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# Team Normals

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1) Be on time
2) Be prepared
3) Do your share
4) Communicate

Bus 1 ML

Questions

How much garbage is discarded per month in an apartment building?

What technologies do / methods have been used to combat garbage overflow?

How often is trash picked up in an urban area?

Have any cities pursued any other solutions?

Which machines are used for garbage collection?

What urban areas use recycling?

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Topic: Garbage / Trash

1) Garbage in streets
2) Infrequent garbage pickup
3) Taking out garbage everyday ☆
4) Smells bad
5) Animals eating garbage ☆
6) Overflowing garbage cans
7) Littering ☆
8) Hazardous Gargabe
9) Recycling inefficient
10) Garbage Dumps

1.) Urban people taking out garbage everyday

a.) What do we knew about the problem?

It is inconvenient to take the garbage out that often

b.) How often urban dwellers take garbage out

c.) - Internet
- first hand people
- Money

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2.) Animals eating garbage

a.) Animals eat overflowing/stray garbage

b.) What animals eat garbage, and what they're eating

c.) - Internet
- Video of eating garbage

3.) Littering

a.) Major problem of people throwing garbage in streets and nature

b.) How much per year is littered, what efforts have been pursued to stop littering

c.) - Internet
- Data
- Expert advice

FINAL CHOICE: Urban Garbage Problems

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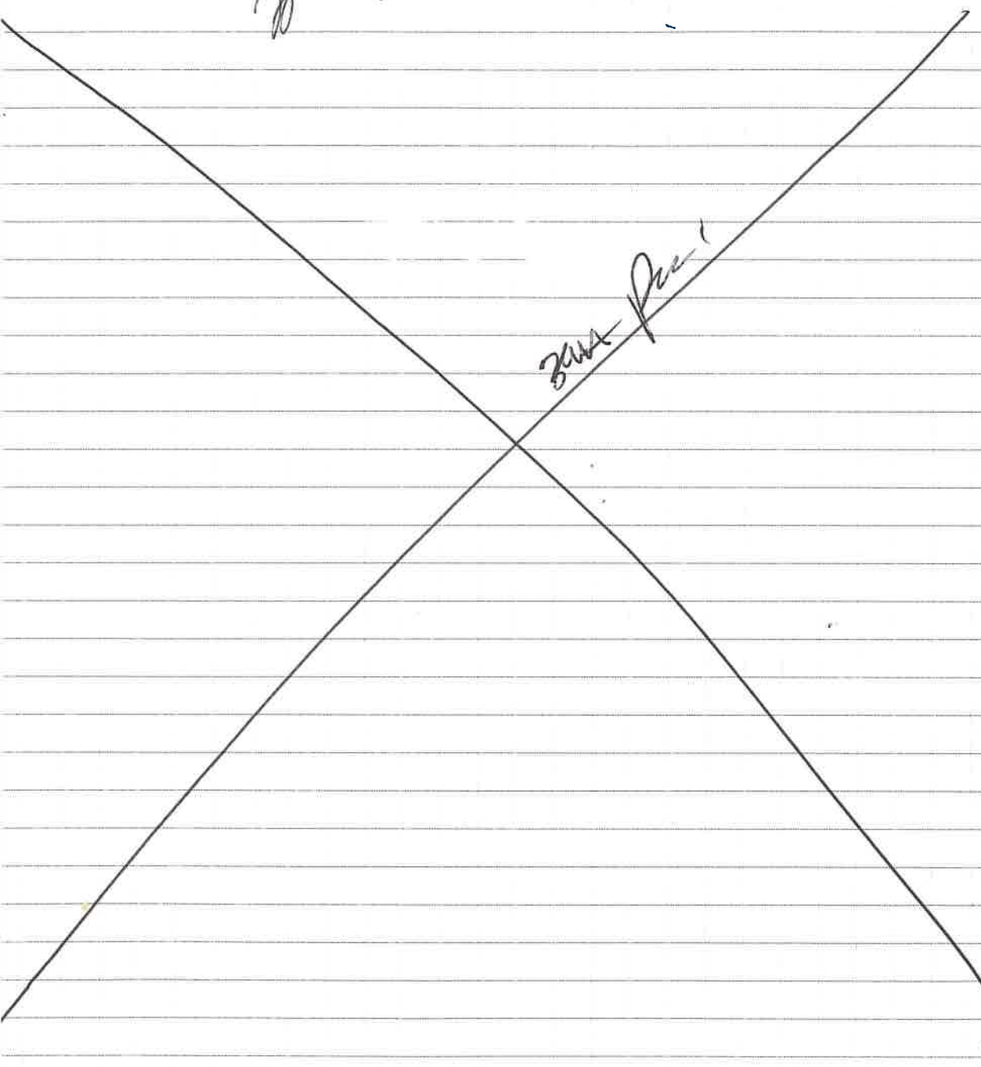
According to the Environmental Protection Agency (EPA), in the United States, ( five years the waste generated is rising by 1 million tons since 2010. 82% of An are living with garbage filled streets, animals consuming garbage, and current waste management systems.



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http://eprints-bangaloreuniversity.in/4174/1/136-E30004.pdf
Narendra Kumar, G., Swamy, C., & Nagadarshini, K. N. (2014). Efficient garbage disposal management in metropolitan cities using VANETs. *Journal of Clean Energy Technologies*, *2*(3), 258-262.

Summary: Rapid increase in population, has led to improper waste management in metropolitan cities resulting in increased pests and spreading of diseases. Every five years the waste generated is rising by 1 million ton, which causes several new problems relating to pollution, and environmental problems annually.

https://www.epa.gov/trash-free-waters/impacts-misman y54aged-trash "Impacts of Mismanaged Trash." *EPA*, Environmental Protection Agency, 23 May 2017,

Summary: Trash travels through the world's rivers and oceans which not only causes environmental impacts, but also severely impacts habitats for animals, toxic/chemical impacts, biological impacts, and human impacts. Trash isn't only an aesthetic problem, but it has the greatest potential to harm the environment in the long run.

https://pubs.acs.org/doi/abs/10.1021/es203954r
Hodzic, A., Wiedinmyer, C., Salcedo, D., & Jimenez, J. L. (2012). Impact of trash burning on air quality in Mexico City. *Environmental science & technology*, *46*(9), 4950-4957.

Summary: Air pollution experienced by expanding urban areas is responsible for serious health effects and death for millions of people every year. Trash burning is a common disposal method in poor areas, yet it is uncontrolled in many countries, and its contribution to air pollution is unclear due to uncertainties in its emissions.

https://www.agrostrat.gr/sites/default/files/inventory/Understanding%20envir%20pollution_2010.pdf
Hill, M. K. (2010). *Understanding environmental pollution*. Cambridge University Press.

Summary: Trash affects most aspects of the environment, due to the toxicity of plastic, especially in waste, it affects the air pollution, water pollution, and current solutions towards current waste management factors has led to a hazardous work area, which has left with other pollution factors such as drinking-water pollution.

http://www.teamsters952.org/Europe_Finds.pdf
Rosenthal, E. (2010). Europe finds clean energy in trash, but US lags. *The New York Times*, *12*.
Summary: The United States, have still not found an efficient solution when it comes to managing trash. The current problems include cheap landfills which will one day run out of space, and lead to hazardous air, and unsafe environments in the states. Other countries have found viable solutions which not only gets rid of trash, but uses it as fuel for everyday things such as fueling the fireplace, BBQ, etc.

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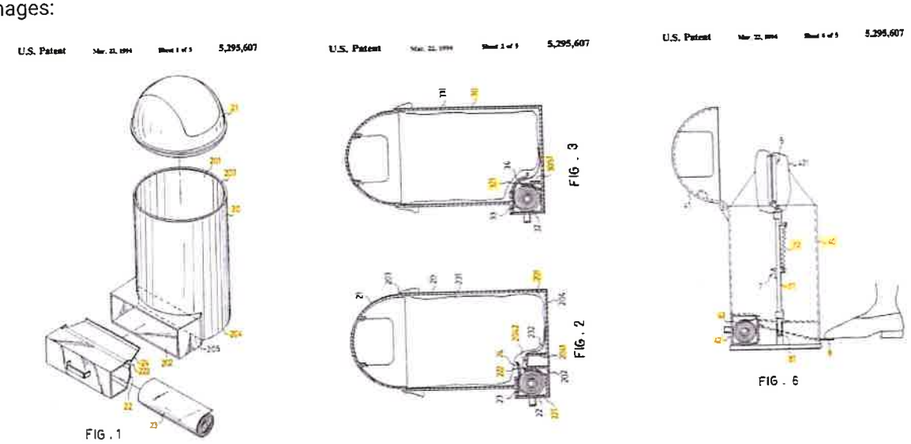
Patent P&C Pt 1 10/1/19

https://patents.google.com/patent/US5295607A/en

Chang, D. F. (1994). *U.S. Patent No. 5,295,607*. Washington, DC: U.S. Patent and Trademark Office.

Abstract: A trash tank includes a tank body having an open top, a closed bottom, a horizontally extending slot, and a receiving space. A hollow casing is connected detachably to the tank body adjacent to the horizontally extending slot of the tank body. The hollow casing may receive a rolled-up strip of garbage sacks and has a slit which is communicated with the horizontally extending slot of the tank body.

Images:




2 Pros and 2 Cons

Pros:

- It has a convenient slit which allows the top to be opened, and the lid is round which creates safety for the consumers.
- The can has a closed surface, which allows no leakage of trash, which allows no bugs to fly or other types of smaller creatures to sneak in.

Cons:

- The size of the trash can is not big enough to hold the current amounts of trash.
- The trash can needs constant refilling of a plastic bad to keep the can from getting dirty, which is inconvenient.

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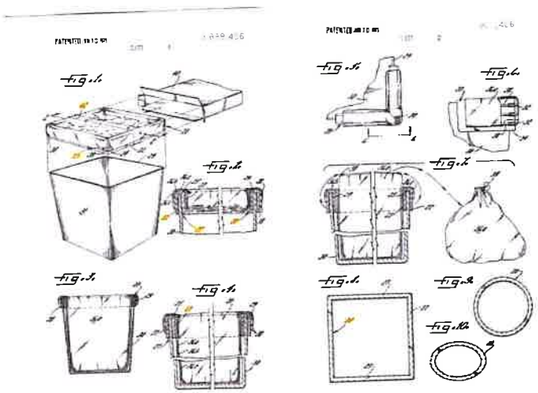
Patent P&C Pt 2 10/1/19



https://patents.google.com/patent/US3888406A/en

Nippes, J. T. (1975). *U.S. Patent No. 3,888,406*. Washington, DC: U.S. Patent and Trademark Office.

Abstract: Trash disposal apparatus including a support collar for attachment to a trash receptacle for simultaneously supporting a plurality of nested trash liner bags within the confines of the receptacle. The collar comprises an inverted U-shaped channel member formed to engage the upper rim of the trash receptacle. Liners are attached to notches in the outer surface of the support collar in a manner which facilitates the removal of the inner most liner from the trash receptacle when filled to capacity and provides a replacement liner which is already properly positioned within the receptacle.



2 Pros and 2 Cons

Pros:

- The capacity of the trash receptacle allows for big amounts of trash, which is correlated with the constant increase of trash
- It creates good compartment/closure for liner trash bags, which doesn't allow constant overflow of trash bags on urban streets.

Cons:

- It doesn't have a system of recyclables or waste, which creates confusion between the garbage collectors.
- The trash receptacle is big and doesn't have wheels, which makes it hard to transport and move in.

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Patent P&C Pt 3

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https://patentimages.storage.googleapis.com/02/9b/2a/28f69b65388877/US6119869.pdf

Low, A. A. (1909). *U.S. Patent No. 929,960*. Washington, DC: U.S. Patent and Trademark Office.

FIG. 5

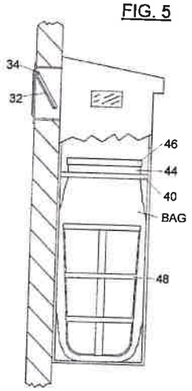



FIG.6a

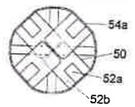
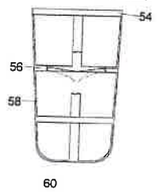
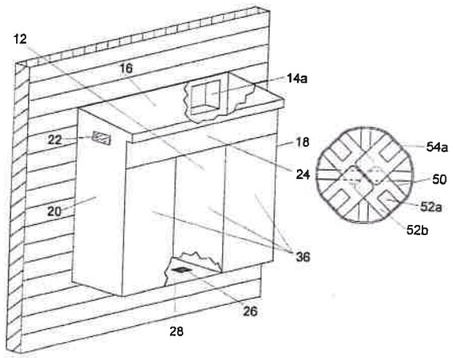



FIG. 6b




A waste disposal and sorting system, having insulated push doors and, enabling a one handed motion for immediate disposal and selective sorting of waste materials simultaneously and an outer container having different sections for the selective separate storage of waste for recycling purposes. The unit is position through passageways and in a wall of a building. An apparatus is used for preventing glass from breaking in the disposing process in a recycling section.

Pros:

- The garbage is stored in an outside receptacle, therefore it does not smell within the residence or on the ground level streets

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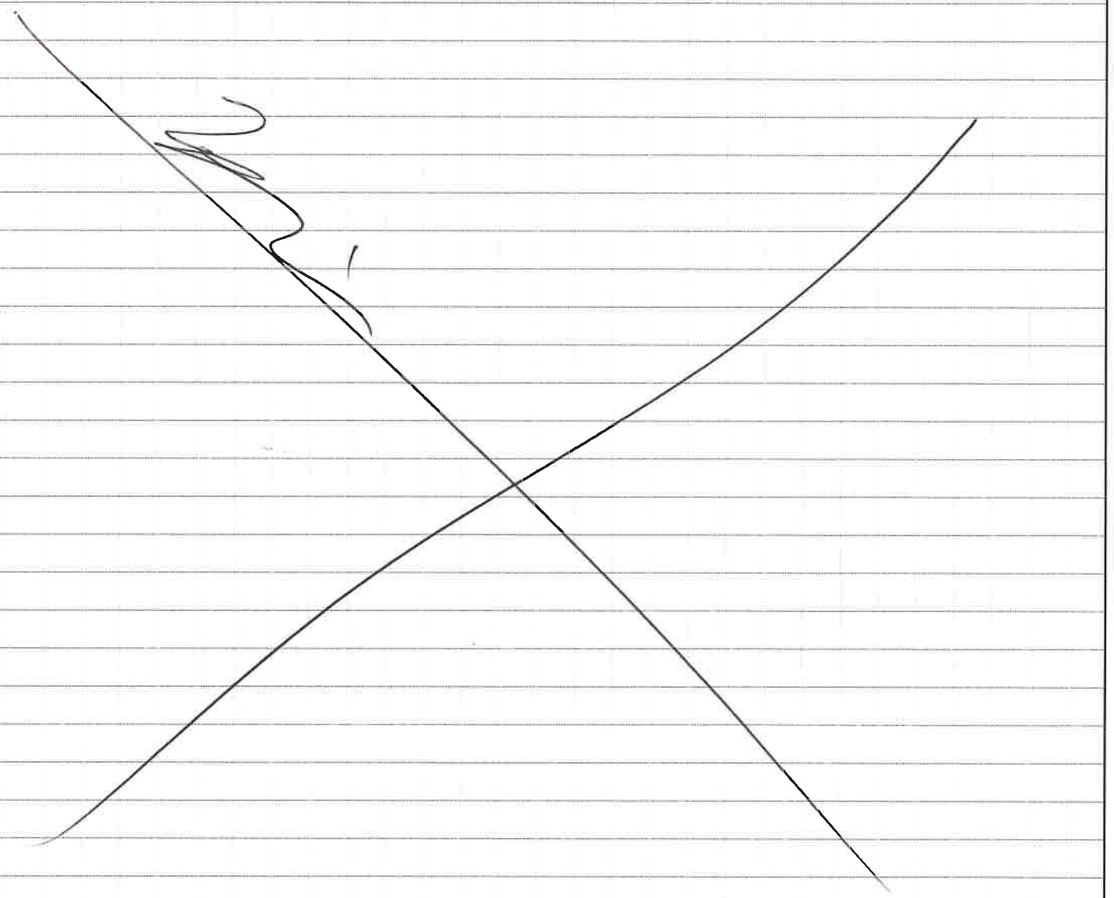
- The receptacle is also accessible through the residence so one does not have to go to a back alley or trash shoot to dispose garbage

Cons:

- Once the cans are full, it must be extracted through the residence and carried to an outside garbage can, creating inconvenience
- Garbage receptacles could also break and the contents could spill onto streets and people below



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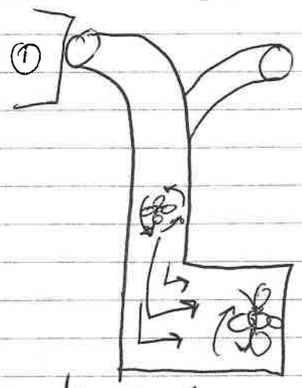
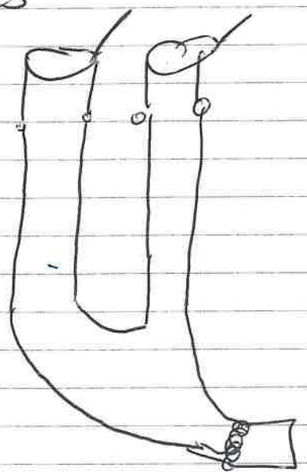
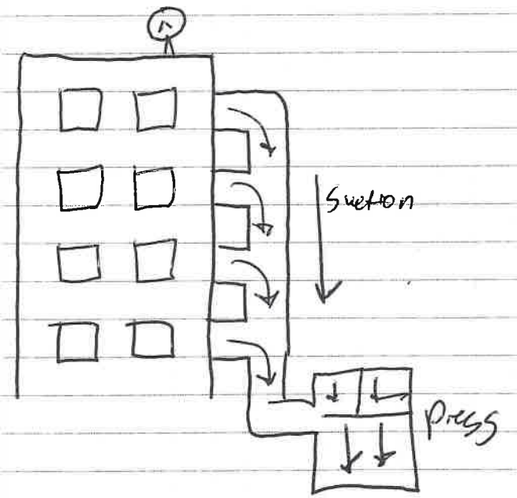
# Brainstorm Ideas




personalized shoots, one for each apartment. Fans suck and destroy the garbage




removeable rolling garbage receptacles for each apartment with suction to a large receptacle

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# Design Specifications

1. **Target Customer:**
   The target customer will most likely be the landlords or owners of apartment/office buildings.

2. **Design Criteria:**

**Customer Needs:** Our customer will most likely be the landlords or owners of apartment/office buildings. We will also need to appeal to the contractors of urban buildings. The landlords will need a quick efficient way to deal with physical waste so that their property looks pristine. They will also want a product that does not interfere with the residents. Contractors are going to want a simple efficient waste system so that their builders do not have to deal with complex and time consuming things.

**Safety and Legal Issues:** With us tackling the problem of overflowing trash in urban areas, there are safety precautions with this. We have to worry about the trash over flowing and ripping the garbage bag. Another issue of this is, glass breaking in the bag cutting the bag and getting in the streets or side walks. This can cause many safety hazards and hurt a lot of people. The inside of the chute should also not be accessible to people or animals due the large rotating fan.

**Performance:** The waste system needs to efficiently deposit waste from apartment and office buildings that currently require residents and patrons to bring it to a community receptacle. A new system would be accessible on all floors and deposit into one large place where is it compacted and picked up frequently.

**Ergonomics:** The people will use this by putting their garbage into our product. This will make everything much more efficient and help our trash problem.

**Materials:** The materials that are used for the chute should be strong and durable, such as steel, and most garbage chutes are made up of aluminized steel, galvanized steel, or stainless steel. The garbage chute will most likely be made out of one of those materials. There will be a fan on the very bottom of the chute near the dumpster. The fan is used for incinerating the garbage, and will most likely be made out of a motor with a stationary inner core with a shell, made of cast iron, cast aluminum, or stamped steel.

**Durability:** The product will be made mainly out of steel, a very durable material. This steel will not bend or fall apart easily, nor will it dent that easily, but when it does, maintenance will take care of the problem.

**Maintenance:** Some maintenance will be required around ever 3 years to ensure the best quality of the product.

**Service/Product Life:** The service that will be provided by the product is more efficient 'taking out' of trash, and the product life is going to approximately be around 15 years.

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Design Specifications

**Target Cost:** The beginning cost of garbage shoots varies, however our target cost to up keep it will be around $15 per floor.

**Size and Weight:** The size of the product will be relatively the same height as most apartments seen in Ann Arbor, so the product will be about 3-4 stories tall or about 45 feet tall maximum. The final product made will be shrunk by at least 10 times. The weight shouldn't be too heavy because it will be attached to the building, but if it is too light it won't be able to withstand the constant garbage flow. The average American throws away 4.4 pounds of trash each day and at average 28 people live in one apartment building which means everyday 123.2 pounds of trash is discarded. The average weight of a trash chute is 1,000 pounds, which will be the same weight of our garbage chute, but will be shrunk from at least 10 times for the final product.

**Global Environment:** The product will not include any toxic or dangerous substances and at the end of this product's life (once it no longer has use) will be disposed of either through the junkyard or metal reused for making more of the product. Although this is not the most efficient and environmentally friendly way of disposing of used materials, our expectation of the product's life is a long time meaning these materials will not be burned through as fast.

**Aesthetics:** The product will not have any bright colors, and the surface treatment will be smooth and not have any rough textures. The Shape of the shoot will have certain compartments attached to the building and the main chute. The material will be a strong/durable material such as metal.

**Environment:** We will make our product as environmental friendly as possible. Our group will make sure that with the least amount of garbage as possible gets into the streets and environment.

3. **Constraints**

Constraints include the actual size of the product. The product will have to be shrunk because the product will be about 3-4 stories tall or about 45 feet tall maximum. The final product made will be shrunk by at least 10 times. As long as we follow by schedule, the product should be finished before the invention convention and end of semester 1.

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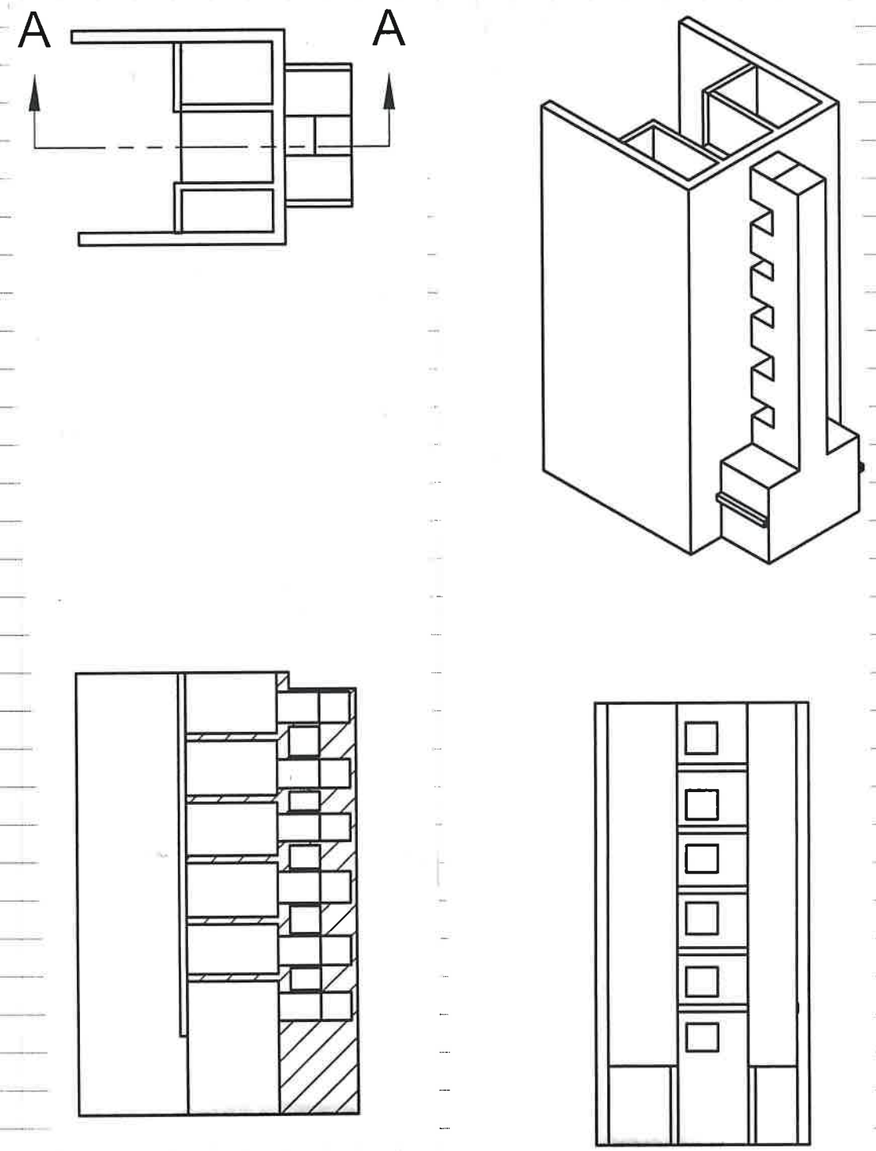


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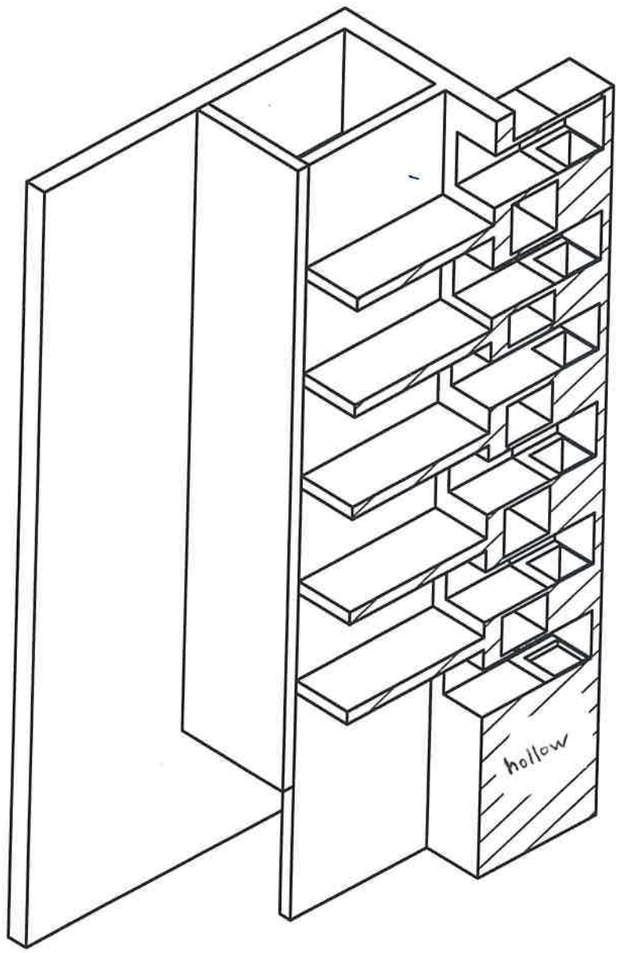


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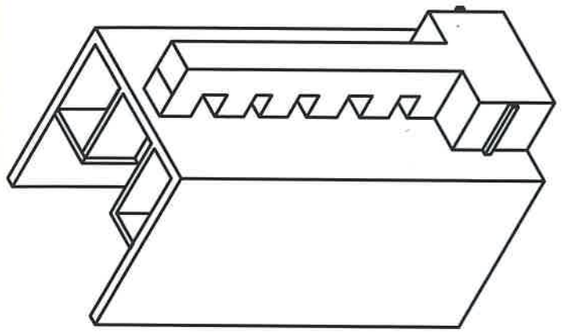

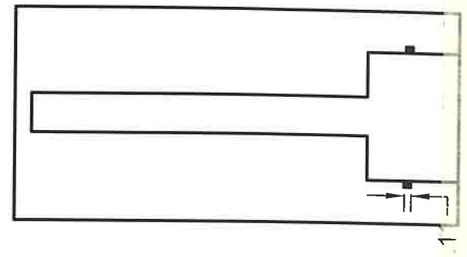

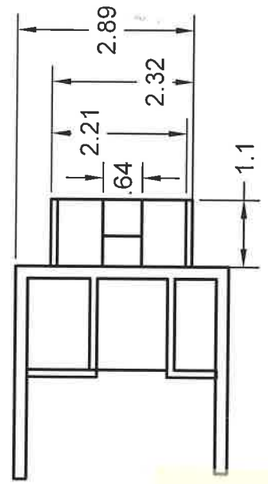


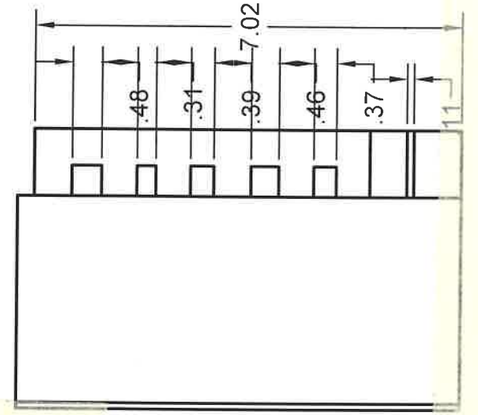


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## Originality

Countries such as the UK have been incorporating trash chutes on public streets for garbage disposal. and some factories already incorporate vacuum chutes, but no apartment complexes in the U.S. are using trash chutes for trash collection. There is also no collapsible/foldable dumpster in the market as well.

## Ideating

We brainstormed 3 different solutions and took inspiration off licensed inventions which targeted waste management. We eliminated the two other ideas because they were not super uniqūe and original. The first eliminated design included the disintegration of trash, but it didn't target apartments. Our second eliminated design is a chute underneath a trash receptacle, but the placements of the chute would make it too complicated.

## Social Value

his will benefit the environment
ctor as there will be less trash
irrounding densely populated
ban areas. It will also create
ore jobs as there will need more
ansportation of the trash, due to
e foldable dumpster. The
impster will also make it more
nvenient for the users and the
nefactors. The product doesn't
clude any toxic materials.

## Design and Building

Material List

- Plywood
- Aluminum flashing
- 5 circuit buttons
- 12 electrical wires
- Circuit propeller
- Circuit fan
- Plastic Visqueen
- Screws
- Plexiglass

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## Value Proposition

This will benefit most Americans, but the users and benefactors will be people who live in apartments. The age limit varies from all ages, except for toddlers younger than the age of eight. There is no certain gender that will be most benefited from this. Garbagemen will benefit the most out of this, because collecting the garbage will be much easier, especially in dense urban areas. Garbagemen live hard grueling jobs and this will be a big improvement in trash collection. And maintenance is required every 3 years to ensure the best quality of the product.

## Identifying and Understanding

According to the Environmental Protection Agency (EPA), in the United States, every five years the waste is rising by one million tons since 2010. 82% of Americans are living with garbage-filled streets, animals consuming garbage and current inefficient waste management systems. Sources for research include EPA, google patents, Bangalore University, Cambridge University, etc.

## Market Potential

This will most likely not be on the consumer market, so the average buyer won't be able to get this chute. The type of people who would want this would be landlords of apartments, owners of apartment complexes or designers of apartment buildings. The chute will cost about $15 per floor to manage, but the cost of the chute varies with the number of floors in the apartment complex.

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