

Passive-Locking Implant-Retained Auricular Prosthesis Attachment

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Overview

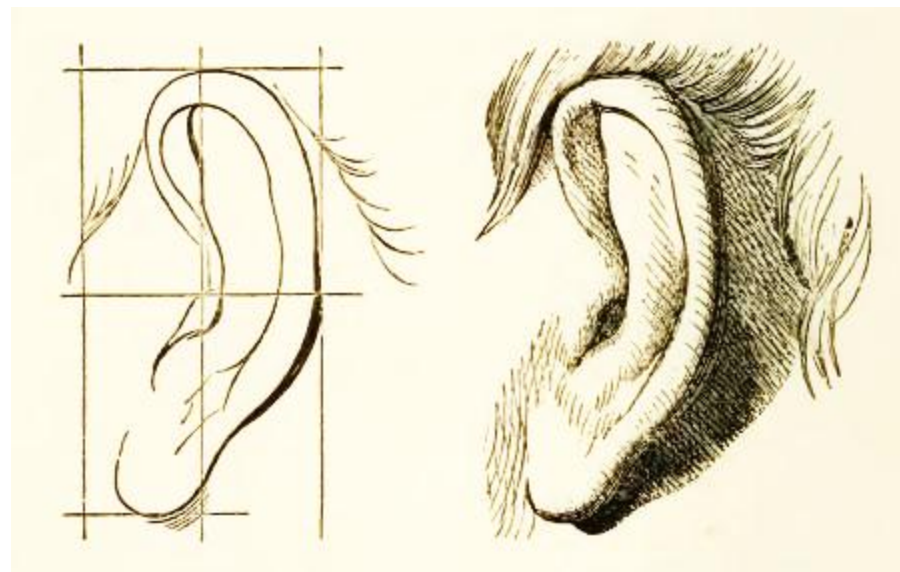
- Project Summary
- Design Requirements
- Current Practices
- Alternative Designs
- Design Matrix
- Testing and Future Work



<http://www.harlandlawfirm.com/PracticeAreas.htm>

Project Summary

- Replace current design for ear prosthetic attachment
- Create new locking mechanism
- Incorporate existing housing



Background

- Treatment for:
 - Microtia, Cancer
 - Accidents (Burns, etc.)
- Procedure
 - Mold/Scanned model of area is made for surgical guides
 - 3 Temporary pins implanted in mastoid bone for 3-6 months
 - Temporary pins replaced
 - Modeled ear is fitted and matched aesthetically



http://www.ijdr.in/articles/2011/22/1/images/IndianJDentRes_2011_22_1_152_79983_f7.jpg

Design Requirements

- Must create solid attachment of prosthetic
- Must utilize existing hardware
- Must be user friendly
- Must be hypo-allergenic
- Must maintain aesthetics



Current Practices

- Pin + Magnetic Housing with O-ring locking system



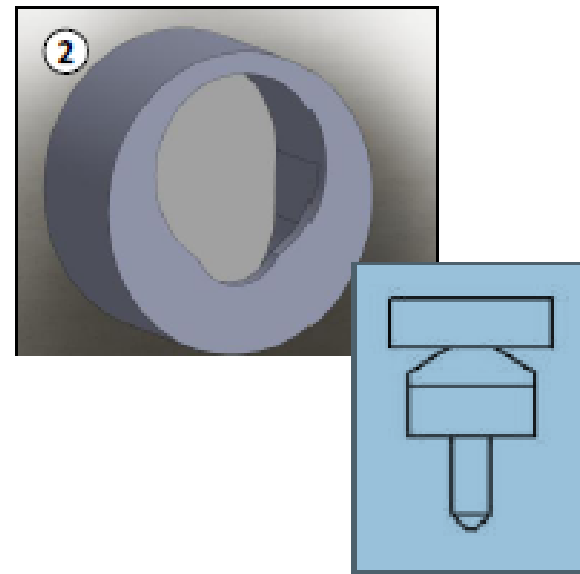
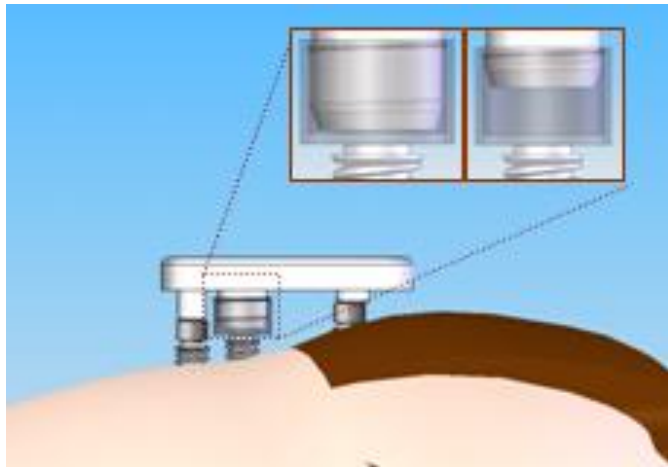
<http://www.medicalartprosthetics.com/content.php?page=prostheses&sec=auricular>



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- Bar + Press fit locking device

Previous Design Projects



Alternate Designs

- Snap-Fit System
- Pin Secured System
- Magnetic Locking Mechanism

Snap Fit System

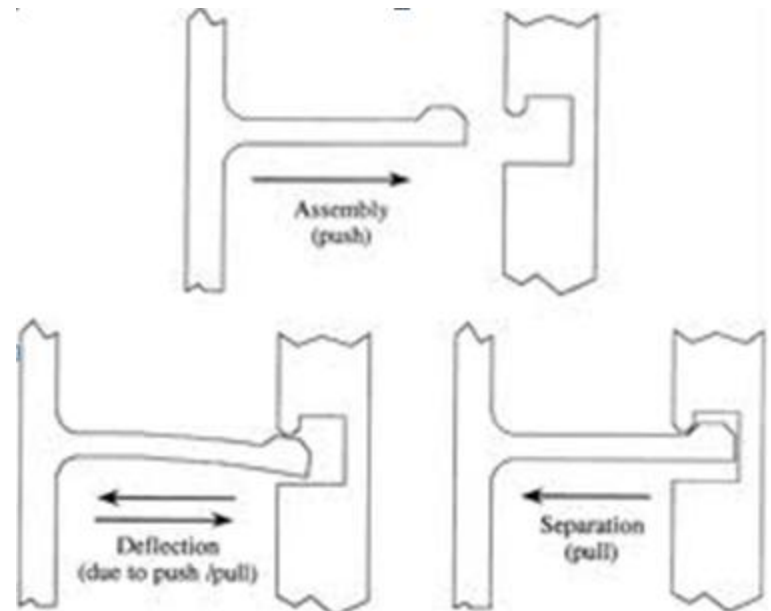
- A two part system composed of a housing and attachment point which utilizes the elastic properties of the housing to connect and disconnect from the attachment point.

Pros

- Requires little effort
- Secure locking mechanism
- Ergonomically friendly

Cons

- Poor durability
- Increases wear and tear on prosthesis
- Difficult removal mechanism



Pin Securing System

- A system of locks inside of the prosthesis that are activated by pushing an externally located pin.

Pros

- Effective locking system
- High durability
- Minimizes contact with prosthesis

Cons

- Involves alteration of existing system
- Difficult to use
- Incorporates visible component



http://www.alibaba.com/promotion/promotion_bent-arm-pin-promotion-list.html

Magnetic Locking Mechanism

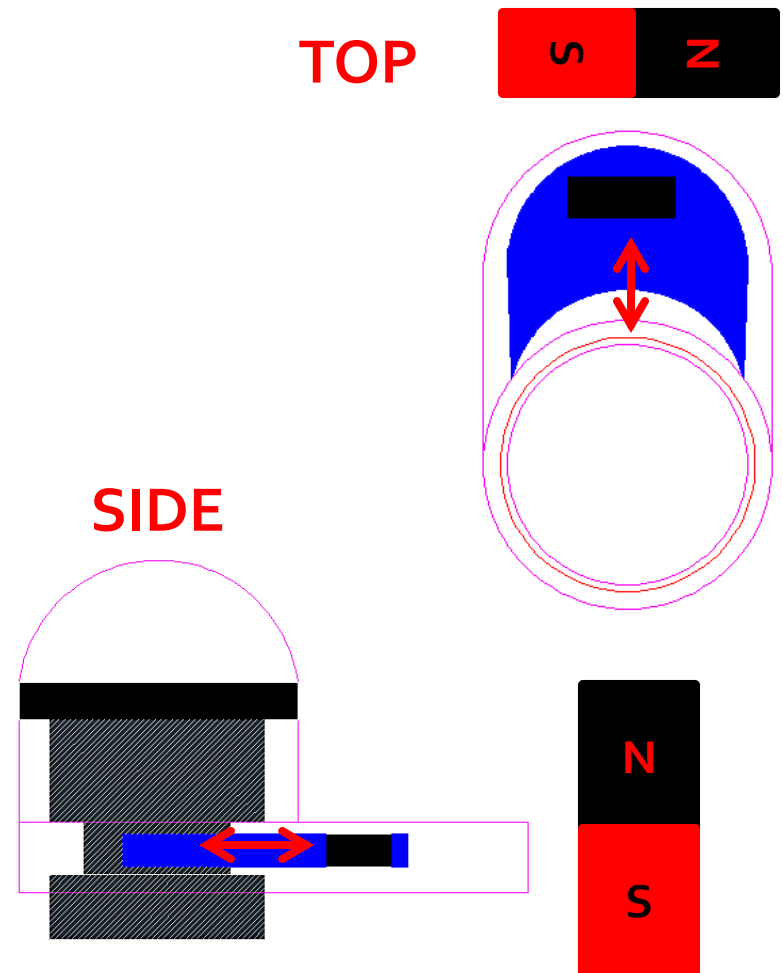
- Uses gravity to drop locking piece in place. Magnetic key is then used to dislodge the piece.

Pros

- Minimizes contact and effort to attach/detach
- Compact design
- Can utilize parts from the current method

Cons

- Two – part design
- Not ergonomically friendly



Design Matrix

Parameters	Total Weight	Magnet	Pin	Snap Fit
Safety	10	10	10	10
Durability	20	18	18	10
Ergonomics	20	14	16	12
Feasibility	25	20	18	16
Client Preference	10	10	8	6
Ease of Concealment	15	13	8	15
Total	100	85	78	69

Testing

- Steady dislodging force
- Impulse dislodging force
- Lateral force
- Ease of use (unlocking)
- Tilt angle of head
- Deform magnetic slider



<http://www.aliexpress.com/fm-store/204164/153710-Testing-Equipment.html>

Future Work

- Develop large scale prototype
- Actual scale prototype
- Testing of prototype
- Implement into useable prosthetic



http://articles.whmsoft.com/getimage.php?fullimage=http%3A%2F%2Fca.che.gawkerassets.com%2Fassets%2Fimages%2F8%2F2008%2F12%2F340x_Chemistry.jpg

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Questions????



<http://www.mrmediatraining.com/index.php/tag/question-of-the-week/>