PADDLE POWERED CAN CRUSHER WITH CONVEYOR

SONARGAON UNIVERSITY (SU)

A Project & Thesis

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ABSTRACT

A can crusher is a device which is used for squashing food and beverage cans, beer cans to save space for recycling. The disposal of the used cans compose a problem because the empty cans occupy space. Also the transport of empty cans become difficult. There is a need to crush these cans So that they occupy smaller space for storage and transport. This will help recycling of the material of the can. It can be placed everywhere in the park, houses. Recycling plays a very important role to save our natural resources. The main aim of this project is to fabricate a Can Crusher machine to reduce the scrap volume and use the Cans so that carrying them to the recycle site becomes easy. Now-a-days, is a large number of cans are used in hotels, bar, canteens etc. and a large volume of space is required for storing or dumping the used Cans. Our task for this project is to design and create a can crusher that will minimize the volume of aluminum cans by 70%. The can crusher will be made up of various parts including a lever, base frame, can bin, piston cylinder arrangement, chain sprocket mechanism and bearing.

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NOMENCLATURE

Symbol	Description	Unit
N1	Speed of the driving sprocket	rpm
N2	Speed of the driving sprocket	rpm
T1	Teeth of the driving	Sprocket
T2	Teeth of the driving	Sprocket
T	Torque	Nm
P	Power	W
R	Crank Radius	m
M	Mass	kg

CHAPTER 1: INTRODUCTION

- **General**
- **Objectives**

1.1 General:

Can Crushers are used in mechanical and allied industries which crush cans made of different materials. The Can Crusher machine is widely used in beverage industries or in scrap dealers' shop to reduce the volume of the cans. Consequently, it leads to the reduction of the transportation cost. This machine is primarily used to save space and for recycling. It can be placed anywhere. In today's life most of the food items are packed in cans like cold and hot drinks and other beverages. Commercial establishments like cafeteria and bars, have to deal with leftover cans. Storage of these cans is often a problem and these increases total volume of the trash. Therefore, using can crusher in such places proves to be advantageous. [1] A can crusher can be defined as "A device used for crushing aluminum cans for easier storage in recycling bins there by giving you extra space by flattening of cans". This project consists of designing and fabrication of an automatic can crusher machine. In order to reduce the waste, we planned to create can crusher that will reduce the volume of aluminum cans by approximately seventy percent by which transportation volume will increase and transportation cost will reduce. Can crushers are primarily used to save space and for recycling. Also the purpose of this project is to understand the fundamental knowledge of design and mechanism by using fulcrum system and a simple mechanism property. A mechanical can crusher machine is basically one of the most aid able machines. It helps to reduce the pollution of the environment. Thus helps to create a better place to live in, apart from that, this can crusher can actually be the future mode of recycles apart from the recycle bins. It can be placed everywhere, in the park, houses, restaurants, malls, canteens even in cars. Using a similar type of a design from the diagram below, but with an added bin below the can crusher concept of recycling can be applied. In this project, development of a recycle bin can crusher so the cans might crush as flat and look as symmetrically as possible and inserted the bin. The designs are an environment friendly and use simple mechanism properties. The design is so done that the knowledge of designing, mechanism and forces. The study of manufacturing was very important in order to carry out this project to ensure that what are needs to do.

This project is about designing and fabricating the Recycle Bin Can Crusher Machine to help people easy to crush the can as well as bottle and bring anywhere. This project involves the process of designing the different parts of this crusher machine considering forces and ergonomic factor for people to use. After the design has completed, it was transformed to its real product where the design is used for guideline. This project is mainly about generating a new concept of can crusher that would make easier to bring anywhere and easier to crush the can. This machine is developed solely for the purpose of recycling as are harmful to environment and aluminum to plants growth. Many people recycle items like paper, glass, and aluminum, while these efforts are a vital part of the process, the true recycling path continues long after recyclables are collected from household bins or community drop-off centers, bar etc. Collecting, processing, manufacturing, and purchasing recycled products create a closed circle or loop that ensures the value of recycling. Recycling is a series of activities that includes the collection of used, reused, or unused items that would otherwise be considered waste, sorting and processing the recyclable products into raw materials, and remanufacturing the recycled raw materials into new products. [2]

1.2 Objectives:

The main objectives of the project are-

i) To fabricate a simple and easy to use can Crusher machine involving low cost of construction and easily movable from one place to another.

ii) To reduce the volume of the cans at least 70%. [3]

iii) Reduce the volume of aluminum cans.

iv) By reducing the size, increases the space for storage.

v) Reduces transportation cost.

CHAPTER 2: LITERATURE REVIEW

- **Historical Background**
- **Crushers**
- **Types of Can Crusher**
- **Why Trust Us**
- **Recycling Cans is Important**

2.1 Historical Background:

From the research papers of many researchers we have found the following findings: Elfasakhan A, et.al.(2012) presented a new design. This Can Crusher which can crush a single can at a time consists of a hardware and software. The hardware includes mechanical structure, servo motor, light sensor, microcontroller and pneumatic system. The pneumatic system has been used instead of an electrical motor since electrical motor with the needed specification (torque and horsepower) is very expensive. The software is the maestro for operating and controlling different system components.

More S,R, et.al. (2013) have presented a review on study of jaw plates jaw crusher which tells us that crushers are major size reduction equipment used in mechanical, metallurgical and allied industries which crushes different types of soft and hard materials. This paper provides the background of swing jaw plates of jaw Crusher and kinematics and dynamic analysis are done to improve the design.

Saif Set. al. (2014) has proposed a paper on fully automatic Can Crusher using pneumatics and microcontroller sensor.

KhanapureL R., et.al .(2014) have presented a paper which provide crushing action in both the strokes thus making it a dual stroke Can Crusher and provide automatic falling of crushed cans and automatic feed of new cans to be crushed so as to keep the crushing area free from human intervention thus providing safety to the operator.

Kumar N et.al. (2016) have presented a paper about fabrication of mechanical crusher which would help to crush the used juice cans, paint cans and punched sheet metal waste. The crusher is designed to operate on a crank and slotted lever mechanism and the power for the electrical operation of the crusher is taken from an electrical motor. This Crusher crushes the cans effectively and the manufacturing as well as the maintenance cost is very less which is suitable for small recycling plants.

Patel,B.Aet.al .(2016) have presented a paper on design and fabrication of automatic Can crusher and vending machine using cam and follower mechanism. Total process of crushing is automatic, no manual supervision is necessary for the whole process. Vending mechanism is introduced in project marketing and to create public.

Wakchaure. Cet .al. (2016) have presented a paper on design and fabrication of automatic Can Crusher using double acting cylinder for pneumatic system and ice's.

Shine S et al. (2017) carried out the study of the current Can Crushers and the various mechanisms employed. Some of the technological aspects like robust design, volume reduction were successfully implemented. Overall, the project was very enriching in terms of Technical fabrication and design process. The current prototype reduces the volume of cans by 65 %. Auto feed mechanism have trouble due to speed which needs some improvement in near future. From the above research papers, we have found that a number of methods are used for fabricating the Can Crusher including pneumatic system with IC's ,motors etc. Pneumatic Can Crushers use automation reducing human intervention. However the use of air compressor, valves and pipelines make the equipment more expensive which is not suitable for small scale recycling plant. Further in the manually operated models of the research papers the crushed cans need to be removed manually and also new cans need to be placed every time. Therefore we have chosen this project to fabricate an auto-feed, cost effective Can Crusher where the removal of crushed cans is not manual.

2.2 Crushers:

Nowadays, waste management is one of the areas which are gaining importance day by day. The amount of waste coming is in a tremendous quantity. Aluminum cans and Tin cans are the important products which are being recycled on an increasing scale. For carrying out this process mechanical crushers are used. For recycling of these cans, large crushers are being used in industries, which is not suitable for small scale industries as the machines cost high. In order to crush the cans in a less time, a can crusher machine using crank and slotted lever mechanism having high crushing ability can be employed. A mechanical crusher machine is used for crushing aluminum cans and punched sheet metal wastes for recycling purpose and also for easy storage and transportation. The crank and slotted lever mechanism converts the rotating motion into reciprocating motion; this is the principle which is used in the mechanical crusher. [9]

2.3 Types of Can Crusher

By operation, Can Crushers can be classified as:

(a) Manual

(b) Semi-automatic

(c) Automatic

(a) Manual:

Manual Can Crushers are the most common and approximately 9 out of 10 crushers sold are manual Crusher. Manual means that we can insert just a single can into the Crusher. Can compression process is done manually, we need to pull the leveler, which lowers the crushing plate and compresses the aluminum can. After crushing a can, we need to dispose the compressed can and insert next can into the Crusher. This process can take quite long time, if lot of cans need to be crushed. This is where semi-automatic Can Crushers become handy. [5]

Figure 2.1: Manual Can Crusher

(b) Semi-automatic:

Semi-automatic Crushers differ from manual Crushers, because they have collection tray on top of the crusher. In this tray we can place multiple cans and crush them one by one. Different Crushers have trays with varying capacities, some Crushers can store only 4 cans, while other can store even up to 10 cans. Semi-automatic Crushers make can compression process faster, as we do not have to place a new can into Crusher after compressing previous one. This allows speeding up crushing process multiple times. However the crushing process needs to be done by us and there aren’t any automatic Systems in semi-automatic Can Crushers.[5]

Figure 2.2: Semi-automatic Can Crusher

(c) Automatic:

Automatic Can Crushers will crush aluminum cans automatically. These crushers usually work with pneumatic engines and compresses cans with air pressure. Automatic Can Crushers are the fastest of three crusher type and takes less effort however, it is hard to find fully automatic Can Crusher, as they are mostly made by individuals or small companies and are produced in small scale. This means that automatic crushers are available to limited number of customers or are used only by their manufacturers. [5]

By installation or placement can Crushers can be classified as-

(a) Horizontal

(b) Vertical

(c) Multi position

(a) Horizontal Can Crusher:

Horizontal Can Crushers can be installed to horizontal places, for example desk. These Can Crushers are not that common as vertical Can Crushers, because there is not any convenient way to dispose the empty can after compression. This means that we have to take that can out of the crusher manually and throw it into a trash bag. [5]

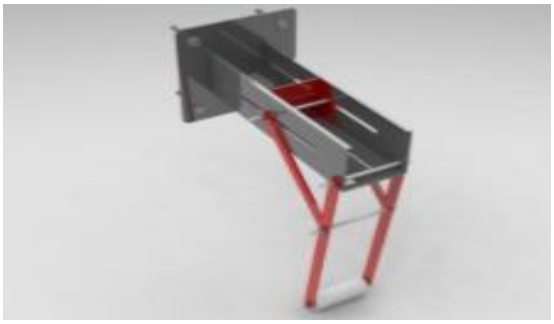


Figure 2.4: Horizontal Can Crusher

(b) Vertical Can Crusher:

Vertical Can Crushers are the most popular type of aluminum Can Crushers. Vertical Can Crushers usually get installed to a wall. These crushers come with a special mounting plates or screws and can be installed to different materials, like plastic, wood and other. What makes vertical Can Crushers so popular is that they can be installed in more convenient places. For example, we can install a vertical Can Crusher to a wall in garage or in kitchen and place the garbage bin directly under the crusher, so when soda or beer can is compressed, it will immediately get thrown out in the trash either manually, or automatically by the crusher. [5]

Figure 2.5: Vertical Can Crusher

(c) Multi position Can Crusher:

Multi position Can Crushers can be installed both horizontal and vertical way. These are universal Can Crushers and can be used practically anywhere. By their shape, size and way how they compress aluminum cans, they are more similar to horizontal than vertical crushers. Basically, multi position Can Crushers are same as horizontal crushers, but with additional mounting hardware that allows to mount them both horizontally and vertically.[5]

Figure 2.6: Multi-position Can Crusher

2.4: Why trust us?

While conducting our research on can crusher, we found that there was a notable lack of high-quality articles and reviews on this particular product category. Of the few sources we could find, the majority lacked detail, and many were written by people who hadn't actually tested the can crushers themselves. In addition to reading through many of the article, reviews, forum threads and bed its we could find on the subject, we conducted testing on six can crushers that we determined were the best on the market.

Before we could begin testing, we needed to source around1,000 uncrushed cans. To find all of those cans, we used a couple different methods. The first was to buy lots of soda for our office, which we drank over the course of about a month.

The other method was to go to recycling centers and ask people if they would be willing to sell their uncrushed soda cans to us. While we did get more than a few sideways glances, ultimately we were able to get the cans we needed

2:5 why recycling cans is important

There's a good reason why so much emphasis is put onto the recycling of aluminum cans namely, the lifespan of recycled aluminum is essentially "endless". In other words, there is no limit to the number of times an aluminum can is able to be recycled, and the energy and capital equipment required to recycle is significantly lower than it is for the production of new aluminum.

In fact, according to the U.S. Energy Information Administration, recycled aluminum requires about 90 percent less energy and capital equipment than newly-process aluminum. This efficiency explains why about 75 percent of the 800 million metric tons of aluminum produced since the late 19th century are still in use today.

CHAPTER 3: THEORITICAL ASPECTS

- **Features To Consider**
- **Working Principle**
- **Can Crusher Working**
- **Flow Chart**

3.1 Features to consider

If you're interested in buying a can crusher, there are a few characteristics that you should prioritize:

First off, you'll want to make sure that the can crusher is made from materials that will last for many years, and that the crusher has a build quality that will ensure its reliability for the duration of its lifespan.

It's also important that the can crusher is easy to use. This means that operation is straightforward, and also that the mechanics of the crusher are designed to make it easy for everyone-including children and the elderly-to use the device. Remember if they can crusher is hard to use, it probably won't be used at all.

Another important, but often overlooked, consideration is how much the can crusher actually reduces the volume of the can itself. Ultimately, the purpose of a can crusher is to compact cans so that more can be stored in less space. This particular metric can be hard to measure, which is why we calculated the volume of cans after being crushed during our testing.

3.2 WORKING PRINCIPLE:

The basic working principle of a paddle powered can crusher is this an empty aluminum can into the opening of crusher. Pull down the leveler with your hand to compress the can take the piece of compressed aluminum out of the crusher and throw it in the trash Quick and simple.

Most crushers on the market are paddle powered can crusher, which means that you will need to do the crushing process manually, by pulling down a paddle. However, to make the compression process faster and easier, many people have made their own automatic can crusher using pneumatic or hydraulic cylinder or electric engines.[6]

3.3 Can Crusher Working:

A combination of a number of rigid bodies assembled together in such a way that the motion of one causes constrained and predictable motion to the others is known as a mechanism. As many mechanisms can be obtained as the number of links in a kinematic chain by fixing, in turn, different links in a kinematic chain. This motion method of obtaining different links in a kinematic chain is called inversion mechanism. Of A mechanism is the mechanical portion of the machine that has the function of transferring motion and forces from a power source to output. The mechanisms in this project are as follows: [5]

- Chain drive mechanism for power transmission
- Inversion of single slider cranks mechanism

3.3.1 Inversion of Single Slider Crank Mechanism:

The kinematic chain is a combination of four, more kinematic pairs, such that there elative motion between the links or elements is completely constrained. The simplest and the basic kinematic chain is a four bar chain. For a four bar chain, the sum of the shortest and longest link lengths should not be greater than the sum of the remaining two link lengths if there is to be continuous relative motion between the two links. A single slider crank chain is a modification of the basic four bar chain. It consists of one sliding pair and three turning pairs. This type of mechanism converts rotary motion into reciprocating motion and vice versa. Link sofa slider crank chains are:

1. Frame and cylinder
2. Crank
3. Connecting rod
4. Crosshead or piston

Four different mechanisms can be obtained by fixing each of the links of the single slider crank chain. In the first inversion, link1 i.e. frame and cylinder is fixed. In the second inversion, link 2 i.e. Crank is fixed. In the third and fourth inversions, link 3 i.e. connecting rod and link 4 i.e. crosshead is fixed respectively. In this project, we use the first inversion. [5]

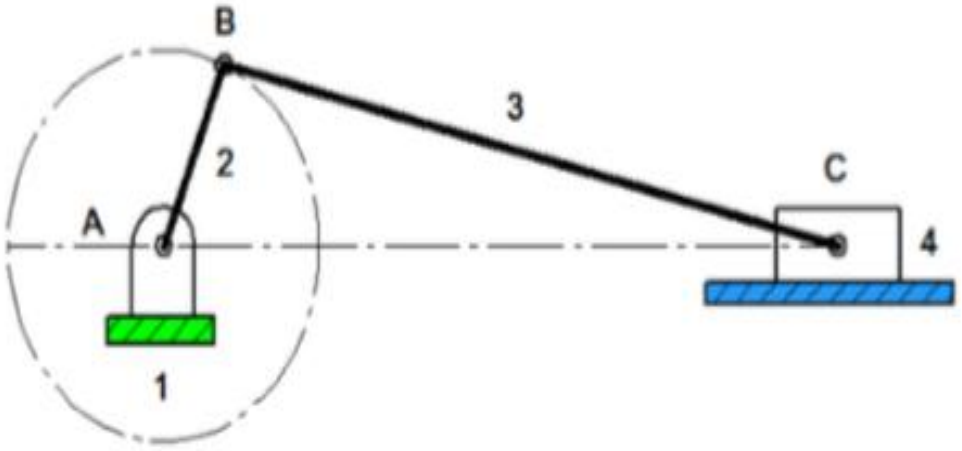


Figure3.1: Single slider crank

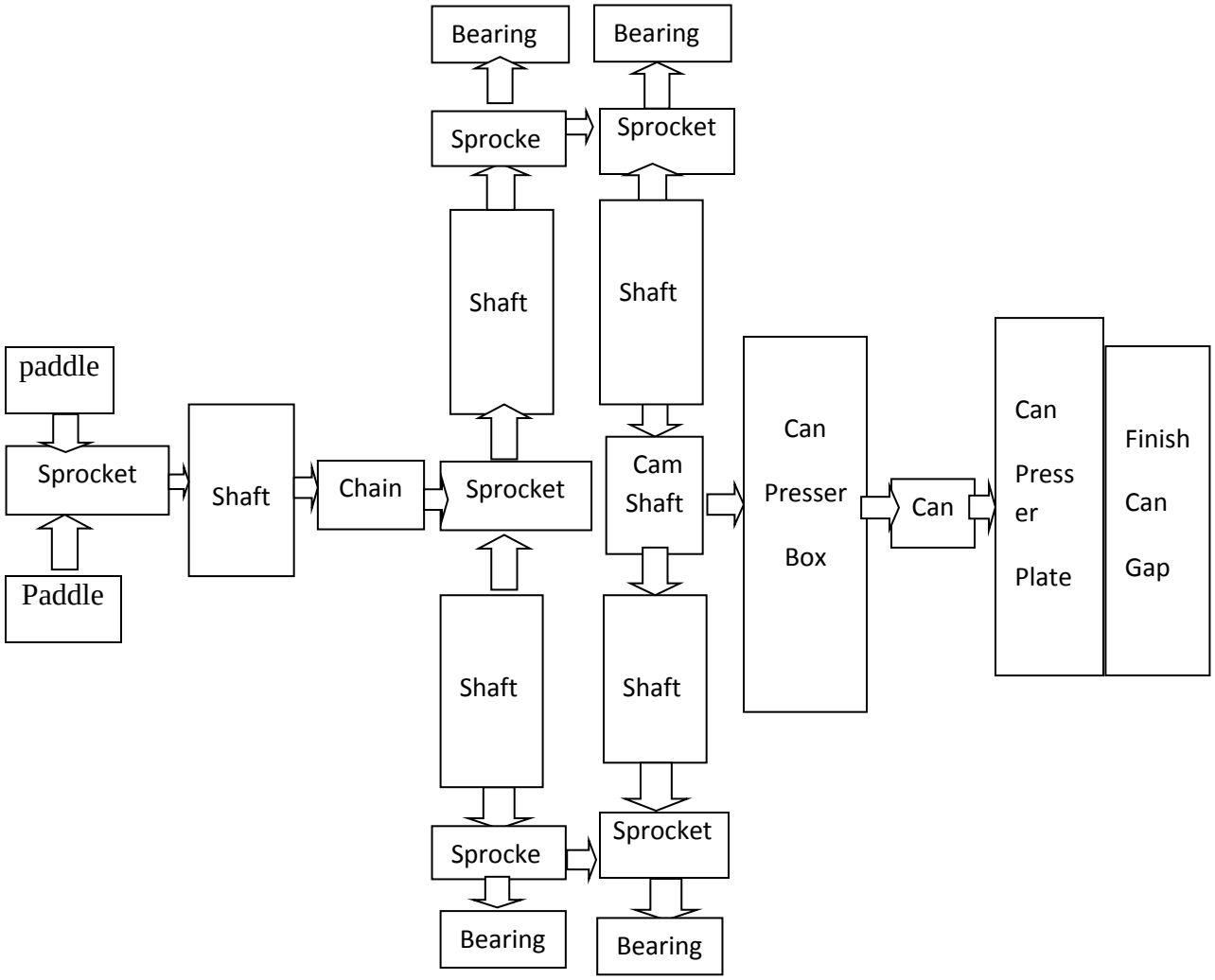
3.3.2 Chain drives mechanism:

Chain drive is a way of transmitting mechanical power from one place to another. It is often used to convey power to the wheels of a vehicle particularly bicycles and bikes. It is also used in a wide variety of machines besides vehicles. Most often, the power is conveyed by a roller chain, known as the drive chain or transmission chain passing over a sprocket gear with the teeth of the gear meshing with the holes in the links of the chain. The gear is turned and this pulls the chain putting mechanical force into the system. Sometimes the power is output by simply rotating the chain, which can be used to lift or drag objects. In other situation, a second gear is placed and the power is recovered by attaching shafts or hubs to this gear. Though drive chains are often simple oval loops, they can also go around corners by placing more than two gears along the chain, gears that do not put power into the system or transmit it out are generally known as idler wheels. By varying the diameter of the input and output gears with respect to each other, the gear ratio can be altered e.g. When the bicycle paddle's gear rotates once, it causes the gear that drive the wheels to rotate more than one revolution.

Roller chain and sprocket is a very efficient method of power transmission compared to (friction-drive)belts with far less frictional loss. Although chains can be made stronger than belts, their greater mass increases drive train inertia. Drive chains are most often made of metals, while belts are often rubber, plastic, urethane or other substances. Drive belts can slip unless they have teeth, which means that the output side may not rotate at a precise speed and some work gets lost to the friction of the belts as it bends around the pulleys. Wear on rubber or plastic belts and their teeth are often easier to observe and chains wear out faster than belts if not properly lubricated. [8]

3.4 Flow Chart:

Application for fabrication of a paddle powered cans crusher:



CHAPTER 4: DESIGN AND CONSTRUCTION OF APPARATUS

- **Proposed Model**
- **Main Parts**
- **Mild Steel**
- **Connecting Rod**
- **Chain**
- **Smaller Sprocket**
- **Larger Sprocket**
- **Bearing & Block**
- **Cylinder**
- **Piston**
- **Crank**
- **Paddle system**
- **System Components & 2D Design**
- **CAD Design of Apparatus**
- **Final Construction Apparatus**

4.1 Proposed Model:

(a)

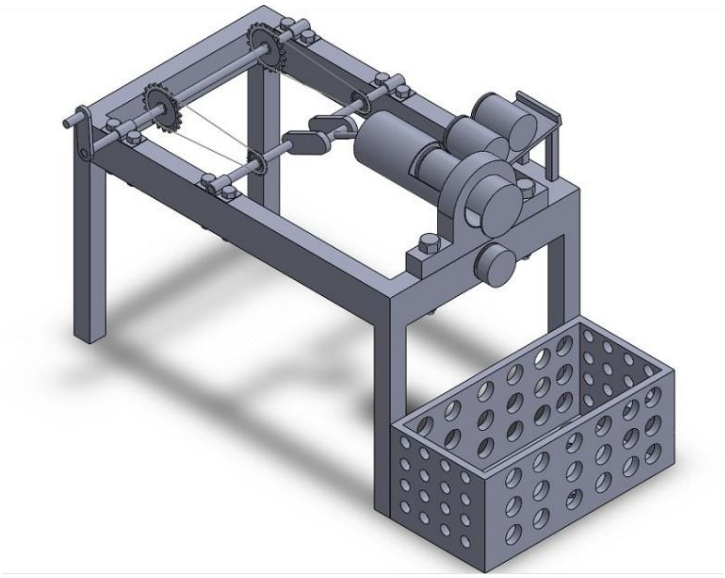


Figure 4.1: Fabrication of a paddle powered can crusher (a)

(b)

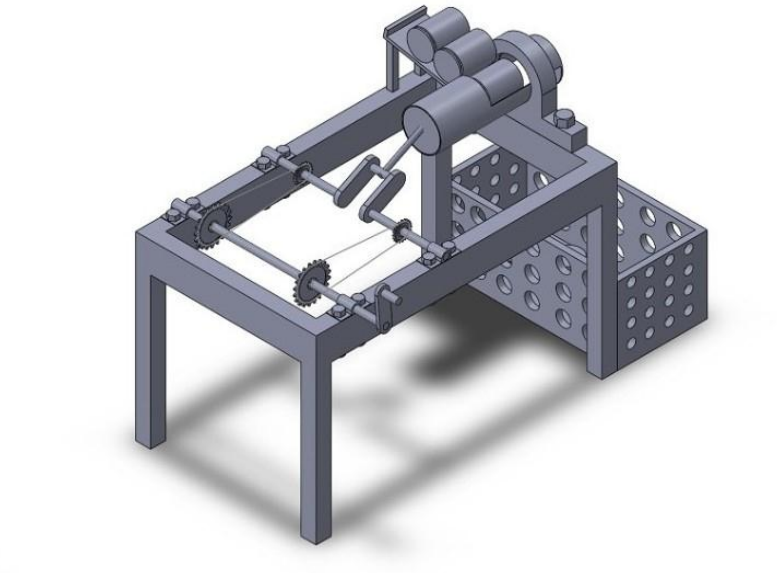


Figure 4.2: Fabrication of a paddle powered Can Crusher (b)

4.2 Main Parts

Selection of Materials for Different Components,

The various material selections for the components are done on the basis of three main Points of view:

- Light Weight
- Strength
- Availability of materials in the market

Selected materials for the components are tabulated below –

Table 4.1: Materials for Components [4]

Mild Steel & M S Bush Pipe	Main Frame
Chain	Power Transmission
Sprocket	Power Transmission
Bearing & block	Support for rotating shaft
crank	It is used to convert circular motion into reciprocating motion
Shaft	in transferring the load
piston	It is the moving component that is contained by a cylinder
cylinder	A cylinder whose cross section is an ellipse, parabola, or hyperbola is called an elliptic cylinder
conveyer	Applications involving the transportation of heavy or bulky materials.

4.3 Mild steel:

Properties of Mild Steel (Mechanical Properties):

Mild steel is the most commonly used steel It is used in the industries as well in the different everyday objects we use. Even the pans and spoon of the kitchen are sometimes made of mild steel. The main target of this article into discuss about different mild steel properties. The mild steel is very important the in manufacturing of metal items. Almost 90%steelproductsof the world are made up of mild steel because it is the cheapest form of steel.

4.3.1 What is mild steel?

Mild steel is the most widely used steel which isnot brittle and cheap in price. Mild steel is not readily tempered or hardened but possesses enough strength.

4.3.2 Mild steel Composition

Mild steel contains –

- carbon 0.16 to 0.18 % (maximum 0.25% is allowable)
- Manganese 0.70 to 0.90 %
- Silicon maximum 0.40%
- Sulfur maximum 0.04%
- Phosphorous maximum 0.04%
- Mildest grade of carbon steel or mild steel contains a very low amount of carbon - 0.05 to 0.26%

4.3.3 Importance of knowledge of mild steel properties:

The use of mild steel is huge and a personhoods into manufacturing or production business need to know a lot about the important characteristics of mild steel. The study of mild steel becomes more significant for student of mechanical or engineering metallurgical engineering. Mild steel is an alloy. And alloy is a product made mixing metals and non metals. Sometimes pure metal cannot fulfill all the properties needed for manufacturing product. So additives are included in the pure metal to obtain some specific properties necessary for the production. Mild steel is made by adding carbon and other elements in the iron. These elements improve the hardness, ductility and tensile strength of the metal.

4.4 Connecting rod:

Connecting rod issued to transfer the load from the slider to the Box and it should bear the high load so it should be very strong. This part plays an important role in transferring the load. Construction of each part is mainly depend upon this component this part plays an important role in the transfer of load from the slider to the Box. The connecting rod is connected to the crank which facilitates the working of the cane crushing machine. The connecting rod is essential as it forms the backbone of this device. [7]

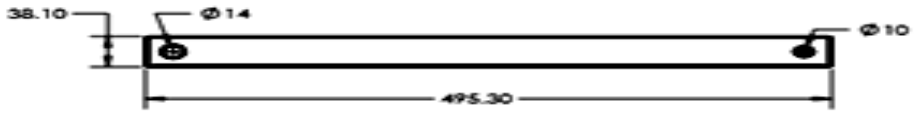


Figure 4.3 Connecting rod

4.5 Chain:

Chain drive is widely used for the transmission of power where shafts are separated at distances greater than that for which gears are practical. In such cases, sprockets take the place of gears and drive one another by means of a chain passing over the sprocket teeth. Roller chain or bush roller chain is the type of chain drive most commonly used for transmission of mechanical power on many kinds of domestic, industrial and agricultural machinery, including conveyors, wire-and tube-drawing machines, printing presses, cars, motorcycles, and bicycles. It consists of a series of short cylindrical rollers held together by side links. It is driven by a toothed wheel called a sprocket. It is a simple, reliable, and efficient means of power transmission through Hans Retold is credited with inventing the roller chain in 1880, sketches by Leonardo ad Vinci in the 16th century show a chain with a roller bearing. [5]

Chain material is such that it has the following properties:

- Corrosion resistance
- Resistance against wear and tear
- Capable to withstand humid manufacturing environments
- Highly durable
- High tensile strength
- Abrasion resistance

Figure 4.4: Chain

4.6 Smaller Sprocket:

Smaller Sprocket is used to connect the handle and the larger sprocket. Chain is used to transfer the power from the handle to the larger sprocket. This sprocket is connected to the handle through bearing. The handle joint is used to transfer the power from the handle and the larger sprocket without any power loss. This part is mainly used for the purpose of power transmission from the handle to the chain to the chain for the effective reciprocating motion of the metal box to crush the cans during the forward and the return stroke.[7]

Figure 4.5: Smaller Sprocket

4.7 Larger Sprocket:

Larger Sprocket is operated by the power which is transferred from the smaller sprocket by using handle from chain these two sprockets are connected by the chain. The power transferred from this sprocket used to crush the can by using the quick return mechanism. This sprocket is connected to the slot by which the cam mechanism is operated to crush the can. This part is used to maintain the tension between the chain and the sprocket to prevent the power loss due to the slipping of the chain. [7]

Figure 4.6: Larger Sprocket

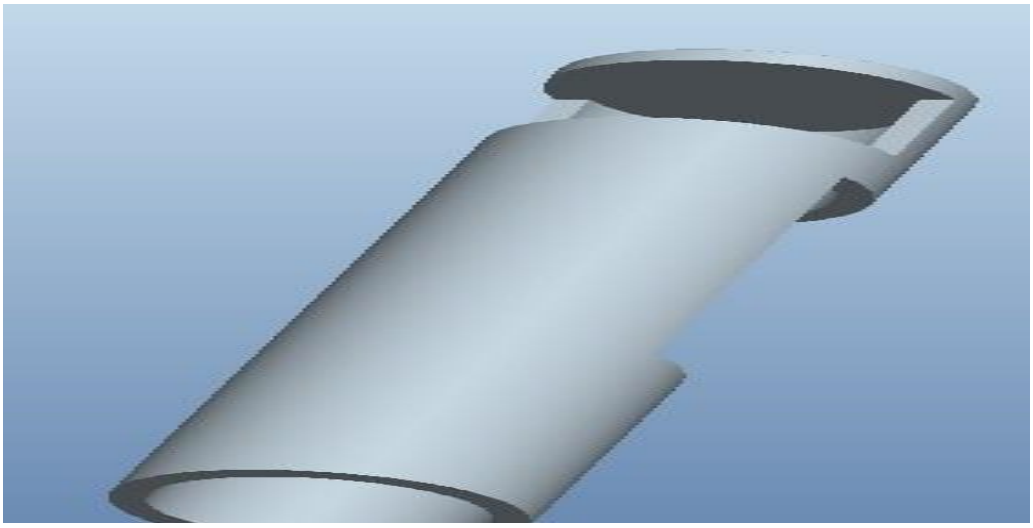
4.8 Bearing and Block:

A Bearing block also known as a Pillow block or Housed bearing unit is a pedestal used to provide support for a rotating shaft with the help of compatible bearings and various accessories. Housing materials for a bearing block is typically made of cast iron or cast steel. A bearing block may contain a bearing with one of several types of rolling elements including ball, cylindrical roller, spherical roller, Tapered roller or metallic or synthetic bushing. The fundamental application of Plummer block is to mount a bearing safely, enabling its outer ring to be stationary while allowing rotation of the inner ring. The housing is bolted to a foundation through the holes in the base. It is of split type or solid type. [10]

Figure 4.7: Bearing & Block

4.9 Cylinder:

A cylinder is one of the most basic curvilinear geometric shapes, the surface formed by the points at a fixed distance from a given line segment, the axis of the cylinder. The solid enclosed by this surface and by two planes perpendicular to the axis is also called a cylinder. The surface area and the volume of a cylinder have been known since deep antiquity. In differential geometry, a cylinder is defined more broadly as any ruled surface spanned by a one-parameter family of parallel lines. A cylinder whose cross section is an ellipse, parabola, or hyperbola is called an elliptic cylinder, parabolic cylinder, or hyperbolic cylinder respectively.



Finger 4:8: Cylinder

4.10 Piston:

A piston is a component of reciprocating engines, reciprocating pumps, gas compressors and pneumatic cylinders, among other similar mechanisms. It is the moving component that is contained by a cylinder and is made gas-tight by piston rings. In an engine, its purpose is to transfer force from expanding gas in the cylinder to the crankshaft via a piston rod and/or connecting rod. In a pump, the function is reversed and force is transferred from the crankshaft to the piston for the purpose of compressing or ejecting the fluid in the cylinder. In some engines, the piston also acts as a valve by covering and uncovering ports in the cylinder wall.

Figure 4.9: Piston

4.11 Crank:

A crank is an arm attached at right angles to a rotating shaft by which reciprocating motion is imparted to or received from the shaft. It is used to convert circular motion into reciprocating motion, or vice-versa. The arm may be a bent portion of the shaft, or a separate arm or disk attached to it. Attached to the end of the crank by a pivot is a rod, usually called a connecting rod. The end of the rod attached to the crank moves in a circular motion, while the other end is usually constrained to move in a linear sliding motion.

The term often refers to a human-powered crank which is used to manually turn an axle, as in a bicycle crank set or a brace and bit drill. In this case a person's arm or leg serves as the connecting rod, applying reciprocating force to the crank. There is usually a bar perpendicular to the other end of the arm, often with a freely rotatable handle or pedal attached.

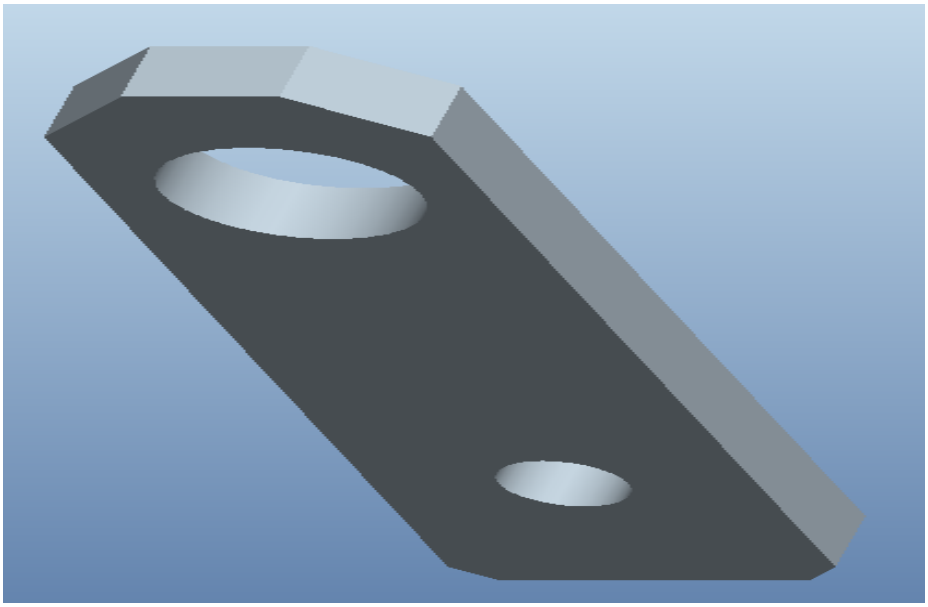


Figure 4.10: Crank

4.12 Paddle system:

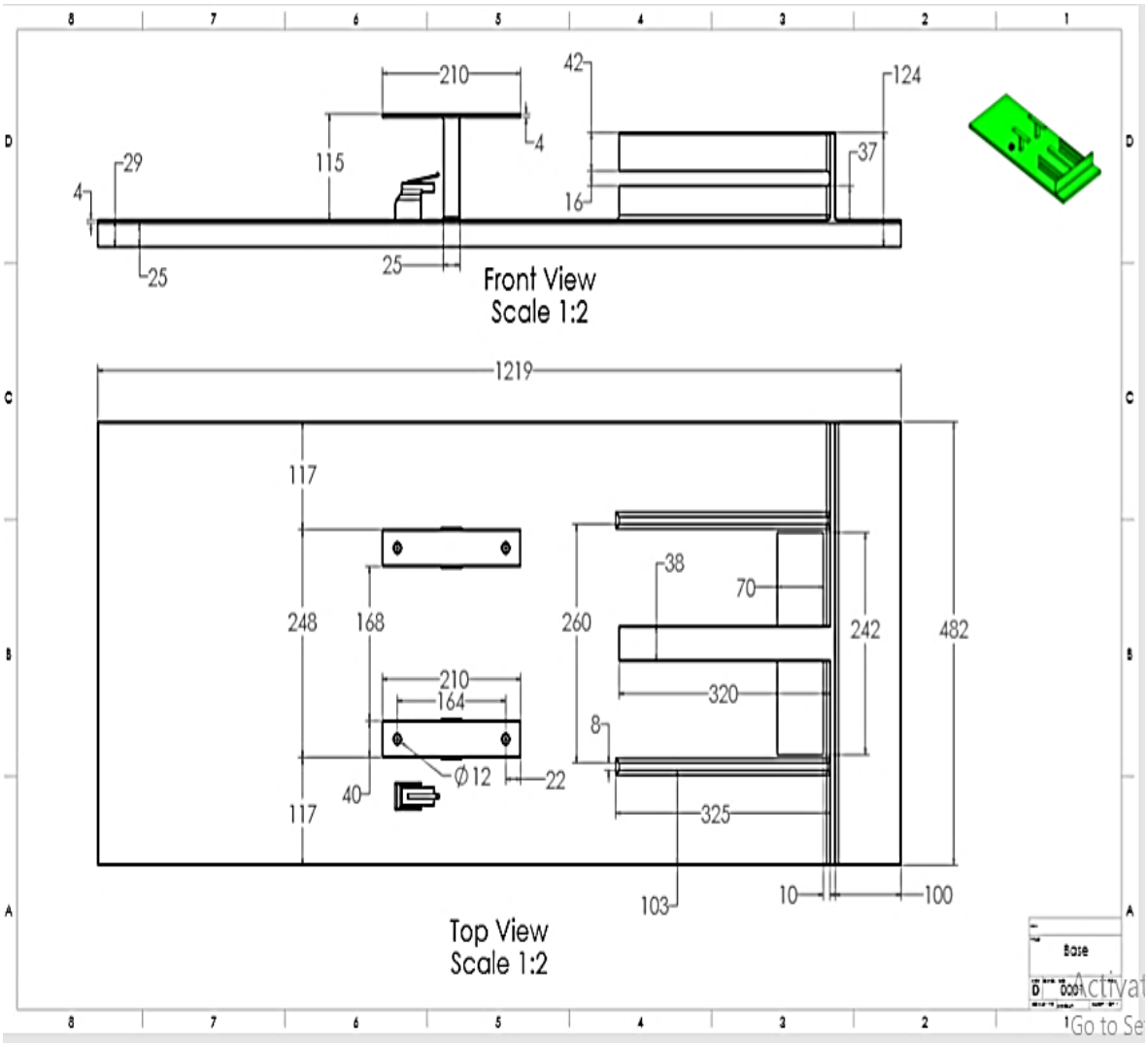
The two most common **types** of **pedals** are clip less (or clip-in) and flat. Clip less **pedals** require **cleats**, which are attached to the shoe and snap into the **pedal**. There are **various** clip-in **pedal** systems, including Shimano's SPD, SPD-SL, Speedway, and Crank Brothers.

Figure 4.11: Paddle

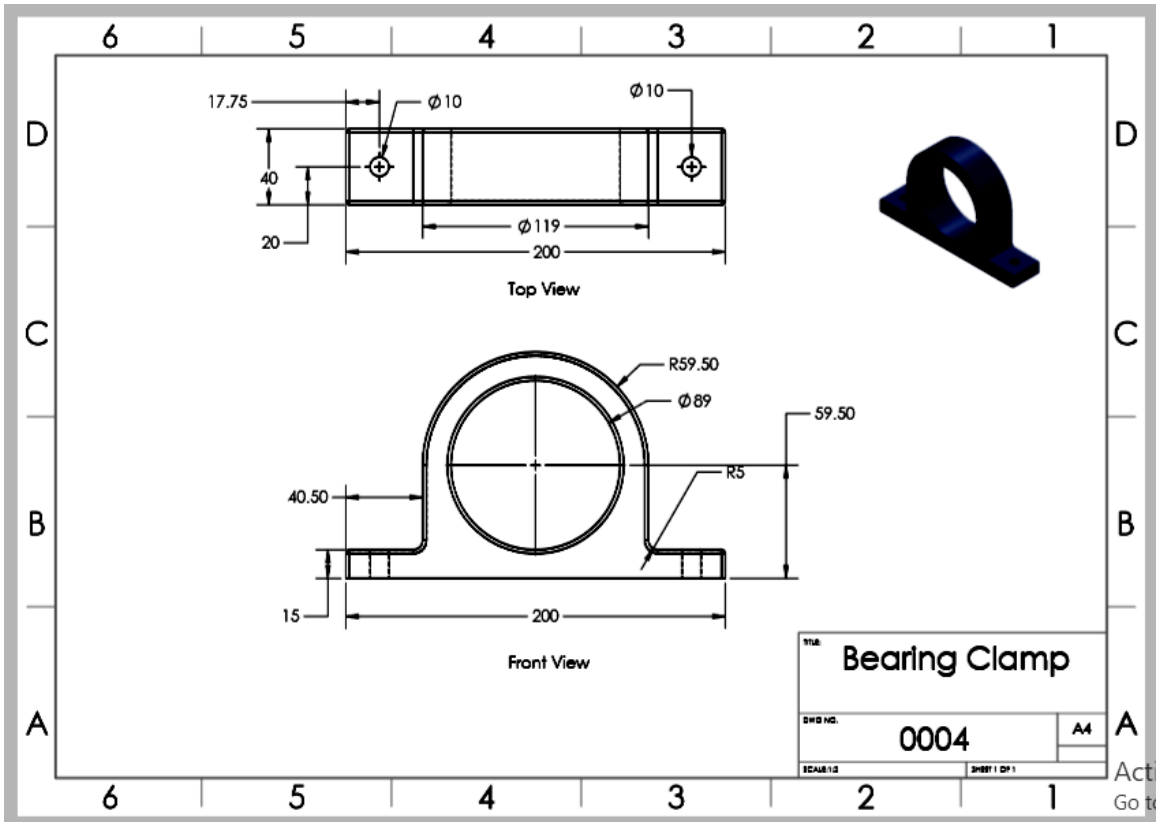
4.13 System components & 2D Design

The main system components are described below:

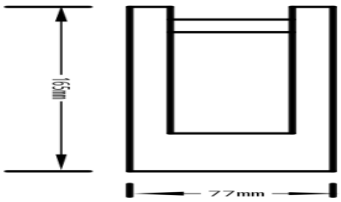
4.13.1Base drawing:



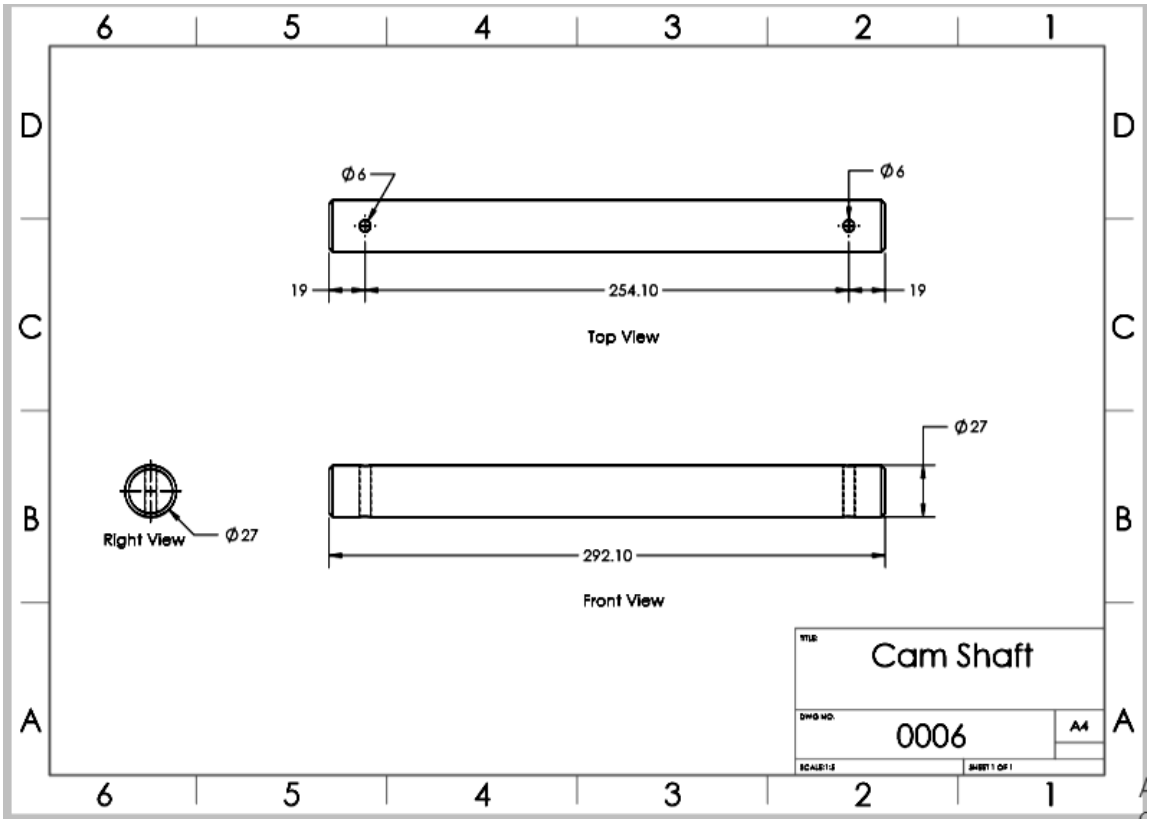
4.13.2 Bearing clamp:



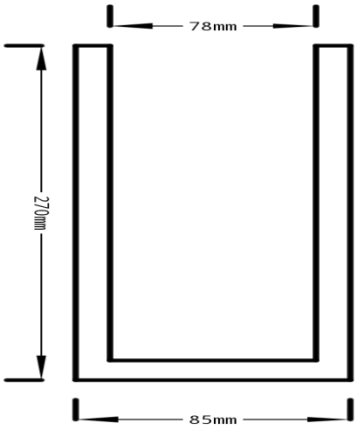
4.13.3 Piston :



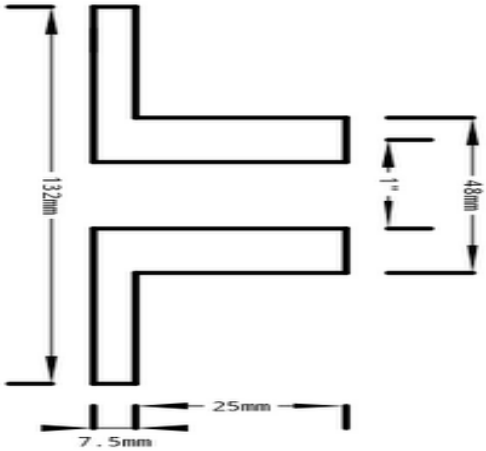
4.13.4 Cam Shaft:



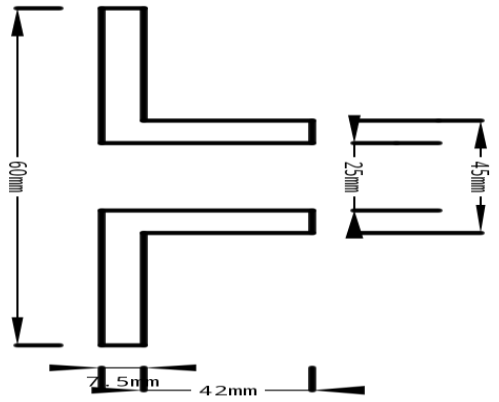
4.13.5 Cylinder:



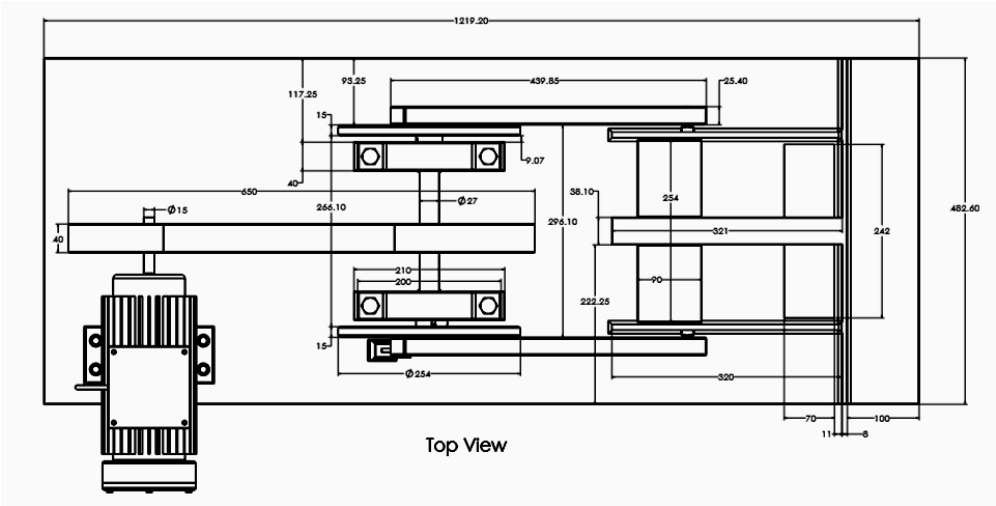
4.13.6 Big pinion:



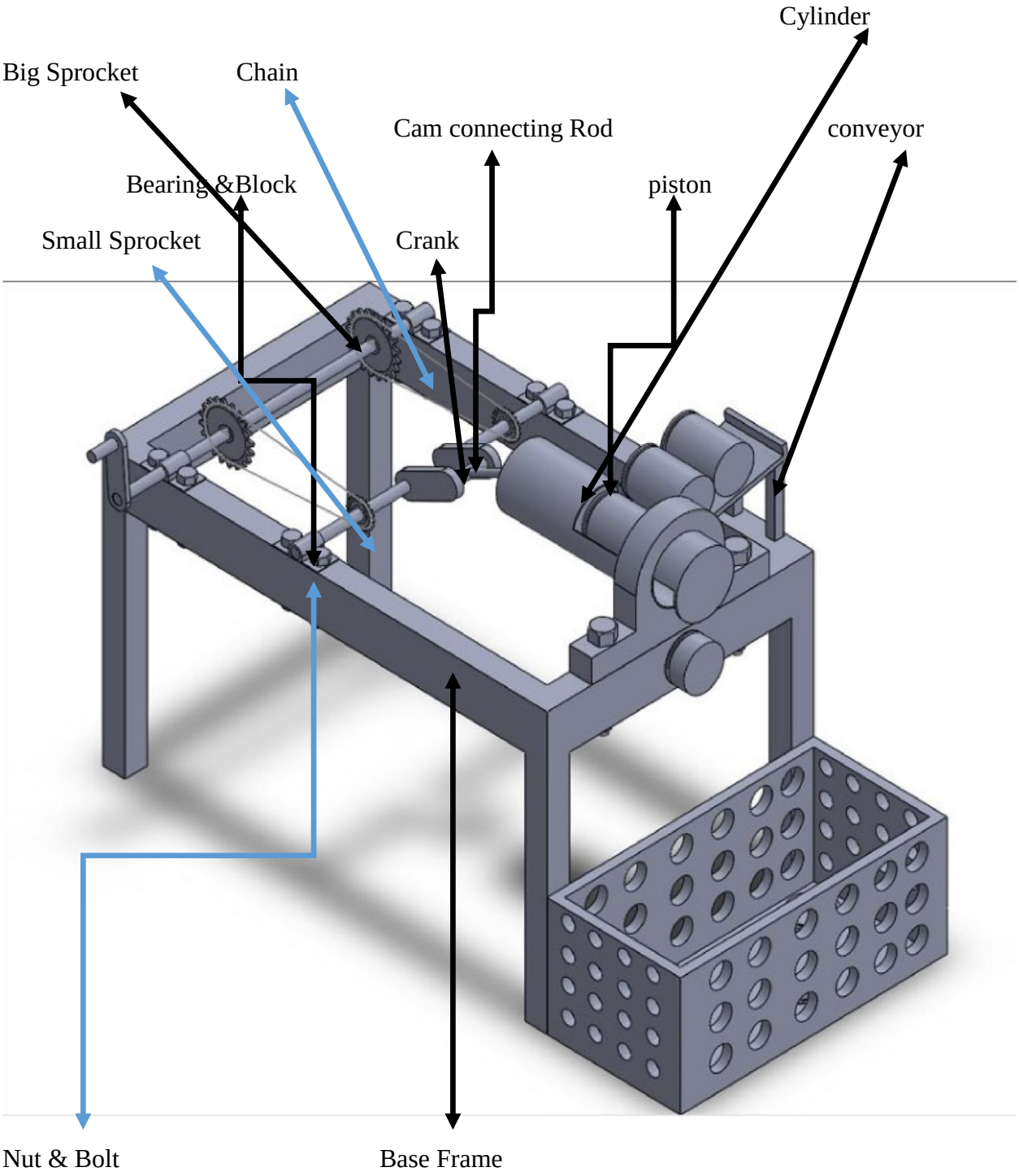
4.13.7 Small pinion:



4.13.8 Top view:



4.14 Final Construction Apparatus:



CHAPTER 5: OPERATION INSTRUCTION FOR A PADDLE POWERED CANS CRUSHER

- **Notice Item of press**
- **Lubrication System**
- **Maintenance and Safety Introduction**
- **Troubles and Remedies**

5.1 Notice Item of press:

1. Please peruse the operation instruction in detail before operating press.

2. Please take priority to choose hand hopper function so as to protect operator's safe .when you use hand electric switch function, the press should be equipped eye protector.

3. The distance between electric hand switch and working area should be not less than 350mm, otherwise it may cause accident.

4. It is no permission putting hand into slide block work area when the press works.

5. Plants should train the new hand for three months to six month.

6. Operator should check whether everything is ready or not. Then you can start the press.

7. Before starting the press, idle the machine for one to three minutes .It s no permission to operate the press on trouble condition.

8. Operating the machine is a simple and dry work which is easy to bring whiny mood so worker should work continuously less than eight hours.

9. When setting cam drive check the machine, it is necessary to hang a caution plate which is striking.

10. Regular inspection of the press should be done by professional checker .It's no permission starting the press when repairing or cleaning the machine.

11. Operating should pay attention to the working state of the press. Once you find any abnormal noise or variation, please stop and check it.

5.2 Lubrication System:

The press adopts dispersive lubricating mode. (Fig.1)

There set lubricating or grease sports on left and right bearing bushes, left and right connecting rod lubrication, press box down side lubricating, chain fill up grease. Users should fill in oil or grease on lubricating sites before start the press. You should also pay attention to lubrication situation during work. Once you find lack of oil ,stop the press and fill in oil to prevent machine parts from being damaging. You should especially notice the lubrication situation of cam drive mechanism, motor shaft bush, press box.

Adjusting mechanism of inclinable device should be filled up grease before work.

5.2.1 Description Lubrication System:

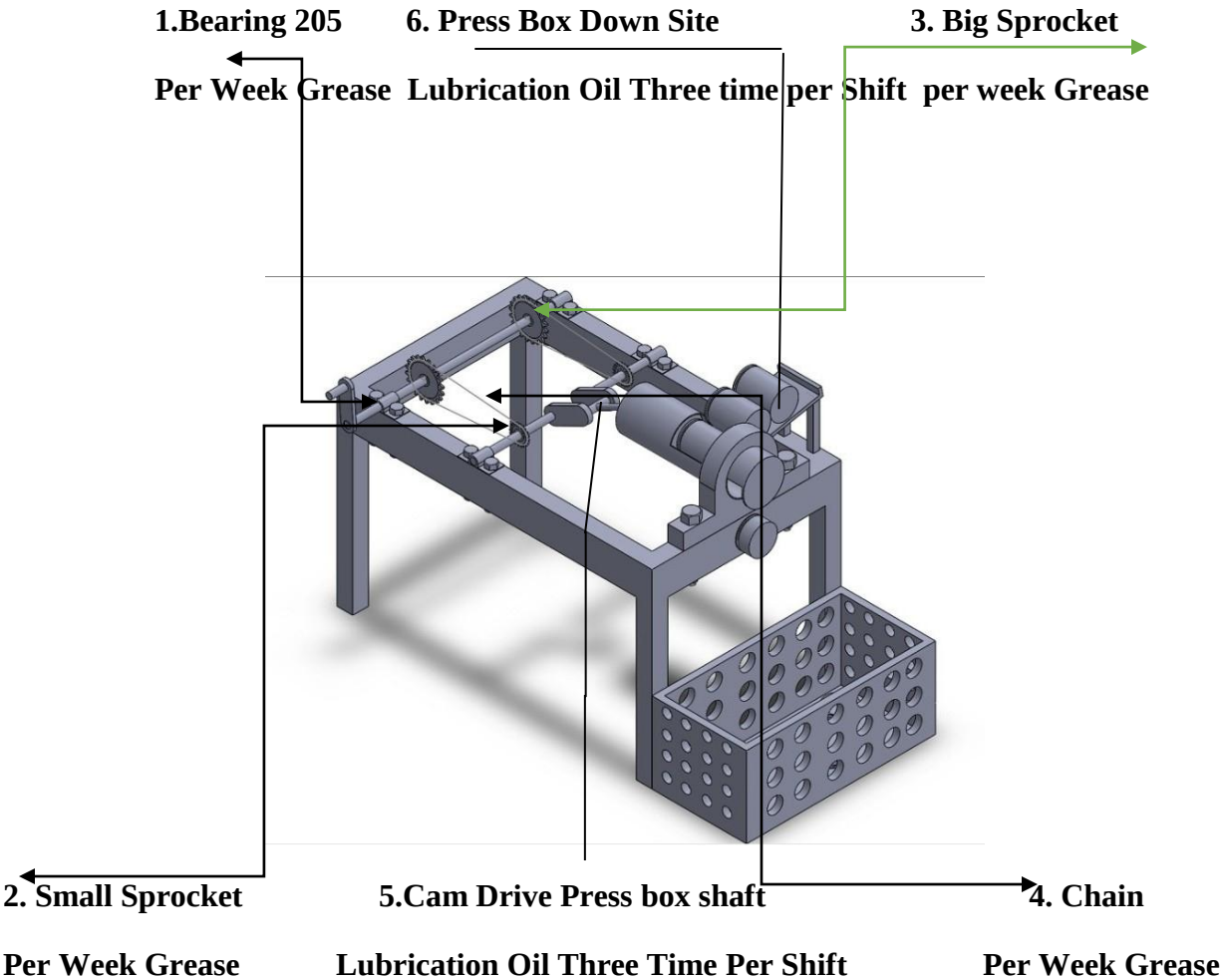


Fig 5.1: Lubrication system drawing.

5.3 Maintenance and Safety Introduction:

1. You should start the motor only after the cam drive come way.

2. It’s no permission to start the press when the cover is removed.

3. Pay attention not to putting your hand onto the hand switch usually to avoid causing accident.

4. When working on shallow drawing, the material must be cleaned and be lubricated.

5. It’s no permission to punch two piece of aluminum beer can on the same time .

6. Cheek the lubrication situation and fill up oil on time.

7. Poor quality finished product, please stop the press and cheek it.

5.4 Troubles and Remedies:

Table 5.1DescriptionTroubles and Remedies

Name	Trouble	Cause	Remedy
Press box shaft	Box shaft heat	1. Box shaft over heat and connecting shaft whole size over losses. 2. Lubrication is poor.	1. Regrind shaft or scrap connecting shaft whole. 2. Check lubrication and repair.
Bearing	Bearing broken	1. The press is overload and protector bearing damaged. 2. Grease condition is poor.	1. Replace a new protector bearing. 2. Grease condition check and grease use bearing.
Cam Wheel	Cam Wheel bolt loss.	1. Looking bolt is losses.	1. Tighten locking bolts and cam wheel resetting.
Chain	The chain has been grievers	1. As the tension is high, the chain breaks down.	1. Chain will have to pay the tension check and resetting.
Sprocket	Sprocket teeth broken	1. Chain setting problem. 2. Lubrication is poor.	1. Replace a new sprocket. 2. Check and adjusting chain. 3. Check lubrication.
Chain cover	Chain cover loss	1. Looking chain cover bolt is losses.	1. Tighten locking bolts and chain cover resetting.

CHAPTER 6: ANALYSIS AND RESULT

- **Cost Analysis**
- **Collected data For Coke Can**
- **Collected data For Beer Can**
- **Result**
- **Output**

6.1 Cost Analysis:

Paddle powered can crusher with conveyor:

Table 6.1: Machine Cost Description [5]

Sl. No.	Part Name	Quantity	Rate(Tk)	Amount
01	M.S flat bar 1.5*.5	2kg	80	160
02	205Bearing&Block	02	200	400
03	Sprocket 09 teeth	01	400	400
04	Sprocket 60 teeth	01	600	600
05	Chain 40,42inch	01	500	500
06	paddle	02	300	600
07	Pipe frame	01	300	300
08	MS Shaft	07kg	80	560
09	Nut bolt	12	300	300
10	Bush pipe od=85mm,id 78mm	15”	700	700
11	MS shaft piston od’78	2kg	80	160
12	Bearing 6203	2	270	540
13	M S Angel1.1/2*1.1/2mm	10kg	75	750
14	Frame making with other accessories	01	4000	4000
15	Color	3pcs150ml	150	450
			Total =	**10570 Taka**

6.2 Collected Data for Coke Can:

Figure 6:1: Uncrushed coke can

Figure 6:2: Crushed Coke cans using the fabrication of a motor powered can crusher

Dimensions of the uncrushed Beer cans used for data collection:

Table 6.3: Beer Can data collection

	BEER CAN	AVEARGE	MAAZA CAN	AVERAGE
Diameter (mm)	66mm	66.2mm	32mm	32.5mm
Length (mm)	116mm	116.4mm	22mm	22.4mm

6.4. Results and discussion:

The crushing machine was successfully fabricated and the machine was tested. The machine crushed multiple cans simultaneously with ease both during paddle as well as during mechanical modes of operation. While crushing the cans manually, the cans got crushed with minimal human effort and reduced the fatigue factor of the worker

COMPARISON OF DIFFERENT PARAMETERS FOR PADDLE POWERED CAN CRUSHER

Table: 6.4:Comparison Of Different Parameters [10]

PARAMETERS	MANUALLY OPERATED	OPERATED ELECTRICALLY
Torque Transmission	Less compared to Manually operated	High
Volume reduction of cans	70%	80%
No. of cans crushed in one minute	20	28
Time consumption during the operation	More	Less
Cost of fabrication	Less	High
Efficiency	Less	High
Human effort	Required	Not Required

6.5 Out Put:

Figure: 6.5: Using the constructed machine fabrication for an paddle powered can crusher.

Cans crush from the machine.

CHAPTER 7: CONCLUSION AND FUTURE SCOPE

- **Conclusion**
- **Future Scope**
-

7.1 Conclusion

After the successful fabrication of the Can Crusher, the machine was tested from which web obtained the above-mentioned observations. The cans were crushed up to the desired volume in the manually operated Crusher. Further we have seen that the Cans were crushed to a much smaller volume in the electrically operated one. The crushers have been fabricated keeping in mind about the minimum power requirement and minimum effort to the operator. The manually operated Can Crusher will be suitable for small scale recycling plants while the electrically operated Can Crusher will be suitable for medium or large scale recycling plants. [4]

7.2 Future Scope

1. The currently developed can crusher machine can crush only low strength cans made of aluminum. The machine can be modified to crush cans which are made of medium strength materials.

2. With automation, the system can become more robust.

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