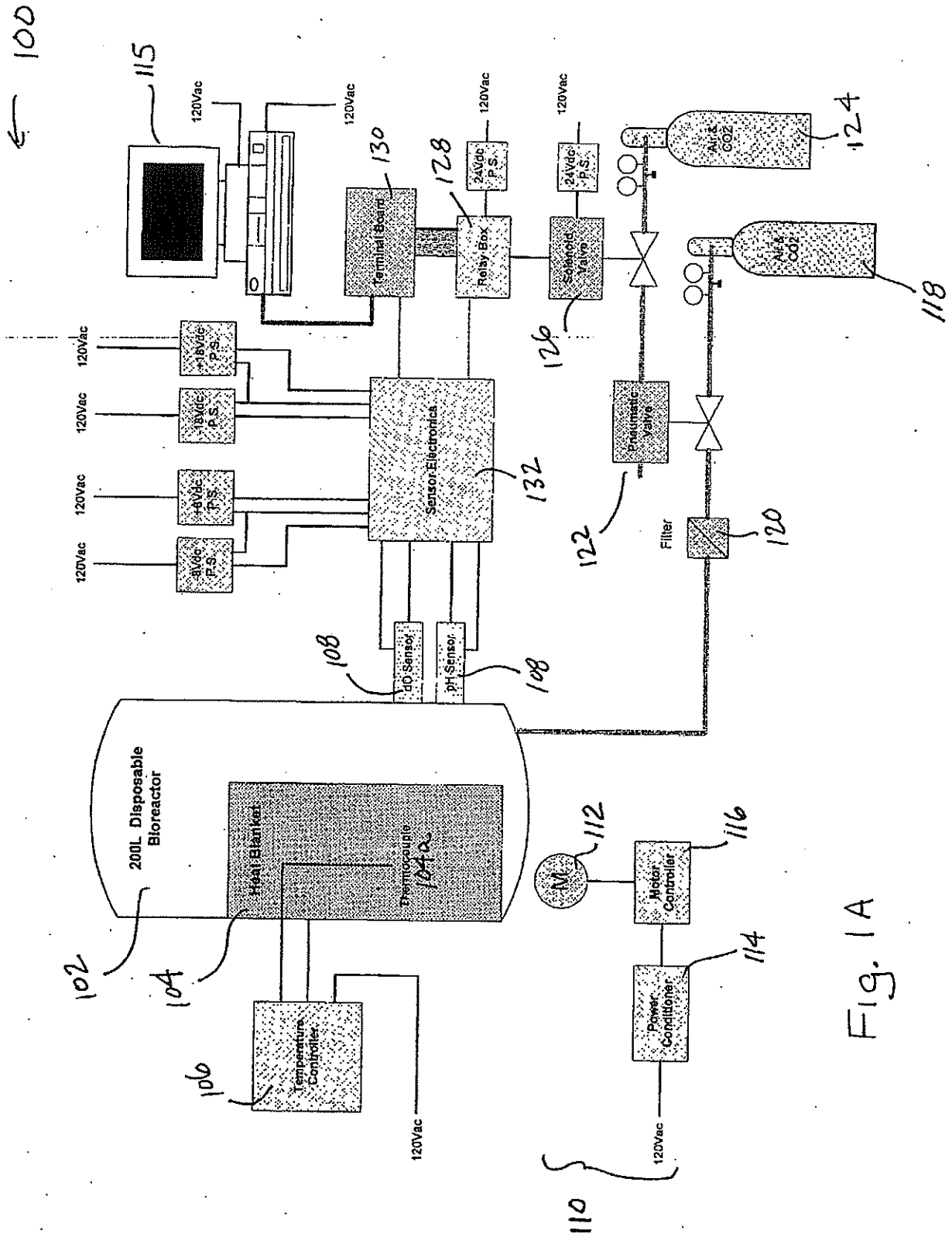

100
115
120Vac
130
128
24Vdc P.S.
Terminal Board
Relay Box
Solenoid Valve
Air & CO2
124
118
126
18Vdc P.S.
8Vdc P.S.
Sensor Electronics
132
Pneumatic Valve
122
Filter
120
108
dO Sensor
pH Sensor
200L Disposable Bioreactor
Heat Blanket
Thermocouple
104a
102
104
106
Temperature Controller
M
112
Motor Controller
116
Power Conditioner
114
110

Fig. 1A

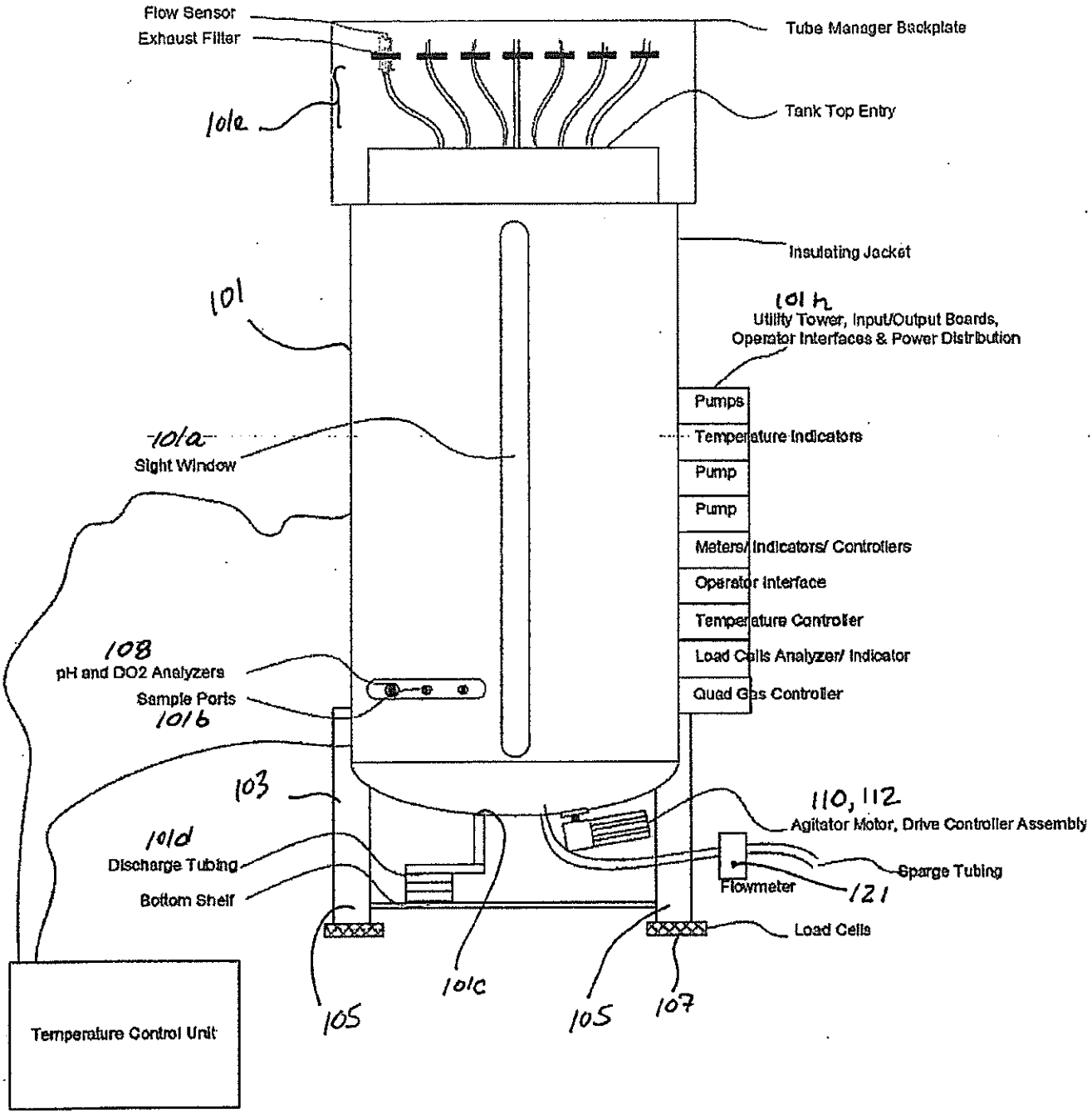

Flow Sensor
Exhaust Filter
101e
Tube Manager Backplate
Tank Top Entry
Insulating Jacket
101
101h
Utility Tower, Input/Output Boards, Operator Interfaces & Power Distribution
Pumps
Temperature Indicators
Pump
Pump
Meters/ Indicators/ Controllers
Operator Interface
Temperature Controller
Load Cells Analyzer/ Indicator
Quad Gas Controller
101a
Sight Window
108
pH and DO2 Analyzers
Sample Ports
101b
103
110, 112
Agitator Motor, Drive Controller Assembly
101d
Discharge Tubing
Bottom Shelf
Sparge Tubing
Flowmeter
121
Load Cells
Temperature Control Unit
105
101c
105
107

Fig. 1B

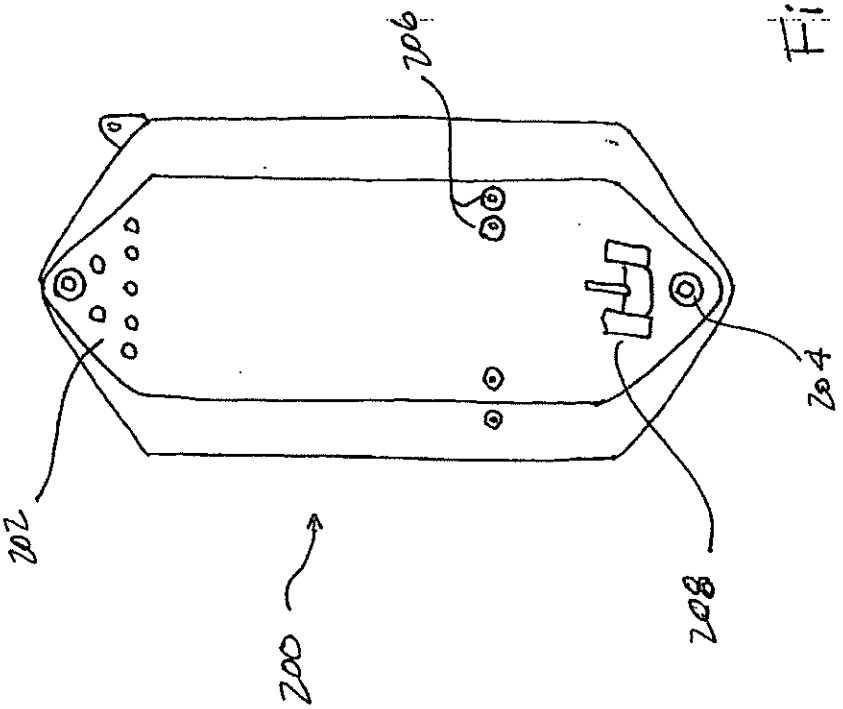
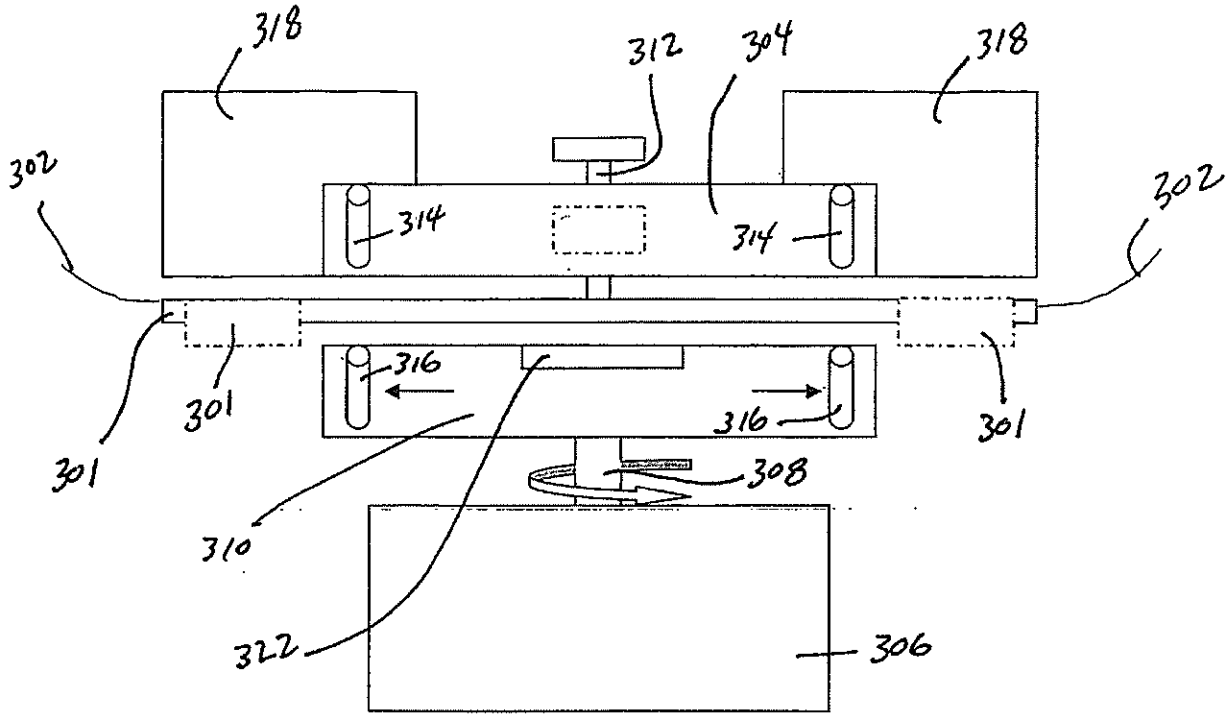


Fig 2

Fig. 3


318
312
304
318
302
314
314
302
316
316
301
301
301
308
310
322
306

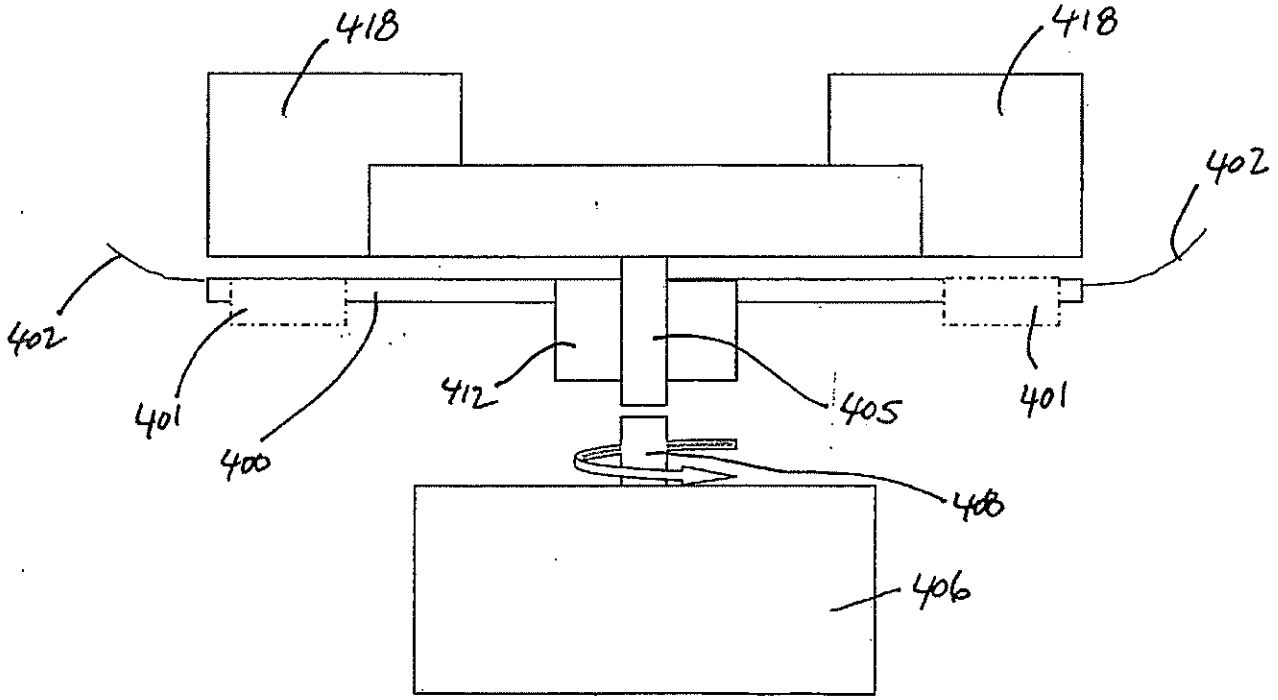

418
418
402
402
401
412
405
401
400
408
406

Fig. 4

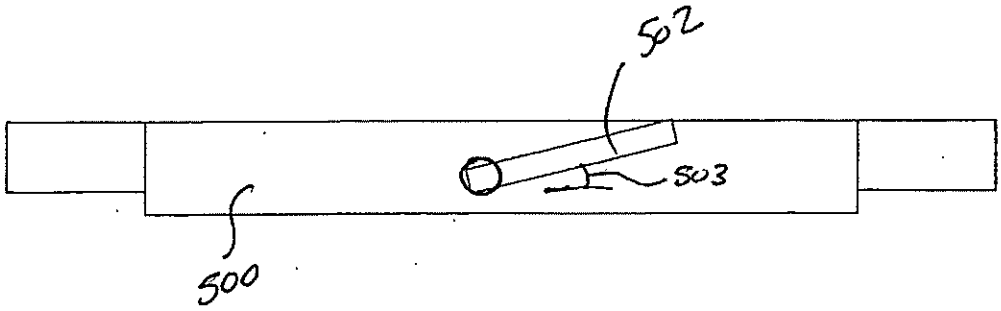


Fig. 5A

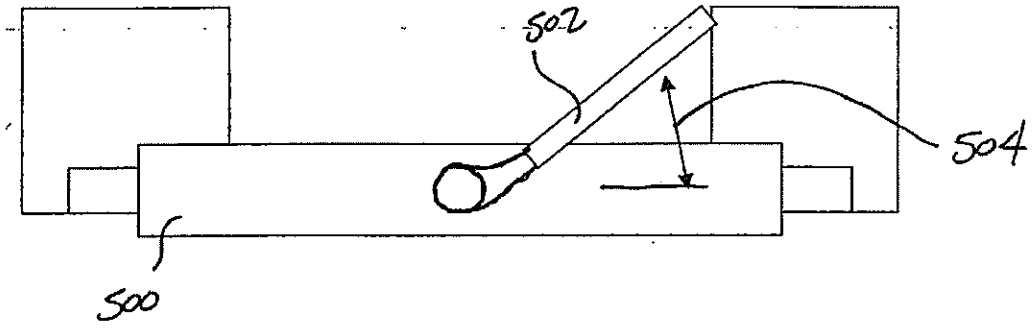


Fig. 5B

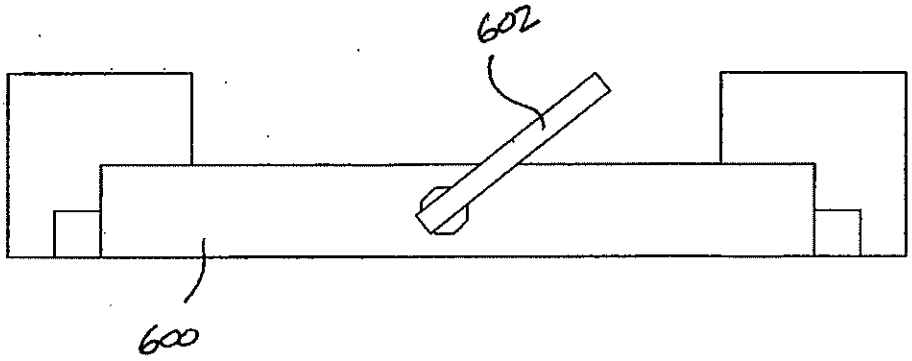


Fig. 6

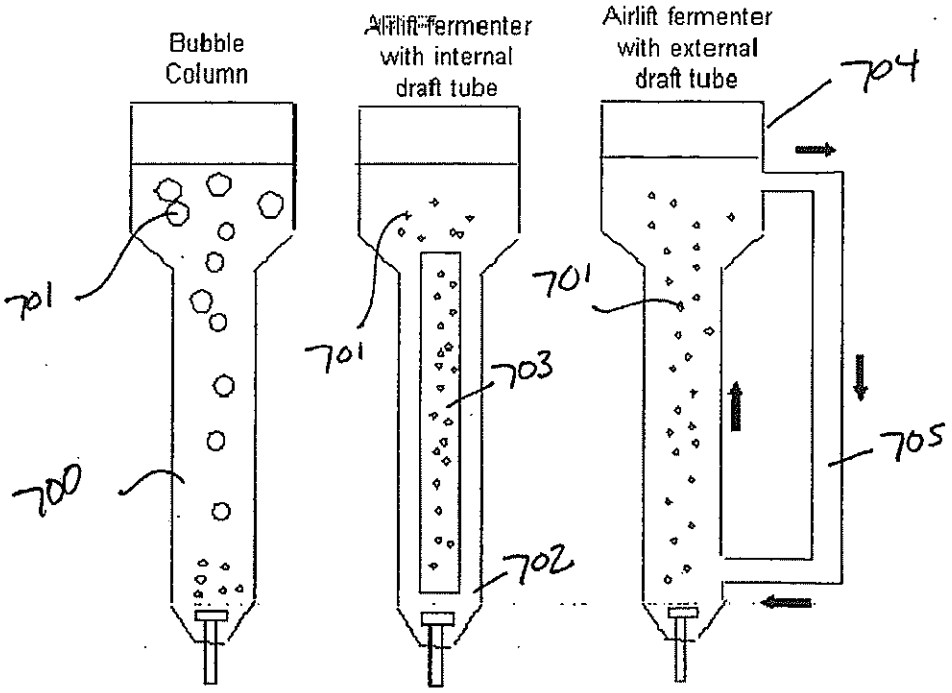

Bubble Column
Airlift fermenter with internal draft tube
Airlift fermenter with external draft tube
701
700
701
703
702
701
704
705

Fig. 7

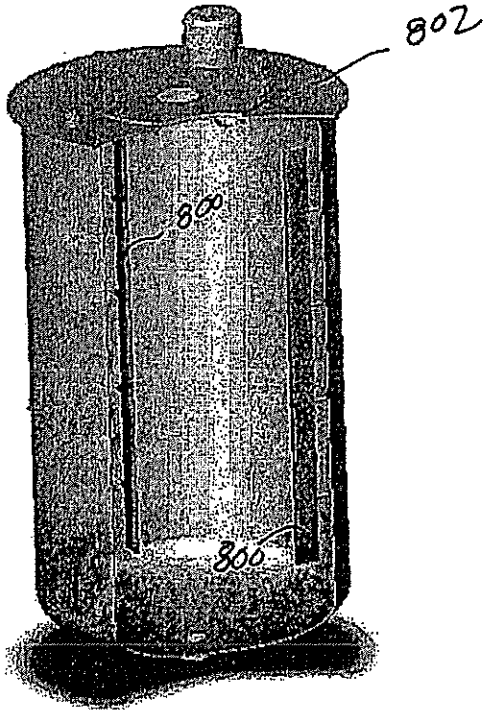

802
800
800

Fig. 8A

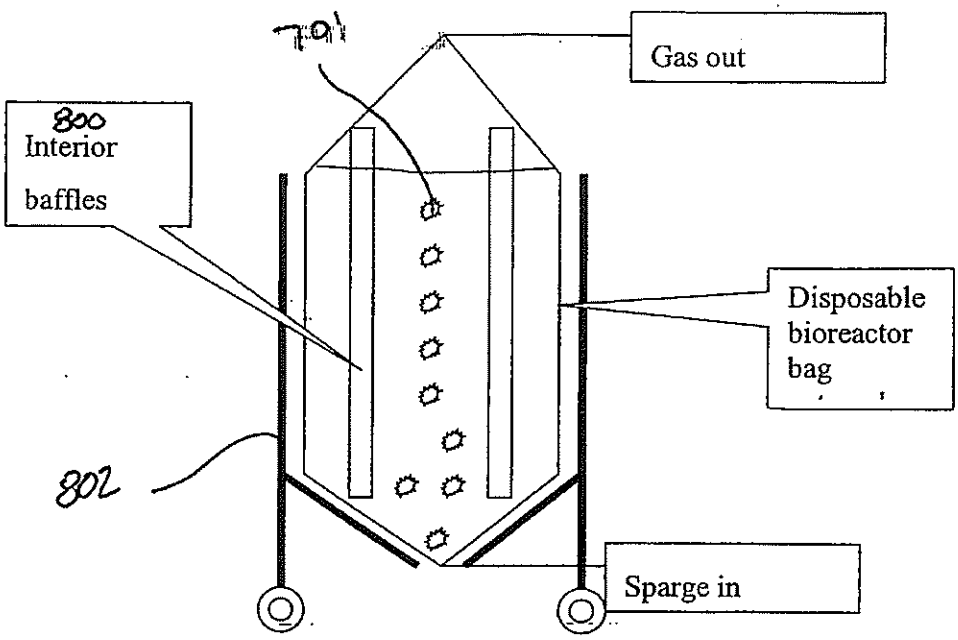

791
Gas out
800
Interior
baffles
Disposable
bioreactor
bag
802
Sparge in

Fig. 8B