A BIOREACTOR FOR TISSUE ENGINEERING

IITM Technology Available for Licensing

Problem Statement

• Traditional bioreactors require intricate designs or sensors to effectively detect and optimize cell and tissue culture.
• There is a demand for bioreactors that can achieve tissue growth with fewer complexities, particularly through the application of physiological flows and stresses.
• Existing bioreactors lack the capability to provide optimal environments for diverse tissue, organ, or cell production with the required functionality.

Technology

Controlled Environment for Cell Growth: The bioreactor is designed with at least two chambers, equipped with sensors and a controller to monitor and regulate conditions like temperature, pH, and gas concentration, enhancing cell proliferation and differentiation with or without scaffolds.

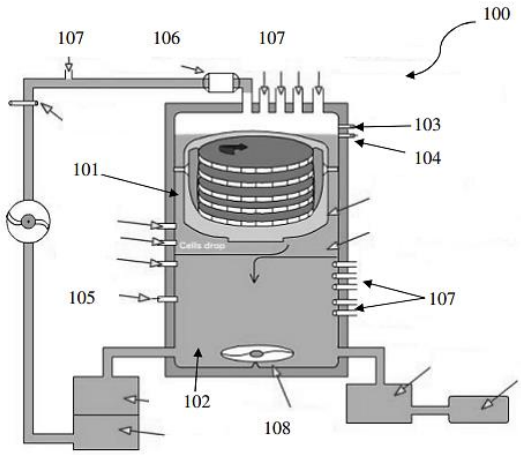
Electromechanical Drive Mechanism: The bioreactor features an electromechanical system that applies magnetic fields and shear stress to the cells, promoting cell growth and maturation, with adjustable inlet/outlet ports for precise environmental control.

Advanced Monitoring and Agitation: The system includes a conical platform and membrane filters to manage cell transfer between chambers, while integrated sensors provide feedback to maintain optimal conditions, ensuring high-quality tissue or cell culture production.

Intellectual Property

- IITM IDF Ref. **976**
- **IN 510399 - Patent Granted**

FIG. 1. illustrates a bioreactor for expanding/growing cells.



100	Bioreactor
101	Upper chamber
102	lower chamber
103	Temperature sensor
104	PH sensor
105	Osmolality sensor
106	Heat exchanger
107	Ports
108	Electromechanical drive mechanism

TRL (Technology Readiness Level)

TRL - 5: Technology validated in relevant environment.

Research Lab

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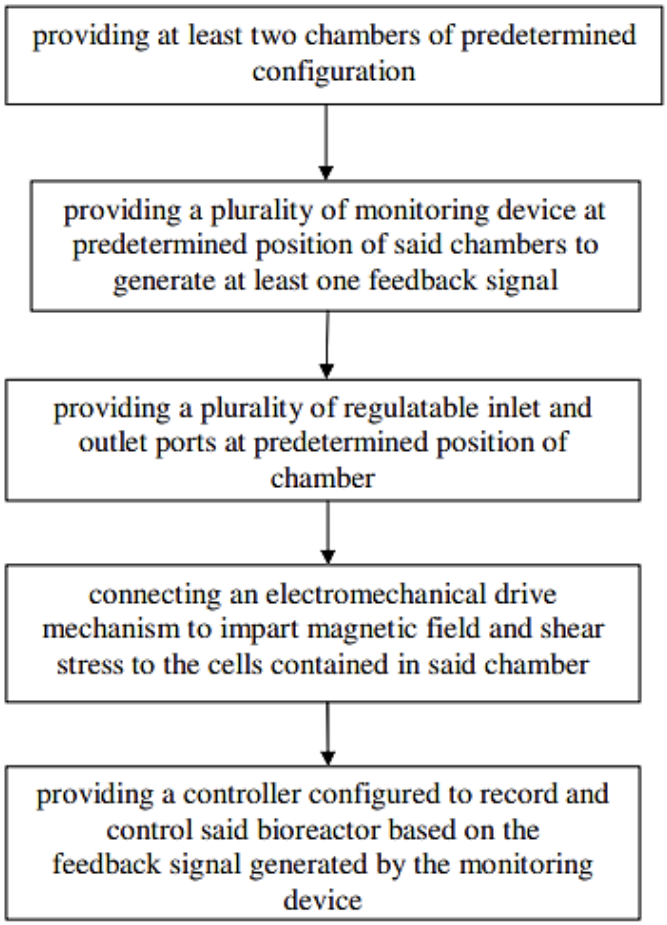
Technology Category/ Market

Category - Advanced Biomanufacturing
Applications - Tissue Engineering, Cell-Based Therapies, Biomaterials Fabrication
Industry - Biotechnology and Pharmaceutical

Market - Bioreactor Market, valued at USD 5.31 billion in 2024, is projected to reach USD 7.60 billion by 2029, growing at a **CAGR of 7.45%**

FIG. 2. illustrates a method of providing a bioreactor for expanding/growing cells.



Key Features / Value Proposition

1. Enhanced Cell Growth
- Optimized for both scaffold-based and scaffold-free cell culture, boosting cell proliferation and differentiation rates.

2. Precision Environmental Control
- Integrated sensors and controllers regulate critical factors like temperature, pH, and gas levels, ensuring consistent

3. Shear Stress and Magnetic Field Application
- Electromechanical drive mechanism imparts controlled shear stress and magnetic fields, enhancing cellular responses and tissue maturation.

4. Scalable Dual-Chamber Design
- Modular bioreactor with separated chambers allows for distinct stages of cell culture, from initial growth to final maturation.

5. Real-Time Monitoring
- Advanced sensors, including temperature, osmolality, and pH, provide continuous feedback, enabling precise adjustments to the cell culture environment.

6. Customizable and Versatile
- Adaptable configuration with replaceable components like membranes and heat exchangers, suitable for various cell types and research applications.

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