Fabrication of Can-Crusher Using Quick-Return Mechanism

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Abstract:

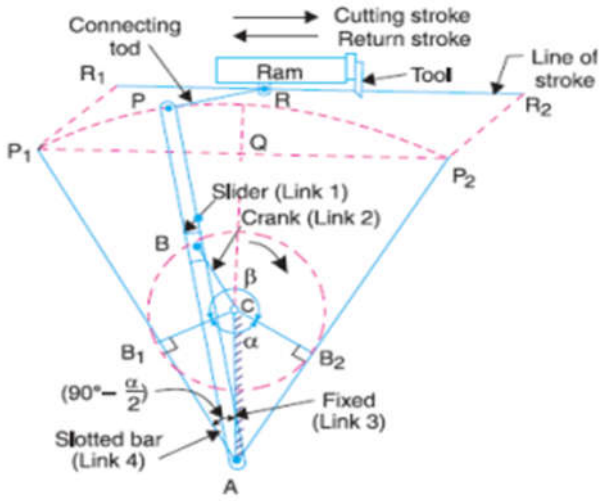
Can Crusher is a crushing machine which pounds various kinds of delicate and hard materials. The can or bottle smasher machine is utilized to reduce the size of can that reduce the transportation volume and in this manner to diminish the transportation cost. In this manner the plan and examination of different parts are essential. This paper is identified with plan and creation of can smasher. Many of the researcher worked in this area to achieve optimum result but still there is some area of scope with respect to this structure and examination. The Electric Motor and a microcontroller is used for manufacture and collecting techniques this undertaking. Still there are various would crusher be able to display in the market, the finishing of this new model gives a more down to earth utilization than past one.
Keywords: Can Crusher, speedy return mechanism, piston.

1. INTRODUCTION

The design and fabrication of this project is based on single slider which uses crank mechanism. The design is is considered in such a way that developed maximum crushing force. The design of this can crusher is optimized in such a way that reduce the volume at maximum extent. For aluminum cans the volume is reduced by seventy percent after crushing. The aluminum can is mostly utilized for packaging of hot and cold drinks d in high amount.it is very difficult for Storage of leftover cans that expend parcel of room, along these lines expanding all out volume of waste. If the leftover cans is transported in natural state it will occupy large area ad increased amount of transportation cost. This venture includes the way toward planning the various pieces of the smasher machine thinking about the powers and ergonomic factor for individuals to utilize. This task mostly about producing another idea of can smasher simpler to ship anyplace and simpler to squash jars. After structure has finished, it was changed to its genuine item where the plan is use for rules.

2. EXPLORATORY SET-UP

This speedy return instrument is for the most part utilized for pulverizing jars. In this fast return instrument, the connection AC (for example connect 3) shaping the turning pair is fixed, as appeared in Fig 01. The wrench CB rotates with uniform angular speed about the fixed point C. A sliding square connected to the wrench pin at B slides along the opened bar AP and consequently causes AP to sway about the rotated point A. A short connection PR transmits the movement from AP to the smash and responds along the line of stroke R1R2. The line of stroke of the smash (for example R1R2) is opposite to AC created. The forward or cutting stroke happens when the wrench turns from the position CB1 to CB2 (or through a point β) in the clockwise bearing. The arrival stroke happens when the wrench turns from the position CB2 to CB1 (or through point α) in the clockwise bearing. Since the wrench has uniform angular speed, Crank and opened switch snappy bring Mechanism back. This is shown in Fig.01



(Fig.01)

3. WORKING OPERATION

Cans smasher depends on the single slider crank instrument convert the revolving movement to reciprocating motion. A can smasher is essentially commonly made out of a solitary slider wrench instrument to drive a cylinder forward or switch in reverse. At the point when the smash pushed ahead it pulverizes the jars and return back with in lesser time as that of forward movement. In this manner squashing is quick. By the responding development of the cylinder, can is squashed effectively by the system. As the wrench begins turning about pt. 'A', it additionally transmits movement to slider. As the slider is fitted inside the opened switch, the opened switch begins swaying about pt. 'B'. The forward stroke is making a larger angle with respect to backward stroke henceforth forward stroke is takes additional time than bring stroke back. Consequently this component is called as speedy Return system.

4. DESIGN PROCEDURE

The point of this is to give the total structure data about the twofold side would crusher be able to machine. In this, the clarifications and some different parameters identified with the undertaking are incorporated. With references from different sources as journal, design data book, literature review information has been done to gather data identified with this venture. The working of the task picture has been made and its picture position is taken and transferred

5.1Force Required to Crush the Soda/Pepsi Can

For a normal Aluminum can, we have some data

Thickness of the can wall = 0.097mm

Diameter of can = 66.04mm

Length of the can = 122mm

For Al3004 alloy, modulus of elasticity (E) = 70 GPa

And Poisson's ratio (μ) = 0.33

Now, to find the crushing load for the can, we need to find out the axial compression load that will compress the can. That load can be found out using following expression:

$$\mathbf{Ax = Et / \{3(1-\mu 2)\}^{0.5} r}$$

Where,
E= Modulus of elasticity
t= Thickness of the cylindrical wall of can
μ=Poisson's ratio
r=Radius of cylindrical can
Here, putting the values of all the known quantities, we have got the minimum value of Axial Load that will crush the can i.e. **Ax = 133N**

4.2 Calculations of force available on the piston that will hit the Can

Mass of the piston, M=2kg
Speed of motor, N=30rpm
Radius of crank, R=120mm
Length of connecting rod, L=300mm
Now angular velocity ω=2πN/60=3.14rad/s
Now L/R=n
n=300/120=2.5
Now, displacement of piston, x=R (1-cosθ)
Since it is decided that the distance moved by the piston is 100mm
Hence, θ=80.4
Since sinβ=sinθ/n, hence β=23.22
Now by hit and trial method we have found the required power of motor should be 0.5HP
I.e. 373watt hence
Since P=2πNT/60
T=59.39Nm
Ax = 133N
Now crank effort, FC=T/R=59.39/0.120
FC=494.5N
Now effort provided by the piston,
F=FCcosβ/sin (θ+β)
Hence **F=467.5N**
As we can see that the force required to crush the can is less than force available at the piston head hence the can will be crushed successfully.

4.3 Volume Reduction

Can Dimensions:
Diameter =67 mm (32.5mm in radius),
Height =124mm
Volume of one uncrushed can
$V = \pi r^2 h$
$V = \pi \times 32.5 \times 32.5 \times 124$
$V = 411.47 \times 1000\ mm^3$
Volume of one can reduced by 70%
$V = \pi r^2 h \times .3$
$V = \pi \times 32.5 \times 32.5 \times 124 \times .3$
$V = 411.47 \times 1000 \times .3$
$V = 123.441 \times 1000\ mm^3$
Height of a crushed can (height reduced by 70%)

h = 124×0.3
F=467.5N
h =37.2 mm
Volume of 20 uncrushed cans
V =πr^2h x 20
V=π x 32.5 x32.5 x124 x 20
V= 411.47 x 1000x 20
V= 8225230mm3
Now, Volume of 20 crushed cans reduced by 70% in height
V =πr^2h x .3 x 20
V =π x 32.5 x 32.5 x 124x .3 x 20
V = 123.441 x1000 x 20
V = 2468820 mm^3
The reduction in the volume comes out to be 69.98%.

4.4 Crushing Rate

Crushing rate may be defined as the number of cans crushed per unit time 'or' the rate at which cans are crushed.
Time taken to crush a single can = 4sec.
Then,
Number of cans crushed in one hour =3600/4
Number of cans crushed in one hour = 900Cans.
Therefore, Total can crushed in one hour is 900 with manual operation.
Hence, **the Crushing Rate is 900cans/hr. (approx.)**

5. FABRICATION

After consummation of planned stage manufacture forms is begun. The material determination and creation of the item base on the structure measurements. Different mechanical procedures for created the planned segment according to measurements are utilized to manufacture the item are welding, cutting, twisting, crushing, penetrating and a lot more strategies. Creation Process is a procedure wherein the ideal item is produced with the assistance of many assembling process.

5.1 Mechanical Components

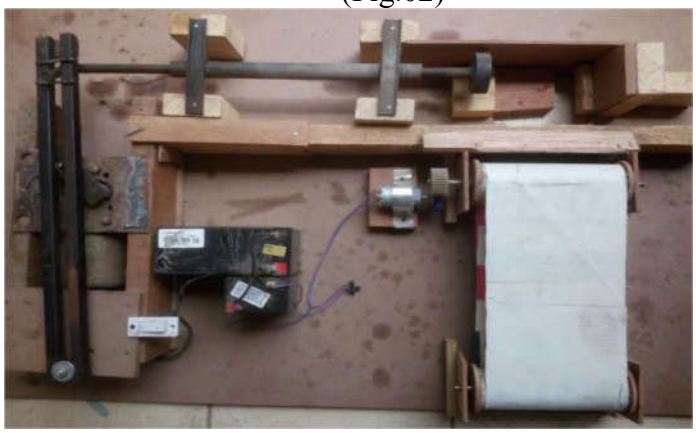
- Shaft
- Crank and slotted lever Mechanism.
- Separating Bin
- Crushing Tray
- Piston

5.2 Machines Used

- Drilling machine
- Lathe machine
- Milling machine
- Grinding machine
- Welding machine

6. FABRICATED CAN CRUSHER

(Fig.02)



(Fig.03)

7. RESULTS & CONCLUSION

- Axial Load that will crush the can. Ax = 133N
- Force available at the piston head. F=467.5N
- The reduction in the volume comes out to be 69.98%.
- The Crushing Rate is 900cans/hr. (approx.)

The structure been grasped for the production of totally customized jars smasher machine which will make the thing extreme for the long time similarly as make it compelling and besides helps with understanding arrangement. The formation of a modified would crusher be able to machine diminished the volume of containers to around 70% similarly as to decrease the human exhaustion. In like manner the customized movement can be possible using the mechanical power transmission worked by electric motor or electric actuator, etc. This only will reduce the volume of the containers or containers to diminish transportation cost by decreasing its volume.

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