FABRICATION OF PNEUMATIC CAN CRUSHER

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***Abstract*: The main aim to make such a mechanical oriented project is to reduce the scrap volume and use it for recycle purpose properly. Even though there are many types of can crusher machine in the market, the completion of the new model provides a more practical usage than previous one. Swacha Bharat Abhiyan is a cleanliness campaign ran by the Government of India, which started on the 145th birth anniversary of the great person Mahatma Gandhi. The main aim of the project is to contribute towards the cleanliness drive. Initially the machine can accept only cans but with further modification it would be able to accept various other types of beverage containers too like plastic bottles. The machine would be installed at various locations like parks, malls, stadiums, bars and various public places. It has been observed that tin cans constitute significant part of garbage at public places. In order to recycle and process these cans, their collection and transportation is necessary. This paper talks about detailed design of a tin can crusher. Tin can crusher helps achieve 65% volume reduction and reduces transportation costs. It is compact in size and can be operated manually by hand. It will help to keep the earth neat and clean as the model is eco-friendly.**

***Index Terms*–Scrap volume, beverage container, recycling, pneumatic**

1. INTRODUCTION

This project consists of designing and fabrication of an automatic can crusher machine. A can crusher can be defined as a device used for crushing aluminum cans or plastic bottle for easier storage in recycling bins thereby giving you extra space by crushing of cans. The main aim of the project is to reduce the scrap. In order to reduce the waste, we planned to create a can crushing machine that will reduce the volume of aluminum cans by approximate 75 percent by which transportation volume will increase and transportation cost will reduce. We can crush Cold drinks cans and other beverage cans by using this machine. Commercial establishments like cafeteria and bars, have to deal with leftover cans. Storage is often a problem and cans consume lot of space, thereby increasing total volume of trash. The transportation cost is also high for moving such a huge number of cans. This machine will help to recycle and maintain eco-friendly environment also.

In 1972, approximately 26,500 tons of aluminum cans were recycled and today that number is estimated to be as high as 800,000 tons. Even though the billions of cans recycled around the world, there are still billions of aluminum cans every year that are being disposed of roadways and in trash cans. Besides, sorting is a time consuming and costly process. One of other difficulties of recycling aluminum cans is the necessity to reduce costs of shipping of these cans due to transportation of huge cargo. This problem could be solved using can crusher.

The proposed machine will crush the can approximately by 75%, thus facilitating more number of can's to be stored in one place and thereby reducing the transportation cost. As it would be installed at various locations the cans would be automatically segregated from other trash thus saving time and money of the respective company.

2. OBJECTIVES

- In order to reduce the waste, we planned to create a can crusher that will reduce the volume of aluminium cans up to eighty percent.
- To develop a tin crushing machine with a compact size and shape, that can be installed anywhere easily.
- To reduce the cost of transportation of the aluminium scraps and to keep the environment clean.

3. PROJECT PLANING

To start of this project, a meeting with supervisor in the first week is done to manage the schedule of weekly meetings. The purpose is to inform the supervisor on the progress of the project and guided by the supervisor to solve difficulty.

Briefing based on the introduction and next task of the project is given by supervisor. Make research of literature review with the means of the internet, books, available published articles and materials that is related to the title.

Designing phase start of by sketching few model models using manual sketch on A4 papers. Following up, is the fabrication of make some method for this project. Choose the material, make some list for the material and dimension. Do it planning of fabrication process for this project.

After that, start the fabrication process. It would take seven weeks to get this design and fabrication process alteration done. Make some analysis and testing for the project. Do the correction for error this project. Finish the fabrication process with painting process.

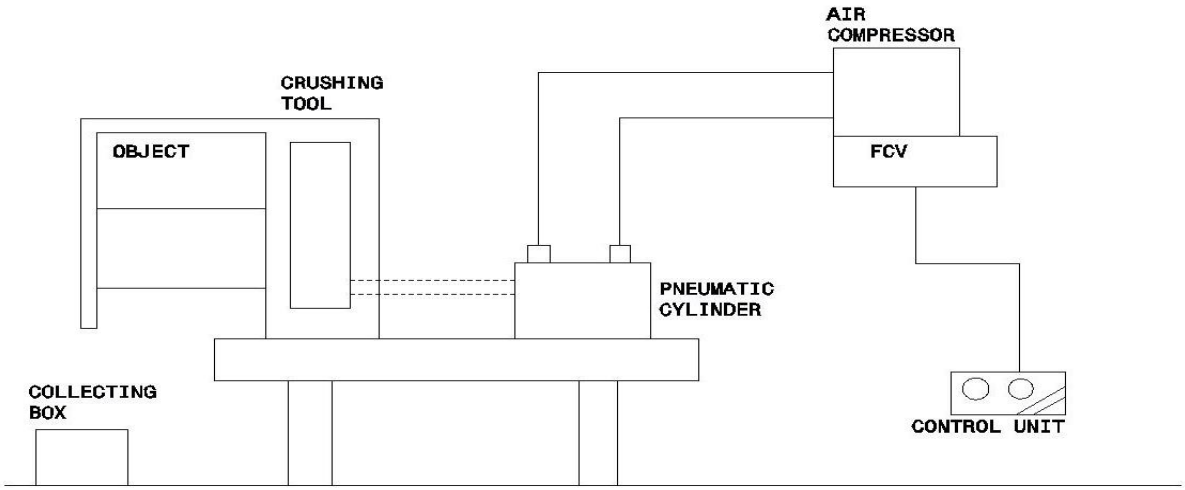

Fig 1 Line diagram for pneumatic can crusher

4. PRINCIPLE OF OPERATION

This can crusher is operated under pneumatic principle. This pneumatic cylinder is powered by compressed air. Hand liver is used to control the pneumatic cylinder movement. By using this hand liver we can operate the pneumatic cylinder front and back, this movement is used for can crushing operation.

The compressed air is stored in the compressor cylinder. This compressed air is given to the pneumatic cylinder through hand liver. This hand liver will give the front and back movement to the pneumatic cylinder based on that movement. In this machine inlet and outlet is provided for cane movement.

Used cane is dropped to the machine through inlet, then it crushed by pneumatic cylinder. The crushed can will come out from the machine through outlet way**.**

5. COMPONENTS USED

5.1. PNEUMATIC DOUBLE ACTING CYLINDER

Pneumatic cylinder consists of A) PISTON B) CYLINDER.

The cylinder is a Single acting cylinder one, which means that the air pressure operates forward and spring returns backward. The air from the compressor is passed through the regulator which controls the pressure to required amount by adjusting its knob. A pressure gauge is attached to the regulator for showing the line pressure. Then the compressed air is passed through the single acting 3/2 solenoid valve for supplying the air to one side of the cylinder.

Fig 2 Pneumatic cylinder

5.2 SOLENOID VALVE WITH CONTROL UNIT

A solenoid valve is an electromechanical device in which the **solenoid** uses an electric current to generate a magnetic field and thereby operate a mechanism which regulates the opening of fluid flow in a valve.

Control unit is an electronic device which automatically opens and closes the solenoid valve according to electronic signal from the micro controller.

Fig 3 Solenoid valve

5.3 MICRO CONTROLLER

A micro controller is an electronic circuit controller system which can be programmed to synchronies the movements of the pneumatic cylinder

Fig 4 Micro Controller

5.5 RESIPROCATING AIR COMPRESSER

Reciprocating Air Compressor is a positive displacement air compressor in which air is sucked in a chamber and compressed with the help of a reciprocating piston. It is called as positive displacement compressor because air is first sucked in a chamber and then compression is achieved by decreasing area of the chamber. The area is decreased by a piston which does reciprocating motion.

Fig 5 Reciprocating Air Compressor

6. DESIGN PERIMETER

6.1 PNEUMATIC CYLINDER

Maximum Pressure range of pneumatic cylinder :-P = 0.1 - 0.7 MPa

Diameter of piston **:-** 0.02 m

6.2 CRUSHING CYLINDER SHAFT

TABLE 1 Specifications of Shaft

Diameter	10 mm
Length	100 mm
Modulus of elasticity	200 GPa
Material Used	Stainless Steel
Yield Stress	315 MPa
Ultimate Stress	505 MPa
Poisson's ratio	0.29
Density	8000 kg/m^3

7. Results and Discussion

- Manual controlling of this operation is also possible with the help of a simple cycle pump that acts like a compressor and reduces cost.
- This mechanism is very easy to operate and occupies less space compared to other Automatic Can Crushers. This machine is also very easy to fabricate.
- As this component is less expensive and it can also be operated by a simple cycle pump, it can be installed in every small shop where beverages or any other type of cans are sold.
- The time taken to crush one can and then to collect it in a collecting box will take around 15 to 18 seconds.
- In manual operation, i.e., while using a cycle pump, the power generated to crush the can is less and also it can operate only for one pneumatic cylinder at a time.
- In automatic operation, i.e., while using a compressor, the power generated is more and both the pneumatic cylinders can be operated simultaneously. This is made possible by the Solenoid Valve with a control unit.

Fig 6 Mechanism of the machine

8. Conclusion

- Thus with the help of this design we can fabricate an automatic can crusher machine to simply reduce the volume of cans as well as to reduce the human effort.
- Through experiments and tests, we can conclude that the efficiency of the volume of the crushed can will remain the same if we use a compressor or a cycle pump.
- Hence when we compare the two methods, using a compressor will be more efficient than using a cycle pump, but, using a cycle pump will save a lot of money.
- We can opt for a compressor in large scale recycling industries and opt for a cycle pump for small industries, shops, bars etc.
- This work holds well in both small and large scale industries and is completely eco-friendly.
- From this work, we can get to know that the working operation used is an easy operation, since pneumatics is used for providing effort for crushing.

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