METHOD AND APPARATUS FOR OPERATOR-INDEPENDENT ULTRASOUND ELASTOGRAPHY

IITM Technology Available for Licensing

Problem Statement

1. The existing methods for quasi-static elastography suffer from **inconsistent image quality**, affecting the **accuracy** of **tissue elasticity assessment.**
2. Current approaches are **not adaptable** to various transducer types, hindering their versatility in clinical settings.
3. The prior art methods are **bulky, expensive, and complex**, posing challenges when **transitioning** from lab to clinical applications.
4. Thus, there's a need for a **cost-effective, user-friendly, and portable solution for precise compression in elastography which is** disclosed in the present patent that also addresses all the above mentioned issues.

Technology Category/ Market

Categories: Applied Mechanics & Mechanical Engineering, Assistive, Test Equipment & Design Manufacturing

Industry: Medical Devices, Ultrasound Technology, Mechanical Engineering, Control Systems, Imaging Technology, Biomedical Imaging, Automation and Robotics.

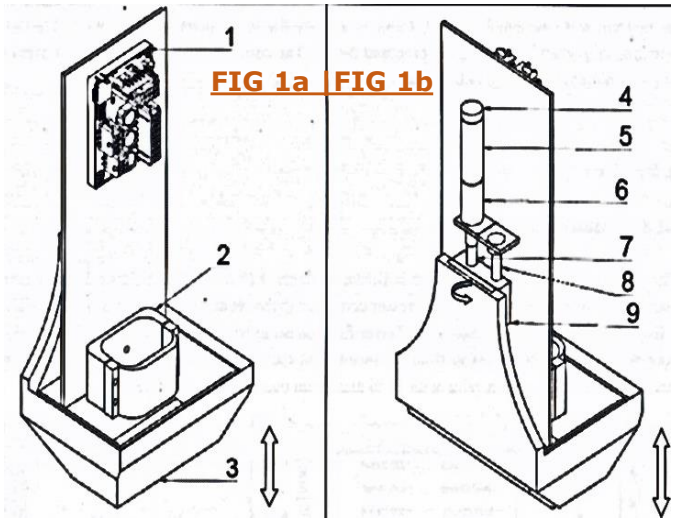
Applications: Medical Imaging and Diagnosis, Cancer Detection, Research and Development, Biomechanical Studies, Liver Disease Assessment, Quality Control, Musculoskeletal Medicine, Cardiology, Gastroenterology, Education.

Market: The global **Elastography Imaging** Market Size was valued at **$3.0 billion in 2021** and is projected to reach **$6.0 billion by 2031**, growing at a **CAGR of 7.1% in 2022-2031.**

Technology

A **method and apparatus** for **operator-independent ultrasound elastography** are disclosed herein.

FIG 1a & 1b illustrates a **compact and hand-held device capable of precise compression and relaxation**, designed to attach to **various ultrasound transducer probes** regardless of their **size and weight.**



TRL (Technology Readiness Level)

TRL - 4, Experimentally validated in lab.

Key Features / Value Proposition

❖ ***User Perspective:***

- Users benefit from **Enhanced Image Quality** by reducing reliance on operator skill.
- **Versatile** as it easily attaches to various probes, making it **user-friendly** in clinical settings.
- Automation reduces **Operator Dependency** and the risk of human errors, improving reliability.

❖ ***Technology Perspective:***

- The apparatus **synchronizes compression with data acquisition, enhancing reliability**.
- **Innovative motorized compression device** translates rotation into **linear compression**.
- **Advanced feedforward control algorithm** ensures precise **compression and relaxation.**

❖ ***Industrial Perspective:***

- **Market Demand**: The device meets the need for operator-independent elastography with high-quality results.
- **Competitive Edge**: Its automation and improved quality give it a competitive edge in the medical imaging industry.
- **Technology Innovation**: Motorized compression and synchronization offer opportunities for IP and industry partnerships.

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Intellectual Property	Research Lab
IITM IDF No: 1730; **Application No: 201841027733**	**Prof. Arun K. Thittai** **Department of Applied Mechanics**

Method and Apparatus

An apparatus for operator-independent ultrasound elastography said apparatus comprising:

- A compact and hand-held compressor device can be attached to a wide range of ultrasound transducer probes with varying size and weight, provides precise compression & relaxation

- A position controller & a provision for an external compressor

- The compact compressor device can be synchronously operated with the ultrasound data acquisition module of the ultrasound system to obtain improved image quality with minimal operator dependency.

- The compressor device can be an automated compressor unit which provides controlled compression to the tissue for acquiring RF data collaterally and thereby improve the elastogram quality.

The hand-held compressor set up comprises of a motor gear arrangement, a support plate, a supporting rod, and a 3D -printed compressor. Wherein, the motor gear arrangement is attached to a support plate (3D printed compressor plate) with the help of the supporting rod and slider (that provides the desired uni-axial tissue compression) which help the motor to convert the rotation movement to a linear movement to achieve compression in the device.

The motor unit of the compression device is controlled by a slave controller which is instructed by a master controller wherein the master controller is configured with a feedforward control algorithm by taking the input of position, velocity, and acceleration values for controlled compression and relaxation.

The compressor setup has a holder to place the ultrasound transducer that acquires RF data in synchronization with tissue compression wherein the RF data from tissue at different levels of compression are processed to form the elastogram with improved quality.

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