

Electro Magnetically Actuated Artificial Muscle For Prosthetics And Human Augmentation

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Abstract:

A controllable and precise artificial for use in prosthetics and exoskeleton systems has been a topic of high level research for the past few years. Some of the obstacles in the way of this goal are ease of use, controllability, reliability and predicable responses to varying environmental conditions. This research aims to determine the viability of using an electromagnetically actuated system as an artificial muscle in place of traditional systems. The device is designed to be entirely self-contained with no additional components such as belt drives or hydraulic hoses. Several tests including system requirements, ease of use, overall strength and performance under varying conditions. During development of the magnetic muscle, several different configurations and sizes are designed and tested to determine which variant would best meet the requirements of an artificial muscle system. Ultimately this projects aims to develop a solution to the many problems plaguing the current state of powered artificial limbs.

Method:

Two main designs were created for testing purposes, both of which evaluated for power efficiency, weight displacement capabilities and actuation time. With electromagnets being the primary actuating force, with coil parameters were changed such as number of turns, diameter and surface area.

Results:

Based on preliminary results from both designs, a few conclusions are able to be drawn. Firstly due to the low magnet permeability of air design one was determined too inefficient to be viable. Design two at this point in testing, although far more promising seems to lack in comparison to current systems. The system weight to force output ratio is too low in it's current state to be a viable system. Further experimentation however may show better results.

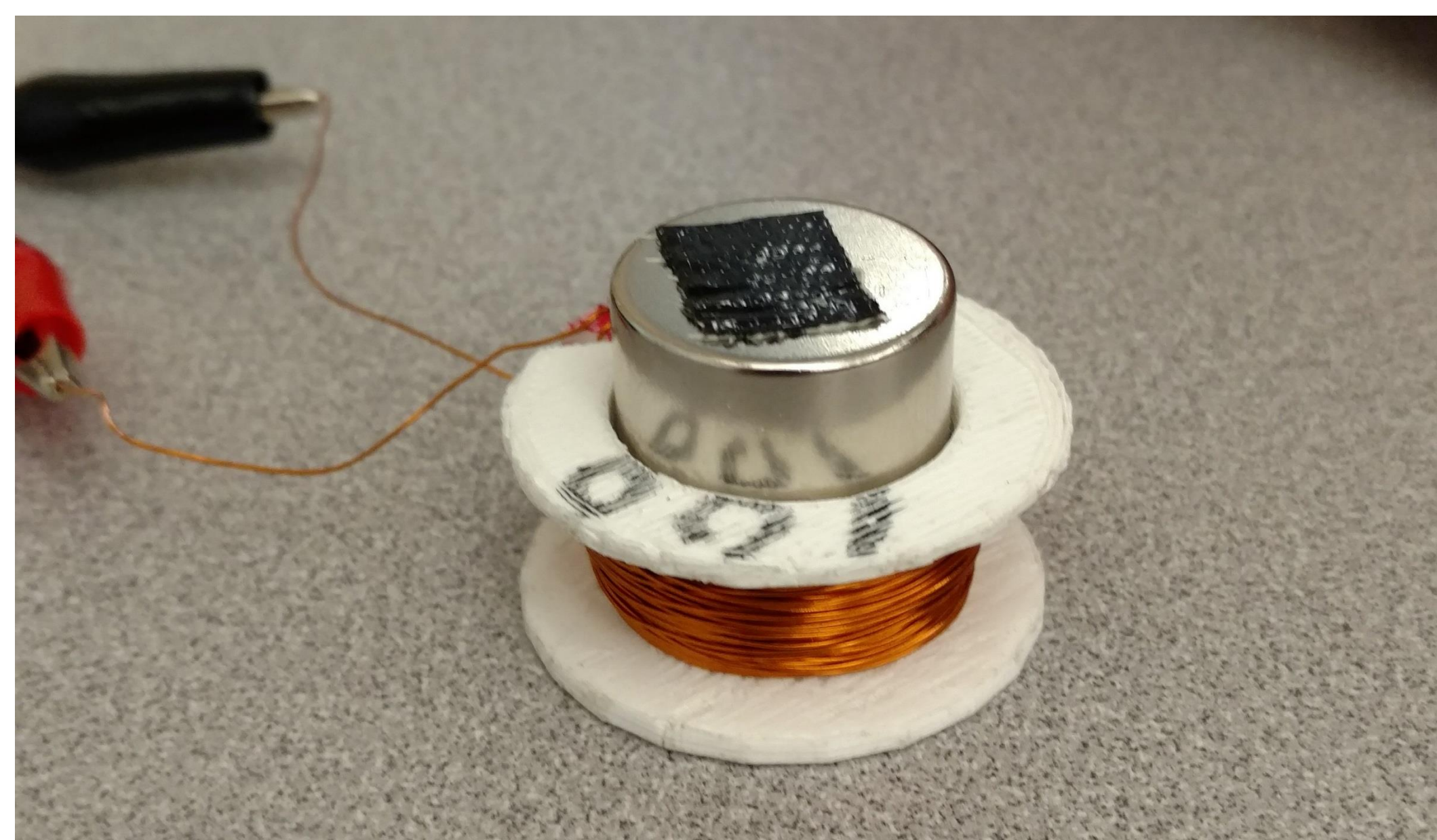


Figure 3: Prototype Mk5 of Design two

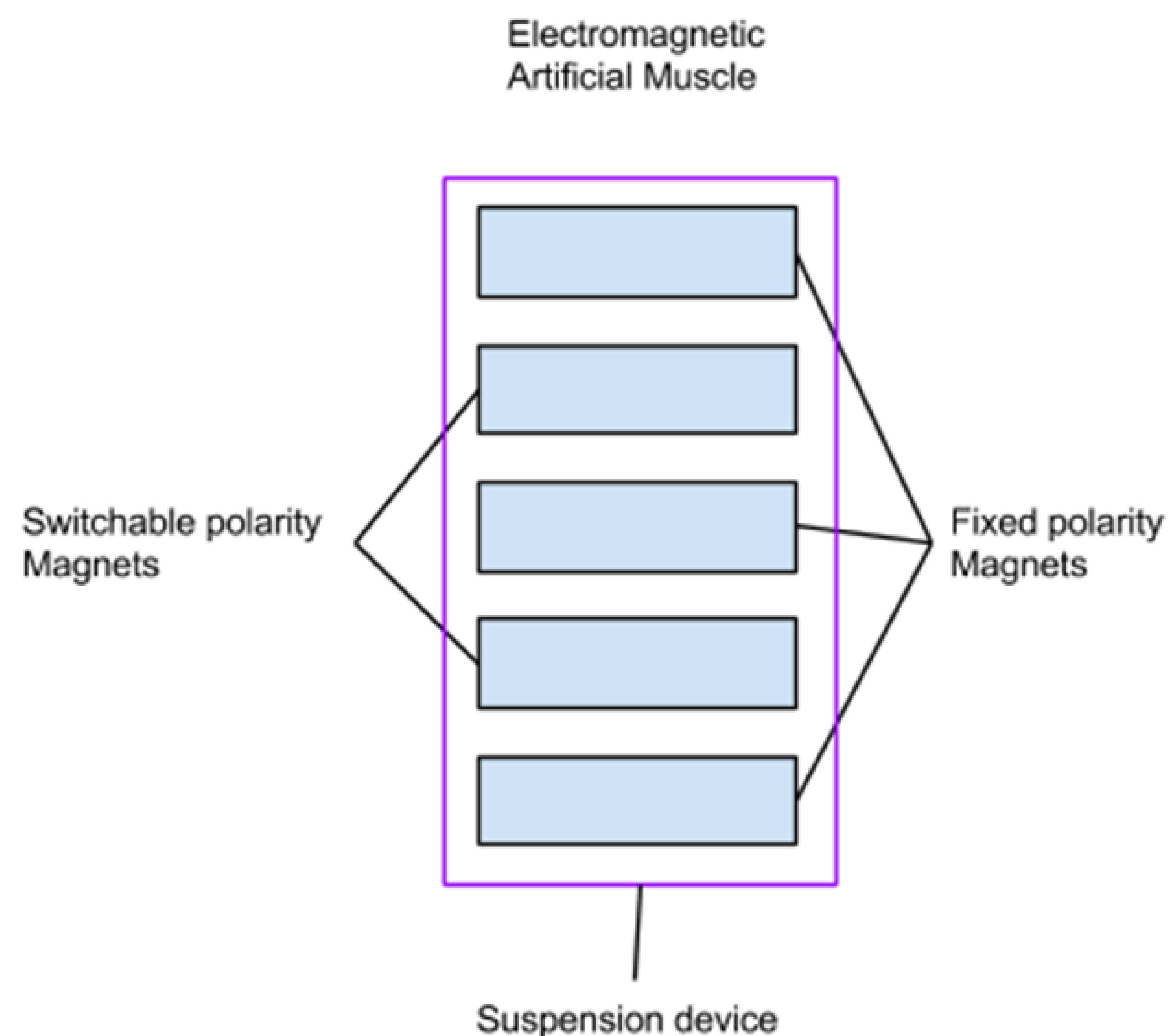


Figure 1: Design one of electromagnetic muscle cross section

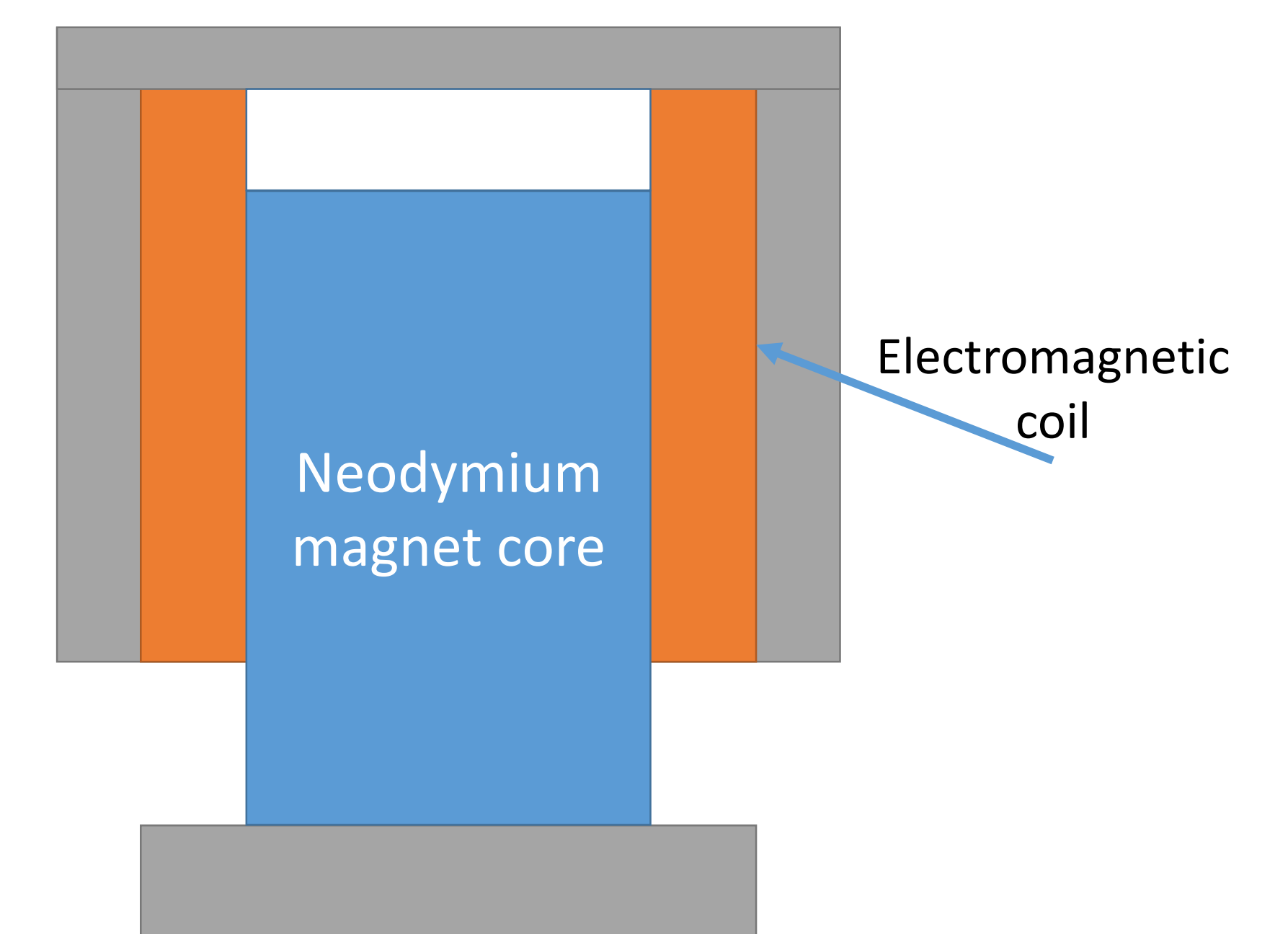


Figure 2: Design two of electromagnetic muscle cross section

Acknowledgments:

The Office of Undergraduate Research for providing funds to conduct this research.
Dr. Eduardo Divo for providing lab space to conduct research