3D Printed Variable Hardness Foot Orthotics with Patient-Specific Fit (2015-016)

Low-cost, Patient-specific Foot Orthotics Evolves to Meet Patient Needs over Time

Market Overview

This custom-fit foot orthotic uses 3D printing, providing a clinician-to-patient manufacturing cycle that produces custom-fit foot orthotics in reduced time and lower costs. Over 29 million Americans, or 9.3 percent of the population, have diabetes. At any given moment, between 4-10 percent of diabetics have a diabetic foot ulcer. In 3-5 percent of cases, the ulcer will become serious enough that an amputation is required to save a limb or the patient's life. Traditional pressure offloading foot orthotics manufactured from foam-box negative imprints are effective in reducing ulceration. The downside, however, is the current manufacturing practices are costly, time-consuming, and labor intensive with high material waste. Clemson University Researchers have developed a 3D-printed custom foot orthotic with patient-specific geometry and variations in material hardness. This orthotic leverages commercially available 3D-printed materials in combination with a suite of proprietary algorithms, customizing the material geometry and enabling rapid fabrication of foot orthotics at a resolution not found in standard orthotic materials.

Application

Diabetic orthotics; Sports performance

Stage of Development

Proof of concept; Prototype

Advantages

- Provides improved hardness and geometric resolution, optimizing pressure reduction
- Utilizes low-cost commercially available 3D-printed materials, resulting in a significant reduction in the turn-around-time to fabricate a custom orthotic

Technical Summary

Clemson University researchers have developed a system to 3D-print custom foot orthotics, such that patient specific geometry and variations in material hardness are directly printed to satisfy clinical need. The inherent flexibility of 3D printed orthotics decreases the wait time from 2-3 weeks to 1 hour for patients needing orthotics. Due to the low-cost and rapid turn-around-time, this orthotic allows clinicians to make subsequent high resolution adjustments in hardness topology to the custom foot orthotic as the patient's response to treatment evolves.

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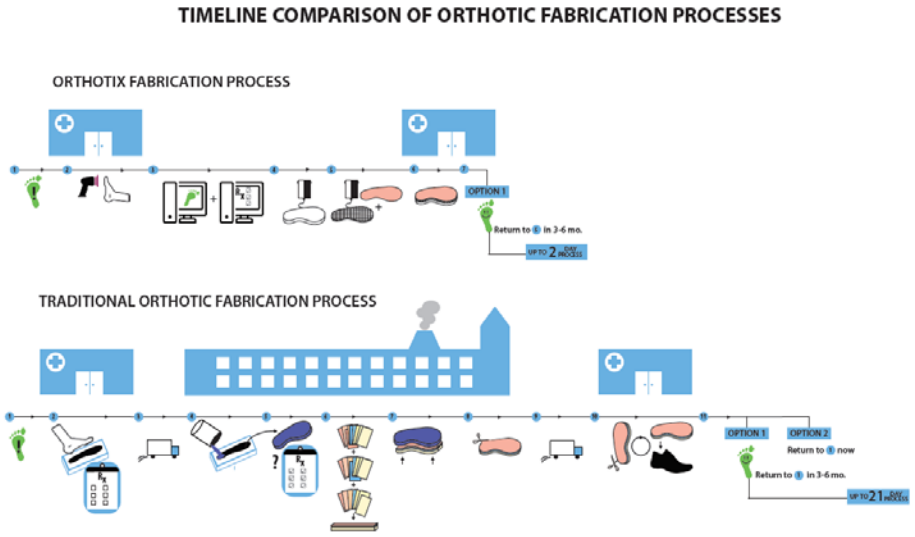

App Type	Country	Serial No.	Patent No.	CURF Ref. Number	Inventors
Provisional Utility	United States	62,117,690 15/046,661	NA	2015-016	John DesJardins, Scott Stanley, Breanne Przestrzelksi, Brain Kaluf, Timothy Pruett, Steven Hoeffner

About the Inventor

Dr. John DesJardins is an Assistant Professor of Bioengineering at Clemson University. He earned his Ph.D. in Bioengineering from Clemson University and possesses over 20 years of experience as a biomechanical research engineer. He currently serves as the director of the Laboratory of Orthopedic Design and Engineering at Clemson University as well as the Frank H. Stelling and C. Dayton Riddle Orthopaedic Education and Research Laboratory at CUBEInC. Dr. DesJardins holds two issued patents and several U.S. and foreign applications. His research interests focus on total joint replacement, orthopaedic biomechanics, and biomaterials.

For More Information

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