



12-9-2010

Design of a Near-Constant Force Spring for Orthopedic Implants

Christopher Hartman
Western Michigan University

Paul Rotarius
Western Michigan University

Follow this and additional works at: http://scholarworks.wmich.edu/honors_theses

 Part of the [Mechanical Engineering Commons](#)

Recommended Citation

Hartman, Christopher and Rotarius, Paul, "Design of a Near-Constant Force Spring for Orthopedic Implants" (2010). *Honors Theses*. 2165.

http://scholarworks.wmich.edu/honors_theses/2165

This Honors Thesis-Open Access is brought to you for free and open access by the Lee Honors College at ScholarWorks at WMU. It has been accepted for inclusion in Honors Theses by an authorized administrator of ScholarWorks at WMU. For more information, please contact maira.bundza@wmich.edu.



Design of a Near-Constant Force Spring for Orthopedic Implants

Project # ME 1012-01

Final Report



for

Biomet Inc.

By:

Christopher Hartman

Paul Rotarius

Faculty Advisor:

Dr. Peter Gustafson

Mechanical & Aeronautical Engineering Assistant Professor
Western Michigan University

December 9, 2010

NOTIFICATION OF INTELLECTUAL PROPERTY

All text, figures, tables, program listings and other data contained in this report are the property of the undersigned students unless otherwise noted. No duplication, use, or redistribution of this material is allowed in any kind without the prior written consent of the undersigned students and industry mentor.

ABSTRACT

The design and testing of a spring assembly for the attachment of an orthopedic implant is presented. The assembly is intended to supply a constant compressive force of approximately 800 lb. at the bone-implant interface, while exhibiting insensitivity to changes in the displacement of the clamping device. This near-constant force will aid in-growth of bone tissue at the implant surface. This constant compressive force was ultimately not attained due to the packaging dimensions and materials available. However, significant improvement was made upon the current design in use by lowering the spring constant around 800 lb.

The final assembly fits in a unique packaging envelope and is composed of a number of springs in compression used to apply tensile load to an anchor plug inserted into the patient's bone, thereby accomplishing the design goal of clamping the bone to the implant surface. The materials used in the assembly are limited to those that are recognized by the Food and Drug Administration (FDA) as biocompatible for long-term implantation.

The design was modeled using an analytical computer program, solid-modeling software, and finite element analysis (FEA) software. The design was validated by the construction of a prototype and correlated physical testing.