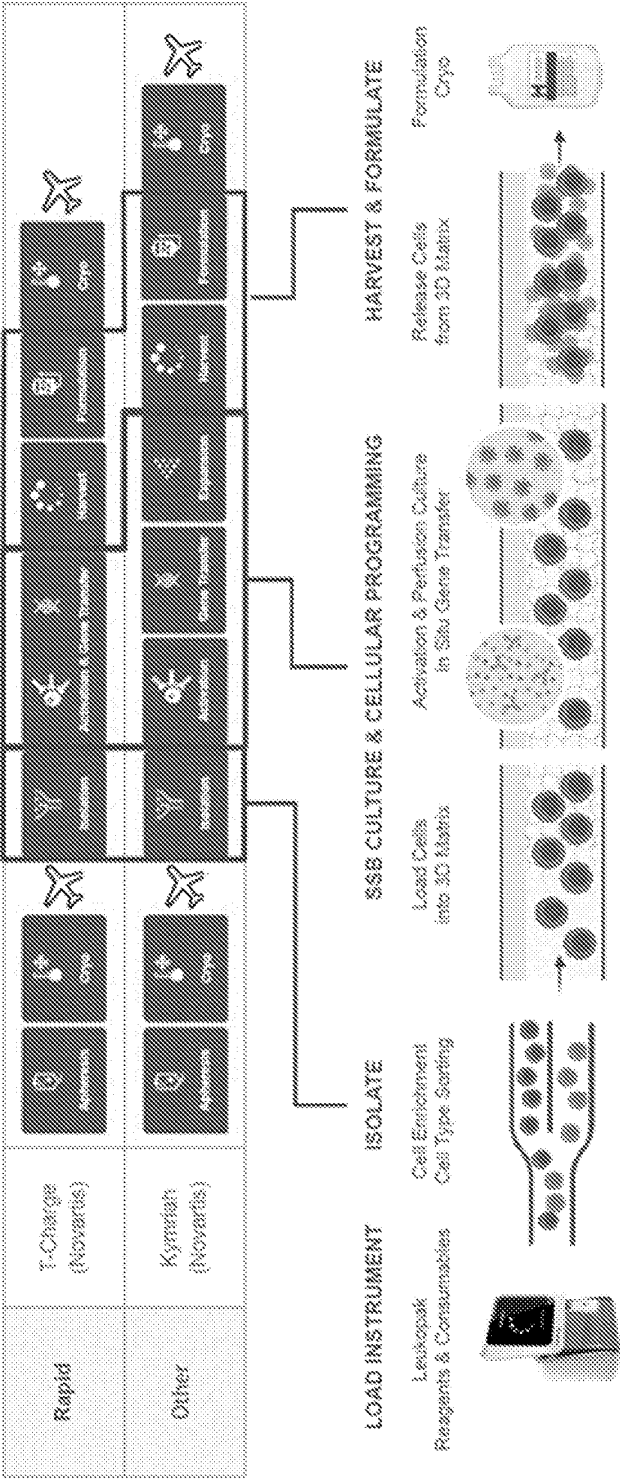


FIG. 56

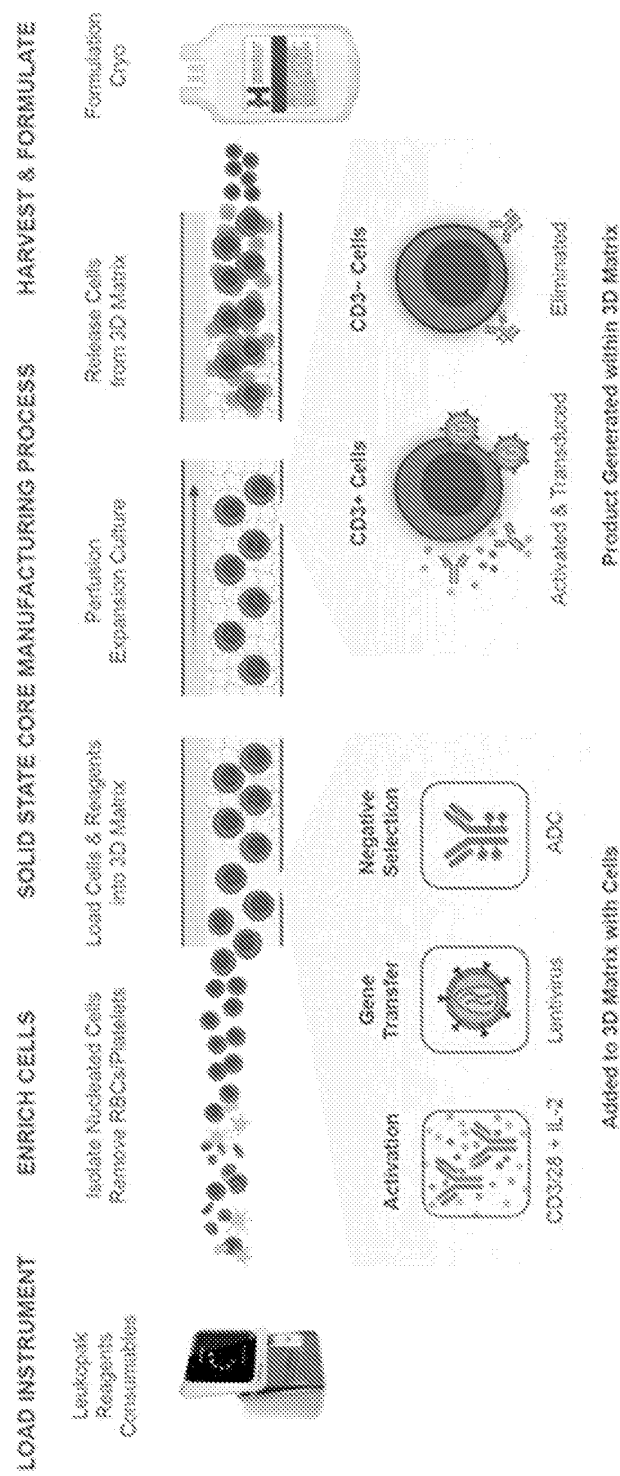


FIG. 57

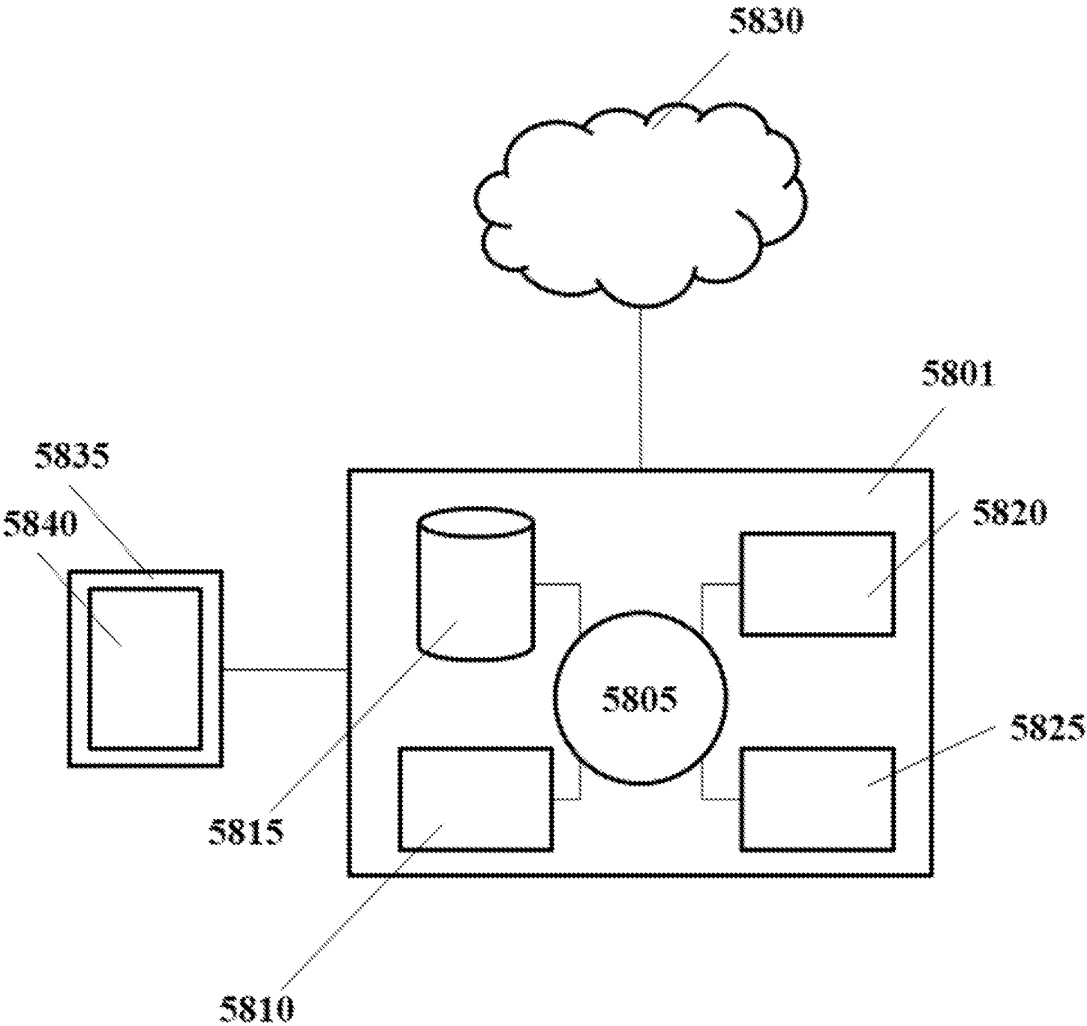


FIG. 58

0.1B - 10B Cells Formats

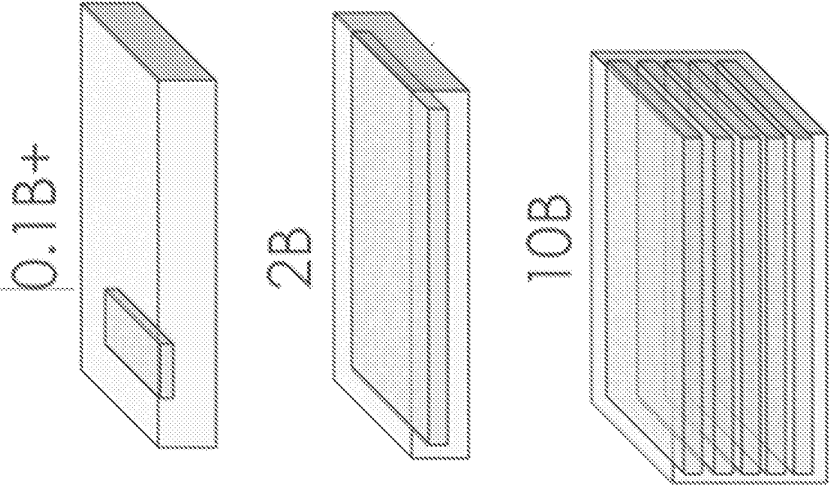


FIG. 59A

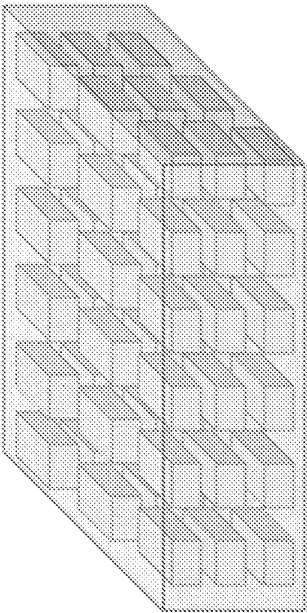


FIG. 59B

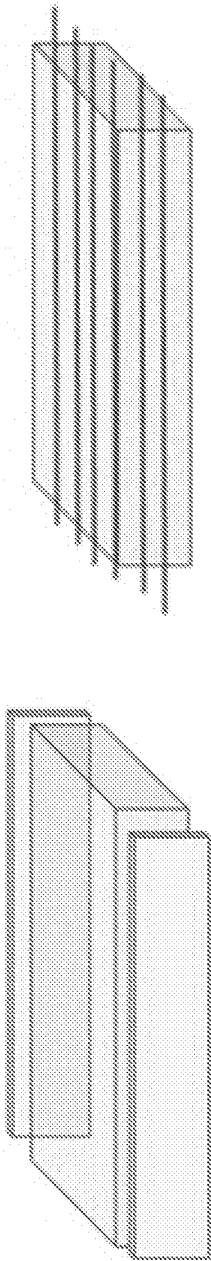


FIG. 60B

FIG. 60A

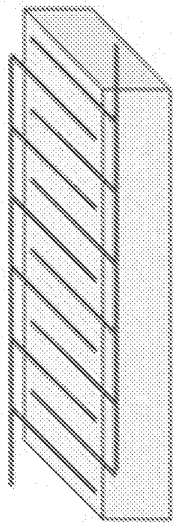


FIG. 60C

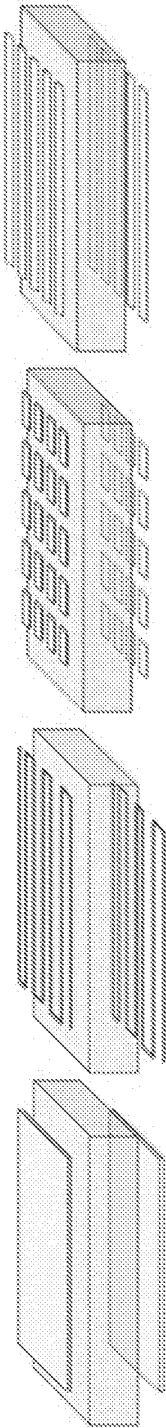


FIG. 61A

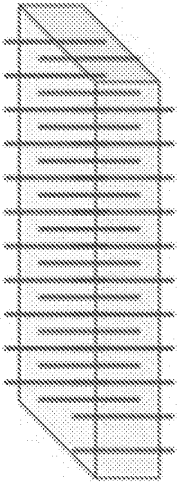


FIG. 61B

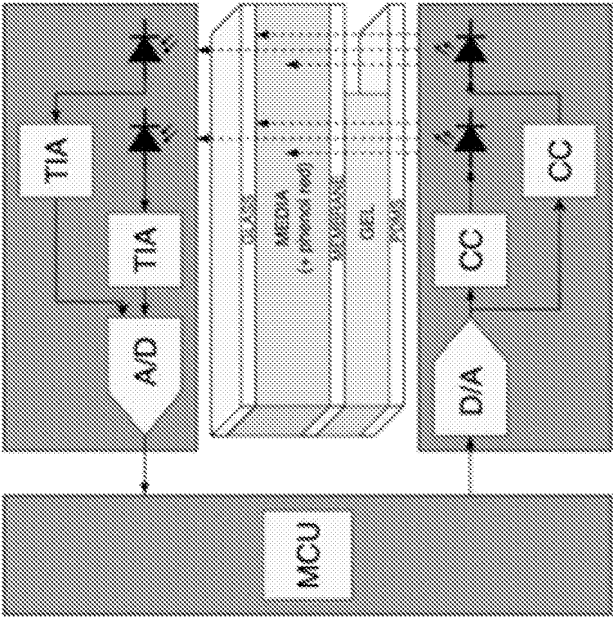


FIG. 62B

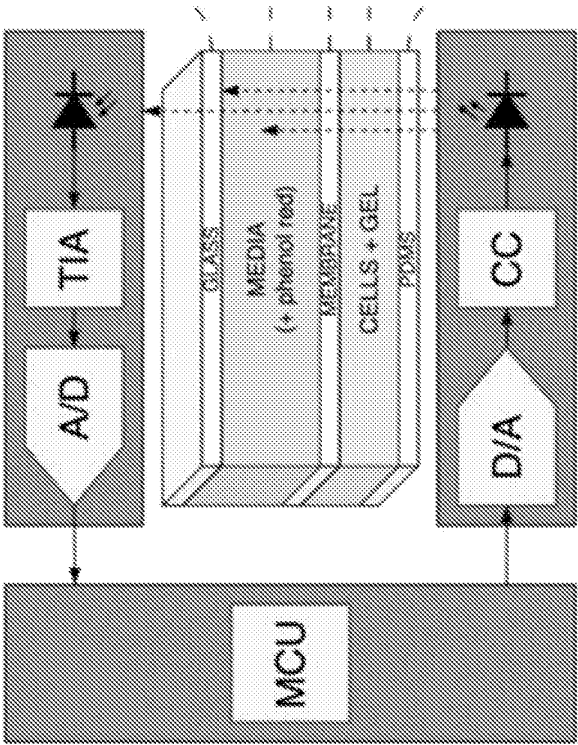


FIG. 62A

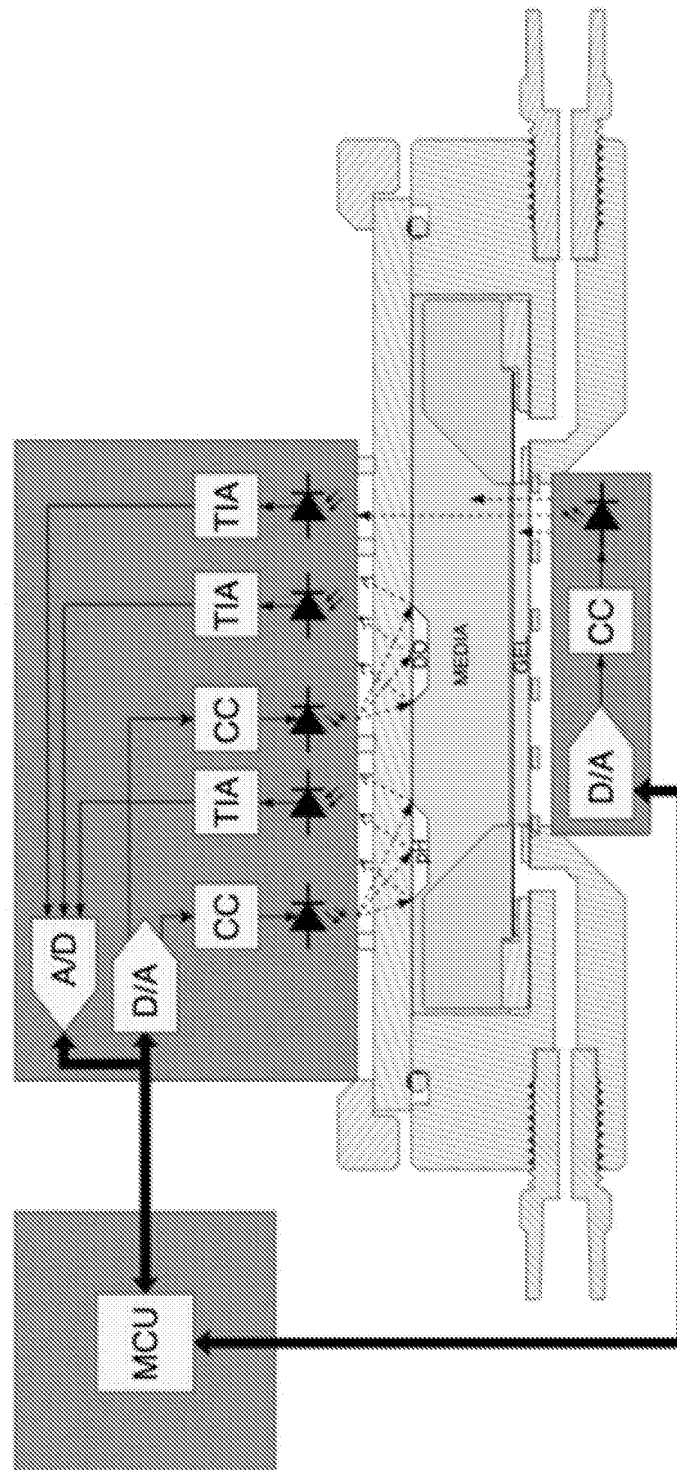


FIG. 63

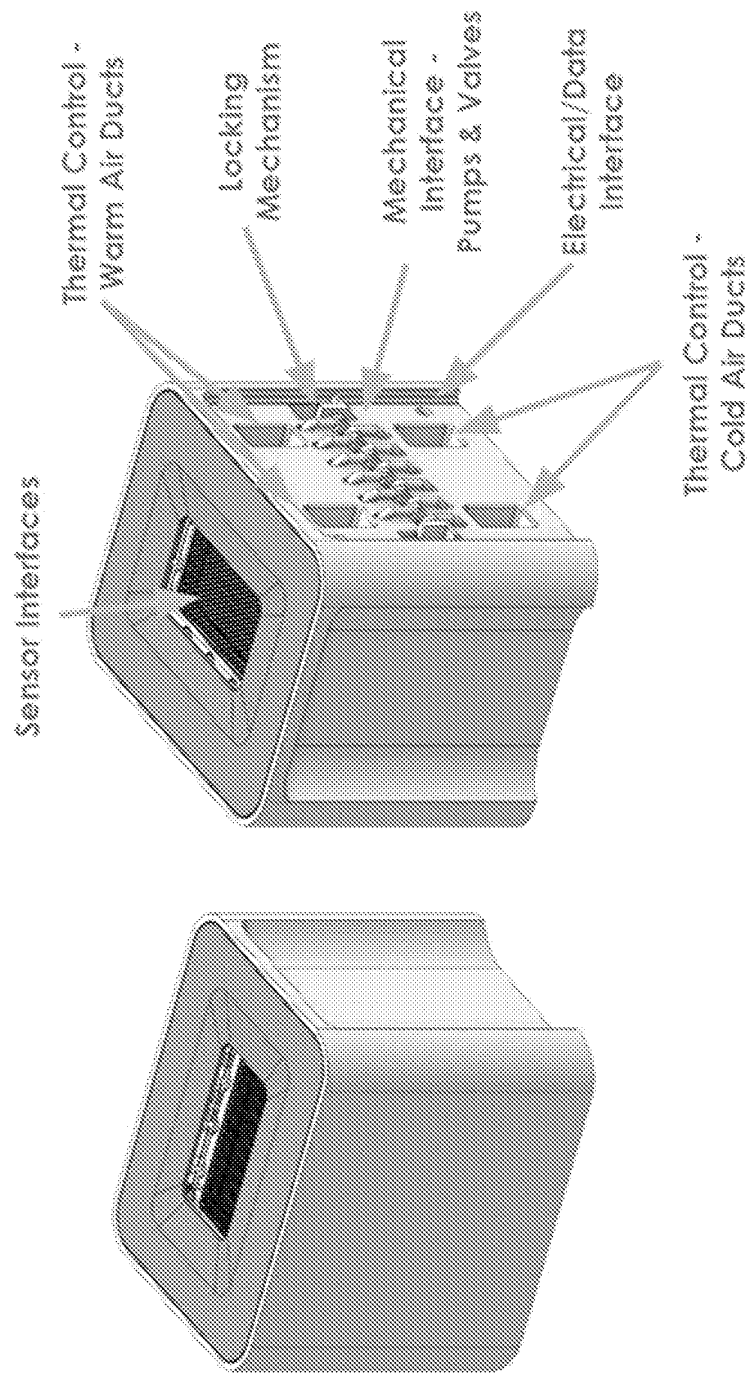


FIG. 64

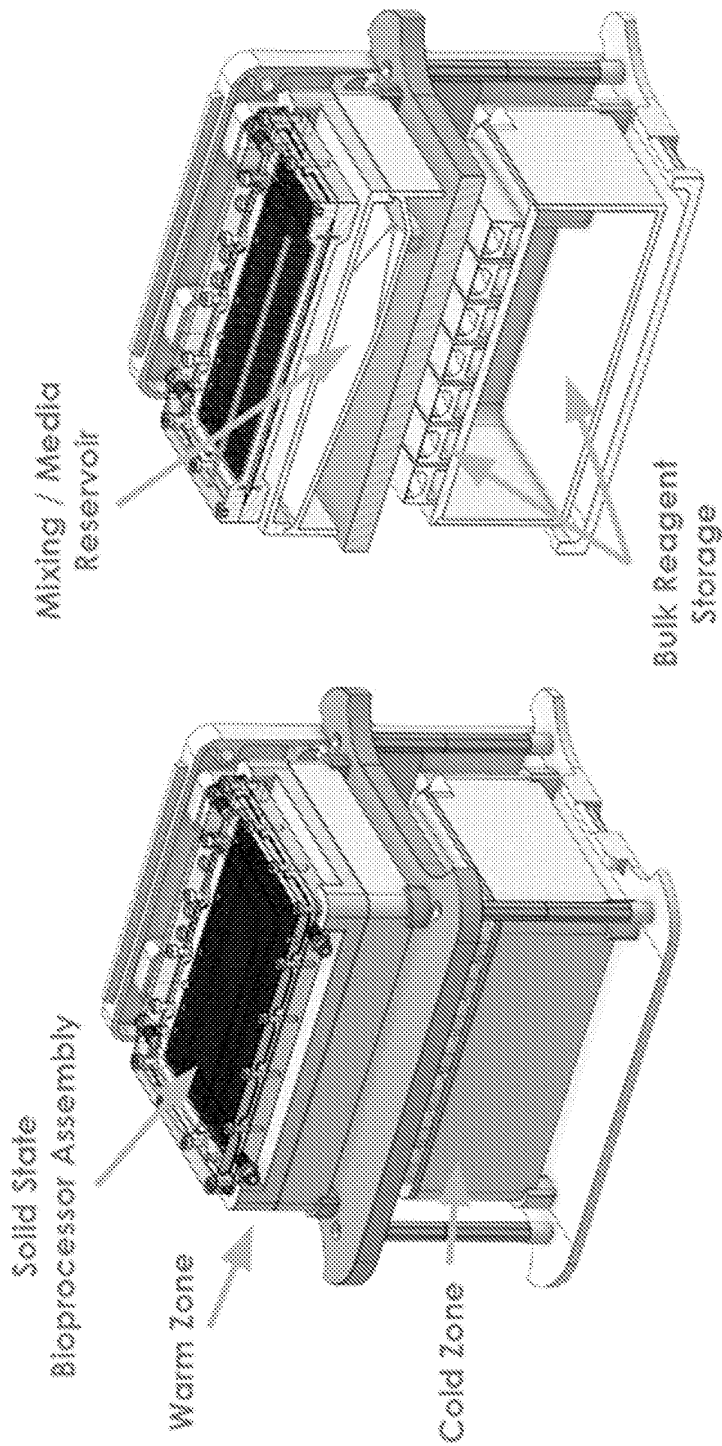
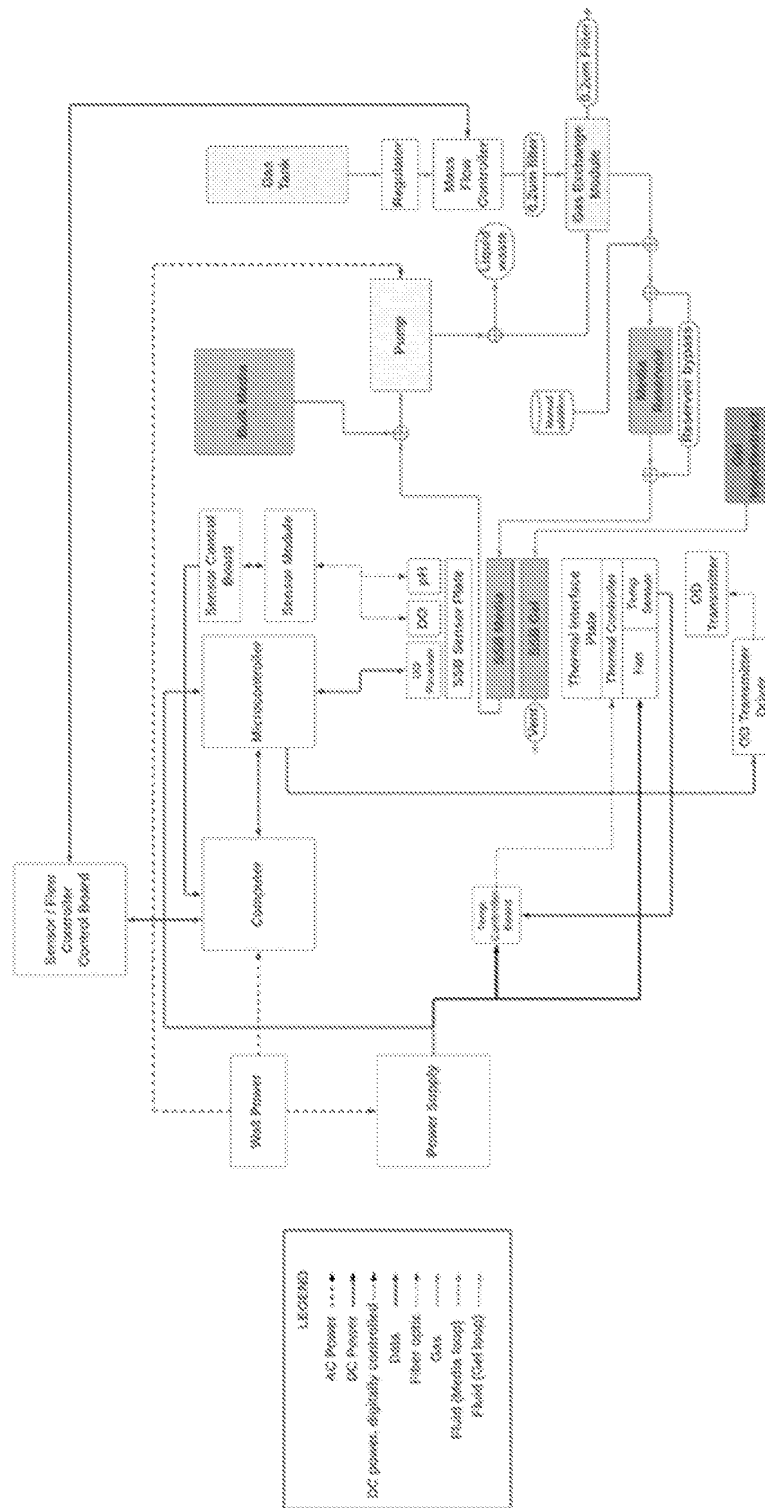


FIG. 65



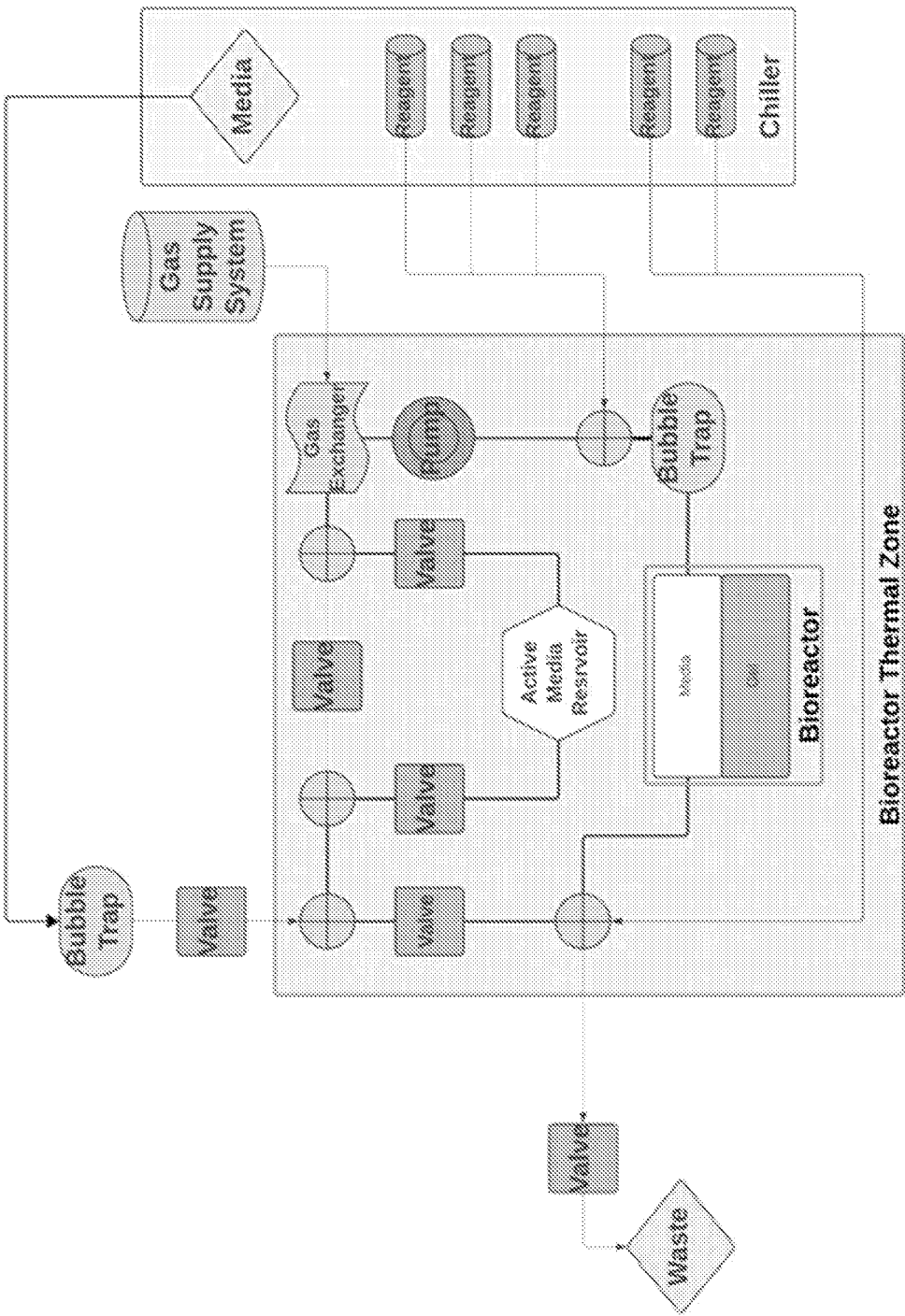


FIG. 67

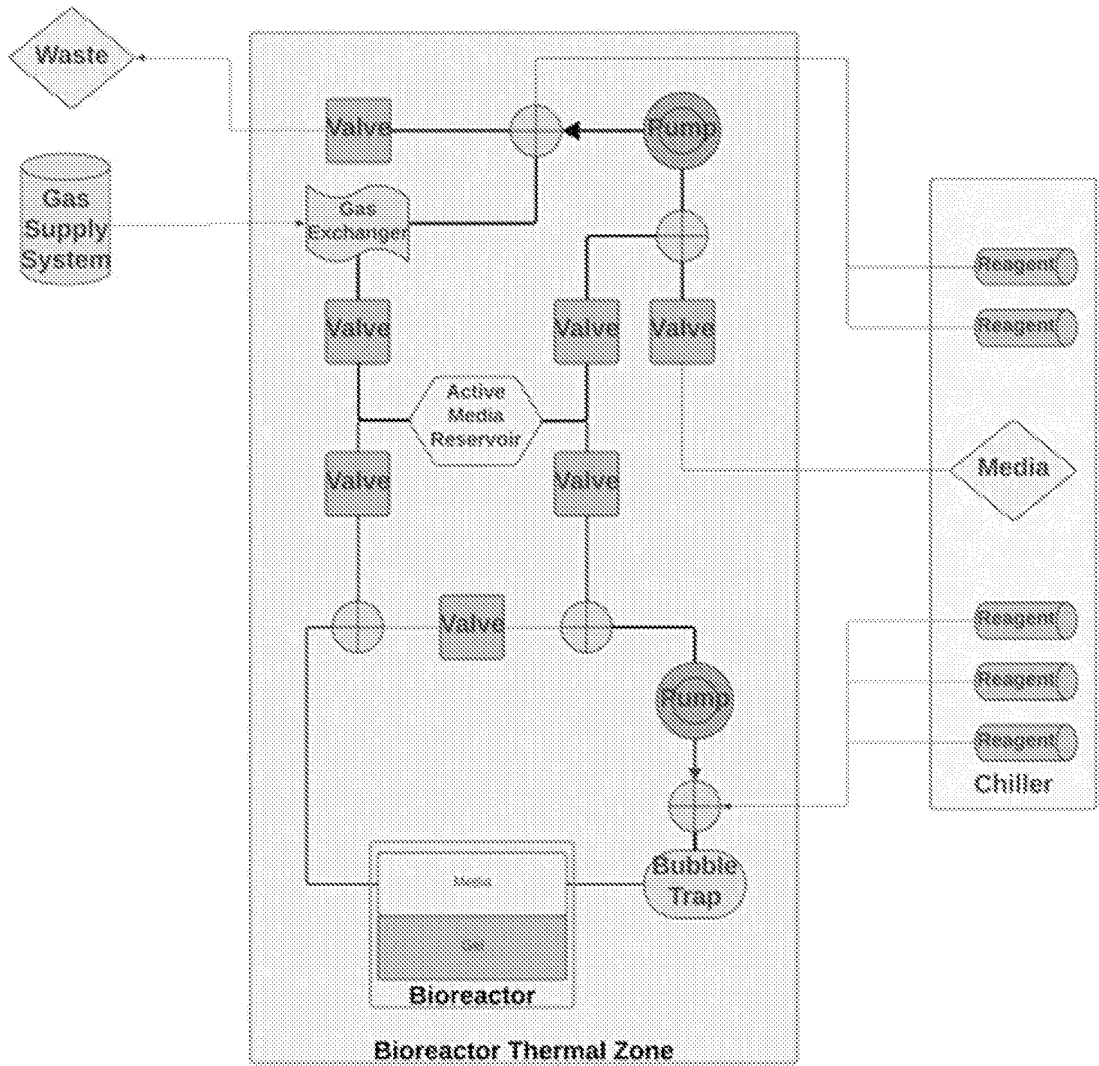
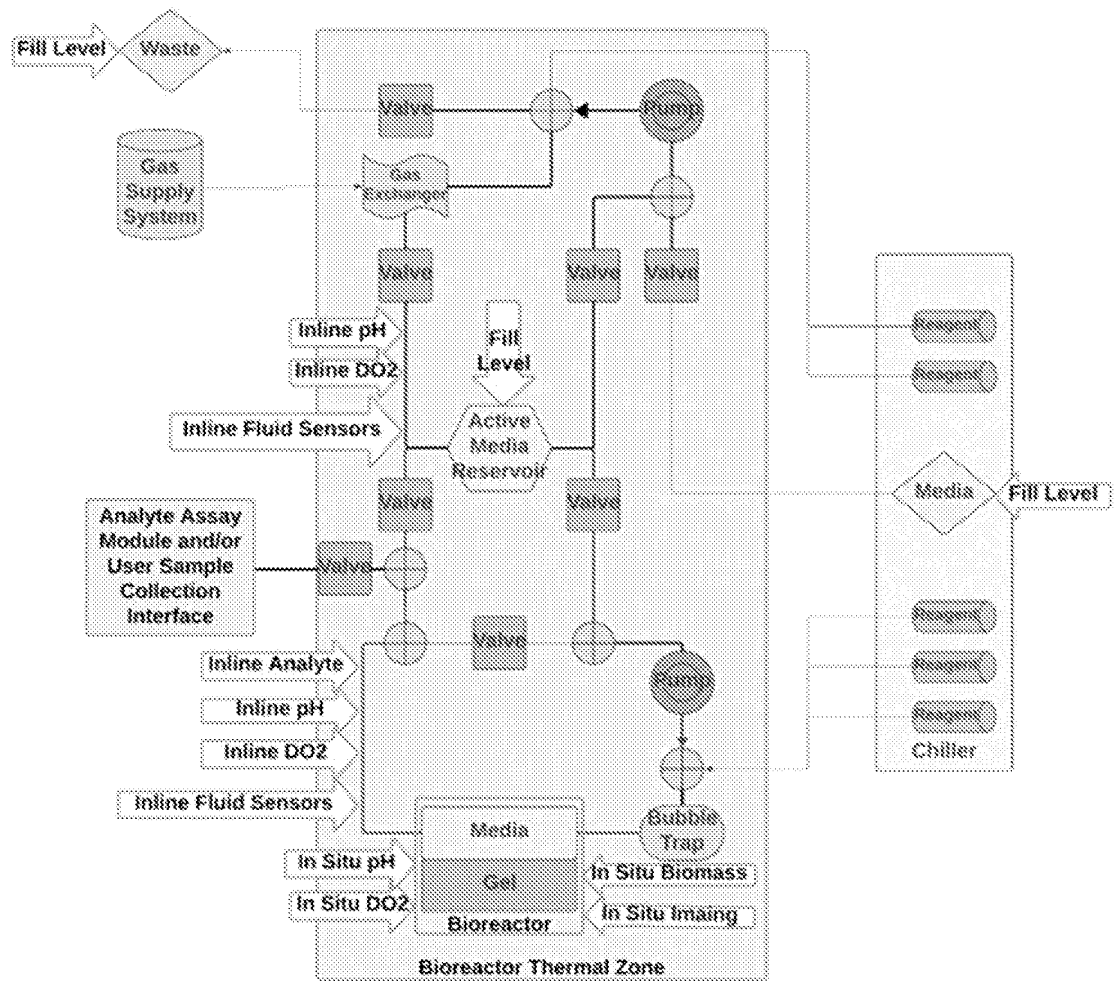


FIG. 68

**FIG. 69**

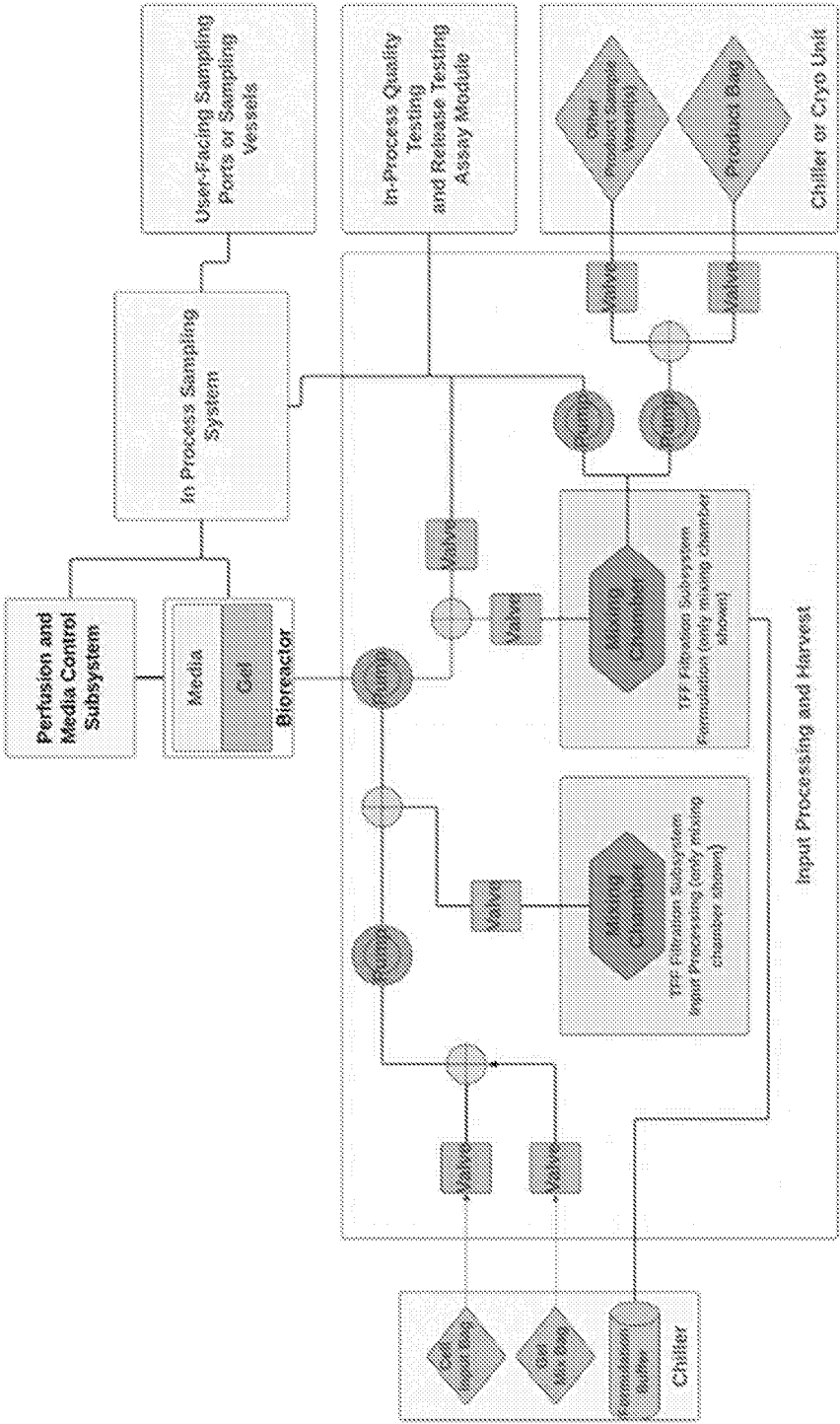


FIG. 70

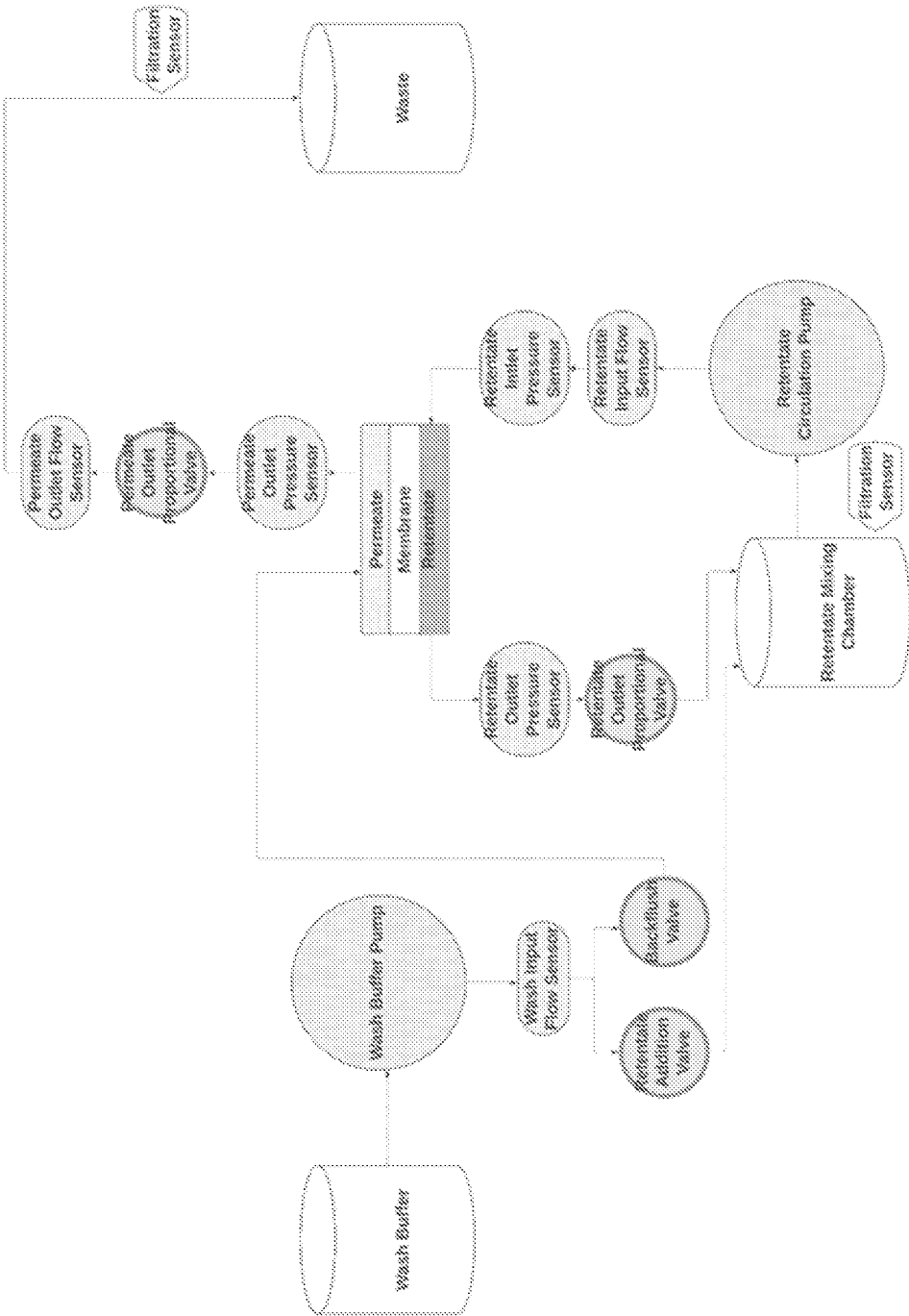


FIG. 71

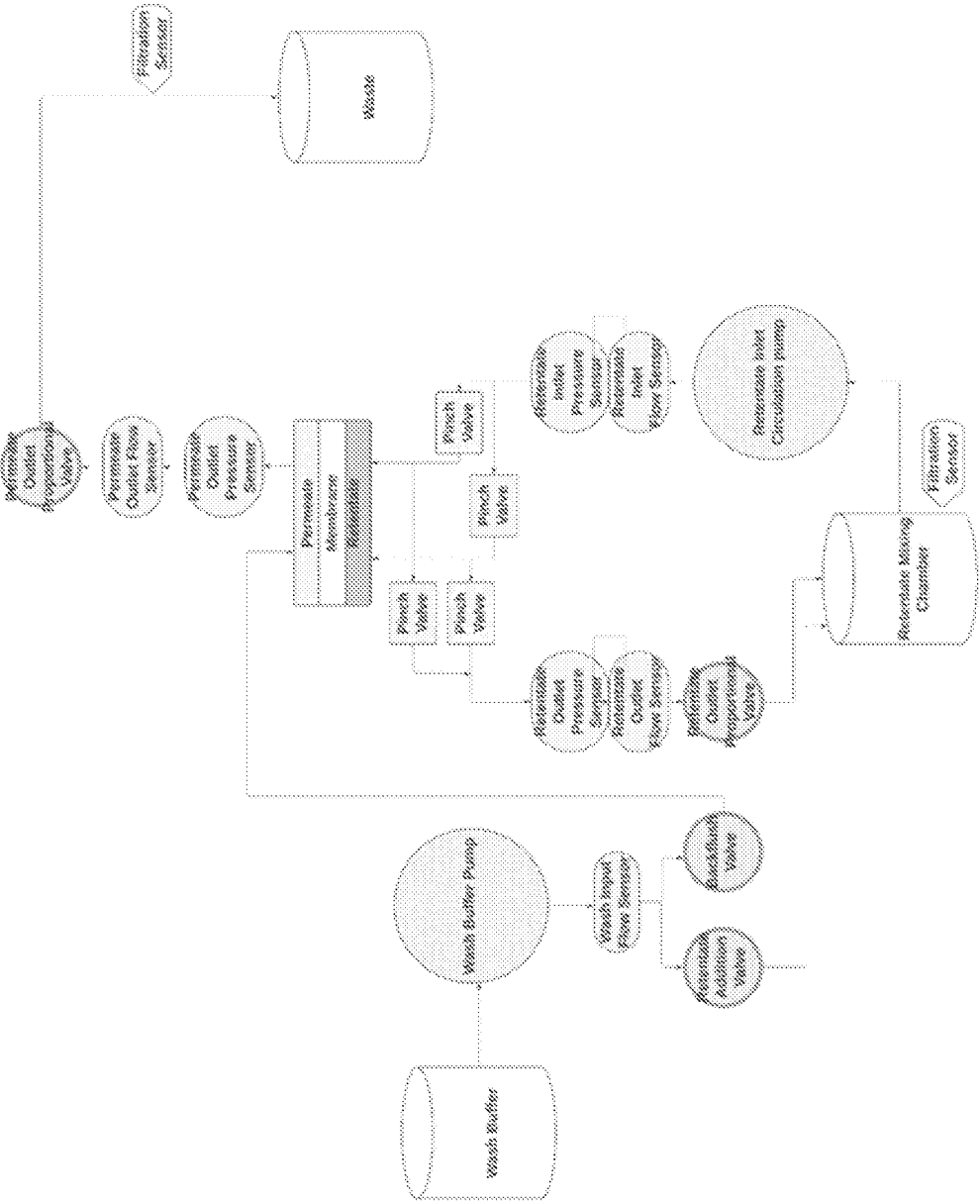


FIG. 72

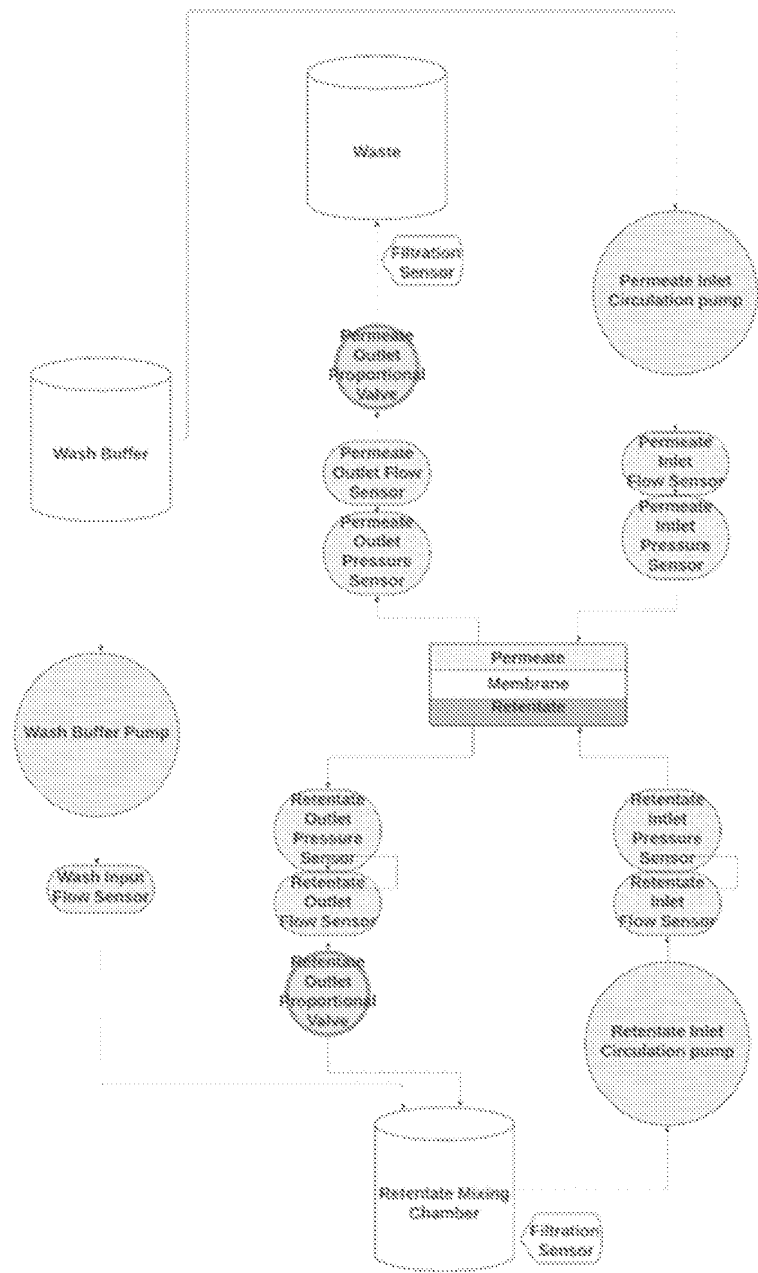
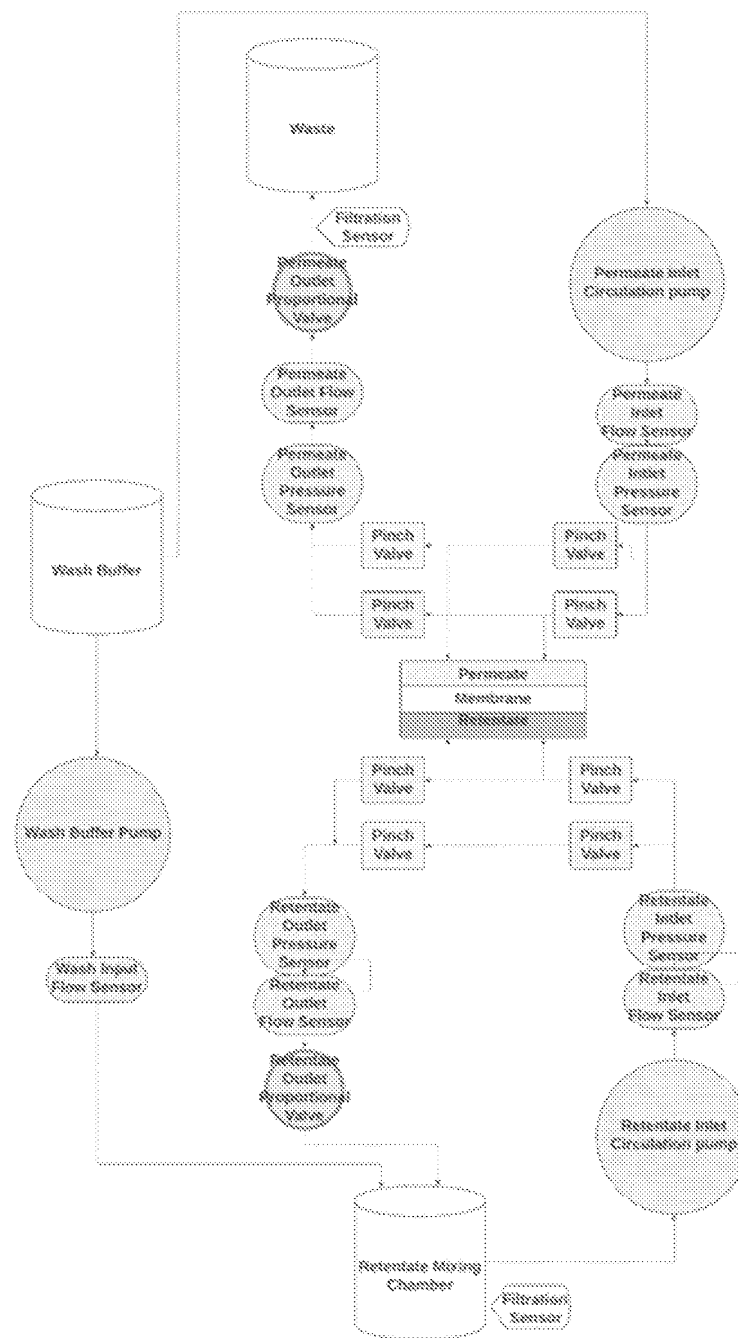
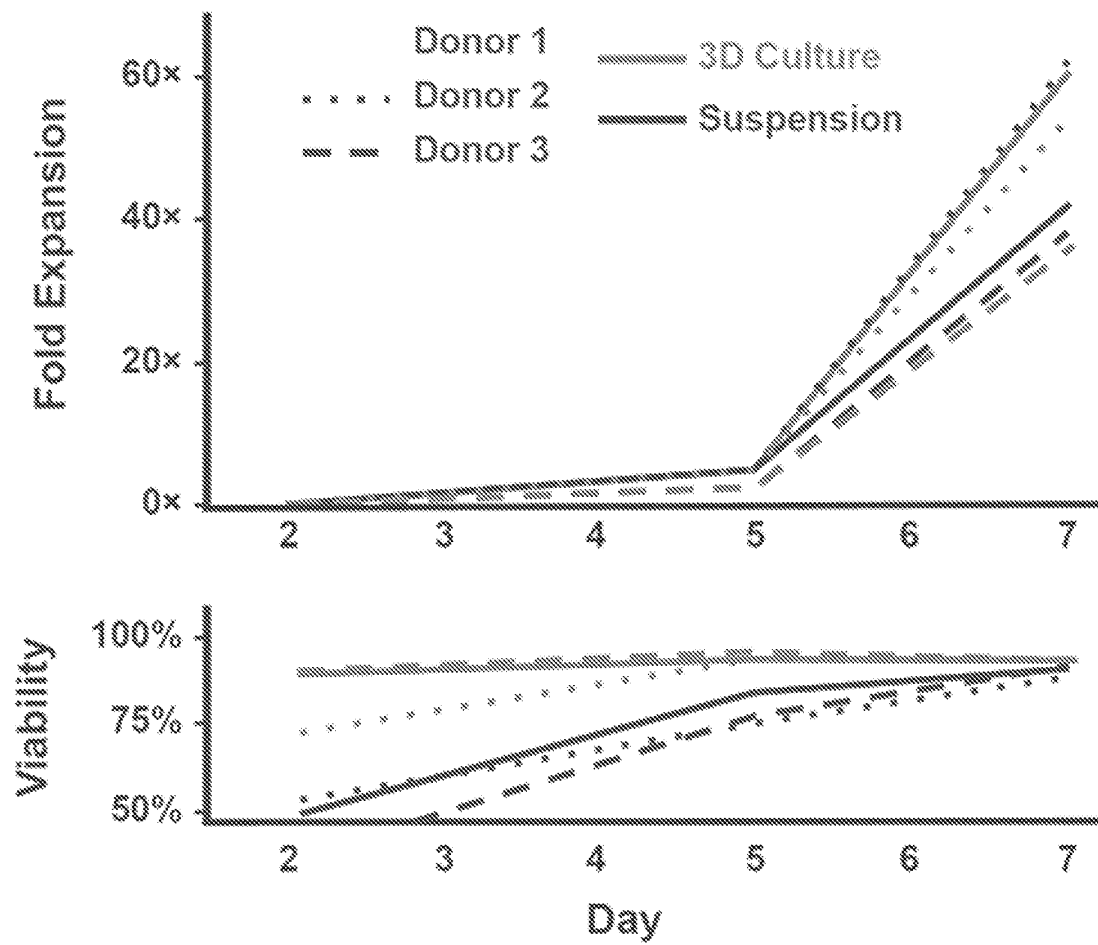


FIG. 73

**FIG. 74**

**FIG. 75**

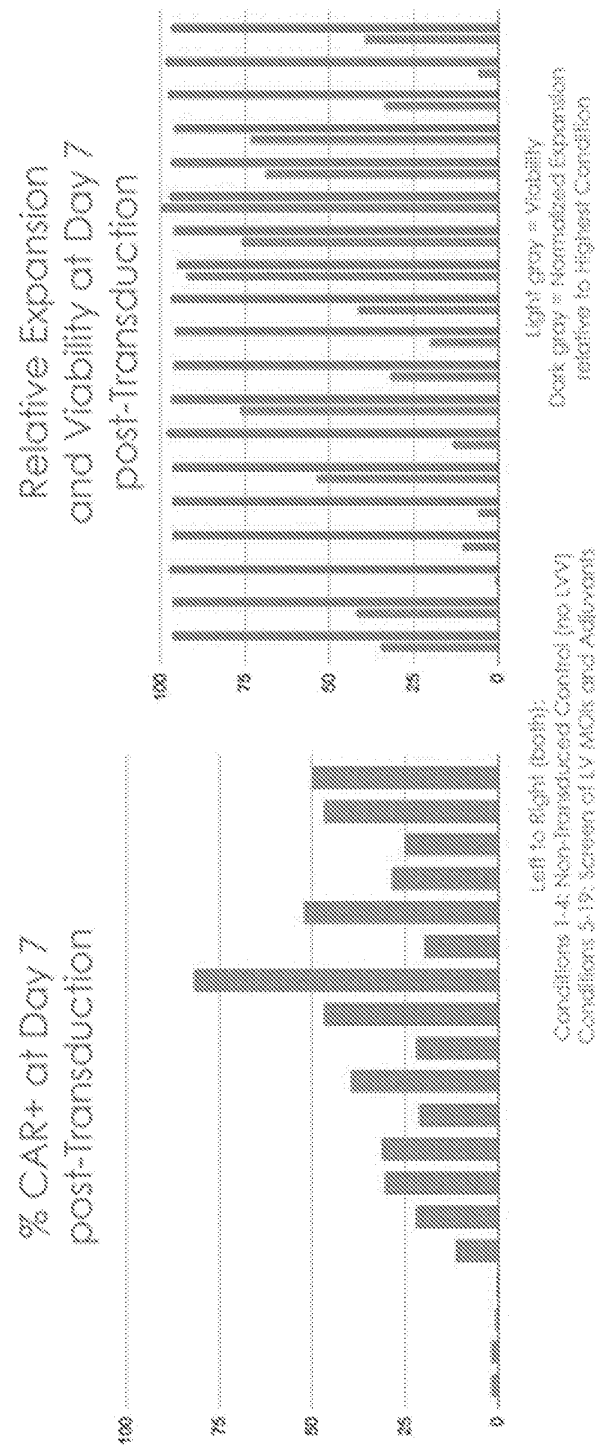


FIG. 76

60/70

108 M
cells/cm³
93.2% Viable
53.6% CD8+

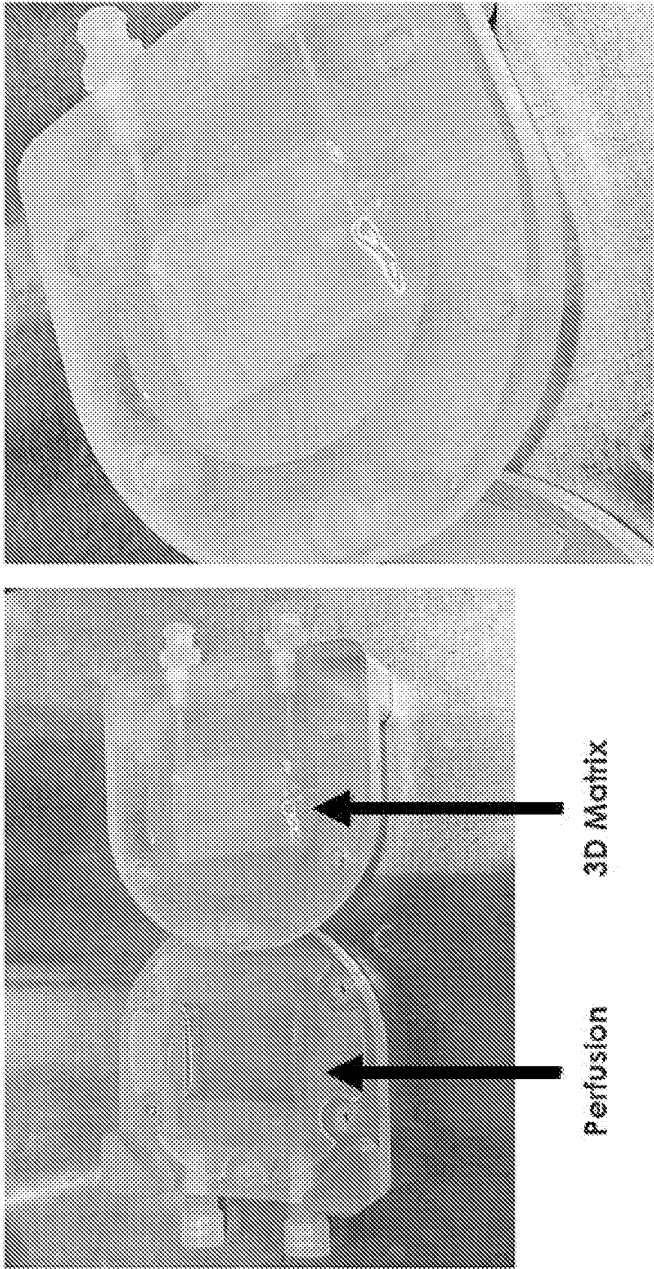


FIG. 77

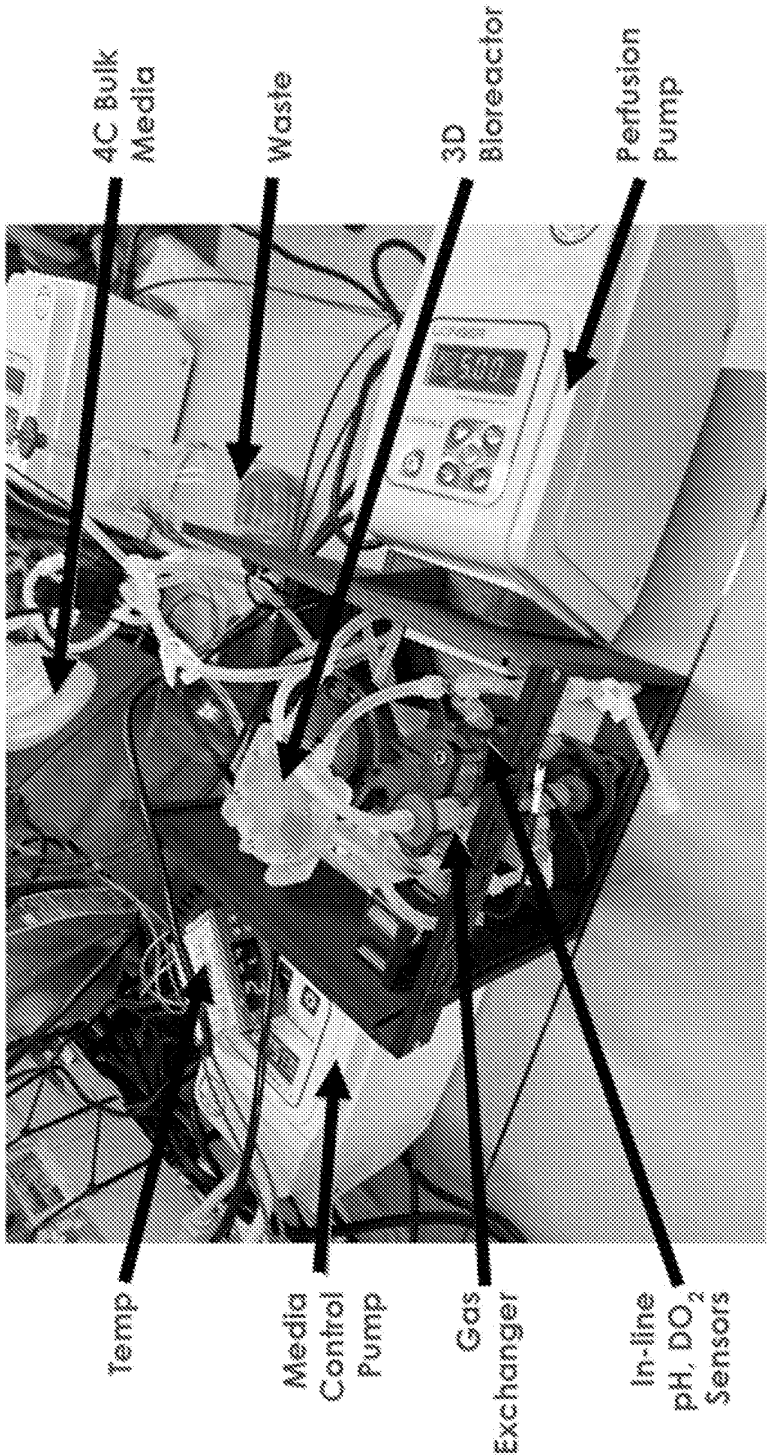


FIG. 78

Running T Cell
Expansion
in Prototype

In Situ
Sensors:
pH
DO2
Optical
Density



FIG. 79

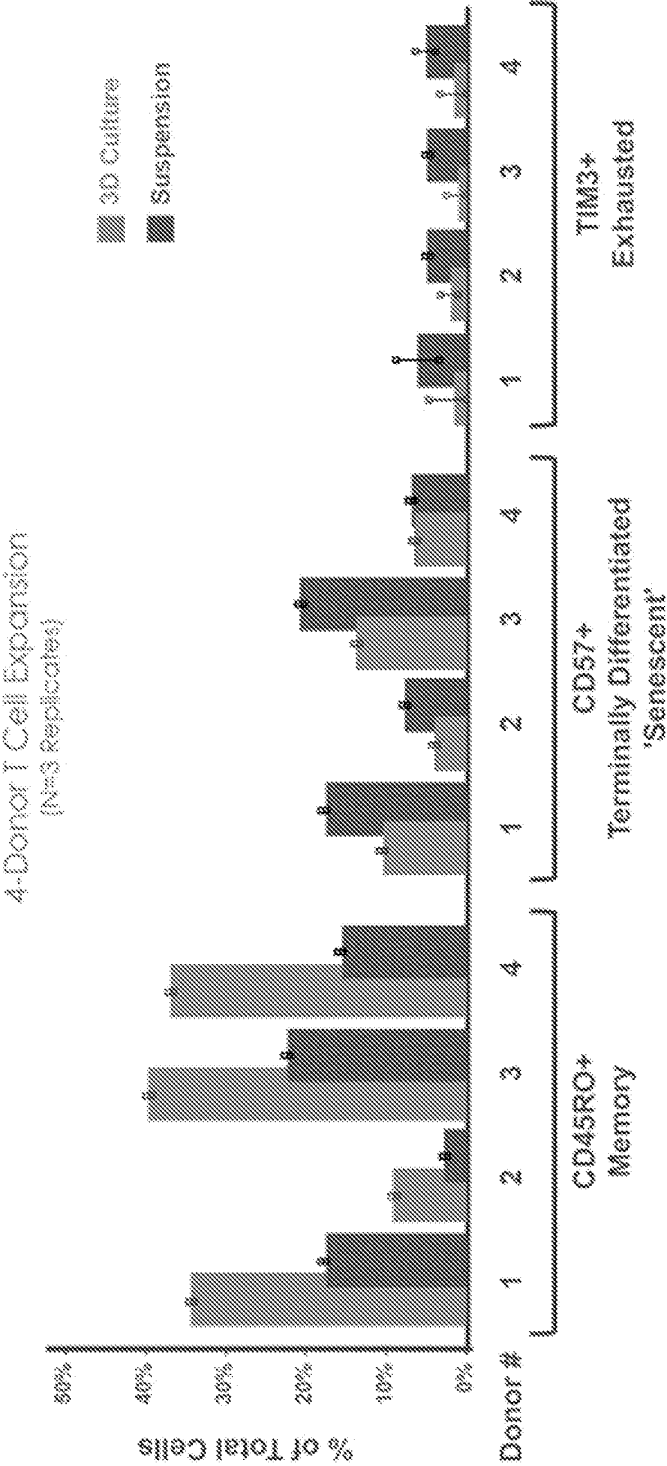
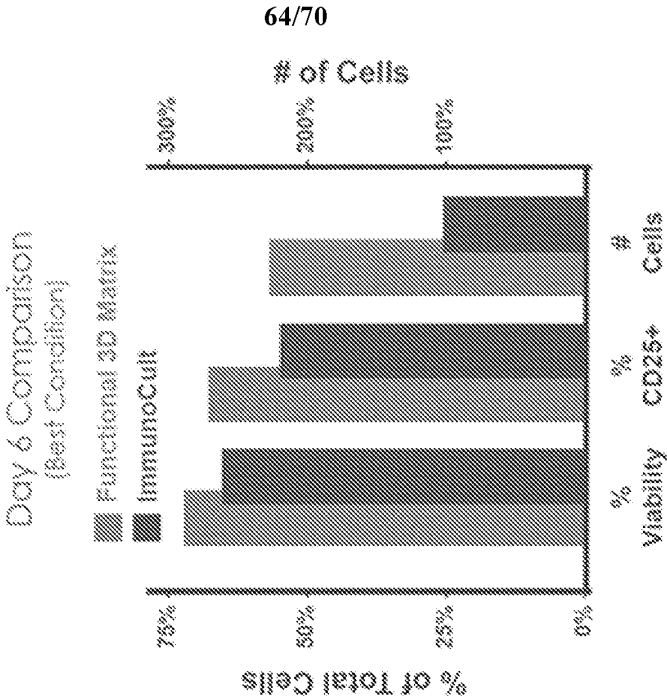


FIG. 80



Activating CD3/CD28 3D Matrix vs.
ImmunoCult Human CD3/CD28 T Cell Activator

	Day 3	Day 6
T Cell Counts	125%	148%
% CD25+	120%	130%
% Divided	N/A	105%
Viability	No Change	

Meta-analysis across conditions

FIG. 8I

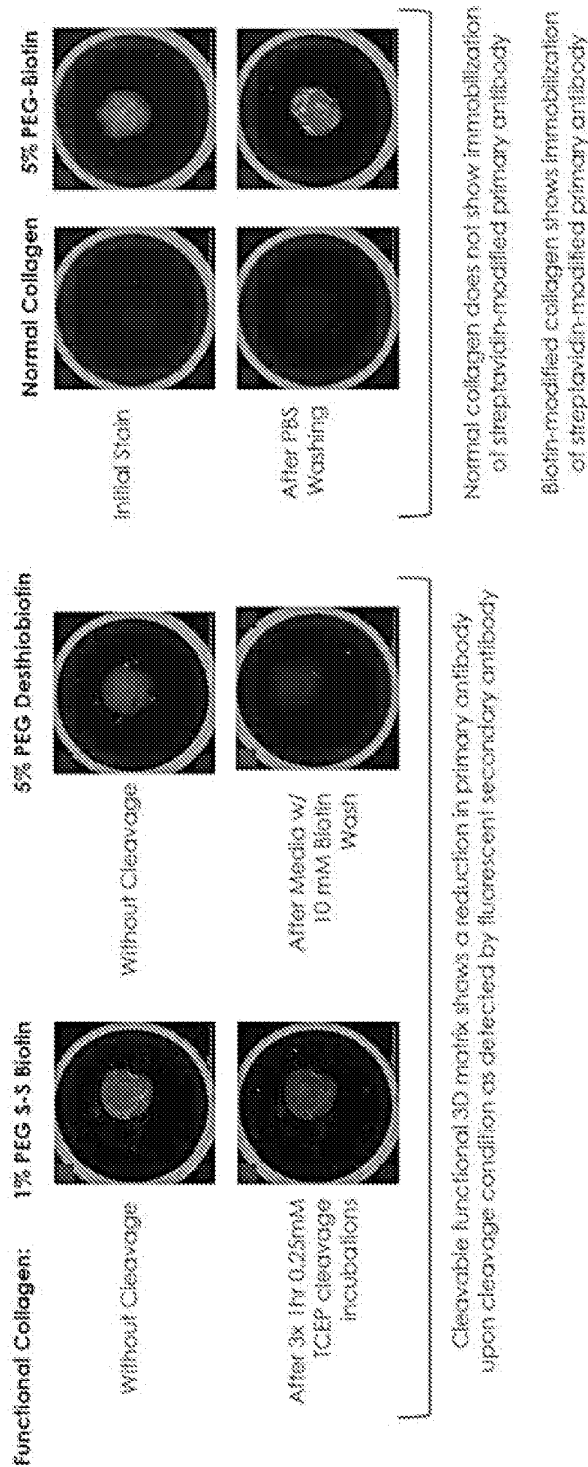


FIG. 82

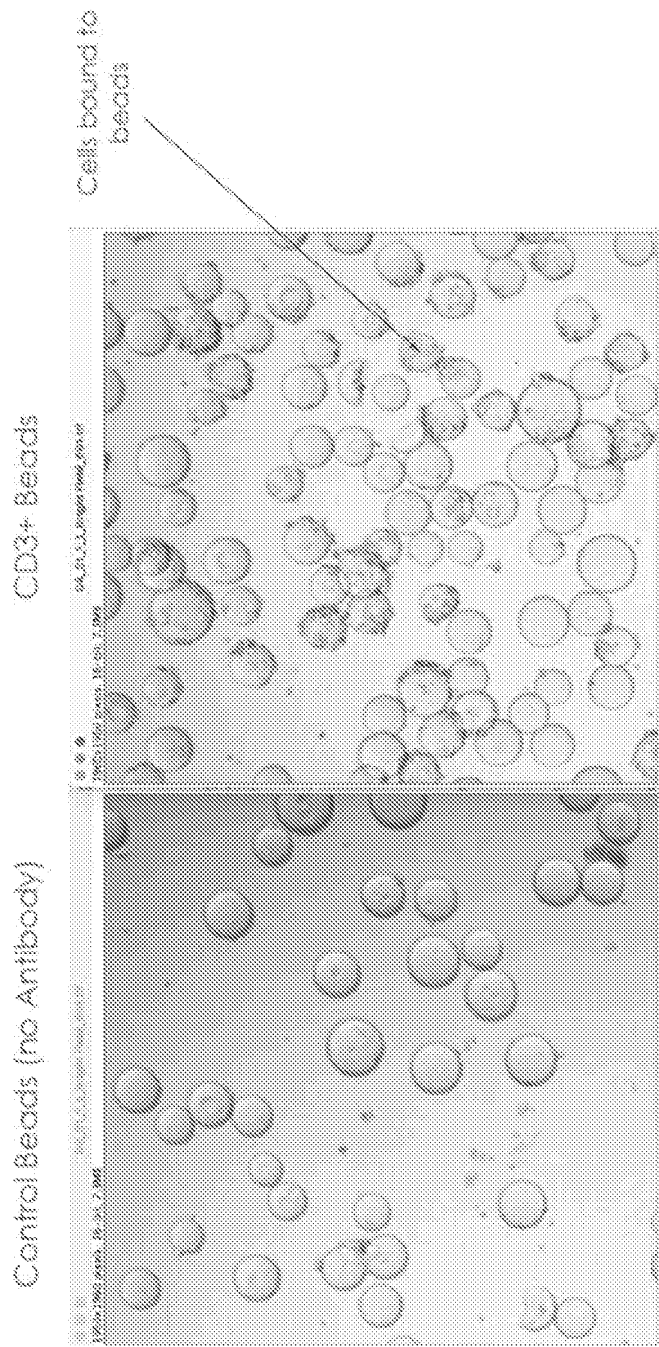


FIG. 83

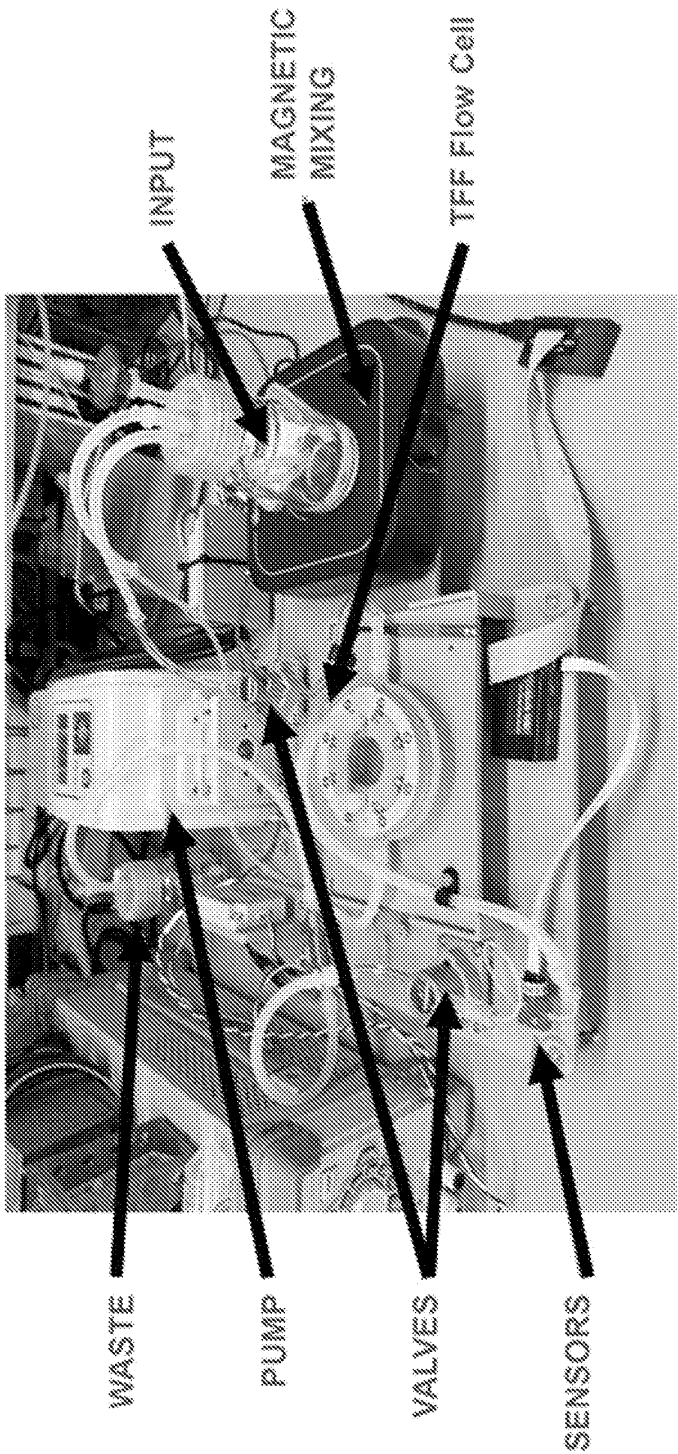


FIG. 84

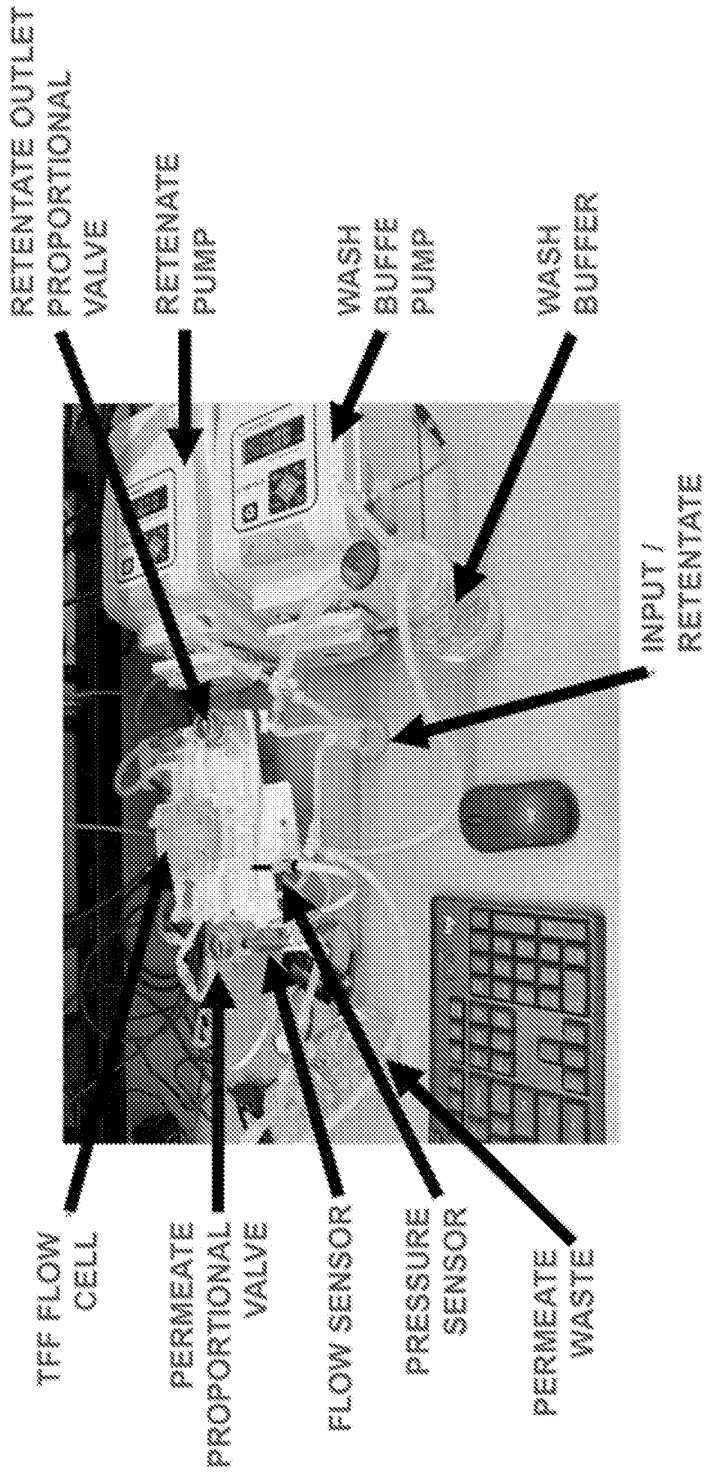


FIG. 85

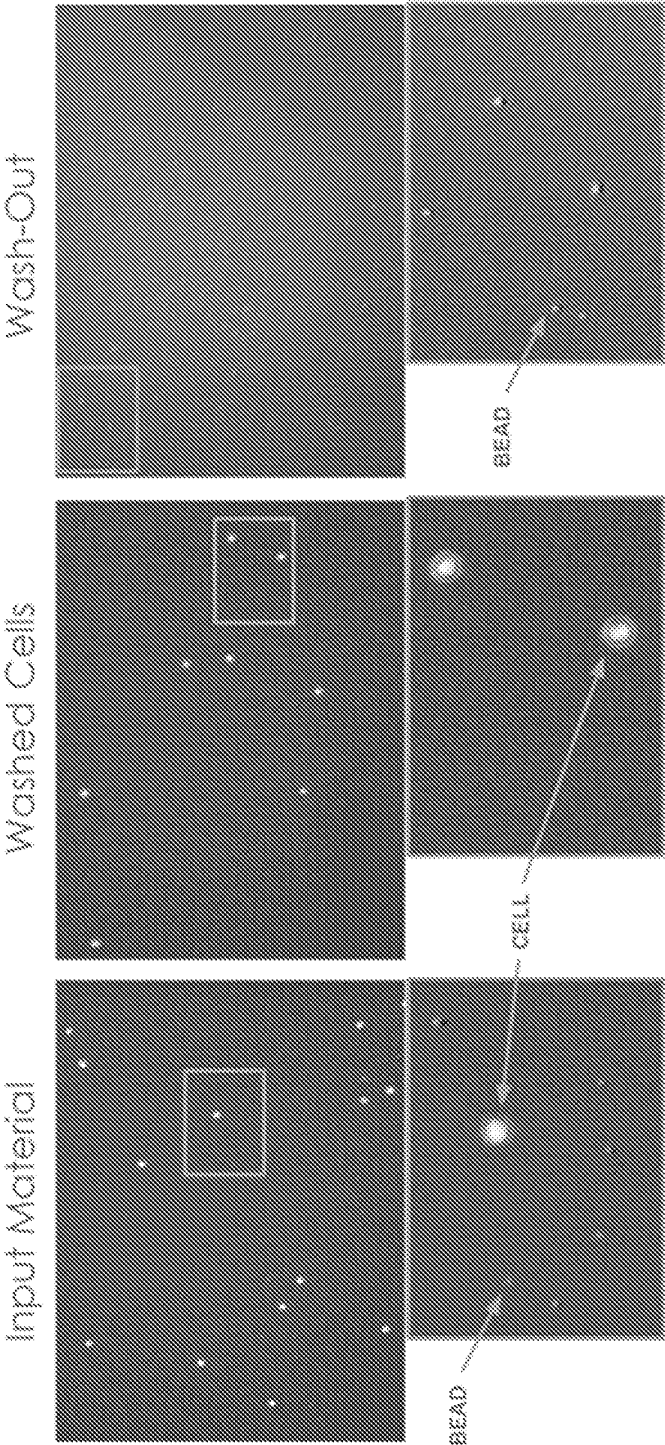


FIG. 86

70/70

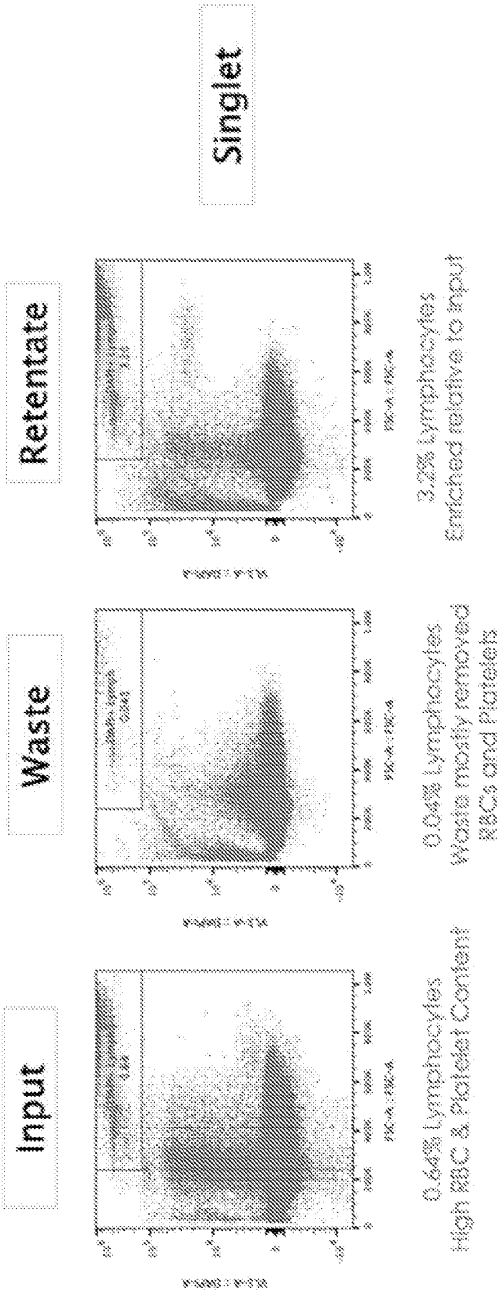


FIG. 87