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(72) Inventors; and

(71) Applicants: **KHORI, Vahid** [IR/IR]; Department of Pharmacology and Toxicology, Ischemic Disorders Research Center, Golestan University of Medical Sciences, Golestan, Iran, Gorgan, 4918936316 (IR). **BASIRI, Salar** [IR/IR]; No 303 (South East Suite) - 3rd Floor - Denay2 Building - After Mihandoost Allay - Near to Beryanak St - North to South Slow Lane - Navvab Highway, Tehran, 1355797193 (IR).

(72) Inventors: **SHAMS AMIRI, Rouzbeh**; Department of Pharmacology and Toxicology, Ischemic Disorders Research Center, Golestan University of Medical Sciences, Golestan, Iran, Gorgan, 4918936316 (IR). **GHAMOUSHIRAMANDI, Amir**; Late Night Chemist Ryde, Shop 1, 46, Blaxland Road RYDE NSW, Sydney, New South Wales 2112 (AU). **POORKHANI, Amir Houshang**; Department of Pharmacology and Toxicology, Ischemic Disorders Research Center, Golestan University of Medical Sciences, Golestan, Iran, Gorgan, 4918936316 (IR). **AHMADI, Farahnazsadat**; Department of Pharmacology and Toxicology, Ischemic Disorders Research Center, Golestan University of Medical Sciences, Golestan, Iran, Gorgan, 4918936316 (IR). **KHORI, Anahid**; Unit 201/ 3 Mooltan Avenue, Macquarie Park, NSW 2113, Sydney, New South Wales NSW 2113 (AU).

(74) Agent: **BASIRI, Salar**; No 303 (South East Suite) - 3rd Floor - Denay2 Building - After Mihandoost Allay - Near to Beryanak St - North to South Slow Lane - Navvab Highway, Tehran, 1355797193 (IR).

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(54) Title: A BIOREACTOR FOR QUANTITATIVE CARDIAC ANTI-FIBROTIC DRUG ASSESSMENT

(57) Abstract: This disclosure related to a 3D biomimetic bioreactor platform. The 3D biomimetic bioreactor platform induces and quantifies cardiac fibrosis through synchronized multi-modal stimulation, maintaining native tissue preservation and inducing fibrosis from zero to any predefined ratio. The system combines electrical, mechanical, and biochemical cues to modulate tissue behavior, with real-time data acquisition on conduction velocity, tissue impedance, and strain-response curves. Advanced technologies, including vascularized microjet and 3D magnetic actuator, enable precise control over mechanical stretching and temporal modulation of strain. This innovative platform empowers researchers to study cardiac fibrosis mechanisms, assess treatment efficacy, and optimize therapeutic strategies for associated cardiovascular disorders, revolutionizing the field of cardiovascular research.

