

# Mechanical Shredder

## Engineering Analysis

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# Overview

- Design Concept Review
- Chosen Design Concept
- List of Parts and Materials
- Mechanism Design
- SolidWorks Drawings

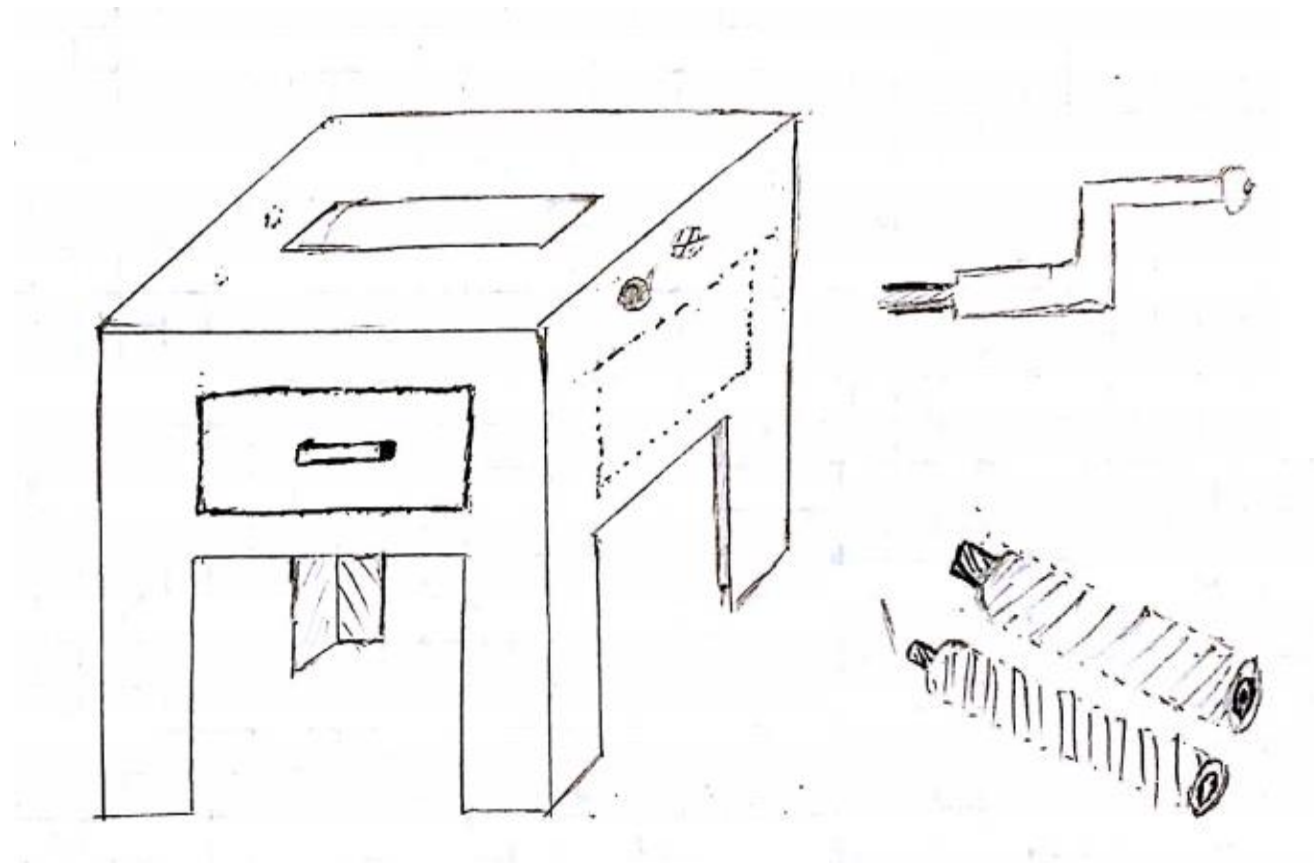
# Introduction

- Team continued with design concepts previously chosen and did analysis on plausibility of system.
- Potential gearing system was developed and an on-market paper shredder was chosen to retrofit for project.
- System drawn in SolidWorks to show designed system.
- Price estimate was done for the system components.

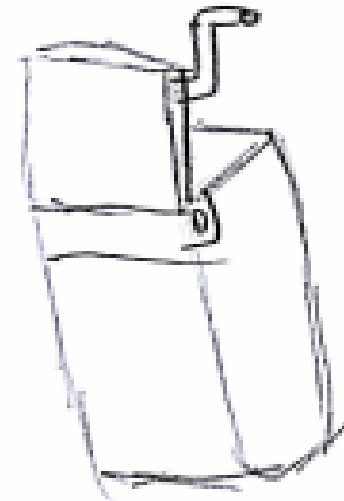
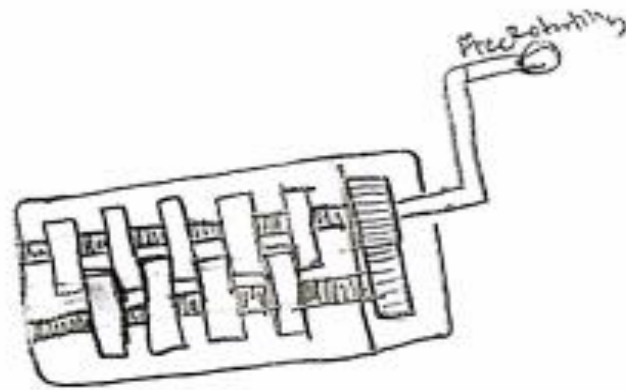
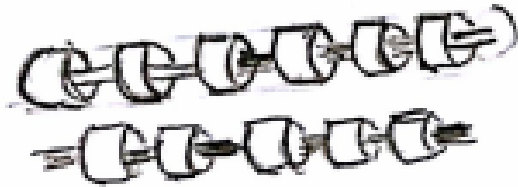
# Customer Needs Review

- The Customer needs a paper shredder that is completely mechanical, portable, environmentally friendly, and can compete with an electric paper shredder
- The group will be limited to a budget of \$100 for our designs and the system has to fit within a 5ft<sup>3</sup> volume
- Paper shredder must shred 10 sheets per feed, 36 pages/minute, and shred paper, CD's and Credit Cards

# Concept Generation Review (Design 1)



# Concept Generation Review (Design 2)



# Additional Requirements

- Find an electric paper shredder to purchase and retrofit for project
- Shredder must have option to be wall-mounted, or stand on its own.
- Handle preferably on front face of shredder.

# Chosen Product

- AmazonBasics 12-Sheet Cross-Cut Paper, CD, and Credit Card Shredder
- Current Price on Amazon: \$54.99
- 8.9 x 12.5 x 15.7 inches  
System ~1.01 ft<sup>3</sup>
- 4.8 Gallon Bin



AmazonBasics Paper Shredder [1]



# Existing Mechanism

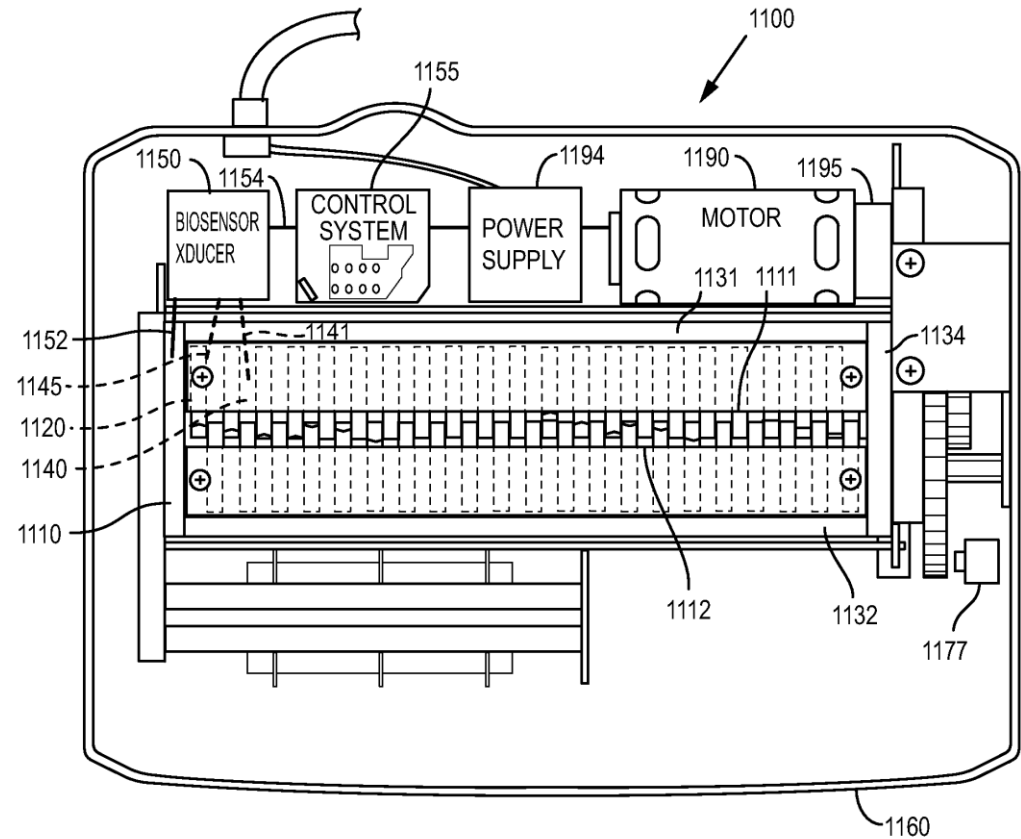
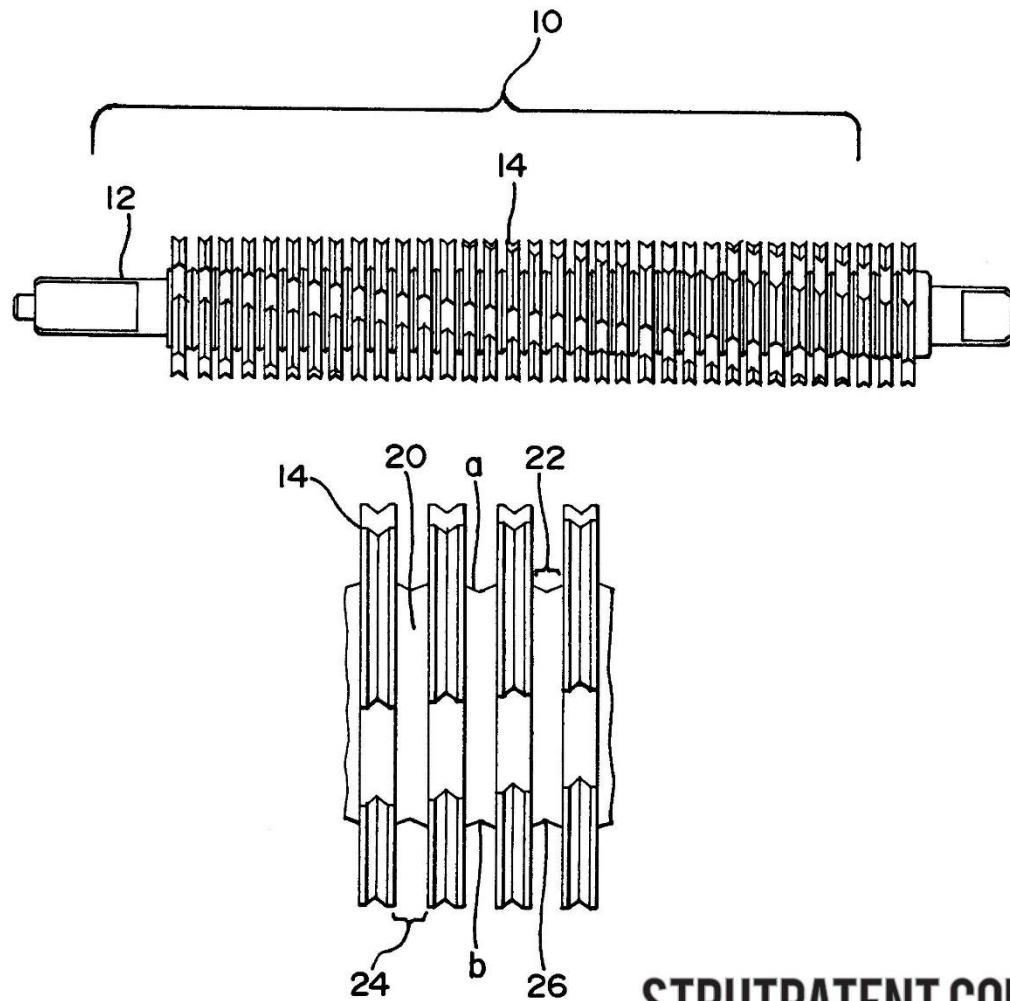
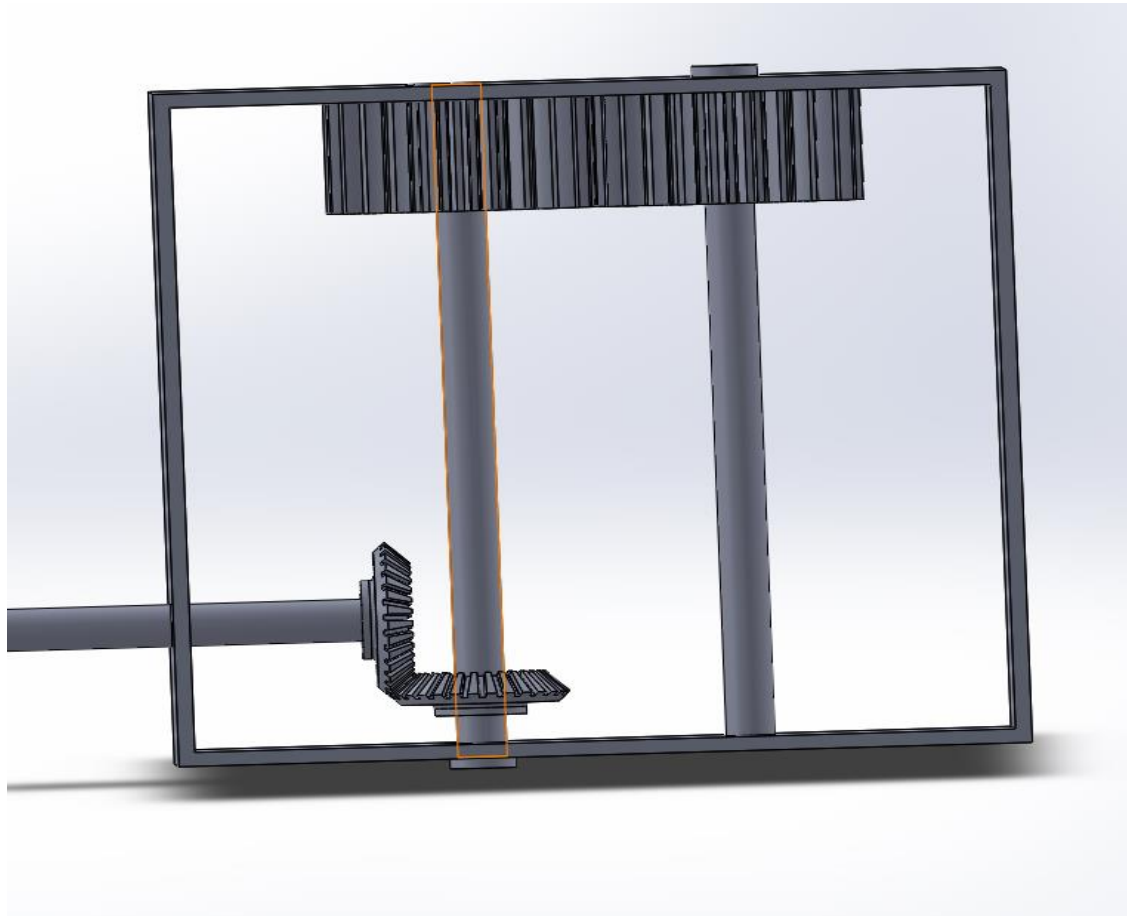


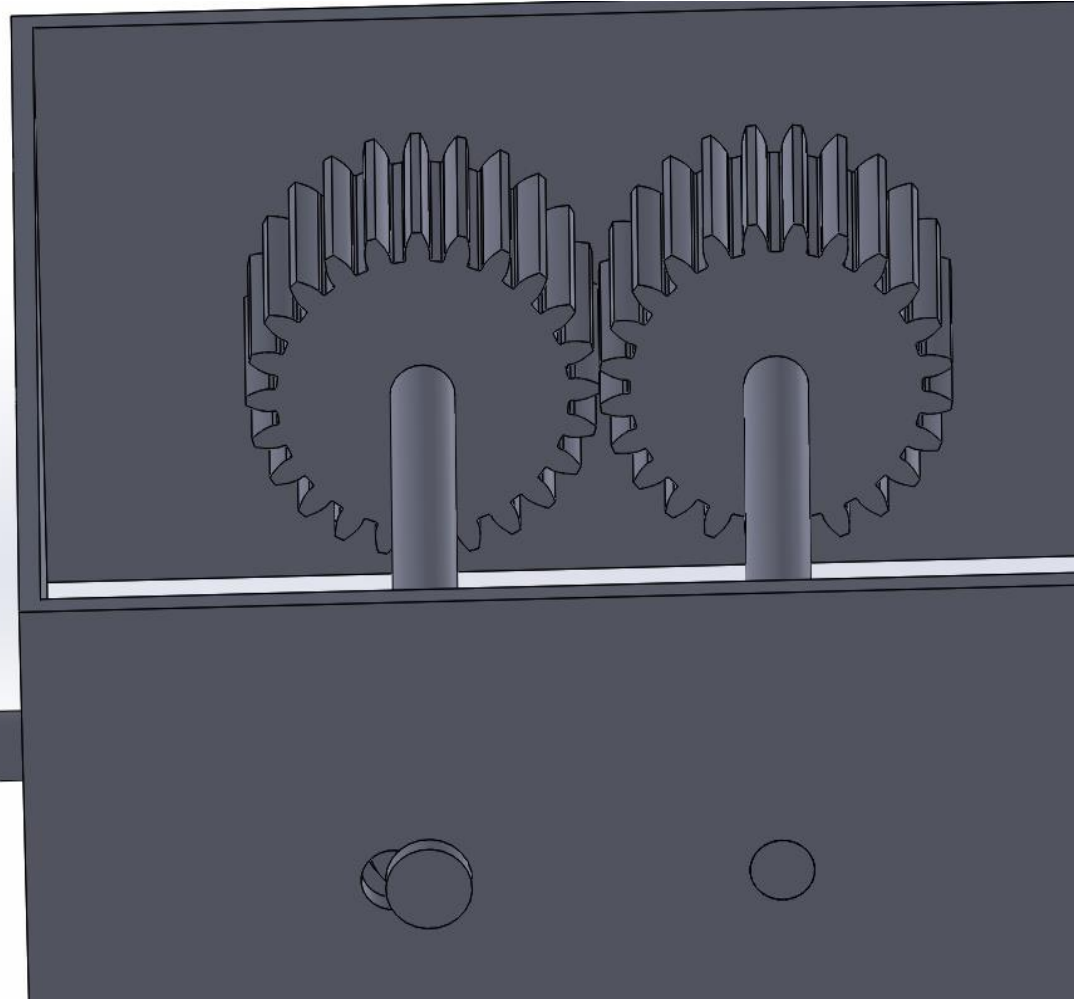
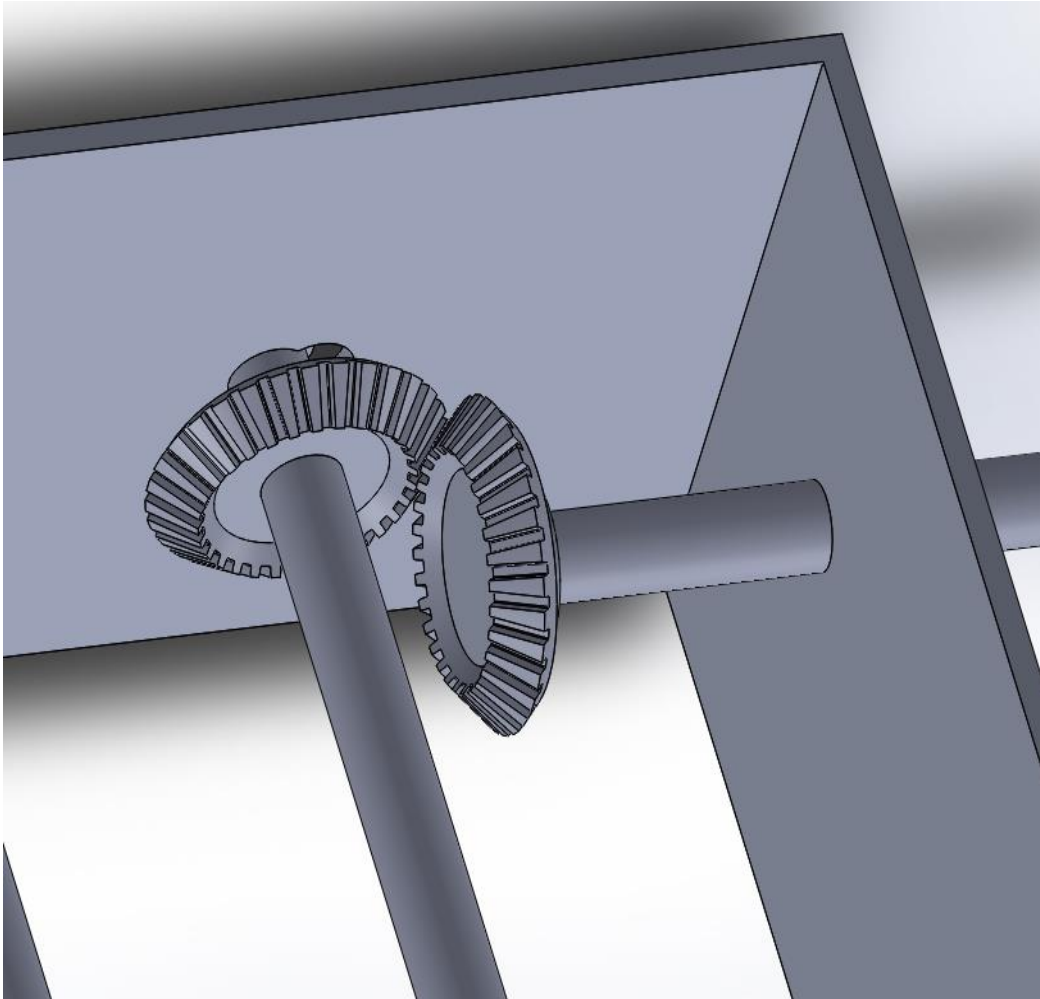
FIG. 11

Electric Paper Shredder Patents [2][3]

# Mechanism Design



# SolidWorks Drawings



# List of Parts and Prices

Parts	Price
AmazonBasics 12-Sheet Cross-Cut Paper, CD, and Credit Card Shredder	\$54.99
5 Steel Ball Bearings	~\$6.00 each*
2 Molded Nylon Plain Bore Bevel Gears	~\$4.00 each*
2 Molded Nylon Plain Bore Spur Gears	~\$10.00 each*
1 Aluminum Crank Handle	~\$20.00*
1 3/8" Diameter Hardened Shaft	\$4.45
	Total: \$137.44

\*Estimated prices for components from McMaster.com [4]

# Conclusion

- Retrofitting paper shredder with bevel system is plausible, but not enough information at the current time about the product.
- Estimated cost of system goes over budget to meet all customer requirements, so some negotiation will need to be done.

# References

[1] Amazon. *Amazon Basics 12 Sheet Cross Cut Credit Shredder* [Online]. Available: <http://www.amazon.com/AmazonBasics-12-Sheet-Cross-Cut-Credit-Shredder/dp/B005QAQFFS>

[2] Bruce R. Kroger and Raymond R. Ferriss, “Paper Shredder Shaft” U.S. Patent 0626078, Aug 26, 1999. [Online]. Available: <http://www.strutpatent.com/patent/06260780/paper-shredder-shaft>

[3] Kevin Chen, Chung Shih Tsai, Hsin-hsiung Chen, “Paper Shredder Control System Responsive to Touch-Sensitive Element” U.S. Patent 8008812 B2, Aug 30, 2011. [Online]. Available: <http://www.google.com/patents/US8008812>

[4] McMaster. *McMaster-Carr* [Online]. Available: <http://www.mcmaster.com>