

"EFFICIENT POUNDING MACHINE USING LEVER"

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Abstract: Pounding machines are the machines which are also known as kandap machines. It is used for pounding spices and making powder of grains. Pound means to strike or hit heavily or repeatedly. Generally, power required for pounding machine is about 3 HP at 1440 rpm. It is seen from literature review that all the machines consumes more power which is expedient from economy point of view. Hence, this innovative project is under taken to reduce power consumption which is significant. Engine works with the help of inertia effect giving more power than it has consumed. Based on this effect, the engine is connected to an electrical motor which is used to provide an initial start to the perpetual lever engine; thereafter it begins to operate with minimum power due to inertia effect of flywheel. For single pound, approximately 100 rpm is required. By using lever principle and taking help of mechanical advantage, this machine runs on 0.5HP motor. Hence, power required is considerably reduced from 3 HP to 0.5HP. This low power required is further taken from integrated solar panel. This Lever based pounding machine can be used to pound a variety of spices, roots and grains. It is an environment friendly machine which can be easily integrated with both household electricity and solar panels. Unlike conventional Pounding machines which are designed to perform a singular purpose. The lever engine based pounding machine can serve multiple purposes with a low energy input and high efficiency.

Keywords– Solar, Pounding, Lever, Mechanical Advantage, Power consumption, Multi purpose

I. INTRODUCTION

Materials like Charcoal, Chalk and even exotic spices need to be processed and powdered before putting it to Industrial and Domestic usage. With the advent of Globalization and the rise of in industrial competition, The demand for powdered goods has increased drastically. In order to fulfill the demands and satisfy each customer, Many Large and medium scale organizations have taken aid of Electrically powered pounding machines in order to meet Large customer demands and reduce the cost involved in employing Skilled and Unskilled labor. Even though most organizations use an Electrical motor based pounding machine, The concern of utilizing Excessive amounts of Non-Renewable Electrical energy which has negative effects on the Environment tends to supersede the value of the profit earned. The project deals with this problem by using the Lever based engine. Lever Principle and Mechanical Advantage. "Give me a place to stand on, and I will move the earth." said the great Greek mathematician and physicist Archimedes. A lever is a machine consisting of a beam or rigid rod pivoted at a fixed hinge, or fulcrum. A lever is a rigid body capable of rotating on a point on itself. On the basis of the location of fulcrum, load and effort, Maintaining the Integrity of the Specifications. The principle of levers can also be understood by Varignon's Theorem of moments which states that the moment of a resultant of two concurrent forces about any point is equal to the algebraic sum of the moments of its components about the same point. In other words, "If many coplanar forces are acting on a body, then the algebraic sum of moments of all the forces about a point in the plane of the forces is equal to the moment of their resultant about the same point. Perpetual machines are those machines which run continuously. As we know any machine to run continuously we need a force to be always acting on it to run it continuously in Modern day Mechanics.

It is only possible when input is more than output. So perpetual machines are impossible as per Newton's third law of motion. But as we know science is far ahead beyond Newton's classical laws; And lever principle provides an output far greater than the input provided by the principle of conservation of moment or Varignon's theorem. The lever engine provides a larger output by lifting a weight of approximately 140kg by providing nominal input of 100-200 watt. This is possible due to the obtained Mechanical advantage in the lever assembly because of which the machine takes minimum input to produce a larger output and therefore behaving somewhat like a perpetual machine.

II. LITERATURE REVIEW

Mohd.ShahjadAspak Sheikh [1] designed and fabricated a Bicycle, provided to transmit rotary motion between two shafts where gears are unsuitable or to impart linear motion. This gives rotation motion to the flywheel of approx. 10kg. It is often a part of a cylinder shaft that strikes a lever at one or more points on its circular path. This cam is used to deliver pulses of power to a steam hammer. This cylindrical hammer moves up and down and helps to crush the chili **A Odior, E Orsarh [2]** Yam is a daily nutritional food requirement for man and in order to facilitate the processing of yam for consumption, a yam pounding machine has been developed using mainly some locally sourced materials. The machine consists of a shaft, pulleys, belt, bearings, electric motor, yam beaters, bowl and the frame. The machine was developed to enhance the hygienic processing of yam for both domestic and commercial consumption, while eliminating the tedious process of preparing pounded yam. **pounding machine. Oweziem Uchenna et al [3]** focused on the design of an electromechanical yam machine consists of a shaft, electric motor, trough, propeller (yam beater), pulleys and the frame with vents for adequate cooling of the machine during operation. The maximum volume of yam pounded was gotten to be 6000000mm³ while a power requirement of 1 hp was needed to drive the machine. From experiment carried out in using the machine to pound three different species of yam, it was observed that irrespective of the improvement done on reducing overheating during pound, it pounds in less time compared to the already existing ones. **Alexander Slocum [4]** in his lecture 'Fundamental of Design' stated that the simplest mechanism, and perhaps the first, is a lever and a fulcrum. The lever is a link, the fulcrum a joint, and the ground is also a link. Together they form a 2-bar linkage. These simple elements (a tree branch and a rock) with a force can create huge forces to do useful work. Once a person witnesses the mechanical advantage offered by a lever, they never seem to forget it, and often use it. From using a pry bar, or sometimes naughtily a screwdriver, to pry open a box, to a wine bottle opener, many of us use levers in our daily lives. A pair of pliers is essentially two levers that share a common fulcrum and hence are essentially levers placed back-to-back. Scissors shear paper (and rock smashes scissors) and the mechanism is again a pair of levers placed back-to-back with a common pivot

III. OBJECTIVE

Reducing human effort

Improving Rate of production (Mass Production)

Eco-Friendly

Reduce power consumption.

Can be Integrated with solar panels

IV. PROBLEM DEFINATION

Traditional Pounding machine mainly consists of a high power 2-3 HP x 1440 rpm motor, 2-4 hammers (as per design specification of the machine), and cam and followers. It is used for crushing and making powder of various spices, roots, charcoal, and chalk for industrial as well as for domestic purpose. For running this machine high volt and continuous supply of electricity is needed. Electrical power up to 1.15kW to 2kW power is required. For developing country like India, it is difficult to get this kind of electrical supply in every nook and corner. So, at these places pounding becomes a difficult task and to complete it people have adopted the manual method, in which they pound the spices using hammer by themselves only. This process takes a lot of time and manpower and makes the job tedious.

V. METHODOLOGY

The Ozzo-G engine provided by the Perpetual Gravity laboratories works on the lever mechanism. Because of this lever, we are able to get more power at output than at input side. By designing the suitable attachments to this engine, we will able to perform various operations like pounding, mixing and etc. Thus, this project focuses on designing and manufacturing

attachments for making an Efficient Pounding machine. The lever fulcrum in existing machine is towards the force arm end of the lever. so by changing the fulcrum position towards load arm it get mechanical advantage.

VI. WORKING

Pounding Machines are machines which are also known as Kandap Machine. It is used for pounding spices making powders of grains. A pounding machine consists of a set of heavy steel pounds, loosely held vertically in a frame, in which the pounds can slide up and down. They are lifted by cams on a horizontal rotating shaft. In pounding machine, the camshaft is arranged to lift the pounds from the side, so that it causes the pound to rotate. As the cam shaft moves from under the pounds, the pounds falls onto the material below, crushing the rock, spices, roots etc and the lifting process is repeated at the next pass of the cam. Jas enterprise specially designed lever to lock or unlock the pounding process. Presently majority of pounding machines have lever. The lever fulcrum in existing lever is towards at force arm end of the lever. In these machine fulcrum is towards load arm end to get mechanical advantage. So by using lever engine called Ozzo-G lever engine and keeping rpm approximately 100 pounding per minute, Single Pound. These machine can be operated by photovoltaic solar panel of 230watt. Normal Pounding machine takes lot of energy. The country like India where electricity is not available at every nook and corner. So pounding at these places is done manually, which is time consuming and inefficient. So to tackle these problems, pounding machine which working on lever principle consume less energy. And if it is integrated with solar panel that electrical energy is also not needed.

Below figure shows the existing pounding machines which works on cam and follower mechanism.



Figure 1



Figure 2

Figure 3 SPECIFICATION: 1)Motor power:3HP

2)Number of pounds: 6

3)Working principle: Cam and follower

The Lever based pounding system takes assistance of a Lever engine whose dimensions are listed below: Following are the components used:

- 1 Hammer(s)
2. Hammer Guide plates
3. Cam
4. Cylindrical vessel
5. knuckle joint
6. Pivot.

Ozzo – G Engine is a Mechanical Multiplier Gravity Engine which takes less mechanical power and output multiple times more than the mechanical power. It multiplies the input power and gives the output which is higher as compared to power

consumed. This power is then used to obtain the required force to obtain the crushed/powdered material. One of the most important aspects of the design of such a machine is determining the ideal position of the hammer on the lever. The problem is solved by placing the hammer at the outmost extent on the lever. This is done in order to obtain the maximum speed of pounding along with sufficient pounding weight. A weight of approximately 3Kg is desirable for the hammer in order to obtain the powdered product.

Solid works model of lever based pounding machine:

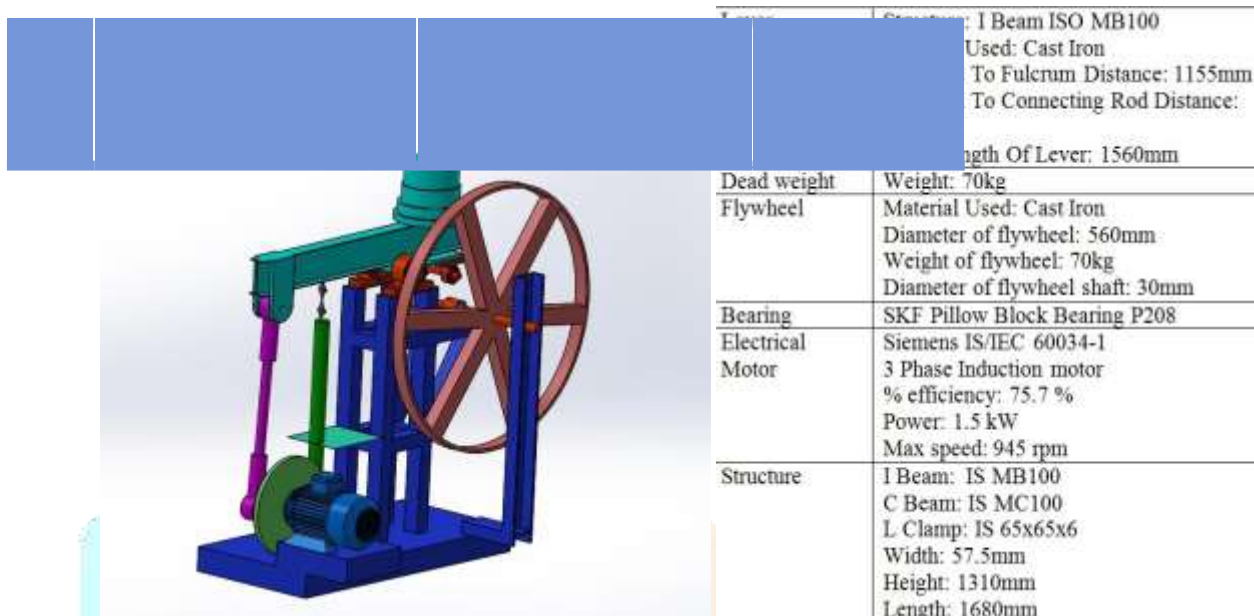


Figure 4

VII. RESULT AND COMPARISON WITH CONVENTIONAL MACHINE

This section compares a conventional Pounding machine and its specifications with the Lever engine-based Pounding machine.

SR NO	PARAMETERS	TRADITIONAL POUNDING MACHINE
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LEVER BASEED

MACHINE

1	Motor	2-3HP	0.5HP
2	Speed (rpm)	1440rpm	100rpm
3	Purpose	Single purpose	Multi purpose
4	No of hammers	4-6 hammer	1-2 hammer
5	Space consumption	more	less
6	Impact force	90-100N	30-50N
7	Cost	INR 1-1.15LAC	INR 65-75K

ECONOMICAL ASPECT : These project is not only based on purely mechanical components but is also powered by solar energy by integrating the electrical motor to solar panels as power required to run this machine is low which gives it an edge over other conventional pounding machine. Along with providing large quantities of powdered goods at minimum labor and maximum efficiency, the machine is also environment friendly and cost effective due to its minimum maintenance cost.

Pounding machine using lever:

Sr. No.	Components	Cost (K)
1)	Motor	3400
2)	Material	25000
3)	Solar panel	14000
4)	Bearing	11000

Total cost	65000 to 75000
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From above table it has been noticed that initial cost of pounding machine using lever is quite high. But the operational cost is very negligible as compared to conventional machine because of solar panel.

1] MECHANICAL ADVANTAGE:

Load = 220.23N Force = 686.7

Therefore, by law of lever

Mechanical advantage = load / force

= 220.23N /686.7

Mechanical advantage = 0.32

2] HAMMER IMPACT

a) force exerted by hammer=5.360 b)

diameter of hammer (d)= 40mm c) area of

$$\text{impact} = \pi/4 \times d^2$$

$$= \pi/4 \times 40^2$$

$$1256.63\text{sqmm}$$

Pressure = Force/Area

$$= 5.360 / 1256.63 = 0.00448\text{Mpa}$$

3] MOTOR FORCE

Force imparted by motor on lever

$$P=2\pi NT/60$$

$$0.37285 \times 10^3 = (2\pi \times 100 \times T)/60$$

$$T=35.59 \text{ N-m}$$

VII. CONCLUSION

The lever based pounding machine multiplies the output force and uses it to produce mechanical work. So the amount of energy consumed by it is minimum. This characteristic of the Lever engine based pounding machine helps it to become an efficient and versatile machine. Due to its Low dependence on input power, The Lever Engine based pounding machine can easily be integrated with Renewable Energy sources. A country like India experiences 300 Sunny days a year, and therefore integrating the Lever Engine based pounding machine with solar panels not only makes the machine independent from household electricity but also increases its portability. Such Solar Integrated Pounding machines can not only be used in underdeveloped villages and towns but also in metro cities. Due to its portability and independence, such machines can also be used to generate Large and medium scale employment in hilly areas where resources and accessibility is limited. By using different sizes and weights of hammer, The range of material which can be pounded can increase to much harder spices and roots such as Turmeric, Sugar, Coffee beans etc. As per the literature review it has been noticed that the present kandap machine takes more power to run the machine. Cost reduction is the major concern of project, so that these machine can be very beneficial to the farmers of our country. Due to the versatile nature of the machine, It can be used to perform different purposes such as Grinding, Paste-making, Pumping etc. This is easily possible by making various attachments which can be mounted and removed easily depending upon the requirement of the user. In conclusion the Lever engine based pounding machine can be used to pound a variety of spices, roots and grains. It is an environment friendly machine which can be easily integrated with both household electricity and solar panels. Unlike conventional Pounding machines which are designed to perform a singular purpose, The lever engine based pounding machine can serve multiple purposes with a low energy input and high efficiency.

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